



WEST DELTA

Water Management Program

CENTRAL DISTRICT

CALIFORNIA DEPARTMENT OF WATER RESOURCES



ON THE COVER

The Pacific Flyway, which follows the valleys of the Sacramento and San Joaquin Rivers in California, provides a major migratory pathway for millions of birds. Many of these birds make California their winter home. The Delta and other wetlands in the Central Valley provide habitat for 60 percent of all waterfowl that winter in California. More than a million waterfowl are frequently in the Delta at one time.

(Department of Fish and Game Photo)

WEST DELTA WATER MANAGEMENT PROGRAM



**Department of Water Resources
Central District**

July 1988

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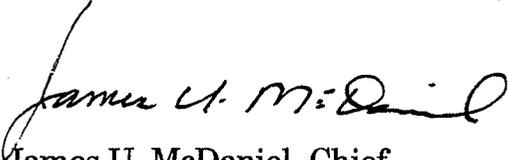
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FOREWORD

Until recently, water management planning in the west Delta has focused primarily on installation of an overland water supply facility on Sherman Island. This facility, to be funded by the State Water Project, would address only the water supply needs of the island. While these needs are important, other issues and programs have also come into focus and have reshaped and broadened the west Delta planning perspective. A difficult agricultural economy and continuing problems of subsidence and levee instability on Sherman Island have necessitated a more comprehensive planning approach.

This planning report describes a wildlife management plan as an alternative land use for Sherman Island and presents methods for implementation. Altering land use practices on Sherman Island as proposed in the wildlife management plan could provide up to 10,000 acres of managed wildlife and waterfowl habitat and also provide substantial flood control benefits; added protection for Delta water quality; recreation opportunities; and water supply reliability to the State Water Project, Contra Costa Canal, and Central Valley Project.

This wildlife management plan represents the principal effort of the West Delta Water Management Program, one of three major planning efforts by the Department of Water Resources in the north, south, and west Delta. The wildlife management plan has many purposes, with a broad range of interests and benefits. As such, it would provide cost-sharing opportunities and would satisfy the needs and meet the objectives of this program.



James U. McDaniel, Chief
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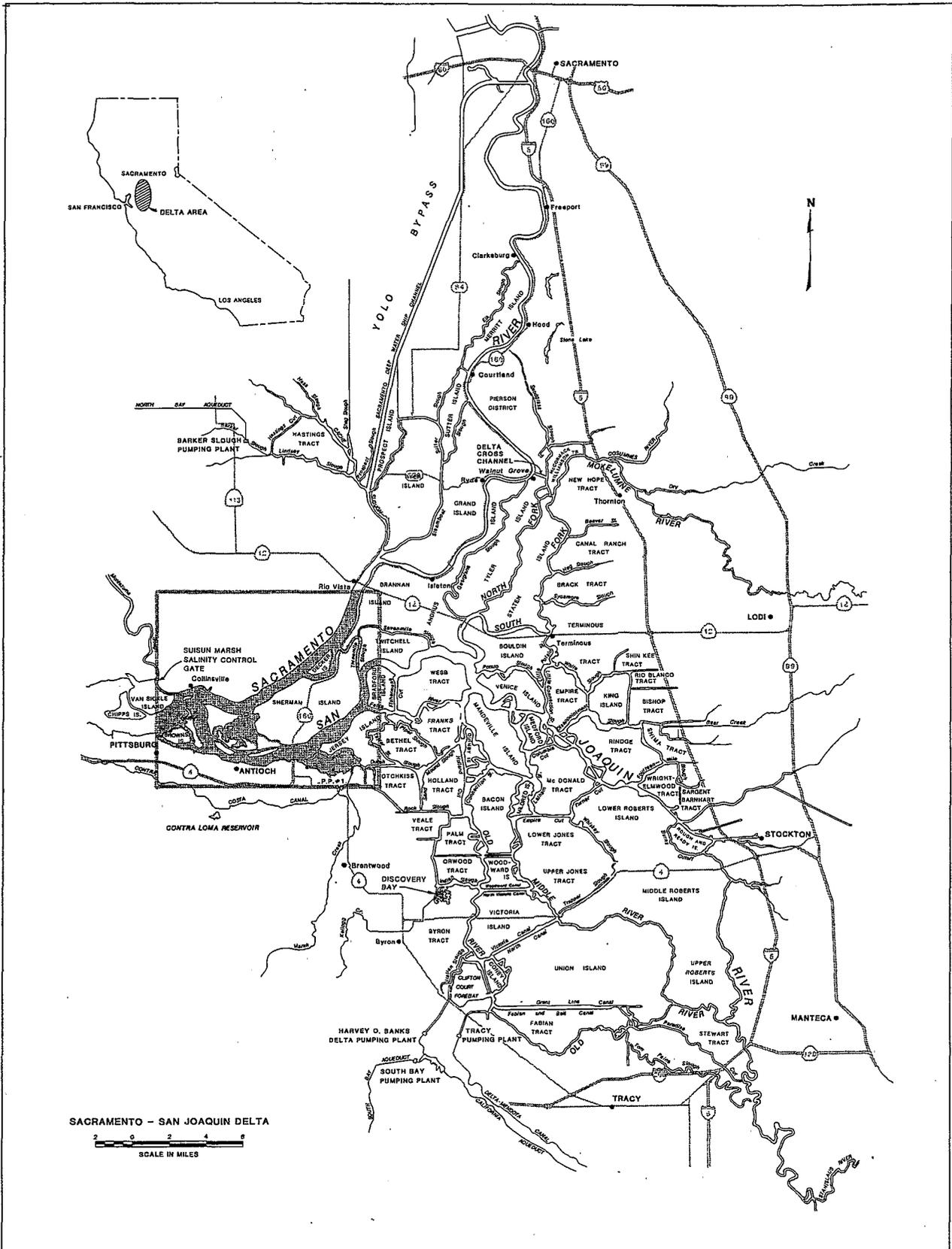


Figure 1
STUDY AREA, WEST DELTA WATER MANAGEMENT PROGRAM

Chapter 1. INTRODUCTION

The West Delta Water Management Program represents parallel planning and environmental documentation to improve water quality, flood protection, and wildlife habitat in the western portion of the Sacramento-San Joaquin Delta. The study area (Figure 1) includes Sherman Island, located at the confluence of the Sacramento River (on the north) and San Joaquin River (on the south). Sherman Island is also bordered by Threemile Slough on the east and by Sherman Lake and the Lower Sherman Island Wildlife Area on the west.

About 200 people live on Sherman Island. State Highway 160, a major artery connecting Sacramento to the Antioch-Pittsburg areas, crosses the island. Several Pacific Gas & Electric Company transmission lines cross the island, which also has several underground gas fields.

The Objectives

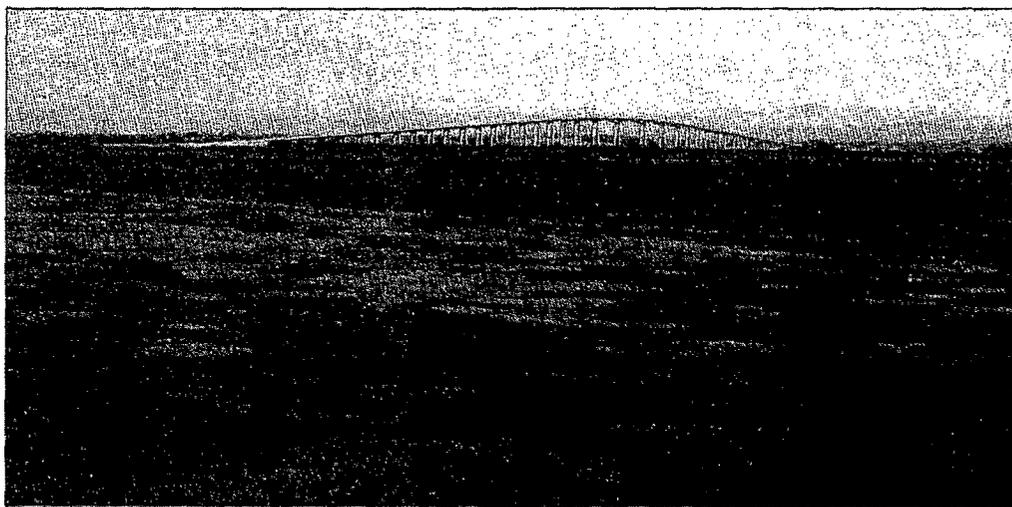
Because of its location, the 10,000-acre Sherman Island is important in protecting the reliability and quality of the Delta water supply and in protecting highways and utilities. The island is the focus of the West Delta Water Management Program, objectives of which are:

- *Improving levees for flood control;*
- *Protecting Delta water quality;*
- *Meeting water supply and water quality needs of Sherman Island ;*
- *Providing habitat for waterfowl and wildlife;*
- *Minimizing oxidation and subsidence;*
- *Protecting the reliability of the State Water Project, Contra Costa Canal, and Central Valley Project;*
- *Identifying potential wildlife habitat mitigation opportunities for present and future water development projects;*
- *Protecting highways and utilities; and*
- *Providing additional recreational opportunities.*

The Planning Process

The planning process is considering plan development, funding sources, land acquisition options, and selection of a lead agency (Water Resources or Fish and Game) to implement the program. The Department of Water Resources will work closely with the U.S. Army Corps of Engineers to determine the Corps' possible involvement through existing or newly authorized flood control programs. The West Delta Water Management Program is also being coordinated with planning being done under Senate Bill 34, recent State legislation on Delta levee protection (see Chapter 4). In addition, the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) and other State and Federal laws and programs pertaining to endangered species and wetland preservation will provide guidance throughout the planning process. All appropriate environmental documentation will be completed before any program is implemented.

In an effort to address all alternatives, cost-sharing opportunities, and environmental impacts, planning will also be coordinated with North Delta Water Agency, Department of Fish and Game, Reclamation District 341, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, private entities, and the public. Also, any actions will fully comply with State Water Resources Control Board water right Delta protective standards. Coordination with other agencies will help determine what State and Federal permits will be required.



The Antioch Bridge, seen here on the horizon, is a predominant feature of Sherman Island. State Highway 160, which crosses Sherman Island to the Antioch Bridge, is a major artery connecting Sacramento with the Pittsburg/Antioch area. Added flood protection for this highway system would be provided by the West Delta Water Management Program.

DWR Photo 7E27-34

The Schedule

The planning, environmental documentation, and project implementation process for the West Delta Water Management Program is scheduled for completion in about two years. The schedule is shown below:

<i>Publish Wildlife Management Plan</i>	<i>Mid -1988</i>
<i>Complete Planning Report</i>	<i>Mid -1988</i>
<i>Hold Public Meetings</i>	<i>Late 1988</i>
<i>Sign Agreement: Department of Fish and Game/DWR</i>	<i>Late 1988</i>
<i>Sign Agreement: North Delta Water Agency/DWR</i>	<i>Mid-1989</i>
<i>Complete Environmental Documentation</i>	<i>Mid-1989</i>
<i>Complete Land Acquisition</i>	<i>Late 1989</i>
<i>Begin Levee Rehabilitation</i>	<i>Mid-1989</i>
<i>Begin Project Implementation</i>	<i>Early 1990</i>

The wildlife management plan will identify wildlife management alternatives and specify a plan for developing various habitat types on Sherman Island. Much information from drafts of the plan is included here. Two agreements will be required to implement any of the wildlife management alternatives. The agreement with Department of Fish and Game will stipulate a lead agency and responsibilities for implementing the program. The agreement with North Delta Water Agency is to amend the 1981 agreement (discussed later) to include the wildlife management plan as an alternative to constructing an overland water supply facility on Sherman Island.

Once the Fish and Game/Water Resources agreement is complete, environmental documentation requirements specific to this program will be determined, in compliance with the California Environmental Quality Act. Initial study requirements will be completed to identify possible impacts attributable to the proposed plan. Mitigation requirements will also be addressed. If significant environmental impacts are identified, an environmental impact report will be prepared; otherwise, a negative declaration will be prepared for the program.

Assuming a wildlife management plan is selected, land acquisition will begin after completion of required environmental documentation. Land acquisition will be a negotiated settlement with land owners; acquisition options are discussed in Chapter 3. Rehabilitation of Sherman Island's nonproject levees, planned as part of any water management alternative, is also discussed in Chapter 3.

The Delta

The Sacramento-San Joaquin Delta is a unique and valuable resource. Natural runoff and floodflows from the Sacramento, San Joaquin, Mokelumne, and Cosumnes Rivers flow into the Delta, which receives runoff from 40 percent of the State's land area. Until reclaimed by levees built in the late 1800s and early 1900s, the Delta was mostly a tidal marsh. The Delta supports hundreds of species of fish, wildlife, and plants. It is part of an interconnected estuary system that includes the Suisun Marsh and San Francisco Bay and provides a passageway to and from the Pacific Ocean for migrating fish. Navigation and recreation are also important.

The Delta covers 700,000 acres interlaced with hundreds of miles of waterways. Much of the land is below sea level and relies on more than 1,000 miles of levees for protection against flooding. The levees protect hundreds of miles of highways, pipelines, railroads, and powerlines. Unstable levees and limited channel capacity have led to repeated and expensive flooding. The most serious recent flooding was in the north Delta in February 1986.

Water projects divert water from Delta channels to meet the needs of about two-thirds of the State's population and to irrigate 4.5 million acres. Diversion facilities of the Central Valley Project and the State Water Project are in the south Delta, about 12 miles northwest of Tracy. Other diversion facilities include the North Bay Aqueduct, Contra Costa Canal, and about 1,800 local irrigation diversions.

The integrity of the Delta levee system plays a major role in protecting the beneficial uses of the Delta.

SHERMAN ISLAND

In 1868, Sherman Island was the site of the first large-scale attempt to reclaim Delta marshland. Until then, the island was covered in tules, except for a few small plots along the river that were partially reclaimed. The levee was completed in April 1869. Sherman Island's levee system was primarily built of local organic peat materials and was 3 to 5 feet high.

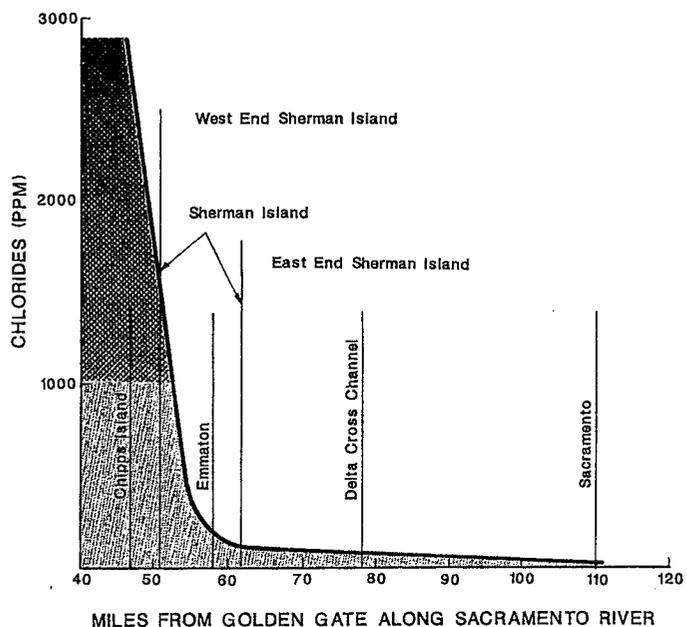
As with much of the Delta peat land, Sherman Island began to subside shortly after being reclaimed. Drying of the organic soil caused shrinkage, wind caused soil erosion, and working the soil for farms caused oxidation. Because of island subsidence, parts of Sherman Island are now about 20 feet below sea level, and levees are more than 25 feet above the island floor. Subsidence is also a major problem affecting stability of Delta levees.

Levees on Sherman Island developed crevasses and failed several times between 1870 and the early 1900s as a result of high water pressure on the unstable foundations. In 1909, the northern levee on the Sacramento River near Decker Island failed, leaving a small lake on the interior of the levee. A similar breach on the San Joaquin River side in 1969 also left a small lake.

Levees on the northern side of Sherman Island, along the Sacramento River, have been rehabilitated to meet standards established for Federal Flood Control Project levees. However, levees along the San Joaquin River southern side are local nonproject levees. Problems with the nonproject levee continue near the 1969 break, including seepage and settlement, requiring immediate and costly repair work.

Sherman Island is situated where fresh river water and salty bay water meet and mix. The figure below shows that under typical summer salinity conditions in the lower Sacramento River, salinity rises sharply in the area of Sherman Island. This is why the island's levees are critical to controlling salinity intrusion to the interior Delta. A levee break would increase the rate and area of mixing and would allow the saline bay water to move farther upstream, jeopardizing the fresh water supply taken from the Delta for cities and farms in the San Francisco Bay area, San Joaquin Valley, and Southern California.

SALINITY GRADIENT IN RELATION TO SHERMAN ISLAND LOCATION



Chapter 2. WATER PROBLEMS IN THE WEST DELTA

The West Delta Water Management Program is centered around four major issues: flood control, water quality, water supply reliability, and wildlife concerns. The importance of these issues to the west Delta, and to the Delta as a whole, has necessitated this broadened scope of planning. This chapter describes the issues and the opportunities for providing solutions.

Flooding

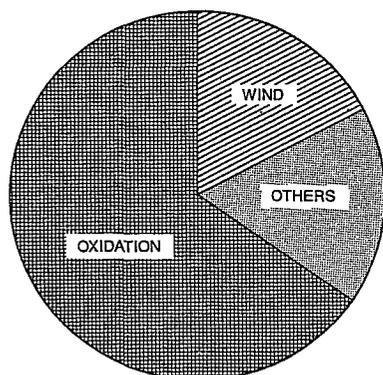
Generally, flooding of Delta islands is caused by levee overtopping or levee failure.

Levee overtopping has been and continues to be a problem in the northern and western Delta during periods of high flows. Overtopping is mainly due to inadequate channel capacity during high flows and high tides. On Sherman Island, flood control issues usually involve levee stability, which in this area is related primarily to subsidence. Major structural levee failures occurred on Sherman Island in 1909 and in 1969. All alternatives under consideration for the West Delta Water Management Program include rehabilitation for the levees.

LAND SUBSIDENCE: CAUSES AND CONTROL

The graph below shows that oxidation is the primary contributor to subsidence of the Delta islands.

RELATIVE CONTRIBUTION TO SUBSIDENCE UNDER PRESENT CULTIVATION PRACTICES



Oxidation occurs when water is removed from organic soils, thus exposing the soil to aerobic decomposition. Repeated tilling accelerates the process. Tilling also aggravates wind-induced erosion. Delta peat soils are very light and easily blown away. Wind also hastens oxidation by exposing new soil surface. The wetting and drying cycle of crop irrigation adds to the problem, because the peat soils shrink as they dry.

Crop and land use management is part of the West Delta Water Management Program and is the best means of preventing oxidation and shrinkage, and to some extent wind erosion. Land use management or changes in land use to control subsidence could provide significant wildlife habitat benefits as well.

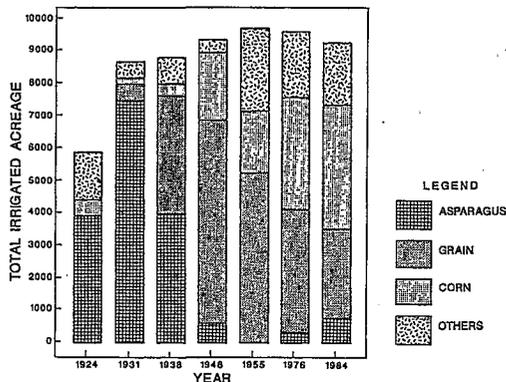
AGRICULTURE -- IN THE DELTA AND ON SHERMAN ISLAND

The Delta is remarkably fertile, and agriculture is the predominant land use, beginning with the subsistence gardening of the Gold Rush. Today more than 70 percent of the Delta is farmed, and its farm products contribute more than \$400 million to California's economy each year.

On Sherman Island, total acreage in production has been relatively constant, at about 9,700 acres, since the late 1940s. Cropping patterns have shifted somewhat, from asparagus to a mixture of corn and grain, as shown by the graph below. Crop rotation to replenish soil nutrients is not normally practiced.

Deep, porous, peat soil promotes the use of subsurface irrigation throughout most of Sherman Island. Most crops are planted in late fall and winter, and harvest begins during late summer and early fall. Corn is planted in April. Asparagus requires much hand labor, and once established is not taken out of production for about 10 years.

**SHERMAN ISLAND
HISTORICAL CROPPING PATTERNS**



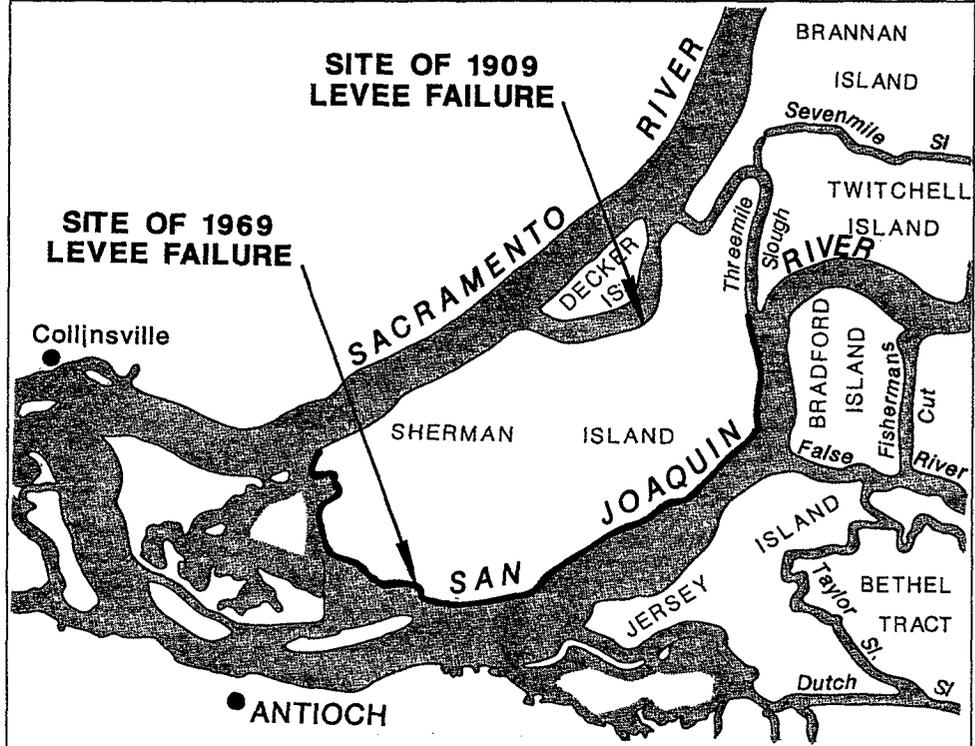
There are two major designations of levees in the Delta: project and nonproject. Project levees are part of the Federal Flood Control Project, and they constitute about 35 percent of the Delta levee system. These were built and are maintained to more stringent standards than are nonproject levees. Nonproject levees, which make up the remaining 65 percent of the Delta levee system, were constructed and are maintained by island landowners or local levee and reclamation districts to widely fluctuating standards.

Sherman Island is surrounded by about 20 miles of levees. About half, primarily on the south side of the island, are nonproject levees (see Figure 2). In 1969, one of these nonproject levees failed due to instability. Nonproject levee failures can be attributed partly to the unstable nature of organic soils and partly to subsidence of island land surfaces, which increases the pressure on the levees from water levels in adjoining channels. Rehabilitation of nonproject levees on Sherman Island and reduction of subsidence are important flood control benefits.

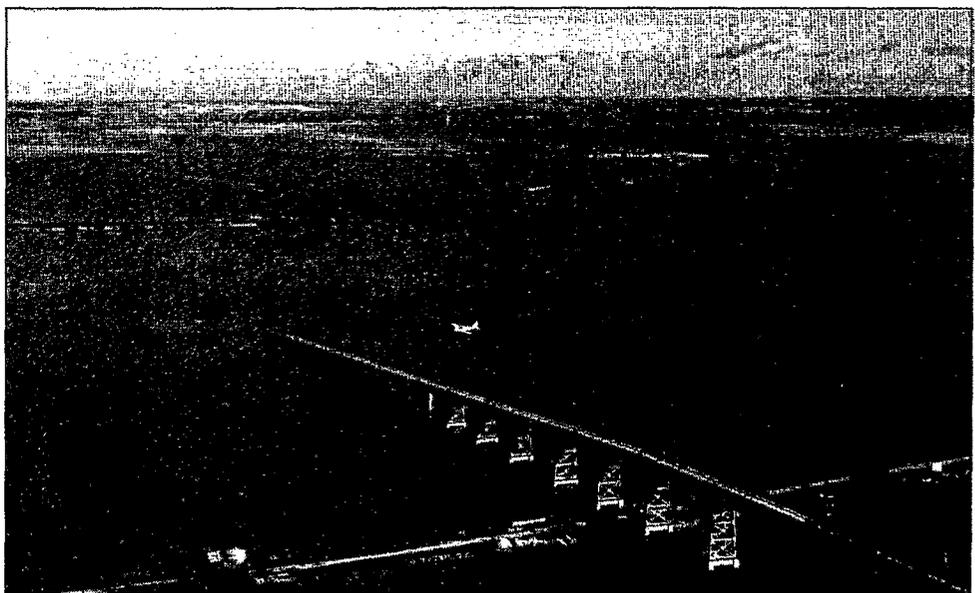
Department of Water Resources studies have indicated that some Delta island floors are subsiding at a maximum rate approaching 3 inches per year. While this value is only an estimate, Sherman Island has subsided about 20 feet since its reclamation in 1869, for an average of about 2 inches per year.

In addition to the flood improvement actions included in the West Delta Water Management Program, other Delta levee improvement needs are being investigated under related program activities; these are discussed in Chapter 4. The following sections show how flood control is also tied directly to the critical issues of water quality and water supply reliability.

Figure 2
NONPROJECT LEVEES ON SHERMAN ISLAND



About 10 miles of nonproject levees would be improved on Sherman Island as part of any wildlife management plan. This improvement would provide significant flood control and water quality benefits.



In 1969, a break in one of Sherman Island's levees flooded Highway 160 and the approach to the Antioch Bridge. Preserving levees on Sherman Island is indeed critical to protect this transportation system.
 DWR Photo 3681-1B

Water Quality

Eight islands and tracts in the western Delta have been recognized by the Legislature as important to the long-term protection of water quality in the Delta. The largest of these is Sherman Island. The others are Hotchkiss Tract, Holland Tract, Bradford Island, Bethel Island, Jersey Island, Webb Tract, and Twitchell Island (see Figure 3).

These islands and tracts are important to Delta water quality because they are adjacent to major Delta channels in the area where fresh water from the east meets ocean salt water from the west. Here in the western Delta, there is significant mixing when these water sources meet.

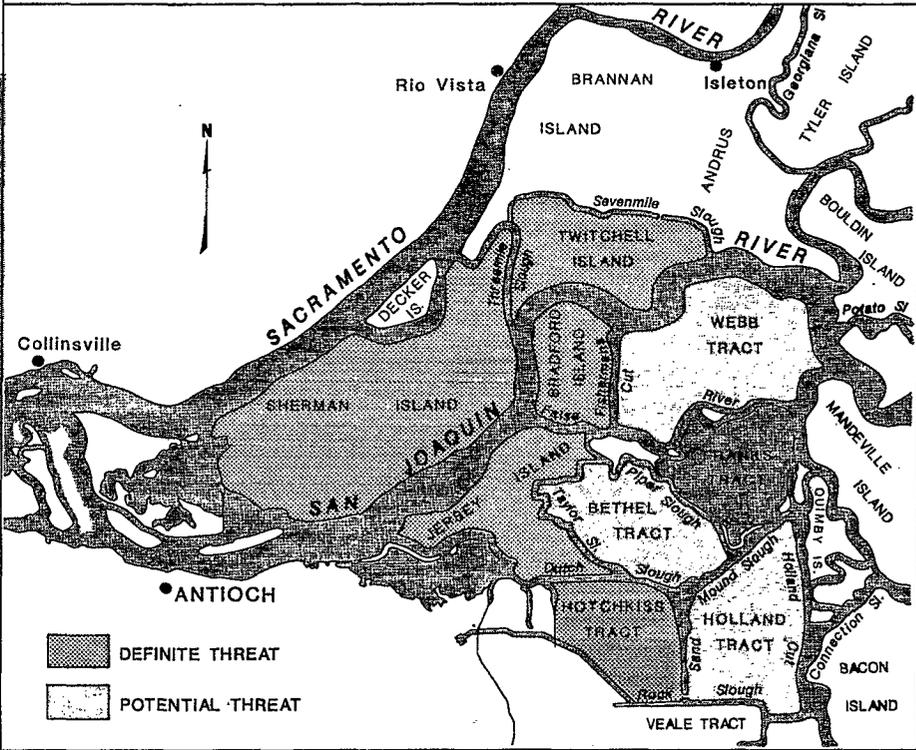
Flooding of any of these west Delta islands would increase the rate and area of mixing, and would allow the saline water to move farther upstream. If a levee were to break and not be repaired, the situation would continue, resulting in long-term degradation of Delta water quality that would adversely affect several beneficial uses, including fish and wildlife, municipal and industrial, and agricultural uses.

Another water quality benefit provided by Sherman Island is short-term protection. Even if Sherman Island were reclaimed after flooding, there could be severe adverse short-term water quality problems. These problems would result from salty ocean water rushing into Delta channels to fill the large volume of Sherman Island, which is up to 20 feet below sea level. This problem would be similar for other large Delta island failures during low flow conditions. The situation on Sherman Island would be especially severe because of the island's size and elevation.

In the summer of 1972, the Andrus Island levee broke, flooding an area slightly larger than Sherman Island. Salt concentrations in the central and western Delta quickly showed an increase up to sixfold. It took a large volume of extra reservoir releases to flush the salty water from the west Delta. The Andrus Island levee break may also have been a contributing factor in high mortality of juvenile bass that year. Similar impacts could occur if one of Sherman Island's levees were to fail under low flow conditions.

Figure 3
ISLANDS POSING THREAT TO WATER QUALITY
IF PERMANENTLY FLOODED

With 10,000 acres, Sherman Island is the largest of the eight western Delta islands critical to Delta water quality. Objectives of the West Delta Water Management Program include protection against water quality degradation resulting from flooding.



When the levee broke on Sherman Island in 1969, water rushed through to fill the island. That break was in winter. If a break like this were to happen during summer, when streamflows are low, water would rush into the Delta from the bays, bringing immediate higher salinities upstream and degrading water quality. If Sherman Island were to remain flooded, long-term water quality problems would prevail. The West Delta Water Management Program is designed to prevent such a disaster.
 DWR Central District Photo (W. Fisher)

Water Supply Reliability

Because of Sherman Island's location at the western edge of the Delta, where fresh and salt water mix, the island's levee system is especially important to the long-term reliability of the State Water Project, the Central Valley Project, and Contra Costa Canal. These major water projects rely on Delta water quality, and any factor that may affect this water quality also affects the quality of these water supplies.

The quality of water supplies derived from the Delta depends to a great extent on the path the water takes through the Delta to the export facilities. Water that leaves the Sacramento River upstream of Sherman Island travels a good quality path to the export facilities because mixing with saline water from the ocean is minimal or non-existent. Water that takes a reverse flow path around the western end of Sherman Island is of poorer quality because it is forced to blend with ocean-derived water higher in chlorides. Increasing chloride levels affect the ability of water project operators to meet Delta water quality standards. Permanent flooding of Sherman Island -- or any of the west Delta islands -- would worsen this situation in that this poor quality path would be even higher in chlorides. This would require modifications in project operations involving releases of upstream storage to help offset the chloride levels.

Many actions, such as conservation, reclamation, water transfers, and marketing, are being investigated to improve reliability of State Water Project supplies. Further progress can be made by improving the stability of nonproject levees. Within the framework of the West Delta Water Management Program, reducing subsidence and rehabilitating the nonproject levees on Sherman Island will contribute toward meeting this objective.



Subsidence of island soils contributes to unstable levees that can eventually fail, as one did on Sherman Island in 1969. During such a failure, life and property are threatened, and water quality and supply are jeopardized by increased salinity intrusion. Land use management options in the West Delta Water Management Program would reduce subsidence and, thus, provide greater flood protection.
DWR Photos 3681-22 (top) and 3680-36 (bottom)



Wildlife Concerns

The complex interface between land and water in the Bay-Delta estuary provides rich and varied habitat for wildlife, especially birds. The Delta and neighboring Suisun Marsh are particularly important to waterfowl migrating via the Pacific Flyway.

In the Delta, the principal attraction for waterfowl is winter-flooded agricultural fields -- mainly cereal crops. The Delta and other wetlands in the Central Valley provide winter habitat for 60 percent of all waterfowl that winter in California. More than a million waterfowl are frequently in the Delta at one time. This includes almost 400,000 pintails, California's most numerous ducks.

In Suisun Marsh, waterfowl use public and private wetlands managed for waterfowl habitat and recreational hunting. During the fall of dry years, the marsh has provided feeding and resting areas for up to an estimated 28 percent of California waterfowl, amounting to as many as a million birds. Species of ducks wintering in the area include pintail, shoveler, mallard, widgeon, greenwinged teal, ruddy duck, canvasback, scaups, gadwall, bufflehead, and scoter. Geese, though much less common than ducks, are represented by Canada, snow, and white-fronted species.

Small mammals also find suitable habitat in the Delta, Suisun Marsh, and adjoining upland areas. Vegetated levees, remnants of riparian forest, and undeveloped islands provide some of the best mammalian habitats in the region. Species include muskrat, mink, river otter, beaver, raccoon, gray fox, and skunks. The area also supports a variety of non-game wildlife, including songbirds, hawks, owls, reptiles, and amphibians.

West Delta water management planning recognizes the value of this vast wildlife resource, and alternatives under consideration could greatly enhance its value.

FARMLANDS AS WILDLIFE HABITAT

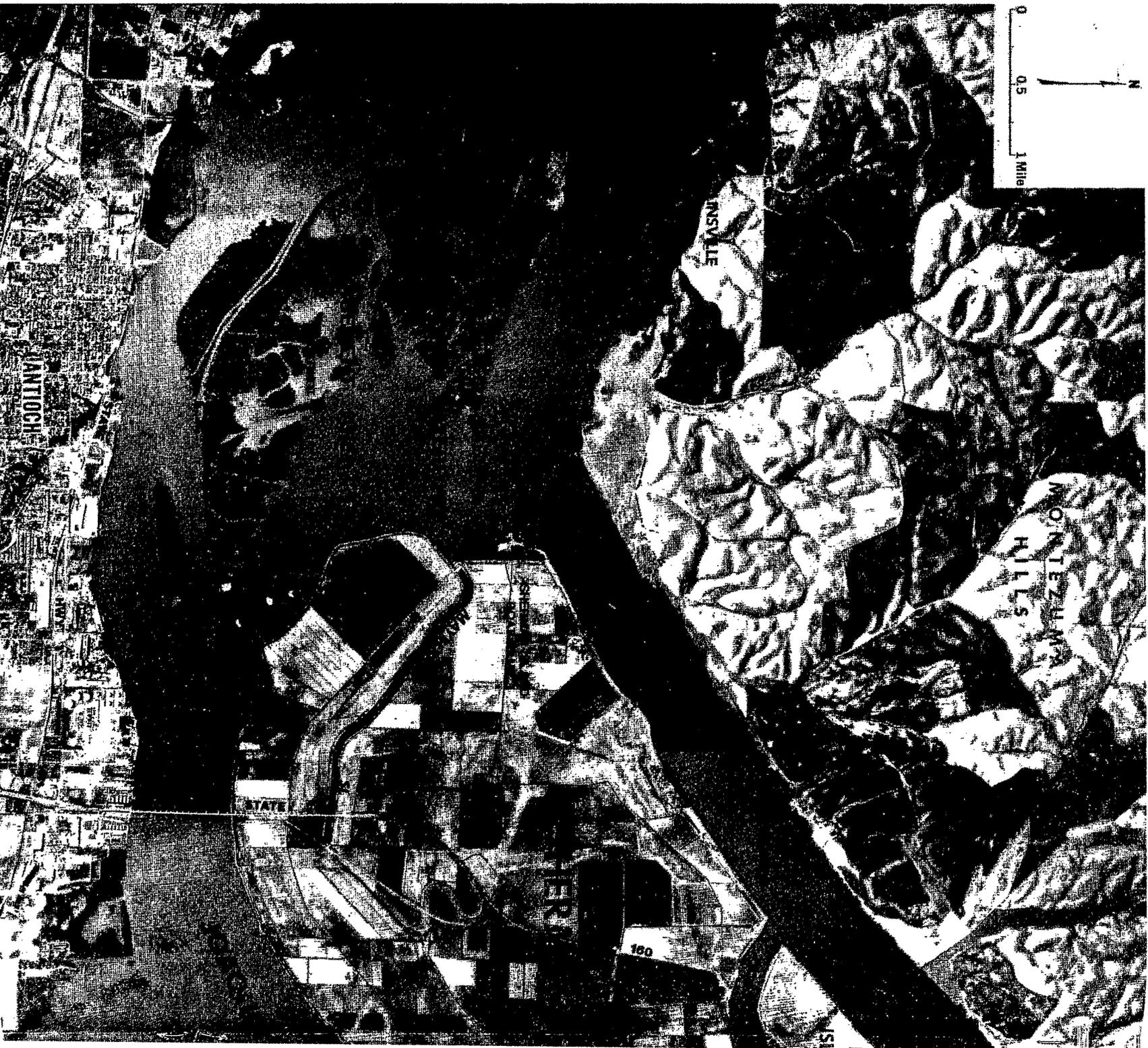
Farmland is the predominant habitat in the Delta today. During fall and winter, the fields provide unharvested grain, young sprouts, weed seeds, worms, insects, and grubs for food, as well as a resting area for migratory birds. Permanent pasture is also important. Pasture, available year-round, provides abundant cover and plants and insects for food so that a diverse wildlife community can develop. Cultivated row crops, on the other hand, are frequently disturbed and thus offer minimal wildlife habitat.

Crop patterns and types and intensity of irrigation, cultivation, and other farming practices influence the uses of wildlife habitat and the values of agricultural lands as habitat. For example, recently developed harvesters cut corn and grain so close to the ground that little stubble is left for cover, and almost no grain is left on the ground for food. The agricultural management alternative would intensify farming practices beneficial to wildlife. Such practices include minimum or no tilling, leaving some grain and corn crops on the field as food for waterfowl and wildlife, and moving at times when pheasant and quail are not hatching.

A wildlife management plan proposed for Sherman Island would help stabilize and enhance the long-term prognosis for wildlife habitat in the western Delta, and would address problems such as subsidence.



During fall and winter, fields in the Delta provide habitat for migrating birds such as tundra swans (left). Fields and pastures also provide habitat for one of the most important upland game birds of the Delta, the introduced long-necked pheasant (right). Wildlife habitat is provided in all water management alternatives under the West Delta Water Management Program.
DWR Central District Photos (P. Wendt)





SHERMAN ISLAND: YESTERDAY AND TODAY

This aerial view shows Sherman Island as it is today, with remnants of its early reclamation.

When reclamation of Sherman Island was completed in 1869, it included lower Sherman Island and Sherman Island Lake, shown here as the Sherman Island Waterfowl Management Area. The levees failed several times in the 1870s, and reclamation efforts were finally abandoned on this tule-covered western part of the island.

Today the Department of Fish and Game manages the Sherman Island Waterfowl Management Area, a highly productive marsh area that supports both hunting and fishing. A wildlife management plan for Sherman Island would supplement and enhance this existing waterfowl management area.

Chapter 3. WATER MANAGEMENT PLANNING

Planning for the West Delta Water Management Program is designed to provide information and flexibility in program implementation. Under contract to the Department of Fish and Game, a consultant has prepared a report, *Sherman Island Wildlife Management Plan* (May 1988), which discusses various wildlife plan alternatives, benefits, and costs. All the land management alternatives presented in the *Wildlife Management Plan* offer flexibility, opportunities to decrease subsidence, and optimum wildlife and waterfowl benefits. These alternatives are discussed later in this chapter.

Environmental documentation requirements, a phased implementation approach, and cost-sharing allocation options will be investigated. Water management planning in the west Delta will consider multiple objectives, including benefits to flood control, water supply reliability, and wildlife.

Permits and Agreements

Several State and Federal permits may be required before work can begin on a West Delta Water Management Program. Permits may be required for construction and operation of the overland facilities and for improving Sherman Island's nonproject levees. Also, coordination with Sacramento County may be required in considering alterations in land use on the island.

Certain institutional requirements must be met before a West Delta Water Management Program can be implemented. Two agreements must be signed before proceeding:

- *A 1981 agreement between the Department of Water Resources and North Delta Water Agency must be amended to include the wildlife management plan as an alternative to the overland water supply facility.*
- *The Department of Water Resources is working on an agreement with the Department of Fish and Game that will designate a lead agency to implement the project and stipulate the cost-sharing obligations of these two agencies.*

Agreements may be required to stipulate cost-sharing responsibilities of potential project participants, such as the Bureau of Reclamation. The environmental documentation process will include evaluation of impacts that may occur as a result of any of these agreements.

Some Actions Being Considered

Alternatives for the West Delta Water Management Program have been designed to allow a phased approach and flexibility in implementation. Phasing provides for lower initial costs and an opportunity to modify future phases based on information learned during initial phases. The process is being guided by the objectives discussed in Chapter 1, plus considerations such as:

ALTERNATIVES	
Agricultural Management Alternative	Managed Agriculture Fallow/Idle
Wetland Management Alternative (includes riparian and upland wildlife habitats and permanent and seasonal wetlands)	20% Wetland Development 40% Wetland Development 60% Wetland Development
No Project	
IMPLEMENTATION CONSIDERATIONS	
Phased Planning	
Land or Easement Acquisition	
Cost Sharing	
Nonproject Levee Rehabilitation	
Mitigation Banking	

- *Maintaining the integrity of the island by reducing the rate of land subsidence, which is largely caused by present farming practices. The Farm Securities Act of 1987, administered by the U.S. Soil Conservation Service, mandates that soil conserving management practices must be developed to minimize soil erosion and loss.*
- *Providing cost-sharing opportunities for special Delta flood control projects identified in Senate Bill 34.*
- *Emphasizing development of wetland and riparian habitat. Senate Concurrent Resolution 28 emphasizes the importance of wetland habitat in California and mandates that the Department of Fish and Game increase wetland habitat in the State.*
- *Managing consumptive water use while effectively providing habitat for wildlife.*
- *Providing for flexibility in acquisition of lands or land use easements.*
- *Providing flexibility in land use management options.*
- *Providing an opportunity to incorporate habitat mitigation for State Water Project and Central Valley Project water management programs.*
- *Minimizing costs by using existing island water distribution systems.*

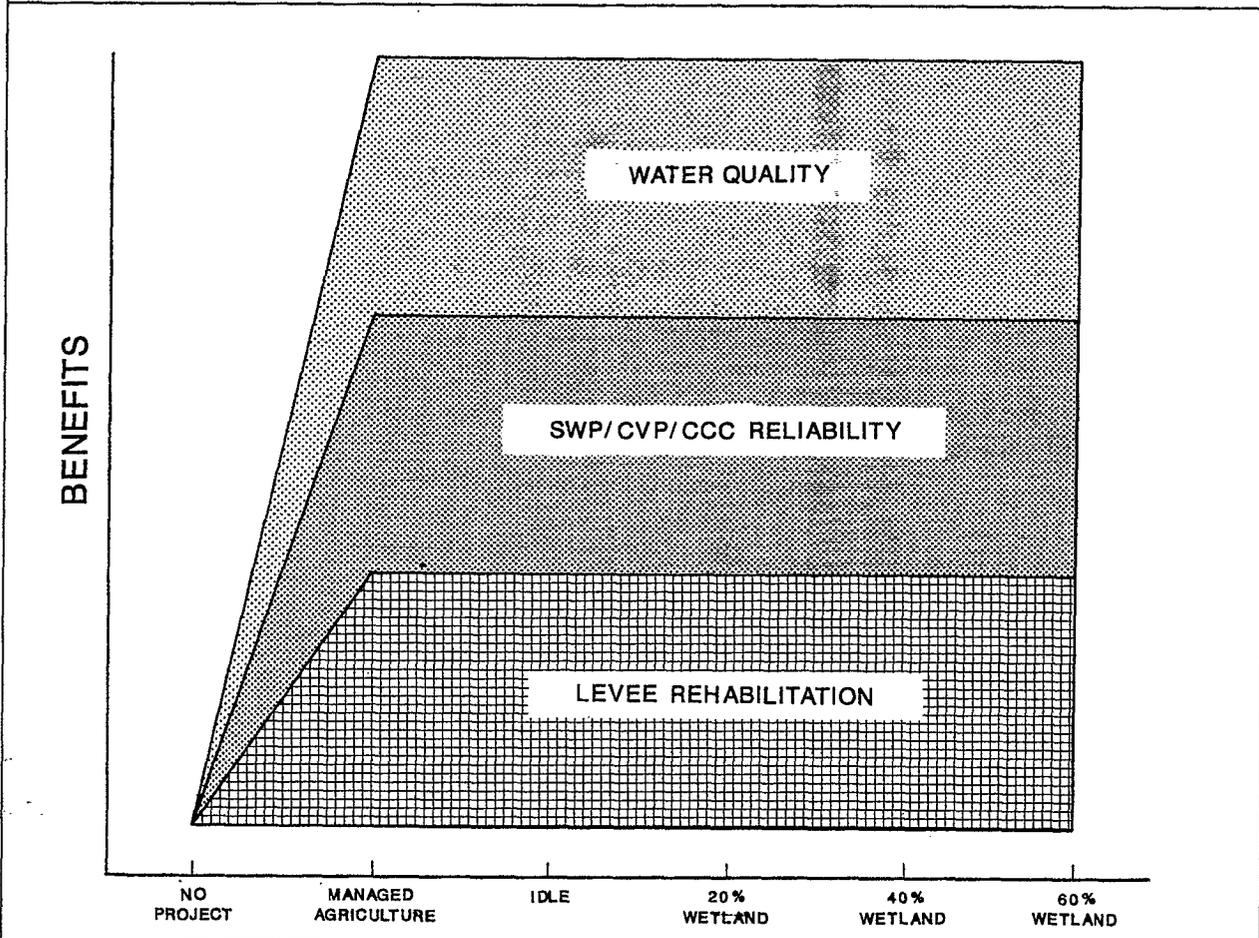
The West Delta Water Management Program consists of two main groups of alternatives plus a base condition for comparison (No Project). These alternatives are summarized in the following sections. A nonproject levee rehabilitation plan and a mitigation banking plan common to all alternatives is also discussed. Levee rehabilitation will be part of the initial phase of any program. This chapter ends with a discussion of project implementation, focusing on a phased approach and also touching on a minimum acquisition plan.

The primary purpose of the West Delta Water Management Program is to provide a range of land use management opportunities that also effectively reduce subsidence. The alternatives are designed to benefit wildlife species that use upland, wetland, and riparian habitat and to provide recreational opportunities for hunting and viewing. The alternatives would also significantly reduce subsidence by minimizing oxidation of peat soils on the island. Reducing subsidence would be achieved through land use management options proposed within each alternative. A conceptualized view of benefits associated with the various alternatives is presented in Figure 4. The figure shows that most of the major benefits to levee rehabilitation, water quality, and water supply reliability would occur in the first phase of project development, primarily due to rehabilitation of the island's nonproject levees. Reduction of subsidence and benefits to wildlife and habitat values would occur more gradually throughout project development.



Delta islands are an important stop for waterfowl migrating via the Pacific Flyway. Seasonal and permanent wetlands proposed under the Wetland Management Alternative would enhance waterfowl habitat and significantly reduce subsidence on Sherman Island. DWR Central District Photo (P. Wendt)

**Figure 4
RELATIVE BENEFITS OF ALTERNATIVES**

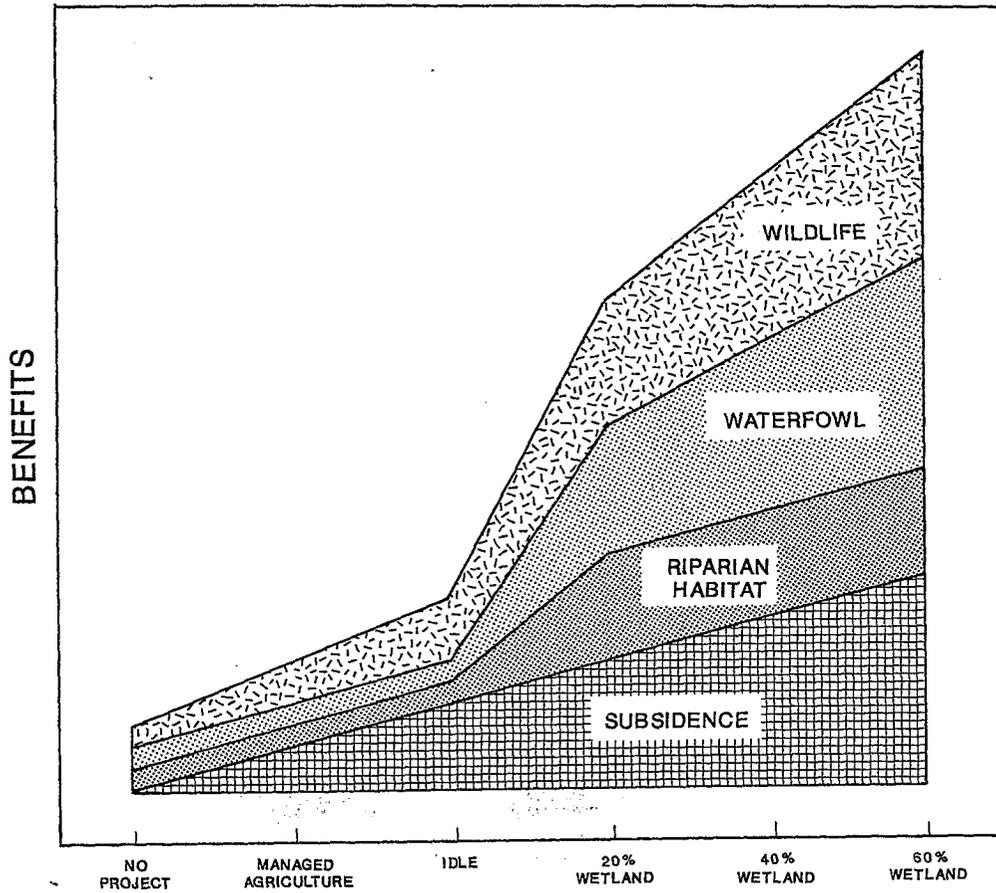


Benefits to water quality, water supply reliability, and levee rehabilitation would be gained immediately through first phase of the West Delta Water Management Program.

The discussion of alternatives provides a conceptual framework for the placement and distribution of vegetative cover types. It also provides general management guidelines that will maximize wildlife benefits within the constraints of each alternative, rather than the specific details of soil and water manipulations. To maximize benefits to wildlife and flood control, the discussion of alternatives assumes use of the entire island. However, use of less than the entire island is possible under a "Minimum Acquisition Plan", discussed later.

The proposed West Delta Water Management Program also assumes that an overland supply system would not be required if land use on Sherman Island were changed as proposed. This will have no effect on a wildlife management plan, since water quality in the Sacramento and San Joaquin Rivers will not limit the habitat types proposed for Sherman Island.

Figure 4 (continued)
RELATIVE BENEFITS OF ALTERNATIVES



Wildlife and land use management benefits can be increased throughout project development.

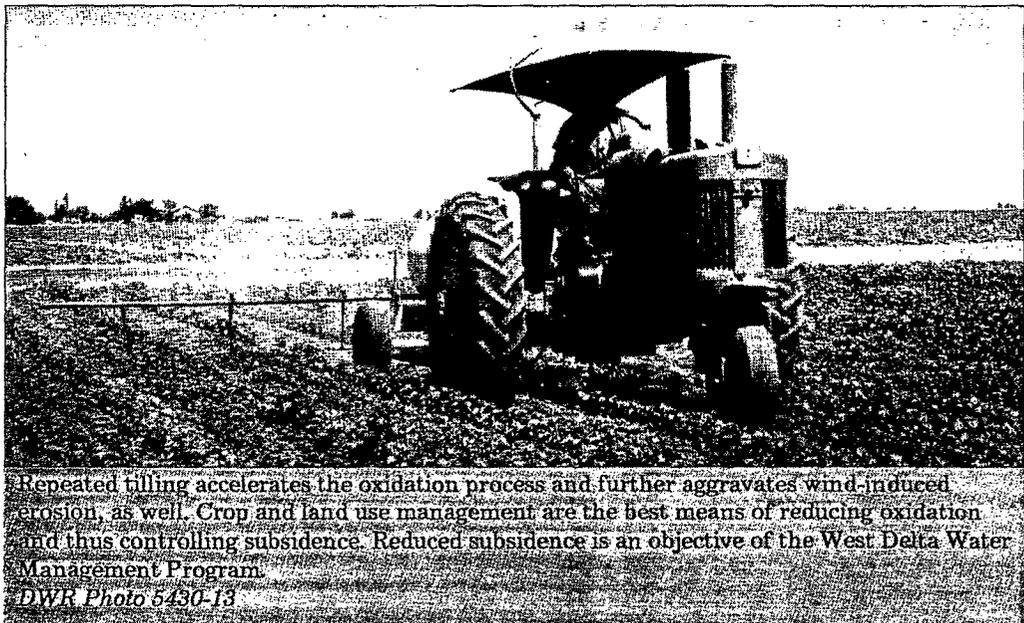
Agricultural Management Alternative

This alternative, the least intensive wildlife management plan, contains two options: *Managed Agriculture* and *Fallow/Idle*. Specific habitats to benefit wildlife would not be developed under either option. Instead, crop production would be modified or eliminated to reduce the rate of soil subsidence and consumptive water use on the island.

Wildlife management in the *Managed Agriculture* alternative would intensify farming practices beneficial to wildlife and also reduce oxidation of the peat soils. *Managed Agriculture* practices include

- *Minimum or no tilling, primarily for corn and grain.*
- *Allowing 10 to 20 percent of corn and grain crops to remain unharvested (providing food for wildlife and waterfowl).*
- *Mowing alfalfa and safflower so it does not coincide with pheasant and quail hatching.*

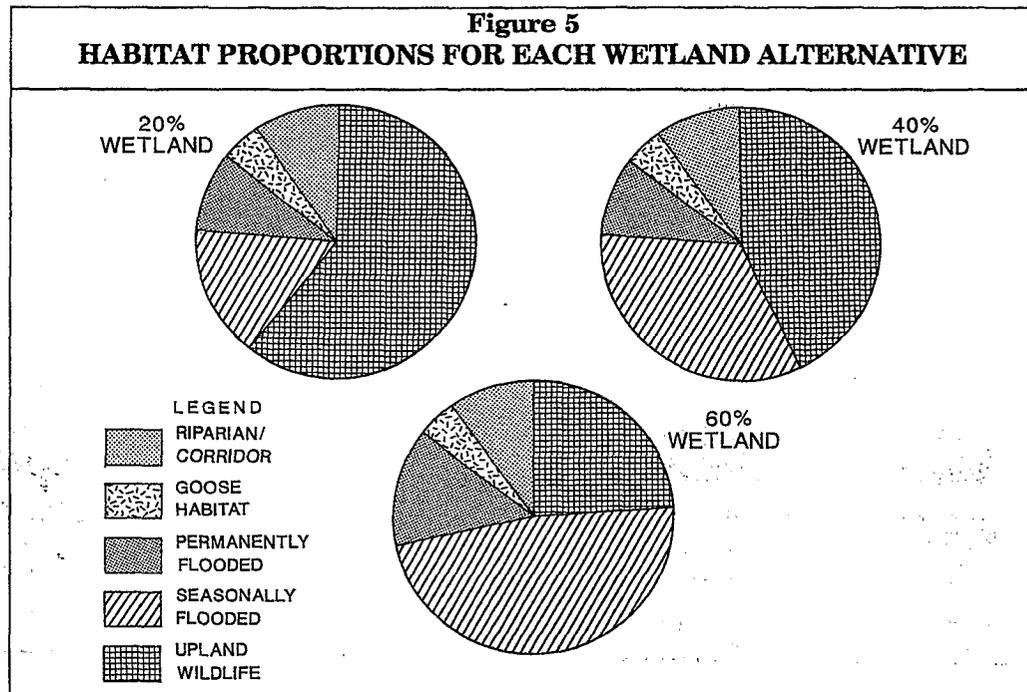
In the *Fallow/Idle* option, no active management program would be implemented. Natural vegetation would be allowed to take over the island. Emphasis would be on controlling subsidence by reducing oxidation and wind erosion. Vegetation that would become established on agricultural fields would depend primarily on existing vegetation, seedbank, and depth of water table. The value of habitats expected as a result of this option is related to the food and cover requirements of each wildlife species. However, an active wildlife management plan would probably be required in five or six years after this option had been implemented, as undesirable species become established.



Repeated tilling accelerates the oxidation process and further aggravates wind-induced erosion, as well. Crop and land use management are the best means of reducing oxidation and thus controlling subsidence. Reduced subsidence is an objective of the West Delta Water Management Program.
DWR Photo 5430-13

Wetland Management Alternative

The most intensive wildlife habitat development would occur in the Wetland Management alternative. Options represent three levels of wetland development: 20, 40, and 60 percent of the total habitat developed. For each option, the island was divided into five cover types to provide a broad diversity of habitat (Figure 5). The proportion of total habitat dedicated to riparian habitat and to goose habitat would remain constant in all three options. Varying mixtures of permanent and seasonal wetlands and upland wildlife habitat are also included.

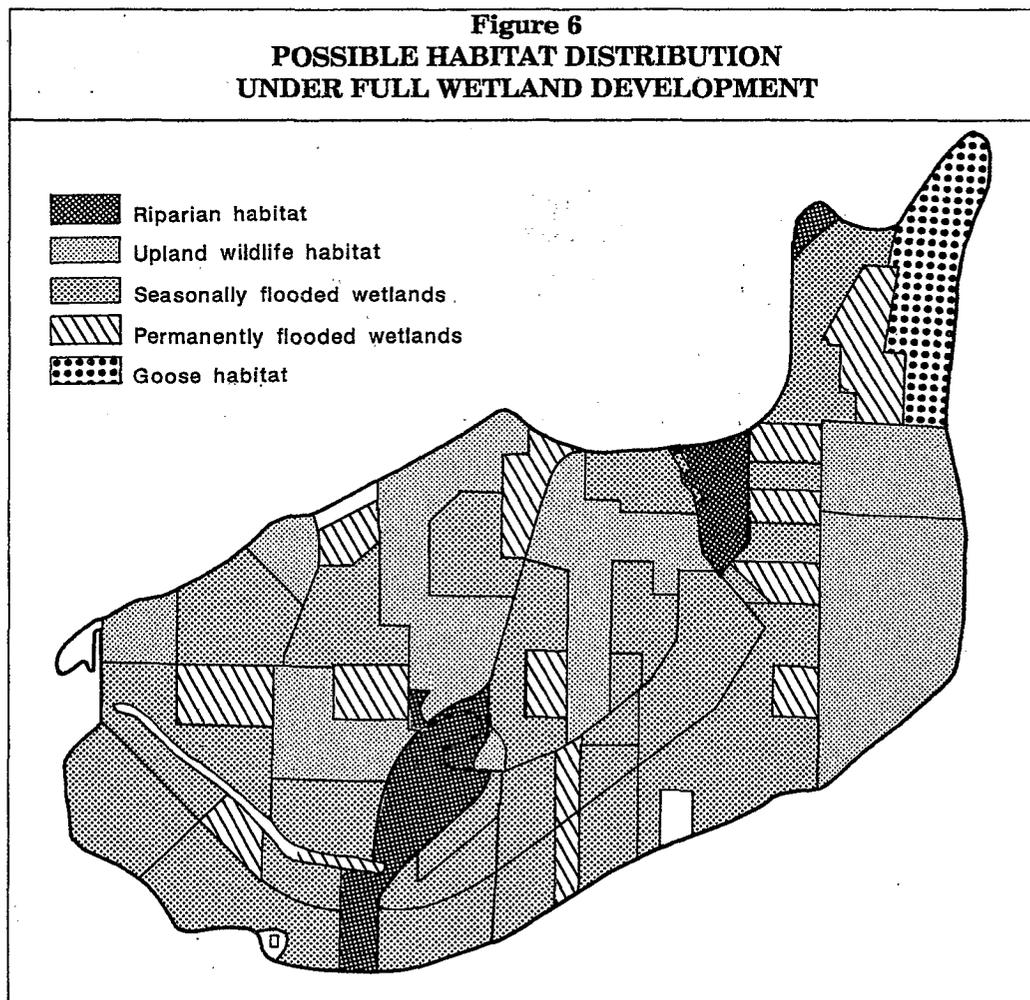


Conceptually, Sherman Island was divided into independent management units following the irrigation and drainage systems now used for agriculture on the island (Figure 6). Since units can be operated independently, development can proceed in an orderly, stepwise fashion whether an entire plan is initiated or the phased plan is used.

Permanent and seasonal wetlands would be at lower elevations, where siphons and canals allow flooding and drainage without modifying the irrigation canal. Permanent ponds throughout the island would provide optimum distribution of food and cover for waterfowl broods. Upland wildlife habitat, composed mainly of a legume/grass mixture, would be placed adjacent to permanent ponds whenever possible to provide nesting cover near good brood habitat. Seasonally flooded wetlands would be interspersed near permanent wetlands throughout most of the island to form a complex of habitat types that would provide food and cover for both upland wildlife and waterfowl.

The distribution of wetland wildlife habitat is important, because it would serve as nesting cover for waterfowl and also provide food and cover for upland game birds (ring-necked pheasant and California quail), raptors, songbirds, and small mammals.

A riparian corridor (not shown on Figure 6) would border all habitats on the periphery of the island as well as wetlands adjacent to Highway 160. The corridor would enhance the quality of the island for wildlife by providing cover and travel lanes between upland wildlife habitat areas. The riparian corridor also has the potential to enhance esthetics and help maintain levee stability. The concept of a corridor such as this has been included in recent levee legislation as a means of reducing subsidence. Despite the limited acreage involved, riparian habitat on the island would benefit many wildlife species. More than 100 species use riparian habitats in the Delta.



The wetland management alternative includes habitat at the northeastern portion of Sherman Island to be managed specifically for geese. This is pasture land now used for cattle grazing and is at higher elevation than most of the island. The soils are mostly clay, which have a higher moisture content. White-fronted geese regularly use this area, as well as adjacent portions Twitchell, Bradford, and Jersey Islands.

Because of the diversity of habitat types provided in the Wetland Management Alternative, nonconsumptive and consumptive recreational opportunities can be developed. Nonconsumptive recreational opportunities might include a nature trail, a picnic area, and an observation tower. Siting the nature trail adjacent to Highway 160 would provide easy access to several cover types. Because of its location, Sherman Island probably will receive moderate to heavy hunting if wildlife habitat is developed. Fishing already represents a major component of public use and probably will remain high. To facilitate such consumptive recreational use, a hunter check station is planned to provide information on hunting regulations and seasons and to serve as a check site for hunting programs. In addition, this area could be managed as a State Wildlife Management Area under the direction of the Department of Fish and Game.

The Wetland Management Alternative would create a diversity of wetland, upland, and riparian habitats that would benefit an array of wildlife species and would control subsidence on Sherman Island.

"No Project" Alternative

This alternative is provided to show the most likely scenario for island management in the absence of any wildlife management plan. This alternative would consist of constructing an overland water supply facility on Sherman Island. This facility, which was provided for in a 1981 agreement between the Department of Water Resources and North Delta Water Agency, would move irrigation water from Threemile Slough to the southwestern portion of Sherman Island. This would provide an alternative source of water for the island, rather than changing land use practices. Thus, traditional farming practices and associated subsidence would likely continue at current rates.

NORTH DELTA WATER AGENCY AGREEMENT

North Delta Water Agency and the Department of Water Resources signed an agreement in 1981 to assure that the State will maintain a dependable water supply of adequate quality for agricultural uses within the boundaries of North Delta Water Agency.

Installation of an overland water supply facility on Sherman Island is provided for in this 1981 agreement. As planning progressed on development of an overland facility, other issues and programs came into focus, broadening the scope of west Delta planning. In response, local interests and the Department of Water Resources agreed that alternatives to the overland facility should be investigated in order to satisfy the broader concerns of the west Delta.

The Department of Water Resources may meet contract requirements by constructing an overland facility to supply and distribute fresher water from the eastern end of Sherman Island to the central and western ends of the island. Or, there may be a mutually acceptable alternative. One alternative being considered is a wildlife management plan for Sherman Island. Developing such a plan and evaluating its effectiveness is the major thrust of the West Delta Water Management Program. Final design of any plan is subject to approval by North Delta Water Agency and by Sherman Island's Reclamation District No. 341.

Implementation Considerations

The West Delta Water Management Program is still in the planning stage. Many factors are being investigated to provide benefits and as much flexibility as possible. These include phased planning, land acquisition, cost sharing, nonproject levee rehabilitation, and mitigation banking. A necessary part of any program in the western Delta will be rehabilitation of the nonproject levees.

Phased Approach

A phased planning approach can provide flexibility. Development of wildlife and wetland habitat can be accomplished progressively, and any of the alternatives discussed could be the starting point, possibly culminating in a full or partial wetland development plan. Phased planning also provides for a minimum acquisition plan, which initially would involve only a portion of the island. This concept allows a project to be initiated at the lowest possible cost.

The phased approach would provide added information on operation costs and would allow habitats to be developed as funding becomes available. It also allows review of costs and permits modifications in the plan, if needed. Phasing provides insight into management strategies that may improve habitat suitability before the island is further developed. Guidelines can be developed that maximize the benefits to wildlife and that concentrate on the best combination of food and cover for many wildlife species from the initial phase through the final phase.

Land or Easement Acquisition

Land acquisition options include direct purchase or some type of purchased easement that will assure land management practices to benefit wildlife. Easements of this type have been successfully negotiated for similar wildlife management projects in California. In any case, acquisition of parcels will involve negotiations with the landowners. Selection of acquisition options will depend on landowner needs and the type of alternative selected for implementation.

As a starting point for phasing the project, a minimum acquisition plan could be designed that would provide for a minimum initial cost. Such a minimum acquisition plan would require levee improvements and would, therefore, provide added flood protection for State Highway 160 and utilities, benefit Delta water quality, and protect project water supply reliability. Possible later alternatives could further reduce subsidence and provide additional wildlife and waterfowl habitat.

A minimum acquisition plan could provide the best opportunity to initiate the project while additional cost sharing funds are identified. An example of this plan could be a *Managed Agricultural* option developed on the west side of Highway 160 only. This area could later be developed into a wetland management project. Subsequently, a *Managed Agricultural* option could be developed on the eastern half of the island. This approach would provide for managed development of habitat types and also provide for informed decisions about subsequent development. To implement a minimum acquisition plan, an agreement between the Department of Water Resources and North Delta Water Agency would be required.

Cost-Sharing Opportunities

The West Delta Water Management Program will benefit wildlife, waterfowl, flood control, and reliability of State Water Project and Central Valley Project supplies, as well as other Delta water users. The array of potential benefits also broadens cost-sharing opportunities. Although no firm commitments have yet been made to participate in this program, several potential funding sources may be available. These include Department of Water Resources (SWP), Department of Fish and Game (Wildlife Conservation Board), U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation (CVP), and U.S. Army Corps of Engineers. Recent levee legislation may also represent a source of funding because of levee restoration that would be required under any alternative.

Nonproject Levee Rehabilitation

To protect any water management program investment for Sherman Island, nonproject levees on the island must be rehabilitated. This investment would also protect State Highway 160, utilities, Delta water quality, and reliability of project water supplies. The degree to which these levees would be improved is not yet established. However, standards will be consistent with U.S. Army Corps of Engineers requirements and standards for implementation of Senate Bill 34, a program of levee protection recently signed into law by the Governor. Rehabilitation of these levees will be common to all proposed water management program alternatives and will have high priority.

Mitigation Banking

To provide an opportunity to incorporate habitat mitigation for State Water Project and Central Valley Project projects, the mitigation banking concept can be applied to any of the wildlife management alternatives.

In the Mitigation Banking plan, portions of Sherman Island would be developed as needed to mitigate habitat impacts from future water development projects. This would allow "in-kind" mitigation for project impacts. The value of these habitats established on the island as mitigation would depend on the type of habitat developed. Objectives can be established to achieve maximum benefits for wildlife from mitigated habitat. The mitigation bank would develop in an orderly fashion, with habitat types developed adjacent to each other rather than at random throughout the island. As with any of the alternatives, areas with common irrigation and drainage systems should be developed simultaneously to avoid replication of construction efforts.

Chapter 4. RELATED DELTA WATER MANAGEMENT PLANNING

Water management programs are also being planned for the north and south Delta. These and programs for levee improvements are discussed below.

North Delta Water Management Planning

The North Delta Water Management Program represents parallel planning and environmental documentation to improve conditions in the northern portion of the Delta. The study area includes channel systems south of Sacramento, north of the San Joaquin River, east of Rio Vista, and west of Thornton.

Primary objectives are to help alleviate flooding along the Mokelumne River, reduce reverse flow in the lower San Joaquin River, improve water quality, reduce fishery impacts, and improve water supply reliability. Secondary objectives are to provide navigational improvements and recreational enhancements.

The planning and environmental documentation process for the North Delta Water Management Program is scheduled for completion in about three years. The process was initiated with two public scoping meetings conducted in August and September of 1987 to identify significant issues and possible alternatives. Alternatives being considered in this planning process include increasing the hydraulic capacity of the South Fork Mokelumne River as a first phase. Later phases could include partial tide gates in the Sacramento River, Steamboat Slough, and Threemile Slough and possibly a new Sacramento River connecting channel.

South Delta Water Management Planning

The Department of Water Resources and the U.S. Bureau of Reclamation held public meetings in April 1987 to discuss water management alternatives in the south Delta. Information from those meetings will be used to identify significant issues and begin environmental documentation. This work was initiated under an October 1986 agreement (South Delta Agreement) between the Bureau of Reclamation, Department of Water Resources, and South Delta Water Agency, which committed all three parties to work together to develop mutually acceptable, long-term solutions to water supply problems of the South Delta Water Agency.

Objectives of the South Delta Agreement are to improve water levels, circulation patterns, and water quality in the south Delta. Evaluation of alternatives to meet these objectives will also take into account broader objectives of the Bureau of Reclamation and Department of Water Resources concerning fisheries; overall efficiency of Central Valley Project and State Water Project operations; water supply reliability through improved capability for banking winter supplies; navigation; and flood control. (For more information, refer to the Department report, *South Delta Agricultural Water Supply Project, Three Agency Work Plan.*)

In addition, the Department of Water Resources is examining a possible conjunctive use program with local interests for New Melones water, which would allow the State Water Project to use the water during dry years and simultaneously improve water quality in the south Delta. This program would provide additional good quality New Melones releases to the San Joaquin River.

Delta Levee Legislation

The California Legislature recently passed Senate Bill 34; the Governor signed the bill in March 1988. This bill will increase the financial assistance to Delta reclamation and levee districts maintaining non-project levees. The legislation contains a provision for the local districts to pay the first \$1,000 for each mile of levee maintenance and rehabilitation, and then the State will pay up to 75 percent of the cost exceeding \$1,000 per mile. This legislation will provide \$6 million annually for 10 years.

Senate Bill 34 also contains a new Delta Flood Protection Fund of \$6 million annually for 10 years for special flood control projects in the Thornton-Walnut Grove area and to improve eight west Delta islands that are vital to water quality. Sherman Island is the largest of these eight islands. The legislation also contains \$5 million annually for 10 years for environmental mitigation projects.

Corps of Engineers

The U.S. Army Corps of Engineers continues to study the possibility of a federally authorized flood control project in the Delta, which would provide Federal assistance for improving the levees.

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