Newspapers

EXHIBIT A

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Protec of fish puts farm, Bay Area water at risk

By Nancy Vogel
Bee Staff Writer

Efforts to protect a small threatened fish have suddenly blown into a crisis that could disrupt water supplies to San Joaquin Valley farms as soon as next week and to the Silicon Valley later this summer, federal and state water officials said Thursday.

For the past month, federal biologists have forced water project operators to pump less than half what they normally would from the Sacramento-San Joaquin Delta, California's primary source of water, to keep threatened Delta smelt from being killed in pumping plants.

The situation hit a critical point Thursday when the biologists refused to ease the pumping restrictions, which have already lasted two weeks longer than usual because smelt are lingering in harm's way near pumping plants.

"What has emerged in the last 48 to 72 hours is really a water supply crisis," said Steve Macaulay, who represents 20 million water users as general manager of the State Water Contractors.

Demand for water is quickly outstripping the relative trickle flowing south from the Delta, water project officials said.

Allowing so much water past pumping plants and out to the Pacific Ocean will hurt the San Joaquin and Southern California supplies not just next week but for months to come, they said.

"This is a serious situation," said Larry Gage, chief of operations for the State Water Project. "It has the potential at this point of impacting both federal and state water project customers and possibly right away."

Brimming Southern California reservoirs mean cities there have sufficient supplies for the near future, experts said. But if Delta pumping doesn't increase within days, San Joaquin Valley farmers could be forced to watch crops wither in a year of abundant rain and snow, and the Santa Clara Valley Water Agency, supplier to Silicon Valley, may face complete loss of its chief water supply.

Please see WATER, page A21

Water: Fragile smelt only in Delta

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"They need to start pumping more now, in order for us to not lose our federal water supply in eight weeks," said Walt Wadlow, assistant general manager of the Santa Clara Valley Water District.

As it is, federal and state water project operators are drawing down San Luis Reservoir near Los Banos to make up for water that is no longer being shipped south from the Delta because pumps there in May and June killed tens of thousands more Delta smelt than federal protection plans allow. When San Luis, now at 1.2 million acre-feet, drops to roughly 300,000 acre-feet, algae and sediment make the water unusable to the Santa Clara Valley district.

If necessary, the district will switch to groundwater and local reservoirs to serve 1.7 million customers, including high-tech industry, Wadlow said.

Not all San Joaquin Valley farmers have such options. Roughly 4 million acres of farmland, the backbone of a $25 billion industry, are irrigated by the State Water Project and federal Central Valley Project, and farmers have already planted crops in expectation of getting 70 percent to 100 percent of their contract supplies.

"Who is it who goes out and says you, farmer, you can stay in business and you, farmer, lose your crop?" said Jason Peltier, who represents CVP customers as manager of the Central Valley Project Water Association. "We find ourselves with a crisis and no flexibility left in the system."

Since 1993, when the U.S. Fish and Wildlife Service listed the 3-inch Delta smelt, water project operators have typically slowed pumping each May to avoid killing too many of the fragile fish, which are found nowhere else but the Delta.

U.S. and state pumps for the San Luis Reservoir

Bee graphic

But the smelt usually migrate west by the end of May, allowing project operators to accelerate the pumping of water.

This year, perhaps because Delta water is cooler than usual, smelt are lingering within influence of the huge pumping plants in the south Delta.

"Each week we've been through this we thought was the last week, and now it seems like there's not a firm end to the smelt problem," said Chet Bowling, chief of water operations division for the Central Valley Project.

California Department of Fish and Game biologist Dale Sweetnam said that the federal and state pumping plants near Tracy so far in June have killed an estimated 29,585 smelt, while a protection plan backed by the U.S. Endangered Species Act permits the "take" of 10,709 in all of June.

Michael Thabault, a U.S. Fish and Wildlife Service biologist, said there will be no loosening of the pumping restrictions at the moment.

The decision to increase or decrease Delta pumping rests with a team of leaders from more than a dozen federal and state agencies, including the service.

Farm and urban water users on Thursday appealed to those leaders, including U.S. Environmental Protection Agency regional administrator Felicia Marcus and California Resources Agency Secretary Mary Nichols, to increase the flow of water south.

The various agency heads, operating under an umbrella group called CalFed, expect to make a decision about Delta pumping within a week, said CalFed spokeswoman Valerie Holcomb.

To some, the potential water cutbacks are a symptom of how environmental concerns and a swelling population have overtapped California's water system.

"It's just taken more and more flexibility out of the system and we're running into more and more problems," said John Renning, an engineer with the U.S. Bureau of Reclamation, which runs the Central Valley Project.

Peltier blames the "blunt instrument" of the federal Endangered Species Act, saying it gives biologists the power to disrupt billion-dollar economies.

But Gary Bobker, a policy analyst with the environmental group Bay Institute, said water users should simply chalk up the water lost to Delta smelt protection to a 1992 law that dedicated roughly 10 percent of the Central Valley Project's water to fish and wildlife. Environmentalists and farmers have been arguing about how to account for that water since Congress passed the law.

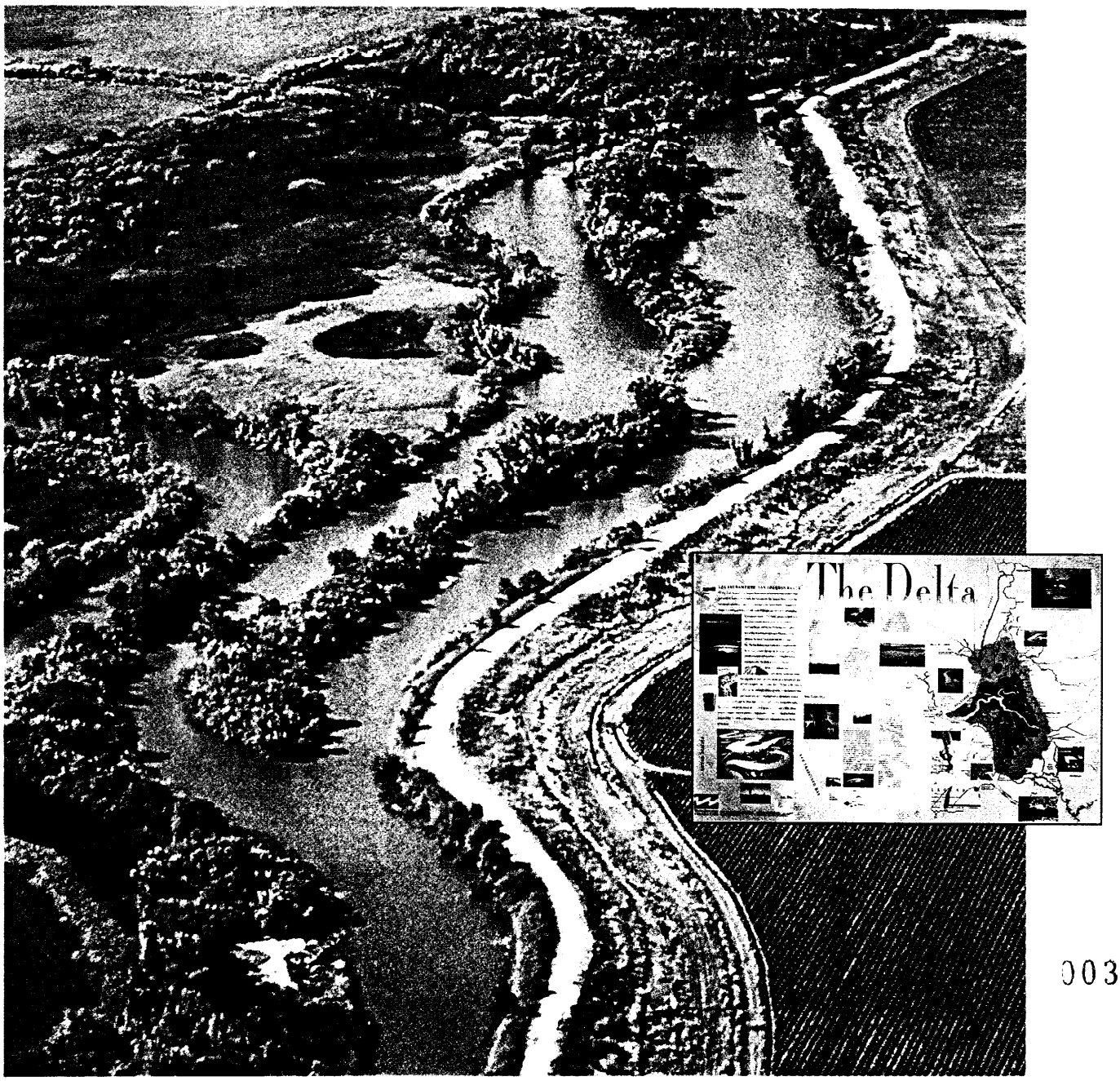
"When is it time to use some of that water?" said Bobker. "It would seem like now would be a good time."

LAYPERSON'S GUIDE TO

The Delta

EXHIBIT B

Prepared by the Water Education Foundation



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Updated 1998

On the Cover:

On the Cover: Comprising just 1 percent of California's total area, the Sacramento-San Joaquin Delta is at the heart of both the state's water supply system and water controversies.

Inset is the Delta Map, a 36" by 24" poster published by the Water Education Foundation. Copies of the map are $8.50 each and can be ordered by contacting the Foundation.

The *Layperson's Guide to the Delta* is prepared and distributed by the Water Education Foundation as a public information tool. It is part of a series of guides which explore pertinent water issues in an objective, easy-to-understand manner.

The mission of the Water Education Foundation, a nonprofit, impartial organization, is to develop and implement education programs leading to a broader understanding of water issues and to resolution of water problems. For more information, contact:

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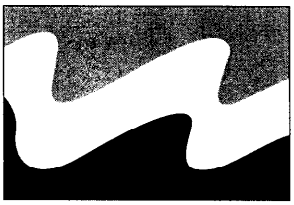

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Introduction

Flowing south, fed by northern Sierra Nevada runoff, the mighty Sacramento River meets the northbound San Joaquin River just south of Sacramento to form the Sacramento-San Joaquin Delta. Here the Sacramento and the San Joaquin California's two largest rivers – mingle with smaller tributaries to form a 700-mile maze of sloughs and waterways surrounding 57 reclaimed islands.

The rivers' combined fresh water flows roll through the Carquinez Strait, a narrow break in the Coast Range, and into San Francisco Bay's northern arm. Suisun Marsh and adjoining bays are the brackish transition between the rivers' fresh water and the salt water of the Bay. The Bay-Delta Estuary is the largest estuary on the West Coast of North America, where the mix of fresh and salt water provides a unique environment supporting diverse plant and animal life.

Originally a haven for trappers in the 1700s and into the 1800s due to abundant wildlife, the Delta later attracted farmers interested in cultivating the region's fertile soil. More than a century ago, these farmers began building a network of levees to drain and "reclaim" this fertile soil. Progressively higher levees were built to keep the surrounding waters out, the lands were pumped dry and the marsh was transformed into productive island farms. By 1930 more than 1,000 miles of levees surrounded close to 500,000 acres of farmland.

The Delta is crucial to the state's overall water picture – it is the heart of California's two largest surface water delivery projects, the State Water Project (SWP) and the federal Central Valley Project (CVP). Since the 1940s, its existing channels have been used to transport water to the projects' pumps in the western and southwestern Delta. From there, Delta water is transported south and west through canals and aqueducts to cities in the north and south Bay Area, millions of acres of San Joaquin Valley farmland and more than 15 million people in southern California.

Water that historically flowed into the Delta also is diverted upstream – before it reaches the Delta – for use on local farms and in distant cities. In total, more than 7,000 diverters obtain water from Delta tributaries or the Delta itself. Two-thirds of the state's residents rely on the Delta for at least a portion of their drinking water.

The Delta also is the state's most important fishery habitat. An estimated 25 percent of all warm water and anadromous sport fishing species and 80 percent of the state's commercial fishery species either live in or migrate through the Delta.

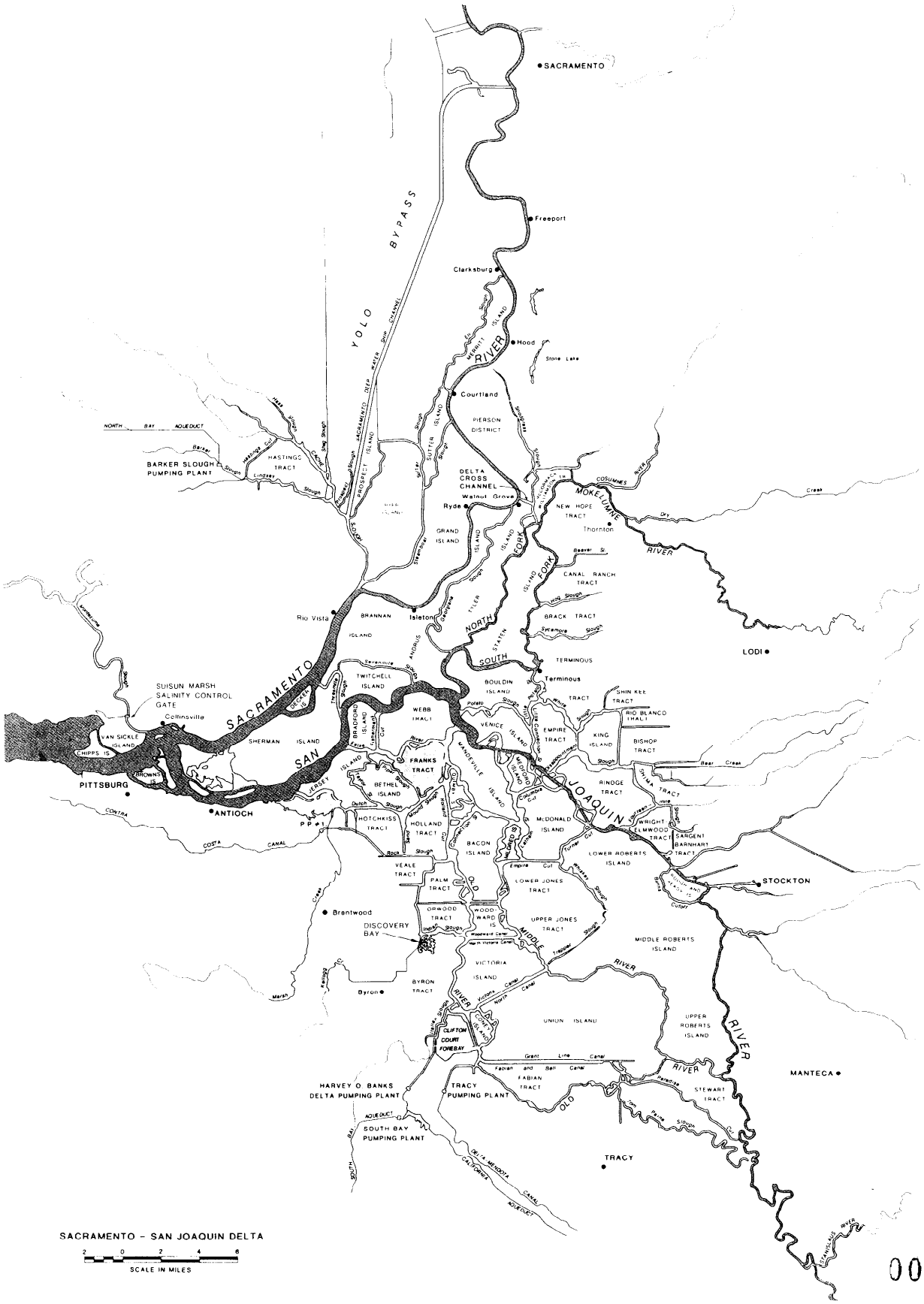
Populations of several species – including striped bass and chinook salmon – have declined because of a combination of drought, entrainment in pumping facilities, poor water quality and the presence of non-native species that compete for food. One of four Sacramento River chinook salmon runs, the winter-run, and the Delta smelt, a small fish found only in the Delta, are protected under the federal Endangered Species Act (ESA), requiring changes in water project operations to help protect them. In 1998, it was proposed that three more runs of Central Valley chinook salmon be added to the endangered species list.

These required changes along with a lengthy drought increased the conflict over Delta water quality, water exports and environmental and recreational values. After years of hearings, months of studies and weeks of negotiations, a landmark Delta Accord was reached in 1994. The agreement among state and federal agencies and the water interest groups – urban, agricultural and environmental – included new water quality standards to protect the estuary, a plan to address non-water project problems and a program to find a consensus-based "fix" to the Bay-Delta.

After working to build consensus between federal, state and stakeholders, the State Water Resources Control Board (State Board) adopted a new water quality plan for the Bay-Delta in 1995. In 1996, CALFED (a joint state-federal planning organization established to develop a Bay-Delta solution) released a phase I report outlining the core programs and three potential solutions. A phase II draft "programmatic" EIS/EIR describing three alternatives for a "fix" was released in 1998 for public review to help determine which alternative will be chosen. The '94 accord, originally set to expire at the end of 1997, was extended until the end of 1998 to allow for more time to determine a solution.

Comprising just 1 percent of California's total area, the Delta is at the heart of both the state's water supply system and water controversies. This Layperson's Guide is intended to provide the reader with a basic background on one of the most fought-over areas in California – the Sacramento-San Joaquin Delta.

This guide's companion is the *Layperson's Guide to San Francisco Bay*. Both are part of a continuing series of guides published by the Water Education Foundation.


SACRAMENTO
Freeport
Clarksburg
YOLO BYPASS
SACRAMENTO DEEP WATER SHIP CHANNEL
Hood
Stone Lake
Courtland
PIERSON DISTRICT
DELTA CROSS CHANNEL
Walnut Grove
Ryde
NORTH BAY AQUEDUCT
BARKER SLOUGH PUMPING PLANT
HASTINGS TRACT
PROSPECT ISLAND
GRAND ISLAND
NEW HOPE TRACT
Thornton
MOKELUMNE RIVER
CANAL RANCH TRACT
BRACK TRACT
LODI
Rio Vista
BRANNAN ISLAND
Isleton
NORTH FORK
SOUTH FORK
TERMINOUS
Terminous
SUISUN MARSH SALINITY CONTROL GATE
Collinsville
SACRAMENTO
SAN JOAQUIN
TWITCHELL ISLAND
BOULDIN ISLAND
SHIN KEE TRACT
RIO BLANCO TRACT
WEBB TRACT
VENICE ISLAND
EMPIRE TRACT
KING ISLAND
BISHOP TRACT
VAN SICKLE ISLAND
SHERMAN ISLAND
CHIPPS IS
BROWNS IS
PITTSBURG
FRANKS TRACT
MANDEVILLE ISLAND
McDONALD ISLAND
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HOLLAND TRACT
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WRIGHT ELMWOOD TRACT
SARGENT BARNHART TRACT
CONTRA COSTA CANAL
VEALE TRACT
PALM TRACT
BACON ISLAND
LOWER ROBERTS ISLAND
LOWER JONES TRACT
STOCKTON
Brentwood
ORWOOD TRACT
WOODWARD IS
UPPER JONES TRACT
DISCOVERY BAY
MIDDLE ROBERTS ISLAND
VICTORIA ISLAND
Byron
BYRON TRACT
UNION ISLAND
UPPER ROBERTS ISLAND
CLIFTON COURT FOREBAY
Grant Line Canal
Fabian and Bell Canal
FABIAN TRACT
MANTECA
HARVEY O. BANKS DELTA PUMPING PLANT
TRACY PUMPING PLANT
STEWART TRACT
SOUTH BAY AQUEDUCT
SOUTH BAY PUMPING PLANT
TRACY
DELTA MENDOTA CANAL
CALIFORNIA AQUEDUCT
SAN JOAQUIN RIVER
SACRAMENTO – SAN JOAQUIN DELTA
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SCALE IN MILES

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Background

Early History

Europeans first sighted San Francisco Bay in 1769 when a party of Spanish explorers in search of Monterey mistook the Bay for an arm of the Pacific Ocean. On a subsequent journey in 1772, Pedro Farges and Father Juan Crespi reached the Bay and wrote the first account of the Delta from a vantage point high on Mt. Diablo. With the Sacramento River overflowing its banks, the explorers' report to the crown of Madrid spoke of a "great inland lake that stretched farther than the eye could see, abounding with game, fish and fowl of all kinds."

Crespi was the first to write about the abundant wildlife in the Delta region, which provided ample food for the first known human inhabitants of the estuary. American Indians. Some 10,000 years ago, these people came south from Alaska and the Pacific Northwest, settling in parts of California. The combined Bay-Delta American Indian population peaked at about 50,000 prior to the arrival of the Spanish. (Within 100 years of the Bay-Delta's "discovery," most of the American Indian population was decimated, primarily because of the spread of European diseases such as measles.)

By 1776 the Spanish had established a mission at the site of San Francisco, one of 21 strung along the coast of California. The missionaries grew dry-land wheat and barley, and cultivated fruits and vegetables by irrigating with nearby river water. Beginning in the 1790s, Delta wildlife began to support a growing fur-trading industry. In 1827, American adventurer Jedediah Smith trapped beaver, otter and mink on the periphery of the giant marsh and blazed a trail north to Fort Vancouver, where his tales of the wealth of animal pelts yielded by the Delta were heard with keen interest by the Hudson Bay Company.

During the next 15 years, trappers were a familiar sight in the Delta. Seagoing ships navigated the Sacramento and San Joaquin rivers with supplies for upriver settlements and took out tallow and an increasing number of animal skins.

California's growth during this period was described as slow, but steady. All that changed in 1848 – gold was discovered in the Sierra Nevada foothills, and the stampede to California was on. Between 1848 and 1850, the state's population grew from 15,000 to 93,000.

The increasing use of hydraulic mining (the use of high-pressure jets of water to expose gold ore) in the 1860s changed the face of the Delta as mud, sand and gravel washed from Sierra foothills flowed into rivers and on downstream into the Delta, choking channels and raising the bottom of the estuary.

Following the gold rush, miners turned farmers transformed the Delta marsh into rich agricultural fields by using Chinese laborers to build levees and stop natural flooding.

Delta Agriculture

By 1860, gold miners turned farmers had settled throughout the Sacramento-San Joaquin Valley region and began to farm. The Delta's rich soil and federal laws encouraging reclamation of swampland prompted settlers to begin draining and reclaiming the marsh. But Delta farming wasn't without peril. The land was constantly threatened by flooding, and using Chinese laborers, farmers began building small levees to hold back flood water. Their efforts were mostly futile, as the levees were able to hold back little more than a high tide.

During the second half of the 19th century, new techniques including mechanical power (for dredging, levee building and land clearing) and pumps (to control water levels on reclaimed land) were introduced to convert the Delta into an agricultural area. Levee-building projects ultimately turned what was once an uncontrolled marshland into a productive agricultural area. By 1880, the amount of reclaimed area was 100,000 acres; by 1900, it had reached 250,000 acres. During the next 30 years, the amount of reclaimed land grew to almost 450,000 acres, all of this accomplished by local interests.

At the same time successful farming burgeoned in the Delta, new species of fish were introduced into the Bay-Delta waters. Striped bass, American shad and white catfish were brought to the Delta. These introduced fish species flourished and along with the intrinsic salmon runs found in California streams and rivers helped support commercial fisheries. From 1873 to 1910 as many as 21 canneries in California processed 5 million pounds of salmon annually from the Sacramento and San Joaquin rivers. Along with fish, game birds, orchard and field crops, new breeds of livestock also were imported into the region.

WATER DEVELOPMENT

Even as agriculture flourished, commercial fishing expanded and the state's population exploded, the Delta suffered enormous damage from vast amounts of sediment and debris swept downstream from hydraulic mining in the mountains. The problems began in the 1860s, but even after an 1884 federal court injunction halted hydraulic mining, silt continued to settle in the Delta, altering navigable channels and hindering shipping activity.

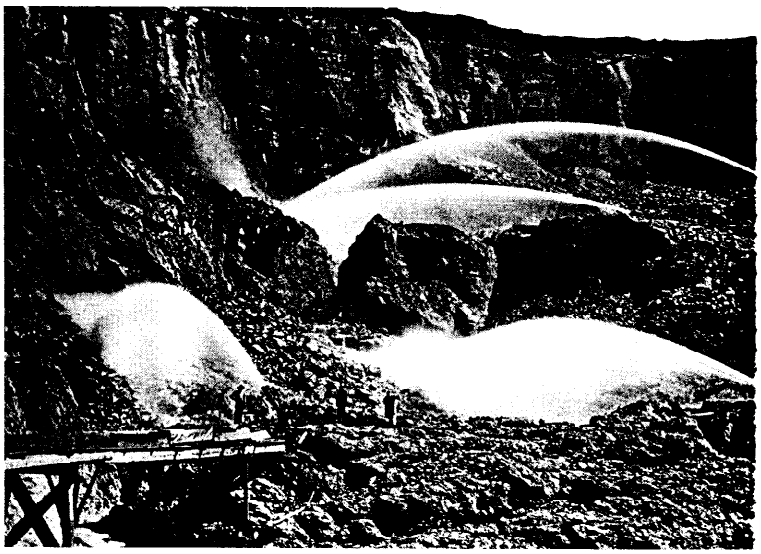
The silt reduced Delta channels' carrying capacity, increasing the danger of flooding. Periodically, the channels were dredged to remove the silt. (Dredging continues today.) There also were problems with flooding in the Delta and upstream in Sacramento. The combination of flooding problems (primarily in the winter and spring), summer salinity intrusion (which damaged Delta crops), and the need for water in other regions of the state sparked interest in water storage and delivery systems.

In 1908, San Francisco chose the Tuolumne River along the western slopes of the Sierra Nevada as its water supply and the Hetch Hetchy Valley in Yosemite National Park as the dam site. Despite protests from conservationists – including Sierra Club founder John Muir – O'Shaughnessy Dam was authorized by Congress and the Hetch Hetchy Valley flooded in 1923. Today, water from the reservoir is transported to San Francisco and Peninsula cities via the Hetch Hetchy Aqueduct south of the Delta.

Across the bay, residents of Alameda and Contra Costa counties voted in 1923 to form the East Bay Municipal Utility District (EBMUD) to meet the region's growing water needs. Seeking the purest source of water possible, the district turned to the Sierra watershed of the Mokelumne River. Today three parallel aqueducts carry this water 90 miles to East Bay reservoirs. The two Bay Area municipal water projects, combined with upstream agricultural diversions, reduced the Delta's historic fresh water flows.

In 1921, the state Legislature authorized an extensive investigation to develop a comprehensive state water plan. For the next 15 years, federal, state and local interests wrangled over how to best supply California with a dependable source of water that would reduce flooding and salinity intrusion. In 1933, the state's voters approved the CVP, authorizing construction of reservoirs to supply water and provide a hydraulic barrier to repel sea water intrusion. But the project could not be financed by the state during the Depression.

The state turned to the federal government for help, and in 1937, the Rivers and Harbors Act authorized construction of the CVP. Unlike the state plan, the federal legislation did not include salinity control as a project purpose. Instead, the CVP was authorized for flood control and navigation, water supply for agricultural and municipal purposes, and hydroelectric power generation. Construction began in the 1940s, and by 1951, most of the initial features of this massive water delivery system were completed.



The Delta suffered enormous damage from the vast amounts of sediment and debris swept downstream from hydraulic mining in the mountains. Hydraulic mining was widely used prior to being outlawed in 1884.

The use of Delta channels as conduits for transporting water began in 1940 with completion of the Contra Costa Canal, the first unit of the CVP. With the 1951 completion of the Delta-Mendota Canal, the Delta became part of a vast water export system. Also in 1951, the Delta Cross Channel was constructed near Walnut Grove to facilitate the transfer of water from the Sacramento River across the Delta to the CVP export pumps located near Tracy. (Also part of the CVP is Friant Dam on the San Joaquin River. The dam captures and diverts fresh water flows that normally would enter the Delta.)

In 1951 the state Legislature authorized the Feather River Project, later known as the SWP, and the project was ratified by voters in 1960. In 1967, the state began pumping water from the Delta into the California Aqueduct, part of the SWP which today serves the north and south Bay Area and the San Joaquin Valley, as well as most of densely populated southern California. By 1975, the combined deliveries of the SWP and CVP, both north and south of the Delta, had grown to about 4.8 million acre-feet: by 1996, the total reached around 9.7 million acre-feet.

The Delta Today

Estuaries are coastal areas where fresh water from rivers mixes with ocean water and where salinity (saltiness) is between the extremes of sea water and fresh water. The Delta, Suisun Bay, San Pablo Bay and south and central San Francisco Bay form such an estuary – the largest on the West Coast.

The Bay-Delta estuary's major source of fresh water comes from the Sacramento and San Joaquin rivers. The sea water comes from the Pacific Ocean via tides. Fresh water, which is less dense than salt water, moves on the surface of the estuary's currents, while heavier salt water flows closer to the bottom. The area where the bottom and surface currents interact most intensely is called the "entrapment" or "null" zone. High concentrations of algae, fish and eggs congregate in this zone, making it an important nurturing area for plants and animals. The location of the entrapment zone moves back and forth from the Delta to near San Pablo Bay, depending on fresh water outflow and ocean tides.

The saltiness of Suisun Bay – the largest, unbroken brackish water marsh habitat in the United States – varies according to the time of year (saltier in the fall) and type of water year (saltier in dry years). Because Suisun Marsh is so important for fish and wildlife, much attention has focused in recent years on the bay's water quality.

Like the Delta, the Bay Area portion of the estuary as we know it is different than that viewed by early explorers. The biggest change is in its size; since 1850, the estuary has shrunk from 787 square miles to 548 square miles, primarily because of debris from hydraulic mining and the intentional filling of tidal wetlands for industry and other urban uses.

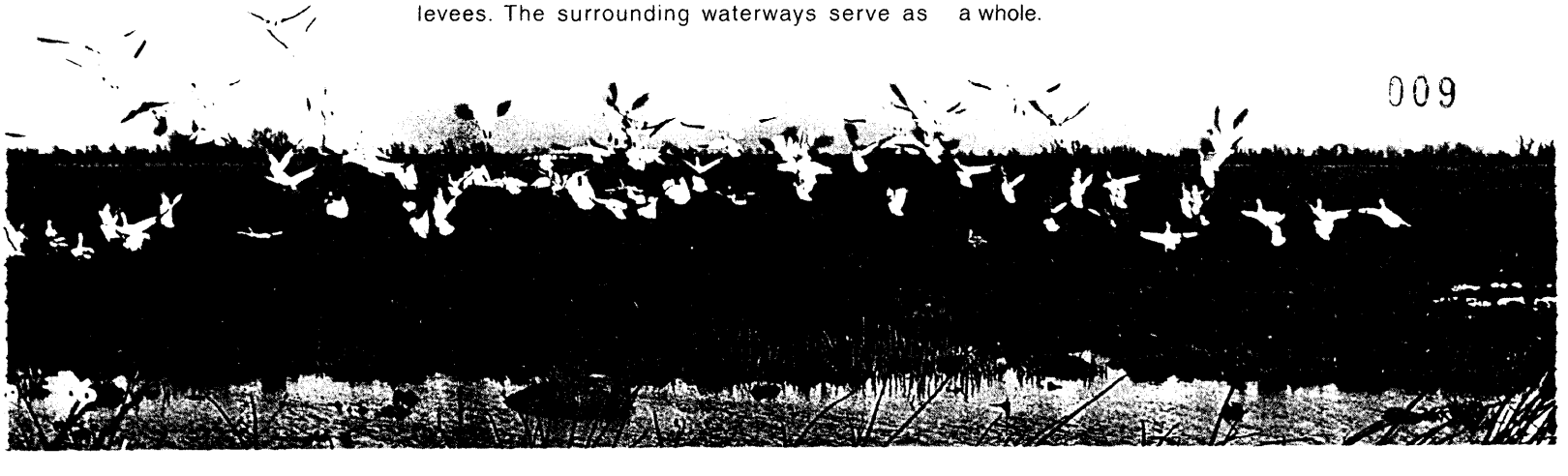
With its transformation from marsh to farmland, the Delta portion of the estuary is comprised of numerous below-sea-level islands protected by levees. The surrounding waterways serve as passageways for fish, and the levees provide valuable habitat for a wide variety of wildlife.

The steamboats and barges of yesterday that ferried the Delta waterways to deliver supplies and transport passengers have been replaced today by thousands of houseboats and power boats – the Delta is one of the most popular recreational spots in the state. Its islands offer camping, hiking, sightseeing, bicycling and horseback riding while Delta channels offer boating, water-skiing and fishing. All these recreational activities contribute money to the local economy, but they also increase pressure on the estuary. For example, wave action produced by boats' wakes cuts into levees, causing erosion.

In addition to its agricultural, recreational and wildlife values, the Delta is vitally important because of its geographical location – it serves as the switching yard for water supplies for the CVP and the SWP. Two-thirds of the state's residents receive at least a portion of their drinking water from the Delta. Consequently, whatever affects the Delta affects large portions of northern, central and southern California.

The significance of the Delta is illustrated by the number of state and federal governmental agencies, in addition to local water districts and city councils, involved in Delta issues. These agencies – and their sometimes conflicting agendas – illustrate how complicated and controversial Delta issues can be. Each of the Delta's problems, be it preserving fisheries, maintaining Delta levees or providing water for agricultural and urban needs throughout the state, brings with it opposing points of view. For the most part, past studies and programs have taken a piecemeal approach to exploring and managing the Delta. It is only recently that state and federal studies, legislation and programs, such as the ones outlined in this guide, have begun to address the estuary as a whole.

Suisun Marsh is an important stop for migratory waterfowl along the Pacific Flyway.



Chronology

1772 First recorded sighting of the Delta by Spanish explorers Father Juan Crespi and Pedro Farges.

1849 Settlers begin farming in the Delta, a year after gold is discovered.

1861 State Legislature authorizes Reclamation District Act allowing drainage of Delta lands and construction of sturdier levees to protect the area from flooding.

1937 Congress authorizes federal Central Valley Project (CVP).

1951 State Legislature authorizes Feather River Project (now State Water Project or SWP).

1959 Delta Protection Act passed to resolve some issues of legal boundaries, salinity control and water exports.

1965 Department of Water Resources (DWR) selects Peripheral Canal as the SWP's Delta facility.

1971 State Water Resources Control Board (State Board) issues Delta Water Rights Decision 1379 establishing water quality standards for the CVP and SWP.

1973 State Department of Fish and Game (DFG) concludes Peripheral Canal is best Delta water facility.

1974 DWR, DFG, U.S. Bureau of Reclamation (Bureau) and U.S. Fish and Wildlife Service sign statement of intent that agencies will provide protection of Delta fish and wildlife.
Department of Interior releases opinion that CVP releases for salinity repulsion are not required by the federal Clean Water Act.
DWR releases legal opinion that the federal act does apply to CVP.

1977 DWR reaffirms Peripheral Canal is best Delta transfer facility after reviewing 40 alternatives.

1978 State Board issues Water Rights Decision 1485 (D-1485) requiring CVP and SWP operation to meet Delta water quality standards.

1979 Bureau announces CVP will voluntarily comply with D-1485 until legal questions of mandatory compliance are resolved.
Senate Bill 200 introduced in Legislature.

1982 Voters defeat Proposition 9, which includes the Peripheral Canal SB 200 package, by 3-2 margin.

1986 Historic DWR-Bureau accord, the Coordinated Operation Agreement (COA), authorized by Congress.

1986 "Racanelli decision" strengthening powers of State Board to protect all uses of Delta water affirmed by state Supreme Court.

1987 State Board begins proceedings to revise D-1485 after the U.S. Environmental Protection Agency (EPA) declares it inadequate to protect Bay-Delta water quality.

1988 SB 34 providing $120 million over 10 years for levee maintenance approved by state Legislature.
Suisun Marsh salinity control gates begin operation.

1989 Sacramento River winter-run chinook salmon listed as endangered species, requiring operational changes in CVP and SWP.

1991 State Board releases new salinity control plan for Bay-Delta.
EPA rejects portions of plan under Clean Water Act; calls upon state to adopt more-stringent standards or face federal rules.

1992 President Bush signs CVP Improvement Act, which allocates 800,000 acre-feet of water annually to environment.
State Board releases draft D-1630, interim standards for the Delta requiring reductions in exports to protect wildlife resources.

1993 Delta smelt declared a federal and state threatened species.
With Gov. Wilson's declaration that the temporary D-1630 is "moot," and should be dropped, the State Board resumes work on permanent standards.
EPA says it will proceed with setting federal Bay-Delta standards.

1994 State and federal officials announce unprecedented agreement on new Bay-Delta water quality standards.

1995 State Board adopts new water quality standards and begins water rights phase.

1998 CALFED releases a "programmatic" draft EIS/EIR offering three alternatives for "fixing" the Delta.

Maintaining levees is imperative to keeping urban and agricultural areas on Delta islands from flooding.

Delta Issues

Water Distribution

The Delta Cross Channel near Walnut Grove, part of the CVP, carries Sacramento River water south and west to the export pumps near Tracy.

With construction of the CVP and SWP, the Delta became a critical link in the state's complex water distribution system. The Delta's channels transport water from upstream reservoirs to the south Delta, where state and federal facilities (the Harvey O. Banks Delta Pumping Plant and the Tracy Pumping Plant) pump water into the California Aqueduct and CVP canals.

These projects provide water to more than 4 million acres of irrigated farmland, primarily in the San Joaquin Valley, and to 20 million people in central and southern California and portions of the Bay Area. All in all, the Delta is a partial or total source of drinking water for two-thirds of the state, and reliance on Delta waters is expected to increase.

In the past decade, California experienced a 25 percent growth rate – double the national average. Officials estimate the state's current population of 32 million will reach 49 million by 2020 – an increase of 53 percent and 63.3 million by 2040. The question remains: where will the water for all these people come from? When matching projected population demand with existing water supplies and facilities, DWR estimates that by 2020, annual urban water needs will increase from 8.8 million acre-feet to 12 million acre-feet. In its Bulletin 160-98, the update of the California Water Plan, DWR estimates the state could face an annual water shortfall of 2.9 million acre-feet in average years and 7 million acre feet in drought years. Along with providing more water for urban uses is the need to maintain water supply reliability for agriculture.

Another critical challenge will be supplying more water for fish and wildlife. Societal values have undergone fundamental change over the past century, evolving from an ethic of conquering nature to one of coexisting with it. This change in values, combined with lobbying by environmental groups and the passage of strict state and federal laws protecting endangered species and plant and wildlife habitat, have effectively blocked most conventional water development over the past two decades. But as the need to further develop the state's water supply has become more apparent, conflict between urban and agricultural users who want to increase supplies from the Delta and environmentalists who want to protect the estuary's ecosystem has increased.

After years of debate, ag, urban and environmental groups finally agreed in 1994 that the issue was not if fresh water outflow was needed to restore the Delta and the Bay, but how much outflow was needed and who should contribute towards it. With CALFED pushing for a resolution by the end of 1998 over how best to balance the Delta, many are convinced that a resolution to the decades old disagreement is near. No longer is the question over what to do, but which to do (see page 17).

Salinity and Agricultural Drainage

The Delta always has been at the mercy of river flows and tides. Before human intervention, salty ocean water from the Bay crept up Delta channels during dry summers when mountain runoff ebbed. Then, during the winter, heavy runoff from the mountains kept the sea water at bay. The diaries of early Spanish explorers and more recent records illustrate that the salt line moves according to the dryness of the year. A great flood in the 1860s resulted in a substantially fresh water Bay. Conversely, salt water reached as far as Sacramento in the 1930s, during one of the state's worst droughts.

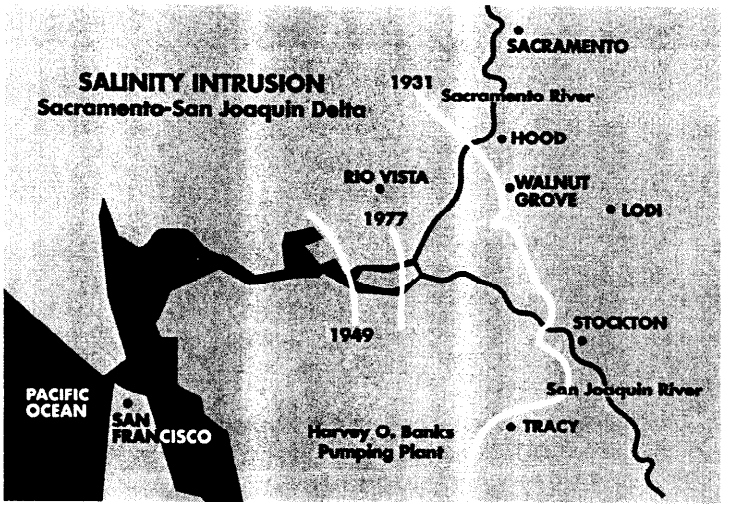
The problem of seasonal salt water intrusion into the Delta was greatly alleviated by the year-round release of fresh water upstream dams and reservoirs. However, salinity intrusion from the ocean or accumulation of minerals from farming discharged into Delta rivers remains a problem. The estuary generally becomes saltier during the summer and fall, but can be influenced in spring months when export pumps are running at full bore to capture runoff. And environmentalists and fishery biologists say efforts to increase the Delta's summertime fresh water flows for human needs – highly saline water affects agricultural production and municipal water quality – in combination with maximum export pumping, has created a saltier estuary in the winter and spring, adversely impacting natural resources.

Historically, the need to keep the Bay's salty water away from the rich Delta soils and local farms was

seen as essential, and as early as 1880 the state proposed building a barrier between the Bay and Delta. Hydraulic barriers, using upstream releases of fresh water to repel sea water (incorporated in today's water projects); physical barriers, such as low-level dams to separate fresh water from saline water with passageways for navigation and fish migration; alterations in existing channels to improve flow patterns; and construction of new channels, such as an "isolated facility" (see page 18), to isolate export water from brackish Delta waters are all means of reducing salinity intrusion in the Delta and improving the transfer of water from the rivers to the export pumps.

In comparison to the rest of the Delta, the western Delta (roughly the area west of Isleton) suffers periodically from higher salt water content with its possible adverse effect on drinking water supplies for the 400,000 residents of eastern Contra Costa County. The recently opened $450 million Los Vaqueros project (including a 100,000 acre-foot reservoir, dam, transfer and pumping stations and a 20-mile pipline) should improve the county's water quality. In general, the greater the amount of fresh water flow from the rivers to San Francisco Bay, the better the water quality in the western Delta. Since the 1960s, the State Board has set water quality standards in an effort to alleviate problems with salinity. (See page 13.)

Agricultural drainage also contributes to the Delta's salinity problems. Because most Delta islands are below sea level, water from surrounding channels seeps through the levees onto the land. Farmers must pump this water from the lands while adding controlled amounts of fresh water for productive agriculture.



Map showing the intrusion of salt water into the Sacramento-San Joaquin Delta in 1949, after completion of Shasta and Friant dams; in 1931, a severe drought year prior to the completion of the CVP and SWP, whose fresh water releases help repel salinity; and in 1977, the state's driest year on record.

In the South Delta, where farmers rely primarily on the waters of the San Joaquin River for their irrigation supply, the process of irrigation concentrates salts in the drainage water, which is then pumped into nearby Delta channels. Sometimes there is no current to "flush" these salts through the Delta, creating localized salinity problems.

The salt content of drainage water flowing down the San Joaquin River, primarily from the west side of the valley, is high, and sources of dilution water are limited. Most of the valley averages less than 10 inches of rain a year, and water from Sierra tributaries is now either exported or diverted for consumptive uses. Flows in some stretches of the San Joaquin River during the summer irrigation season consist almost entirely of irrigation return flows. This increases the salt content of water used downstream by Delta farmers and further increases salt concentrations in this water flowing into the estuary.

Drinking Water Quality

Since the Delta is a drinking water source for about 20 million Californians, the quality of this water is very important. Because the Delta was once a swamp, it has rich, organic soils containing compounds that are the building blocks for suspected human carcinogens called trihalomethanes, or THMs. As water from the Sierra rivers flows through the Delta, it picks up naturally occurring organic materials.

Since the 1970s, scientific studies have shown that chlorine – the disinfectant of choice for surface water – can combine with organic materials in raw water and form THMs during the treatment process. Some THMs, such as chloroform, are suspected to cause cancer in humans, leaving urban water suppliers and health officials with a difficult dilemma: a reduction in chlorine may decrease lifetime cancer risks from drinking Delta water, but could increase occurrences of short-term gastric illnesses.

Pending federal drinking water requirements will reduce the allowable level of THMs from 100 part per million (ppm) to 80 parts ppm in 1998, with the possibility for an even lower standard in the future. Urban water purveyors are concerned about these

standards which could require new technology and an increase in treatment costs by billions of dollars.

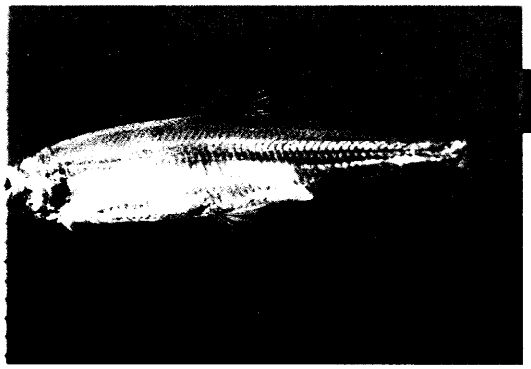
In recent years, water officials throughout the state have experimented with alternative treatment methods in an effort to reduce THMs but, at the same time, maintain effective disinfection to eradicate disease-causing microorganisms. Studies have indicated, for example, that ozone disinfection reduces THMs. But officials also have found that ozone can combine with bromide, a component of sea water, which can intrude into the Delta and increase the salt content of water exported to the Bay Area and southern California via the SWP. Ozone reacts with bromide to form another carcinogenic disinfection byproduct, bromate.

A new cause for concern was raised in 1998 when the Department of Health Services (DHS) released two studies linking an increased risk of miscarriage during the first trimester in pregnant women who drank five or more glasses of tap water daily containing high level of THMs, in particular, bromodichloromethane. Bromodichloromethane forms when chlorine combines with bromides – like those found in the Delta – during the chlorination process at the treatment plant.

These studies, which were published in the journal *Epidemiology*, examined records of about 5,000 Kaiser patients in the areas of Walnut Creek, Santa Clara and Fontana – areas that all rely on the Delta for at least a portion of their drinking water. The studies found that women who drank five or more glasses of tap water a day with certain levels of bromodichloromethane had a higher risk of miscarriage.

DHS officials indicated further study of the subject is needed, including more tests. It also is important to note that the higher miscarriage rate was only evident in 2 percent of the patients studied. A similar study in North Carolina which used a different methodology did not find a correlation between tap water and miscarriages.

If the problem is the bromide in the water before it is treated, some feel improving the quality of the Delta-supplied drinking water is the answer. According to CALFED (see page 18), Alternative 1 would not significantly reduce bromide concentrations. Alternative 2 would reduce bromide concentrations by about 40 percent for Contra Costa Water District and about 25 percent for CVP and SWP exports. Alternative 3, would reduce organic materials and bromides by 60 percent for CVP and SWP supplies because the water would circumvent the salty Delta in an isolated channel. Water diverted by Contra Costa Water District would not improve as significantly.



The Delta smelt, which lives only in the Delta, has experienced a 90 percent decline in population over the past decade.

Fish and Wildlife

Historic fisheries in the Bay-Delta included salmon, steelhead trout, sardines and herring. With the Gold Rush and the state's booming population, a colony of Italian immigrants formed the first commercial fishery between 1848 and 1852 – netting salmon in Central Valley rivers. The first salmon cannery was established in 1863, and commercial canning records lead biologists to believe that salmon runs in the Sacramento and San Joaquin river basins once numbered in the millions.

In addition to salmon fishing in the rivers, commercial fisheries were founded throughout the Bay and Delta for smelt, sole, flounder, sardine, herring and anchovy. There were little controls on these fisheries, however, and overfishing caused a decline in native species. Early settlers responded by introducing new species, such as the American shad and striped bass, both of which supported commercial fisheries for many years. To boost salmon runs, a number of fish hatcheries were established.

Fish populations, however, continued to decline, leading to commercial fishing bans on white sturgeon in 1901, steelhead trout in 1927, striped bass in 1935, and American shad in 1957. Chinook salmon continue to support a commercial fishery, but are now harvested in the ocean. Other commercial fisheries that remain in the estuary today include Pacific herring, bay shrimp and crayfish. Popular sport fish include white catfish, largemouth bass, bluegill, steelhead trout and American shad.

Despite the commercial ban on striped bass (they remain part of the sport fishery), their numbers have declined dramatically since the 1960s from about 3 million adults to an estimated 590,000 today. The striped bass is one of the most-studied fish in the

estuary, and despite being an introduced species, it served as an "indicator" species for many years because of its resource value and sensitivity to changes in the estuary.

Like the striped bass, numbers of chinook or "king" salmon in the Sacramento and San Joaquin river systems have dropped dramatically, and predation by striped bass is considered to be one cause for their decline. Four runs of salmon are found in the Sacramento, characterized by the time of year they pass under the Golden Gate Bridge on their upstream journey to spawn – fall, late-fall, winter and spring. Most attention has been focused on the winter-run, which is an endangered species.

The winter-run population reached its lowest point in 1991 when only 191 adults returned to the Sacramento River to spawn – a fraction of the 117,000 winter-run estimate of 1969. Efforts to restore the run through alterations in Delta pumping and upstream cold water releases helped, leading to a run size of 1,180 winter-run in 1992. In 1995, 1,361 fish returned to the Sacramento River. (Most salmon have three-year life cycles, but fish counts include those immature fish that return but do not spawn.) In 1996, 940 returned, an increase of 600 from 1993. In 1997, the count was 871, a seven-fold increase from 1994.

In 1998, three more salmon runs were proposed for listing under the ESA including the spring-run chinook on the Sacramento River and the fall and late-fall runs on the Sacramento and San Joaquin rivers and their tributaries. The proposed listings have raised concern that such actions could seriously disrupt commercial fisheries, sport fishing and water deliveries.

In addition to the salmon, the effort to protect the threatened Delta smelt, a 3-inch fish that lives only in the Delta, has had an impact on traditional water project operations in the Delta. Biologists maintain that the smelt population has declined 90 percent over the past decade, but opinions differ on the cause of the smelt's decline. While some biologists blame fresh water diversions during the spring months, others maintain there is no evidence to link declining smelt populations and available water in the Delta.

Environmentalists argue that the smelt, like the striped bass and salmon, is an indicator that the health of the estuary is declining.

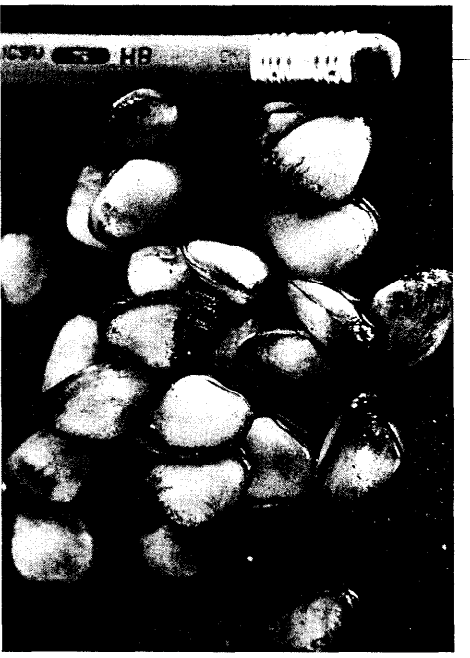
One other possible cause for the smelt's decline, and for other changes in estuary fisheries, is an Asian clam believed to have been accidentally introduced in the Bay-Delta. Since its discovery in 1986 the clam, *potamocorbula amurensis*, has multiplied dramatically and dominates other benthic, or bottom-dweller, organisms such as oysters and crabs. The Asian clam has consumed great quantities of phytoplankton, microscopic plants that supply food for zooplankton, microscopic animals. These organisms form the base of the food chain, and biologists fear their decline is adversely affecting smelt, young salmon and striped bass.

A number of factors are blamed for the decline in striped bass and salmon, both of which are anadromous fish – migrating between fresh and salt water to complete their life cycles. These include introduced species, changes in food supply, loss of habitat, oceanic conditions and water diversions. There is considerable debate over how large a role water diversions have played in this decline, and whether water diversions have caused or exacerbated the problems.

With adoption of the new Bay-Delta standards, however, the debate over whether technological fixes, such as fish screens on diversion pumps, or more fresh water will do the most to restore these resources appears to be somewhat settled – the standards call for both.

More than 400 potential projects to improve fish and wildlife resources in the estuary were identified for possible implementation. Since 1995, a series of "Category III" projects identified by Bay-Delta stakeholders have been chosen for implementation under the Delta Accord. The projects provided increased instream flows for fish; the protection of chinook salmon and Delta smelt populations through fish screens and ladders; improvements for fish reproduction; and programs to teach almond farmers new farming techniques to reduce their use of pesticides. A total of $87.5 million could be allocated for additional ecosystem restoration projects in 1998.

In addition to the 130 fish species that call the estuary home, 380 animals can be found within the ecosystem. Most of the animals 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.



Discovered in the Bay-Delta in 1986, scientists believe the non-native Asian clam (potamocorbula amurensis) has led to the decline of several fish species including smelt, young salmon and striped bass.

Delta Levees

Since the 19th century, more than 1,000 miles of levees have been built to protect "reclaimed" Delta islands. Many of the islands are 25 feet or more below sea level and the water in the surrounding channels. The levees were built to prevent flooding and allow cultivation of the rich soil. Yet on many islands, the levee foundations are composed of the same peat soil formed by the marsh's original vegetation. This organic soil is rich in nutrients, but oxidizes at the rate of about 3 inches per year. This oxidation, known as subsidence, is a critical problem because the process stresses levees and increases the probability of island flooding.

A sound, well-maintained levee system is vital to protect not only the farms and towns on Delta islands, but the supply of fresh water moving through Delta waterways. When levees fail, water rushes into the lower-than-sea-level islands. This water tends to be salty because it is drawn upstream from the Bay. If levees collapse when there are lower fresh water flows (such as during a drought year) to counter the pressure of the sea water, salt water would intrude farther into the Delta and the water that supplies millions of people and acres of farmland.

Since 1980, 17 Delta islands have been partially or completely flooded. Numerous studies have found that Delta levees are deteriorating, and that their repair and maintenance will cost millions of dollars. In some instances, local efforts to repair and maintain levees have come in conflict with state laws protecting riparian vegetation. Delta levees are classified as project or nonproject. Project levees are part of the Federal Flood Control Project and are maintained by the U.S. Army Corps of Engineers (Corps). Nonproject levees, comprising 65 percent of Delta levees, are those constructed and maintained by island landowners or local reclamation districts. These levees are generally considered less stable than those constructed and maintained by the Corps.

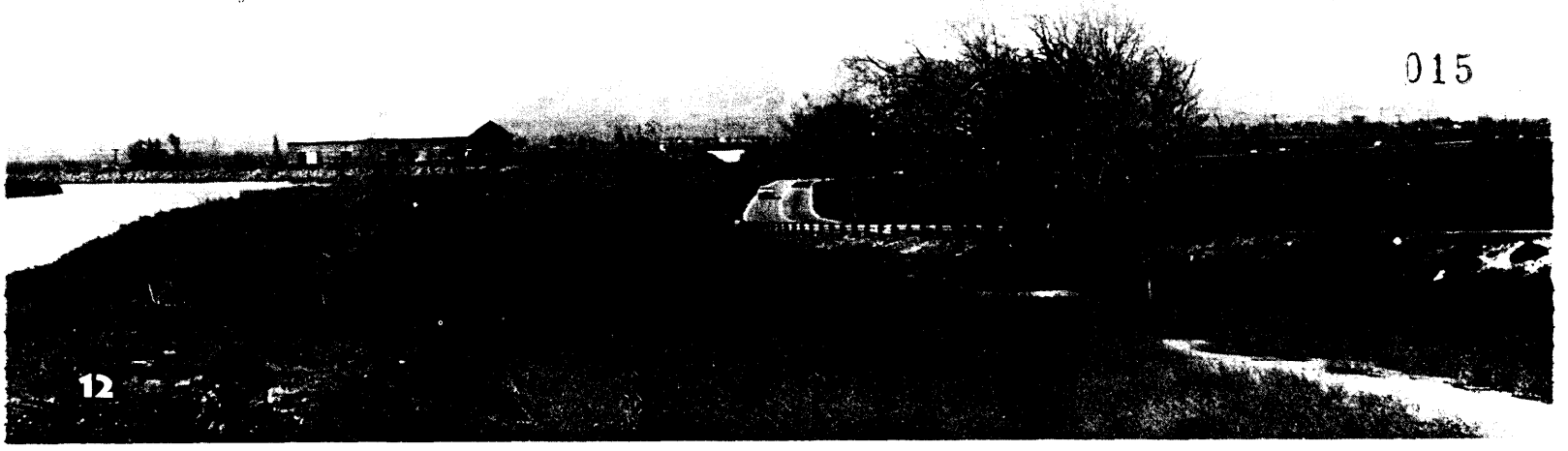
After the floods of 1986, the "Delta Flood Control Protection Act of 1988," was enacted to provide $12 million a year for 10 years to increase funding for levee improvements, and develop flood control plans for the eight western Delta islands and the communities of Thornton and Walnut Grove. In 1991, a bill was passed that required DFG to approve all applications of Delta construction to make sure wildlife habitat is protected.

The numerous earthquake fault lines running through or near the Delta also pose a threat to levee stability. Water officials fear a major quake could cause the levees to fail and flood many Delta islands, forcing Delta water users throughout the state to rely on stored supplies and seriously disrupting water delivery to central and southern California.

Under terms of an emergency response plan drafted by DWR, water suppliers would stop the CVP and SWP Delta pumps, wait for the Delta to stabilize, and increase releases from Folsom, Shasta, and Oroville reservoirs to fill up the Delta with fresh rather than salt water. Once stabilized, work to patch up the levees and block salt water intrusion could begin. Others point out that the 1989 7.1 quake that devastated much of the metropolitan Bay Area was as close to the southern Delta as it was to San Francisco's Marina District – and that no damage occurred in the Delta. The plan still has skeptics who believe that the Delta is essentially a "weak link" in the state's water transportation system.

To help control subsidence and reduce levee failures, DWR has purchased land on two Delta islands, near the point where salt and fresh water meet, and plans to convert them from agricultural use to wildlife habitat. Tilling the soil for farming increases peat soil's exposure to sunlight, increasing oxidation and the potential for levee failure and flooding.

Below, a Delta levee. Note that the water level in the channel, to the left of the levee, is higher than the road and farmland to the right of the levee.



Delta Decisions

D-1485

Since the 1960s, the State Board has set Bay-Delta salinity and flow objectives to maintain water quality for local and statewide use. Those standards are periodically reviewed and revised. In 1978, the State Board, whose five members are appointed to four-year terms by the governor, adopted Water Right Decision 1485 (D-1485) and a Water Quality Control Plan (the Delta Plan) for the Delta.

D-1485 placed permit conditions on the SWP and CVP to meet flow and salinity objectives (allowing 5 million acre-feet Delta outflow), either by reducing export pumping or by releasing waters stored in upstream reservoirs – or both. An underlying premise of D-1485 and the Delta Plan was that water quality should be at least as good as it would have been had the state and federal projects not been built.

The State Board pledged to review the 1978 plan in 10 years to ensure that it provided a "reasonable" level of protection for fish and wildlife and agricultural and urban water users. It also called for additional fisheries and water quality studies and sampling and monitoring programs to gain a better knowledge of the ecosystem and water quality needs for Delta agriculture, and to find answers to some of the persistent questions.

In 1987, EPA notified the State Board that D-1485 was inadequate to protect the estuary. Because the State Board was about to begin a series of public hearings – the Bay-Delta Proceedings – to modify D-1485 and the Delta plan, EPA did not impose its own standards. Meanwhile, a 1986 landmark legal ruling known as the "Racanelli Decision" greatly expanded the obligations and authority of the State Board, directing it to balance and protect all beneficial uses of Bay-Delta waters – including fishery and other instream uses – and to modify existing water rights if necessary to achieve that balance.

The State Board in 1988 issued a draft water quality plan for the Delta, which proposed both water quality and flow objectives. The document unleashed a storm of protest. The State Board withdrew the draft document and in 1991 adopted a salinity plan for the Bay-Delta estuary that addressed temperature, salinity and water quality standards for the estuary, but did not include any increases in fresh water flows to meet those standards. The issue of flows, the State Board said, would be addressed in a pending water right decision.

EPA, citing its authority under the Clean Water Act, rejected key portions of that plan because it established its own standards for Suisun, San Pablo and San Francisco bays.

The D-1630 Plan

In 1993, the State Board released draft Delta Water Right Decision 1630 (D-1630), proposing five-year standards to stabilize the estuary's environmental resources. Under terms of D-1630, CVP and SWP operators would have been required to modify maximum export pumping; minimize "reverse flows"; and contribute to and oversee short-term or "pulse flow" releases from upstream reservoirs – all to increase survival rates for chinook salmon, striped bass and other fish. Through proposed environmental mitigation fees and pulse flows, the State Board was poised to demand – for the first time – that all major water diverters, not just the SWP and CVP, take steps to protect the Delta environment.

Secretary of the Interior Bruce Babbitt (left) and Gov. Wilson (right), along with agricultural, urban and environmental interests, signed the Delta Accord in 1994. The Accord established a framework for increasing fresh water flows to fish and wildlife while providing cities and farmers with a stable water supply.

Reaction to D-1630 was mixed. Environmentalists said it did not go far enough and water purveyors said it went too far. State Board dropped D-1630 and resumed work on permanent standards. On the heels of a lawsuit filed by the Sierra Club Legal Defense Fund and 18 other environmental groups, the EPA released its draft set of water quality standards in December 1993. The federal agency had one year to adopt final standards.

With the release of its draft plan, EPA officials and water interests began meeting to develop final standards to improve water supply flexibility while still protecting the estuary. Months of negotiations led to a historic 1994 accord which established new water quality standards for the Delta.

016

Delta Accord

In a comprehensive plan released by Gov. Wilson, Secretary of the Interior Bruce Babbitt and EPA Administrator Carol Browner, agricultural, urban, business and environmental water interests agreed to a package that increases fresh water flows for fish and wildlife, but provides cities and farmers with more water supply certainty.

In general, the plan required water exports to be reduced annually by about 400,000 acre-feet in average years and up to 1.1 million acre-feet in a prolonged drought over requirements under D-1485. The accord also established greater flexibility for water project operations under the federal ESA. The accord was extended in 1997 until the end of 1998.

Take limits imposed upon water project operations brought complaints that the formulas did not provide any water supply reliability. Under the agreement, compliance with take provisions "is intended to result in no additional loss of water supply." State and federal officials also will use real time monitoring rather than take formulas to develop more water project operation flexibility while still protecting the salmon and smelt.

As state and federal officials stipulated in their 1994 Framework Agreement, the SWP and CVP began voluntary operations in to meet the federal standards. In May 1995, the State Board adopted its own Water Quality Control Plan for the Bay-Delta and in 1998, commenced a water rights process to determine who should give up how much water to comply with the water quality plan. The other 7,000 diverters in the Bay-Delta watershed may be required to contribute water under the 1986 "Racanelli decision.

The 1995 water quality plan replaces the one adopted in 1978. However, D-1485 will remain the regulatory vehicle over outflow requirements pending the conclusion of the water rights phase.

Like the standards promulgated by EPA, the State Board plan established a 2 parts-per-thousand salinity standard to be met through increased outflow. The plan also established a salinity standard on the San Joaquin River, which is expected to reduce the amount of water available to upstream diverters. It also sets export limits; 35 percent of inflow during spring months and 65 percent of inflow during the fall. To protect salmon, a host of "non-water project" habitat improvements have been initiated and the Delta Cross Channel gates remain closed certain times of the year.

Determining who has to give up how much water to meet the 1995 Bay-Delta water quality standards is a potentially contentious issues that could affect CALFED.

In a 1997 draft proposal, State Board staff identified a range of alternatives for meeting the 1995 standards. The alternatives ranged from maintaining the status quo, whereby the CVP and SWP are solely responsible for meeting the Delta water quality standards, to a new watershed approach in which those entities that are not currently contributing water to instream flows – namely the Friant Water Users Authority – would be hit hard by the new flow requirements. Variations of the watershed approach would have less drastic impacts. Overall, staff looked at the Delta's largest diverters and found that adjustments to the rights of 300 to 350 holders would cover 95 percent of the water used within and exported from the Bay-Delta watershed.

Two additional water rights issues are to be addressed by the State Board: a CVP-SWP joint-point diversion to allow for more interagency use of the existing pumping plants, which could increase the amount of water available for export by 250,000 acre-feet, and a CVP "place of use" issue to clean up the Bureau's water rights.

Racanelli Decision

The 1986 Racanelli decision concluded that the State Board in issuing D-1485 had improperly narrowed its water quality planning to the protection of water rights (instead of the protection of all beneficial uses of Delta waters), and to the impacts on water quality of the state and federal projects (instead of the impacts of all factors and water users affecting water quality in the Delta).

This ruling, allowed to stand by the California Supreme Court, instructs the State Board to take into consideration all factors – not just the operation of the state and federal projects – which have a bearing on Delta water quality. The decision also said the State Board had improperly based its previous salinity objectives on levels that are needed to protect existing water rights, rather than determining what flows and salinity are needed to protect the various uses of Delta water.

Agreements

Coordinated Operation Agreement

Despite the continuing controversies and conflicts surrounding the Bay-Delta estuary, some water supply and environmental issues have been addressed through innovative interagency agreements and programs.

In 1986, DWR and the Bureau replaced 26 years of annual agreements regarding the responsibilities of each project to meet Delta water quality and flow standards with the historic Coordinated Operation Agreement (COA). The agreement gave additional safeguards to the fragile Delta by committing the Bureau to a share of the responsibility for sustaining flows in the Delta during dry periods.

A major hurdle in reaching agreement was the federal government's reluctance to set a precedent by accepting the state's authority to prescribe water quality requirements for the Delta to be met by the CVP.

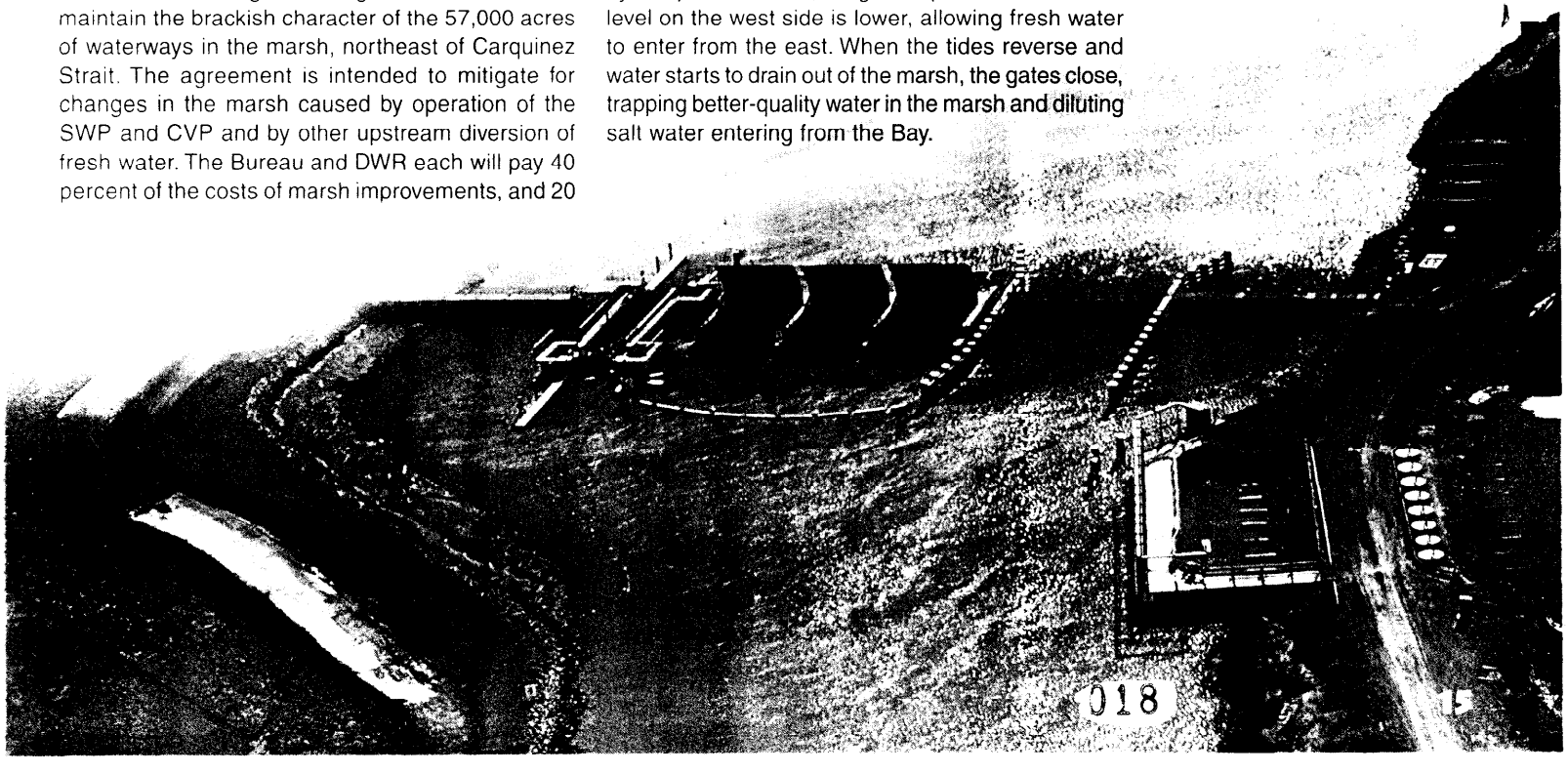
Coordinated operation is vital for both projects to make the best use of their facilities, but had long been controversial. In times of drought prior to the COA's implementation, the SWP may have been forced to sacrifice the needs of some of its customers to meet State Board Bay-Delta flow and water quality standards if the Bureau did not voluntarily agree to contribute water to meet those standards. Under the COA, the federal government committed to share with the state the responsibility to meet most of the water quality and flow standards.

Suisun Marsh Preservation Act

In 1974, the state Legislature passed the Suisun Marsh Preservation Act to preserve and protect the region's unique natural resources. More than 200 species of birds and other wildlife, including the tule elk and the endangered salt marsh harvest mouse, depend on the vegetation that thrives in the region's brackish waters.

In 1987, state and federal representatives of DWR and the Bureau signed an agreement intended to maintain the brackish character of the 57,000 acres of waterways in the marsh, northeast of Carquinez Strait. The agreement is intended to mitigate for changes in the marsh caused by operation of the SWP and CVP and by other upstream diversion of fresh water. The Bureau and DWR each will pay 40 percent of the costs of marsh improvements, and 20 percent will be allocated to other upstream users and reimbursed by the Legislature. To date, approximately $80 million has been spent on marsh improvements.

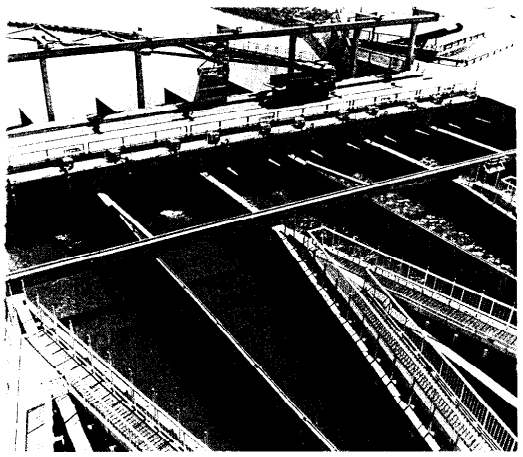
Those improvements include construction and installation of salinity control gates in Montezuma Slough to control salinity intrusion. The concrete structure, completed in 1988 and weighing 6,100 tons, contains three, 36-foot steel gates. Controlled by computer sensors, the gates open when the water level on the west side is lower, allowing fresh water to enter from the east. When the tides reverse and water starts to drain out of the marsh, the gates close, trapping better-quality water in the marsh and diluting salt water entering from the Bay.



The 6,100 ton, 36-foot salinity control gates installed in Montezuma Slough in 1988 ensure better quality water in Suisun marsh and dilute salt water entering from the Bay.

Four Pumps Agreement

Cooperative efforts also are underway to help restore striped bass, steelhead trout and salmon fisheries under a DFG-DWR agreement to mitigate for losses directly caused by the SWP pumps. Under the provisions of the Delta Pumping Plant Fish Protection Agreement – better known as the "Four Pumps Agreement" – co-signed on Dec. 30, 1986, DWR must mitigate for fish lost at the SWP pumps, including the impacts of adding four new pumps to that facility. Modern fish screens and other bypass facilities are in place to divert fish away from the pumps; however, significant losses still occur as a result of screen inadequacies, predation in Clifton Court Forebay and handling as fish are trucked to release sites in the Delta.



Screens at the SWP pumps in the southern Delta divert fish away from the water export pumps and into a holding tank where they are measured, counted and returned to the Delta.

The Bureau signed a similar agreement with DFG in 1992 to compensate for fish lost at its Delta pumps in Tracy. Under the agreement, the Bureau will pay $6.5 million over the next five years to offset the loss of young fish at the pumps, modify and improve the fish collection facility and continue a predator control program to protect young fish.

Article VII of the agreement provides a framework also to mitigate for indirect losses caused by both state and federal facilities. For six years, DFG and DWR, in cooperation with other state and federal agencies and public interest groups, have been working on more than 12 individual mitigation projects to restore populations of these fish. These projects include rearing and stocking striped bass and steelhead, fish hatchery modernizations, spawning gravel replacement, stream flow enhancement and other projects.

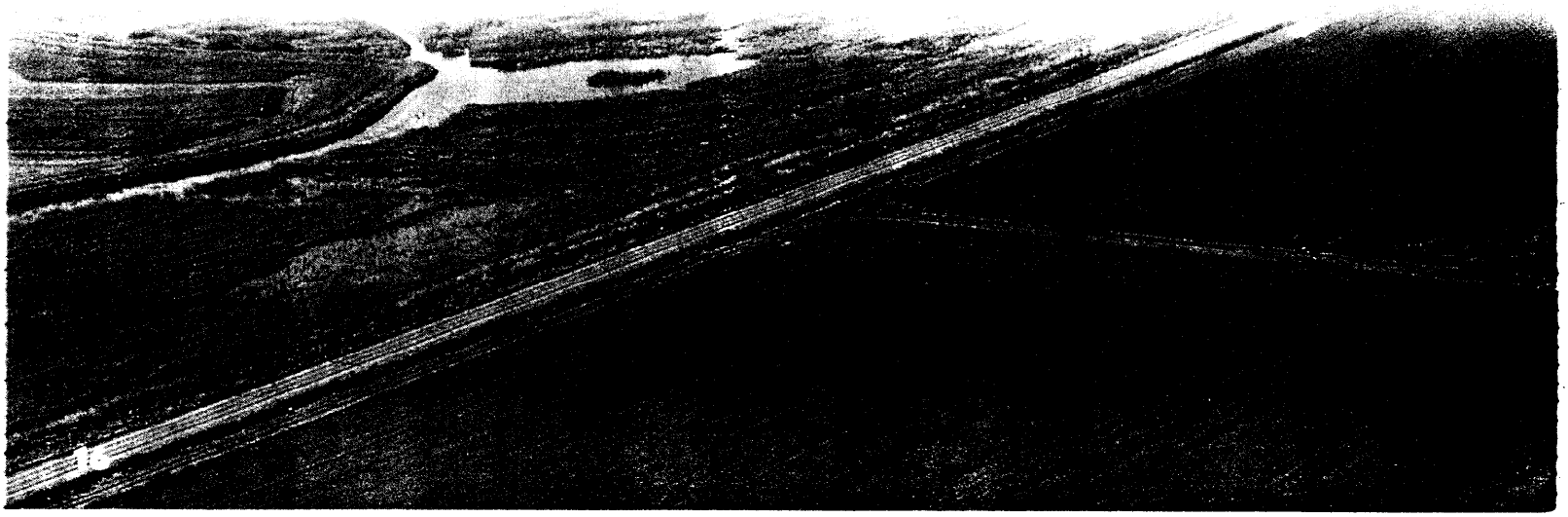
Interagency Ecological Studies Program

The Interagencies Ecological Studies Program (IESP) is a coalition of agencies including DFG, DWR, the Bureau, USFWS, the U.S. Geological Survey, Corps and State Board formed to study and protect the Sacramento-San Joaquin Estuary. The IESP gathers and analyzes information on the variety of factors affecting Bay-Delta fish and wildlife in order to more efficiently manage the estuary.

Testimony indicating that construction of the CVP and SWP contributed to environmental damage in the estuary during hearings on the State Board's D-1379 (1971) led to creation of the IESP.

Currently there are five IESP study elements: fisheries, evaluating salmon, striped bass and other fish; water quality, assessing the impacts of water development on the food chain; fish facilities, obtaining a better understanding of effects of existing Delta pumping facilities on fish; Delta outflow, developing information on the need for Delta outflow to protect the Bay; and hydrodynamics, evaluating fresh water inflow numbers and circulation. When possible, the IESP makes recommendations – based on its studies – about improvements to project operations within the Bay-Delta.

The Delta is a productive farming region as well as a valuable wetland.



CALFED

Background

With the 1994 Delta Accord came a new joint state-federal program set up to implement the standards, coordinate CVP and SWP operation under the standards and develop a long-term solution. Dubbed CALFED (the California Water Policy Council and the Federal Ecosystem Directorate), the program was formed in 1995 to develop a Bay-Delta "fix."

The program involves five federal and five state agencies and is assisted by the 32-member Bay-Delta Advisory Council (BDAC). The BDAC is chartered under the Federal Advisory Committee Act and includes representatives of stakeholder and public interest groups – of major farming, urban, and environmental interests – chosen jointly by the governor of California and secretary of the Interior.

The program is designed to be implemented in three phases: first, identify a clear definition of problems to be addressed, the common key programs and select three alternatives to "fix" the system; secondly, conduct a broad-based environmental review of the three alternatives to identify a single solution and determining water storage, financing and assurances needs; and finally, implement the preferred alternative in a series of stages.

To achieve consensus, CALFED identified six solution principles – assurances – the final alternative should meet:

1. Reduce conflicts in the system among the beneficial users of water – fisheries, habitat and land use, water supply availability and water quality.
2. Be equitable and focus on solving problems in all problem areas, resulting in new benefits and burdens balanced across stakeholder groups.
3. Be affordable with implementation and maintenance costs within foreseeable resources.
4. Be durable with political and economic staying power and be able to sustain the resources it was designed to protect and enhance.
5. Be implementable with broad public acceptance and legal feasibility.
6. Have no significant redirected impacts within the Bay-Delta or other regions of the state, i.e., not benefit one of the triad of interests – environmental, agricultural and urban – at the expense of another.

CALFED released its "programmatic" EIS/EIR statement – phase II – in early 1998 for public comment. After weighing the major characteristics of each of the three alternatives (narrowed from a list of 120) for in-Delta water quality, export water quality, water diversion effects on the fish, Delta flow circulation, water transfer opportunities, operational flexibility, the risk of exporting water supplies, consistency with the solution principles and difficulty in developing an assurances package, CALFED offered no preferred alternative. Instead, CALFED decided to let the public choose which alternative it wants. A brief overview of each alternative follows:

How best to "fix" the Delta is in the hands of CALFED, a joint state-federal program which relies heavily on input from stakeholders and the public.

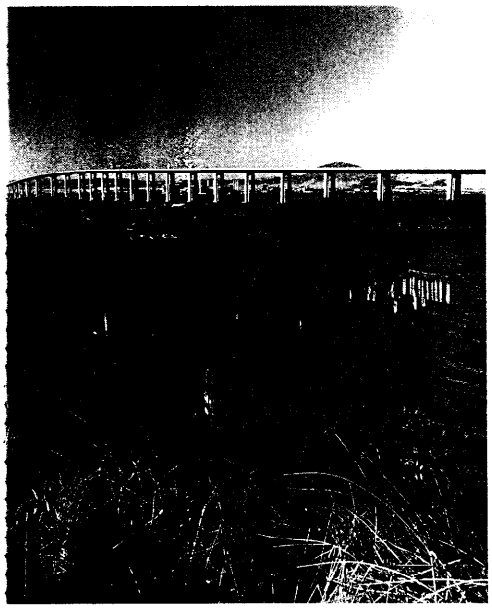
Alternative 1.
Re-operation of the existing system with up to 6.25 million acre-feet of additional surface water and groundwater storage upstream and downstream of the Delta; flow barriers in the South Delta; new, large fish screens installed at the pumping plants; and construction of a new SWP-CVP intertie to allow for shared exports.

Alternative 2.
Construction of a new, shallow Delta channel isolated from Snodgrass Slough with large fish screens for improved flow of better quality Sacramento River water to SWP-CVP pumping plants; up to 6.25 million acre-feet of additional surface water and groundwater storage upstream and downstream of the Delta; McCormack-Williamson Tract floodway and habitat complex; set-back Delta levees; flow barriers in the South Delta; and construction of SWP-CVP intertie.

Alternative 3.
Construction of an additional open-channel isolated facility with screened intake from the Sacramento River to move water around the Delta to the pumps and users in adjacent counties; up to 6.25 million acre-feet of additional surface water and groundwater storage upstream and downstream of the Delta; installation of a new fish screen at SWP-CVP pumping plants; flow barriers in the South Delta; and construction of SWP-CVP intertie.

The Alternatives

Creating a safe, dependable supply of quality water is a major goal for CALFED. Currently, the water supplies from the Bay-Delta are inadequate to meet the needs of all interests. Disagreements over beneficial use, short-term and long-term needs, the inadequate quality of water and flood protection are all being debated but how best to provide these needed improvements is a highly contested issue.



Six common program elements – water use efficiency, water quality, long-term levee protection, ecosystem restoration, water transfers and watershed management – must be included in the Day-Delta fix.

Of the three alternatives, Alternative 1 would require the least change to the existing Delta conveyance system and would preserve the common pool – the area in the Delta where almost all of the three interests obtain their water. (Without the common pool, some fear that agencies would have no incentive to provide fresh water to keep the salty Pacific Ocean water at bay or to maintain the Delta levees which protect drinking water as it flows through the Delta to the export pumps. Salt water harms crops and can corrode local water diversions.) Fish screens would protect fish from entrainment. Alternative 1 would also provide the poorest water supply reliability, the least operating flexibility, the least security in the event of a levee failure and would not improve export water quality, according to CALFED.

Alternative 2 would require the construction of a new shallow channel. According to CALFED, the alternative would provide improved flood control, enhance in-Delta water supply and quality by lowering the salinity level of irrigation water, preserve the common pool concept, provide North Delta flood control benefits and help repel ocean salts that degrade water quality and protect fish from entrainment. It is questionable, however, how much the quality of exported drinking water would improve.

Alternative 3 remains the most controversial. For some, Alternative 3 rehashes memories of the Peripheral Canal, a highly contested issue proposed for the first time in 1960s as a method of improving water quality and conveyance while lessening the negative impact the Delta project's pumps were having on fish.

In 1977, the discussion over using the Peripheral Canal to transport Delta water moved a step closer to reality. DWR proposed an amalgam of joint state-federal programs and facilities which later became Senate Bill 200. The bill included a 42-mile canal to circumvent the maze of Delta channels and more efficiently carry water from the Sacramento River south to CVP and SWP pumping plants. Fresh water would be released into the Delta at strategic points for irrigation, fish and wildlife enhancement, and to repel salt water intrusion. As a compromise, a provision was added guaranteeing more protection for the Delta and north coast rivers. But after much controversy, a referendum on the bill, Proposition 9, was defeated in 1982, primarily because of cost (in 1981 dollars, the water package – including the canal – was estimated at $3.1 billion) and environmental concerns.

Many of the arguments for both sides of the Delta canal issue apply today as they did in 1977. Proponents of the canal say it would help avoid the problem of "reverse flows" which occur when Delta inflow is low and exports are high. The powerful south Delta project pumps actually reverse the natural flow of fresh water through the estuary, drawing water east and south rather than west into the Bay. Not only does this disorient migratory salmon, steelhead and bass and draw fish into project pumps, but under very dry conditions, saltier ocean water is drawn upstream into the San Joaquin River and other channels. Advocates of Alternative 3 say the quality of water, both in the Delta ecosystem and the water being exported, would improve.

Likewise, fears have not changed that the isolated facility – like the Peripheral Canal – will open the door for increased water exports to central and southern California and continue to fuel the long-standing north-south water wars. Other opponents fear the system would be operated in a manner that would harm the environment or remove the comfort provided by the ample common pool which protects in-Delta water users.

Core Programs

CALFED has focused on the following six common program elements which the Bay-Delta fix must cover. They are: a water use efficiency program, a water quality program, a long-term levee protection program, an ecosystem restoration program, water transfers and watershed management coordination.

The water use efficiency program focuses on water recycling and reuse, and water conservation. The conservation components are largely based on the best management practices adopted by urban agencies in 1991 and the efficient water management practices to be adopted by agricultural interests. Agricultural interests lobbied against an early proposal to fallow 800,000 acres of farmland in the Central Valley and CALFED ultimately dropped ag land retirement from its water use efficiency program saying it would violate the solution principles of no significant redirected impacts within the Delta or the rest of the state.

Since then, CALFED has said that it will not include fallowing in its water use efficiency program and instead has proposed farmland retirement for its water quality and ecosystem restoration programs. CALFED estimates that around 40,000 acres of farmland in the San Joaquin Valley will be retired or converted as part of its water quality program. Other methods of improving water quality under the CALFED proposal include monitoring urban storm water releases and improved techniques for the application of herbicides and pesticides which can degrade streams.

Additionally, CALFED intends to improve the integrity of the Delta conveyance system through its long-term levee protection plan. The plan would provide flood protection for the North Delta, control island subsidence, provide a uniform response for emergencies, fund levee stabilization projects and develop standardized maintenance agreements.

The Ecosystem Restoration Program (ERPP) is an integral part of the Bay-Delta fix which would improve water quality during low flows but could reduce water availability for agricultural and urban uses. The program is predicted to take 25 years to implement at a cost of $1.5 billion and would be paid for by a variety of public and private sources, including the funding contained in 1996's Proposition 204, federal/state cost-sharing and stakeholders from the three interests who signed the Bay-Delta Accord in 1994.

The ERPP is intended to address a variety of issues pertaining to the loss and decline of native fish, wildlife and plants as a result of water diversions and land use. The ERPP would work to restore the natural instream flows and Delta outflows to approximate the natural hydrologic cycle. A major area of debate, however, is how to restore lost habitat. By enlarging natural flood plains by setting back levees, wetlands – an integral habitat for young and breeding fish and other wildlife – are restored.

The Ecosystem Restoration Program Plan proposes that 138,000 to 191,000 acres of land within the Delta be converted to wildlife habitat or other uses, including 98,000 acres to 115,000 acres of farmland (some of which – 40,000 to 70,000 – would be "wildlife friendly" and would not require a total cessation of farming).

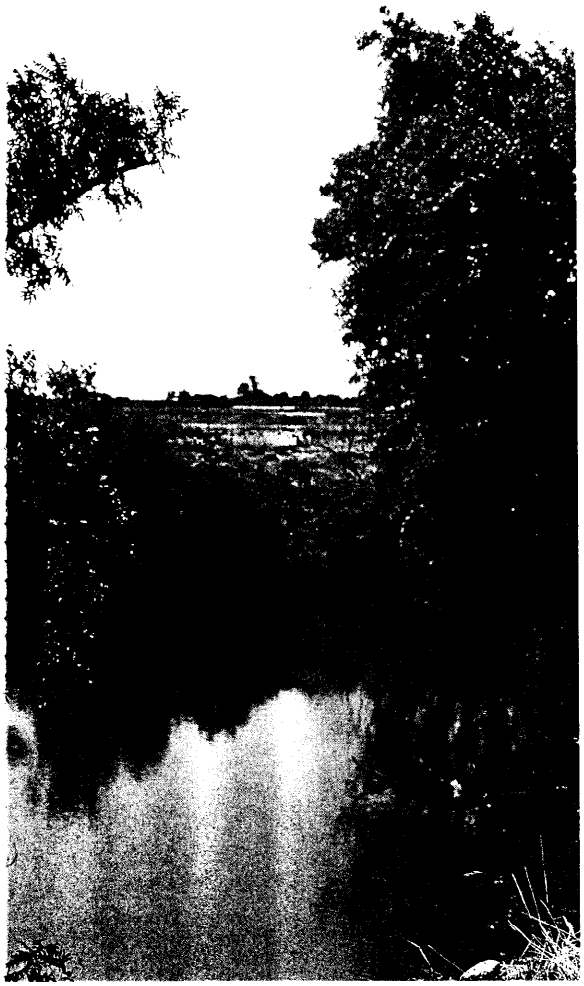
Watershed management and water transfers were two elements added by CALFED in 1998 to the list of core programs. Working on projects involving ecosystem quality, water quality, water supply reliability and levee and channel integrity, the watershed management element will focus on two areas: the upper tributary watersheds above reservoirs and major fish passage obstructions; and the lower watershed, below those obstructions. The water transfers program will provide a framework for regulated water transfers on both a voluntary and compensated basis between the three interest groups.

Funding

The costs to implement the alternatives range from $4 billion to $10.5 billion, with annual capital repayment costs, energy, operation and maintenance estimated at $500 million to $600 million. Part of that funding will come from the second-largest water bond ever passed by California voters, Proposition 204. The "Safe, Clean, Reliable Water Supply Act" was passed in November of 1996 and authorized a $995 million general obligation bond to be repaid over the next 30 years at about $71 million a year. More than half the money – $538 million – will finance improvements to the Delta and its tributaries ($193 million for physical improvements to the Delta system, $100 million toward implementation of the federal CVP Improvement Act, Category III Delta environmental projects, Delta levee improvements and South Delta barriers), including $390 million to CALFED.

In 1998, Gov. Wilson proposed a $1.3 billion general obligation water management bond which would include funding for levee improvements, safe drinking water programs, wastewater recycling, water conservation and conjunctive use and feasibility studies of proposed offstream reservoirs in the Sacramento Valley. The plan has been opposed by environmental group who are against the construction of increased surface storage and conveyance facilities.

Summary



In addition to being an important resource for farmers, boaters and fishermen and the 20 million residents who depend on its waters, the Delta is an ecological haven for numerous species of plants, animals and aquatic life.

The Delta is a region of multiple uses. Its islands' rich soil nourishes an agricultural cornucopia, while the labyrinth of Delta sloughs serves as a recreational playground for boaters and fishermen. The mix of fresh water from Delta rivers and salt water from San Francisco Bay sustains a diverse population of flora and fauna. The Delta also is the heart of California's largest water delivery systems, the CVP and the SWP, whose waters are the lifeblood for 20 million residents, the state's $700 billion industry and more than 4 million acres of productive farmland, primarily in the San Joaquin Valley.

The Delta has long been a subject of conflict and controversy – especially when it comes to water allocations for farms, cities, fish and wildlife. Over the last decade, a number of factors has increased pressure on the fragile Delta system and heightened interest in attaining a solution to Delta problems. These factors include a precipitous decline in many fish species that live in or migrate through the Delta, laws and public pressure to protect the environment, unprecedented urban population growth and a corresponding need for more water, and the 1987-1992 drought.

Add to these issues the concern over the deterioration of Delta levees, drinking water quality and salinity intrusion and it becomes even more complicated. Because of all these factors, there is no simple solution to the Delta dilemma. The many local, state and federal agencies all attempting to come up with solutions for Delta problems often work at cross purposes. The variety of Delta issues and number of special interest groups have added to the long and drawn-out process of addressing and solving local Delta problems and statewide water issues.

At the state level, the future of the Delta seems to reside not only in the hands of the three big interests (ag, urban and environmental), but in the hands of the public. It is the public who will strongly influence which of CALFED's three alternatives to choose for a Bay-Delta "fix" and in what manner water quantity and quality will be addressed. Sure to remain at the forefront of debate will be Alternative 3, which includes the much-contested isolated facility. The defeat of Proposition 9 (the Peripheral Canal ballot package) remains a strong indicator of how the public may react to building a canal to convey water to the south if area protections are not assured.

At the local level, the Delta Protection Commission, established by the state Legislature in 1992, has developed a resource management plan to guide future land-use in this area. Adopted in 1995, the plan identifies a 487,625-acre "primary zone" and a "secondary zone." Local government officials must now amend their general plans to match the regional plan for the primary zone. Local governments will continue to have final authority in the secondary zone. Among the main goals of the commission and the plan is preservation of agricultural land; restoration of levees; conservation of fish and habitat; protection of open space; protection of public access and use of public waterways; and to promote creation of wildlife preserves through voluntary agreements. Now that the plan has been adopted, the commission will decide appeals of local land use decisions.

In mid-1995, the State Board adopted its own Delta water quality control plan similar to the historic 1994 accord. Like the federally drafted rules, the state plan allows for flexibility on endangered species take limits, coordinated real-time monitoring of water project operations, and a commitment to non-flow issues to improve the estuary's environmental resources.

As State Board members begin to consider the water rights issue (a process expected to take up to three years to complete), work on both a long-term Delta "fix" and implementation of the non-flow projects will proceed. With establishment of these agreements, the new water quality plan and the pending CALFED Bay-Delta decision, there is a new sense of optimism toward resolution of Delta issues. Using new strategies to meet supply demands, comply with environmental protection and resolve water quality problems is the challenge that the state's residents and water managers will face into the next century.

Whether this promising venture can succeed is uncertain, for as this guide illustrates, there are many competing uses for the estuary – with interest groups existing for each of these uses.

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California Department of Water Resources

EXHIBIT C

Report to a Joint Hearing of the

Senate Committee on Agriculture and Water Resources and

Assembly Committee on Water, Parks and Wildlife

Delta Fish Protection and Water Supply

June 22, 1999

Presented by
Thomas M. Hannigan, Director

Department of Water Resources

Mr. Chairmen and Committee Members:

Thank you for inviting me to testify on the important subjects of Delta fish protection and water supply. To better understand today's concerns about reduced pumping in the Delta, let's quickly review a few events that lead us to this point, identify the current concerns and possible resolutions, and review the process necessary to get to resolution.

As you may recall, the federal Central Valley Project Improvement Act was enacted in 1992 and requires the Department of Interior to take actions to double the populations of anadromous fish within the vast Central Valley. The U.S. Fish and Wildlife Service developed a list of actions to accomplish this task and the Bureau of Reclamation implemented changes in Central Valley Project operations to accomplish the actions. The CVPIA required a reduction in the yield of the CVP by 800,000 acre-feet of water that is to be managed annually, and this reduction was redirected from rural and urban uses to the benefit of the environment. Defining the 800,000 acre-feet of yield and what it means in terms of annual water supply has been the center of controversy since the Act was signed. This year, that controversy erupted into lawsuits filed by water and environmental stakeholders in federal court.

This information is important because it helps explain some of the conflict that has occurred recently. The efficient implementation of CVPIA can only happen with the cooperation of the State of California; for example, this last spring, we agreed to participate in a series of actions designed to protect juvenile salmon migrating out of the San Joaquin River system by reducing pumping at the State Water Project and CVP facilities in the Delta. The pumping was

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reduced beginning April 17 during a time when additional water was released from reservoirs in the San Joaquin River system.

When the federal judge presiding over the lawsuits declared the CVPIA actions could not be implemented until an accounting for the 800,000 acre-feet of yield is done, we began to operate the two water projects to protect Delta smelt. This protection is defined in the Delta Smelt Biological Opinion for Operations of the CVP and SWP by the USFWS. The Opinion is much like a permit, it is in essence approval of the proposed project operations and it authorizes taking of a protected species incidental to those approved operations.

One criterion contained in the Opinion is for lower exports during a one-month period in the springtime. The one-month period, which for this year started on April 17 and continued until May 17, is to be followed by a resumption of higher exports to meet expected increases in demands for water and to refill depleted storage resulting from the earlier action. Unfortunately, salvage of Delta smelt at the export facilities increased dramatically and by May 20 the Bureau of Reclamation re-initiated consultation with USFWS as required by the incidental take statement in the Opinion.

Since May 20, and at the request of the FWS, the Department and the Bureau have jointly reduced SWP and CVP pumping by about 400,000 acre-feet due to concerns over adverse impacts to delta smelt. It was believed the reduction would be for a short period; historically, concerns over impacts to delta smelt from pumping diminish rapidly after three to four weeks as delta smelt naturally move westward out of the Delta. This year, however, a portion of the population continues to remain within the Delta. As the days of pumping reductions accumulate, the likelihood of potential water supply problems increase. Now, we face three potential problems: (1) an immediate shortage of water for meeting demands; (2) a shortage that could impact water quality and quantity by the end of the summer (this I will call the San Luis "low point"); and (3) a shortage that could reduce the amount of water available to meet next year's needs. I'll discuss each briefly:

Immediate Problem

Today's supply of water is just meeting the day-to-day deliveries. Water is available in Northern California reservoirs to meet the demand; however, neither the SWP or CVP can move that water due to pumping constraints for delta smelt. This means that most of the supply to meet current demand is coming from San Luis Reservoir. San Luis Reservoir is an off-stream storage facility near Los Banos jointly owned and operated by the Department and the Bureau. During wet periods, water is pumped from the Delta and placed into San Luis. During the summer months, releases from San Luis are combined with Delta exports to meet deliveries to the south Bay, Santa Barbara, the San Joaquin Valley and Southern California. Normally, we rely upon exports from the Delta to offset the difference between demands and releases from San Luis Reservoir. Operating so close to the margin means a mechanical failure could lead to short-term shortages.

San Luis Low Point Problem

As I stated earlier, San Luis Reservoir is normally operated in a cyclic manner; however, we try to keep the reservoir from dropping below a level that causes water quality degradation to supplies delivered directly from it. We also try to avoid drawing the reservoir down to a level that begins to jeopardize our ability to provide those supplies.

The Santa Clara Valley Water District extracts water from the western end of the reservoir to meet both municipal and industrial demands in all of Santa Clara County. Unfortunately, water quality degrades when the lake drops below about 300,000 acre-feet. In fact, the supply becomes unusable for some industrial demands at about 200,000 acre-feet. At about 100,000

acre-feet, we believe the District will be unable to withdraw water from San Luis.

Based on recent projections, San Luis Reservoir will drop to about 200,000 acre-feet by the end of August; assuming pumping is increased this week. If exports are not increased until the first of July, storage is expected to drop to about 100,000 acre-feet.

Long-term Problem

If we are unable to replace the storage being released from San Luis Reservoir now, the reduction in exports from the Delta this year could impact the amount of water available for delivery next year. Storage in San Luis Reservoir at the beginning of the water year is very significant to that year's water supply if conditions are dry. Current projections indicate the probability of full SWP water deliveries being met next year is good for most types of water years. This projection, however, does not include possible export restrictions that may be imposed in the winter for spring-run or winter-run salmon. Replacement of the storage in San Luis Reservoir this year would help to reduce the impact these potential export curtailments could have on next year's water supply.

Lower storage in San Luis Reservoir also decreases the ability of the SWP to provide interruptible water supply to its contractors during the winter and early spring. Interruptible supply is water delivered when it becomes available in the Delta. It is not stored within the SWP but delivered directly to contractors who store it within their districts. It is a way of capturing water supply during times when it is less likely to impact fish and increasing overall water supply reliability in the SWP service area. Interruptible supply is very significant to the water users. It is viewed as a way to bolster supply reliability during an era of increasing export restrictions.

There are several things we are currently doing to resolve these three problems and there are various processes we will use to complete our task. We have directed staff to identify technical solutions and the challenges associated with each. We are also meeting at the policy level to ensure effective coordination and communication among our respective agencies. Actions that are being taken include:

- Pursuing an agreement to borrow water from water users. We have begun discussions with water users south of the Delta about temporarily switching them to local supplies to reduce the demand on water from San Luis Reservoir. This could cost between $140 - $170 per acre-foot and would require that the water be replaced at a later time. We have begun exploring how these transactions would be funded.

- Increasing pumping. Yesterday, FWS approved a 500 cfs increase in pumping for the CVP. This increase will provide a small cushion against potential short-term shortages.

- Meeting daily with the experts (those who operate the projects and those who receive water). This will ensure that we have the most current information about demands. Having the ability to accurately forecast demands is critical at this point.

- Evaluating what additional flexibility may be available in the CVP and SWP systems. For example, the SWP has shifted some of the deliveries in Southern California from San Luis to SWP reservoirs in the Southland.

- Monitoring impacts of additional pumping on delta smelt. Currently, we have an extensive real-time monitoring program collecting data and evaluating and disseminating information about the status of delta smelt. With additional monitoring, we could evaluate how changes in exports affect delta smelt distribution; therefore, managing pumping increases to minimize impacts on the species.

- Working closely with stakeholders (water users, environmentalists, and in-Delta agricultural interests). By working through this in a cooperative fashion, we believe we will be able to identify additional sources of water that can relieve the pressure off using storage from San Luis Reservoir; furthermore, we're evaluating real-time data to determine when and how much Delta pumping can be increased.

Over the next several weeks, we will develop solutions for the water supply problems we face. We are optimistic that we can find a way to meet the needs of delta smelt without sacrificing water supply for CVP and SWP contractors. But as we navigate through this difficult time, it is clear the conflict we are experiencing now exemplifies the type of issue the CALFED Program is designed to resolve.

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For more on-line information, see Find DWR Info or return to the DWR California Water Page 

Write or phone the DWR Office of Water Education for more information about DWR's water activities.

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EXHIBIT D

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

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

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

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

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

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

How an Environmental Water Account Could Work

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

EWA Versus Prescriptive Standards

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

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

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

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

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

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

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

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

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

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

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

EWA Gaming Exercises

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Issues To Be Resolved

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

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

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

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

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

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

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