Prospect Island
Ecosystem Restoration Project
Solano County, California

Environmental Assessment/
Initial Study

June 2001

US Army Corps
of Engineers
Sacramento District

Department of
Water Resources
State of California

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Proposed Action The U.S. Army Corps of Engineers (Corps) and the California Department of Water Resources (DWR) propose to construct the restoration of wetlands and fish habitat on Prospect Island, located in the northwestern part of the Sacramento-San Joaquin Delta in Solano County. The island is bounded by the Sacramento River Deep Water Ship Channel (ship channel) to the west, a remnant of Little Holland Tract to the north, Miner Slough to the east, and the confluence of the ship channel and Miner Slough to the south (Figure 1).

1.2 Purpose and Need for Action The restoration of wetlands and fish habitat on Prospect Island was designed to restore environmental resources that have been degraded by construction and operation of the ship channel and Sacramento River Flood Control Project (flood control project). The flood control project was implemented to reduce flood damages throughout the Sacramento River basin and to provide efficient conveyance of floodflows and sediment carried from upstream areas. Although the flood control project reduces the potential for flood damage, its construction and operation have contributed to the degradation of environmental resources along the Sacramento River. The ship channel was constructed to provide navigation to the Port of Sacramento (Port). Both the construction and operation of the ship channel have contributed to the environmental degradation of riverine and wetlandhabitats.

Over half of the threatened and endangered plant and animal species in the State of California depend on wetlands. The proposed restoration work on Prospect Island would provide tidal wetland habitat that may be beneficial for special status species. Fish species that may benefit include Delta smelt, chinook salmon, Central Valley steelhead, and Sacramento splittail. Waterfowl, shorebirds, songbirds, and furbearers would also benefit from restoring an open shallow water habitat with associated riparian vegetation. This Environmental Assessment/Initial Study (EA/IS) thoroughly discusses these expected beneficial effects of the restoration project.

1.3 Authority and Background The Prospect Island Ecosystem Restoration project was authorized by Section 1135 of the Water Resources Development Act (WRDA) of 1986 (33 U.S.C. 2294) and Section 344(a)(3) of WRDA 1992. The acquisition of 1,228 acres of Prospect Island by the Bureau of Reclamation (Reclamation) was authorized by House Resolution 2445, the 1994 Energy and Water Development Appropriations Act. The source of the funds, the Central Valley Project Restoration fund, was authorized in the Central Valley Project Improvement Act of 1992, Title 34 of Public Law 102-575. The fund was established to provide for habitat restoration, improvement and acquisition, and other fish and wildlife restoration activities in the Central Valley Project area of California. The Energy and Water Development Appropriations Act of 1995 appropriated funding for the acquisition of additional acreage for Prospect Island.

On July 16, 1999, the Corps and DWR issued the Finding of No Significant Impact (FONSI) and Negative Declaration, respectively, based on the July 1999 EA/IS prepared for the Prospect Island Fish and Wildlife Habitat Restoration Study. The DWR filed the Negative Declaration and Notice of Determination for the project with the State Clearinghouse on August 4, 1999. Additional information has become available since the FONSI and Negative Declaration

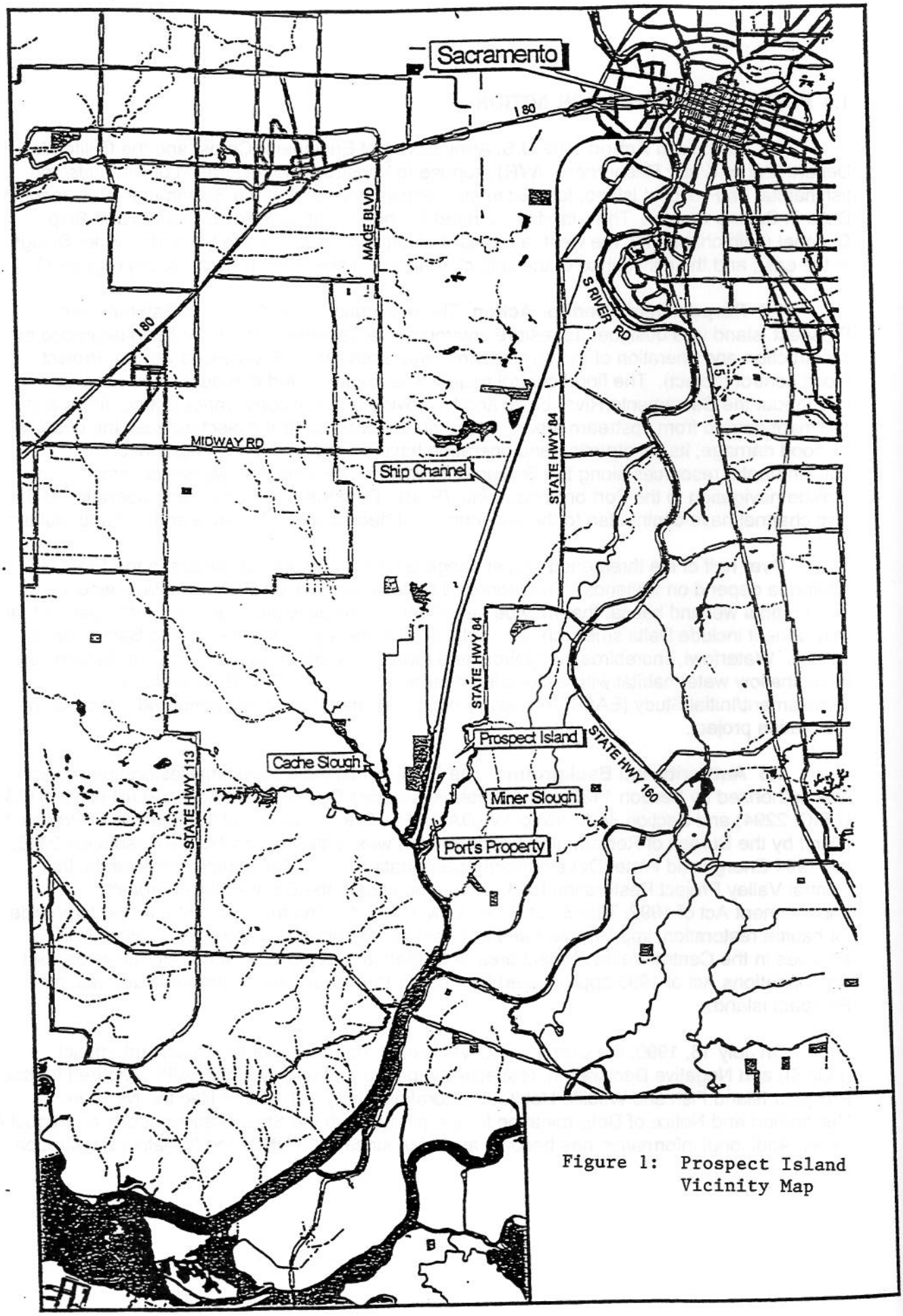


Figure 1: Prospect Island Vicinity Map

were issued. Detailed design work determined that the cost associated with the proposed breach in the ship channel levee would be excessive. As a result, the Corps and DWR have developed new alternatives that were not addressed in the previous EA/IS and have prepared the current EA/IS, pursuant to the National Environmental Policy Act, 42 U.S.C. 4321 et seq. (NEPA), and the California Environmental Quality Act (CEQA), to determine if the new alternatives result in any significant adverse effects.

1.4 Location and Site Description Prospect Island is located in Solano County in the northern portion of the Sacramento-San Joaquin Delta. The project area includes a 1,316-acre parcel purchased in 1994 and shaded riverine aquatic habitat provided by trees growing on the outer side of the levees. The area is bounded on the east by Miner Slough, the west by the ship channel, the south by a levee at about ship channel mile 20, and the north by an east-west levee from Arrowhead Harbor (formerly Five Points Marina) to the ship channel. With the exception of limited areas near the levees, the topography of the island is generally flat, varying from +1 foot mean sea level (msl) in the northern third to -5 feet msl in southern portions of the site.

Prospect Island is located in the extreme downstream portion of the Yolo Bypass and has levees that are at much lower elevations than levees on other Delta islands. The heights of these levees are limited to allow for them to be overtopped during flood events. Flooding on Prospect Island has occurred six times in the last 17 years. Following each of these events, the State of California and the Federal Government, at considerable expense, repaired the levees and pumped the island dry to return the land to agricultural use (Attachment F).

1.5 Purpose and Scope of EA/IS The purpose of the EA/IS is to evaluate the effects on the environment that would result from implementation of wetlands and fish habitat restoration on Prospect Island. This EA/IS complies with the requirements of NEPA and CEQA.

This EA/IS provides (1) baseline data on existing and without-project environmental conditions within the designated study area, (2) an evaluation of potential effects on the environment that would result from implementation of proposed restoration alternatives, and (3) identification of mitigation measures to avoid, minimize, or offset adverse effects to the environment that would result from implementation of the alternatives. Additional details and discussion are provided in the Corps' 1999 Ecosystem Restoration Report (ERR) and EA/IS, which are incorporated by reference into this EA/IS. In essence, the discussion in this EA/IS supplements and updates the 1999 environmental document.

1.6 Decisions Needed. In accordance with NEPA and CEQA, the District Engineer and the Director of DWR must decide, based on the record as a whole, whether the proposed Prospect Island Ecosystem Restoration Project qualifies for a FONSI and a Negative Declaration, respectively. If the project does not qualify, then an Environmental Impact Statement/Environmental Impact Report must be prepared.

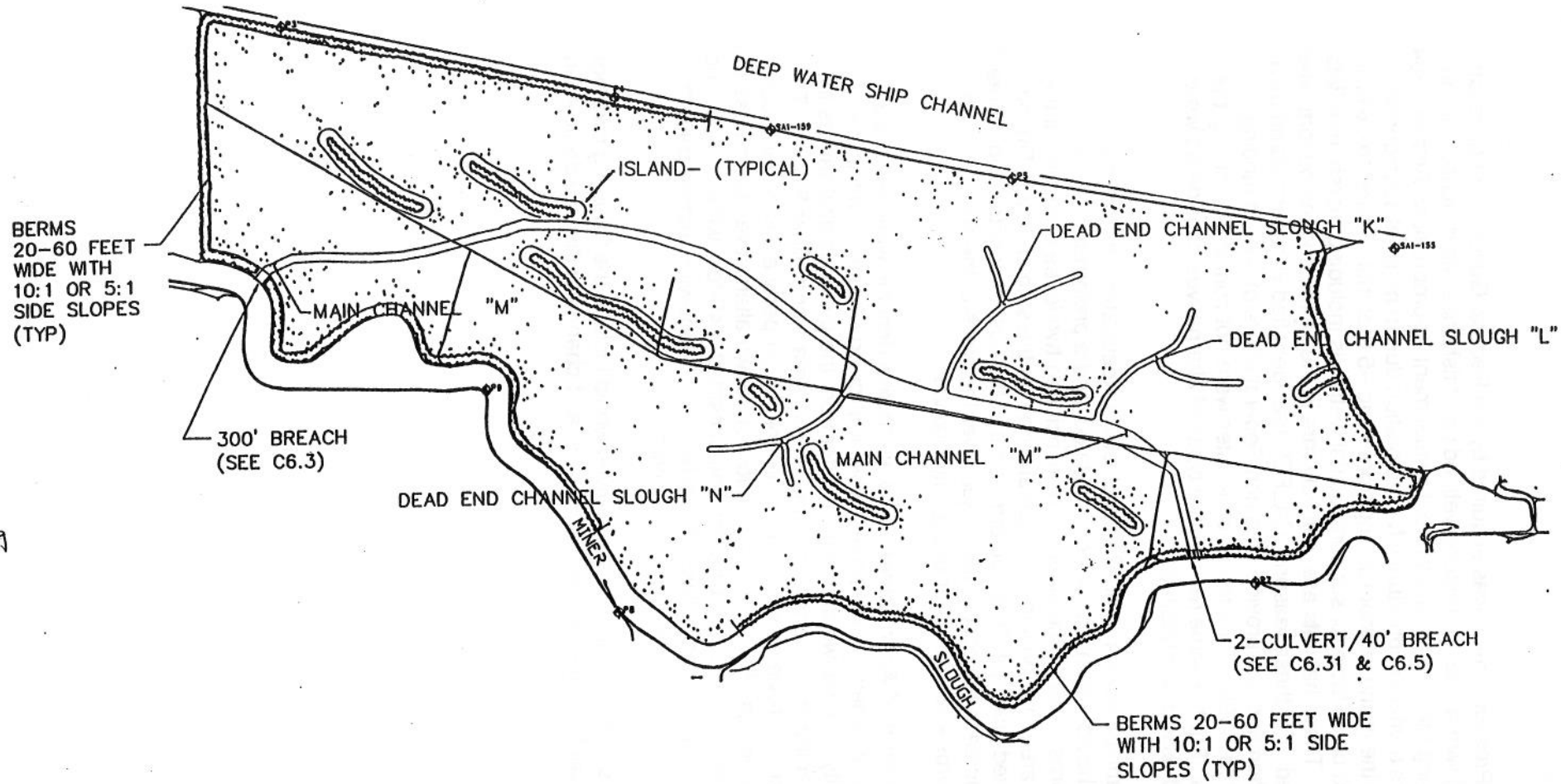
2.0 ALTERNATIVES

2.1 Background. Prospect Island was acquired by the Federal Government (through the Bureau of Reclamation) with a goal to "restore wetlands and fisheries" as described in the House Reports accompanying the Energy and Water Development Appropriations Acts of 1994 and 1995. This island offers a unique opportunity for restoration due to minimal subsidence, which has left elevations in the island interior ranging from +1 to –5 feet msl. Therefore, when flooded, water depths would be suitable for supporting tidal wetlands including marsh, mudflats, and shallow water habitats. These habitats are relatively rare in the Delta, and the opportunities for restoring them are limited. For these reasons, CALFED has identified Prospect Island as a desired location for restoration and has provided the non-Federal share of project funding specifically for this site (Corps, 1999). As a result, other sites were not considered during the development of alternatives. For the same reason, the types of alternatives considered were limited to tidal wetlands and associated habitats.

During an earlier planning stage for the Prospect Island Restoration Project, six alternative plans including the no-action plan were formulated, and a preferred plan was selected and evaluated (Corps, 1999). The selected plan included two levee breaches at the southern end of the project area, one on Miner Slough and one on the ship channel. During detailed design of the selected plan, the Corps determined that the cost of constructing a breach in the ship channel would increase the cost of the project over the limits of the Section 1135 authority. Therefore, the Corps explored other design alternatives.

2.2 General Description of Alternatives. Two alternative designs were developed that preserve the major habitat benefits of the project while improving circulation within the island and, thus, water quality. These two alternatives differ from the previous alternatives in that they include a levee opening at the north end of the project area along Miner Slough. This option was avoided earlier since providing access to an in-holding property along Miner Slough was thought to preclude this design. Further consideration led to two alternatives to address the access problem: (1) purchase the in-holding property and construct a 40-foot-wide breach, and (2) create a 40-foot-wide opening by placing two 13-foot-high by 20-foot-wide arched culverts, side by side, and continue to provide access over the culverts.

Similar to the earlier design, both of the alternatives would include the following common features, including the physical features (i.e., berms, islands, and channels) that are depicted in Figure 2:



Prospect Island

Common Features (Berms, Islands, & Channels) of the Alternatives

Not to Scale

North

Figure 2

Berms. The design includes the construction, under dry conditions, of berms along the interior slopes of existing perimeter levees to add stability to these levees and to provide wildlife habitat. Some levee sections along the ship channel already have gradual slopes and would require no additional protection. All other existing levees would be stabilized with embankments of a 10H:1V slope with a 20- to 60-foot-wide berm at 5.0 feet msl. Project construction would be phased over 2 years to allow soils to consolidate and to minimize the potential for subsidence and landside slumps at or near the Prospect Island levees.

Islands. The proposed project includes islands that have been designed to reduce fetch lengths and associated wind-generated waves and thereby to help protect the levees surrounding the project. The islands would also provide wildlife habitat. Islands would be. constructed under dry conditions, have crowns at 7.0 msl, and would be contoured with 5H:1V slopes to 20- to 40-foot-wide benches at 5.0 feet msl. These benches would transition to existing grades at 5H:1V slopes..

Plantings. Selected constructed berms and islands would receive plantings to help prevent wave erosion in the more exposed locations and along the existing Miner Slough levee. Additional plantings of riparian vegetation on the existing interior slopes of the Miner Slough levee would provide further protection for this levee. These plantings would be timed to coincide with breaching. Constructed berms and islands would also receive selected seeding of native plant materials to establish colonies that could provide seed sources for subsequent dispersal and colonization.

Channels. A main channel would connect the two openings in the Miner Slough levee. This channel would be 100 to 450 feet wide and have a bottom elevation of no lower than –5 feet msl. In addition, three dead-end channels would be constructed. Cut and fill would be balanced on site between islands, levee berms, excavated channels, and a central borrow area with an excavation depth limited to 2 feet or an elevation of –5.0 feet msl, whichever elevation is higher.

Monitoring. The construction period would be followed by a 3-year plant establishment period. During the establishment period, the contractor would monitor the survival of planted vegetation and replace dead plant material so that the plant survival rate at the end of the establishment period would be no less than 70 percent. After construction, the non-Federal sponsor (DWR) would monitor, at their own expense as a separate but related effort, fish, wildlife, vegetation, water quality, zooplankton, phytoplankton, benthos, bathymetry, and organic carbon.

Long-Term Operation and Maintenance. After the 3-year establishment period, the U.S. Fish and Wildlife Service (FWS) would accept responsibility for the long-term operation and maintenance (O&M) of Prospect Island. FWS would receive funding for long-term O&M from an endowment fund established with $1.25 million to be granted to DWR from the California Urban Water Agencies through the Category III program, now administered by CALFED.

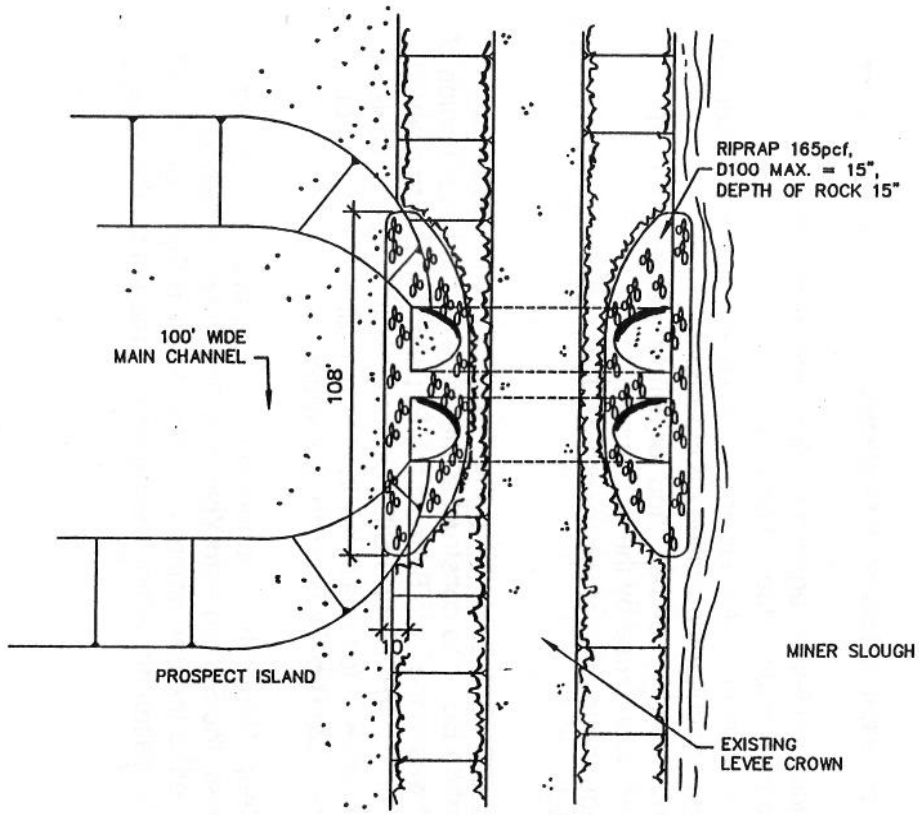
Breach at the Southern End of the Project Area. In both alternatives, levees would be breached to allow tidal action to return to Prospect Island. Each alternative would allow an average residence time for water within Prospect Island of 1.5 days. Both alternatives would include a 300-foot-wide breach in the Miner Slough levee at the southern end of the project area. This breach would be protected by rock and geotextile and have a breach bottom

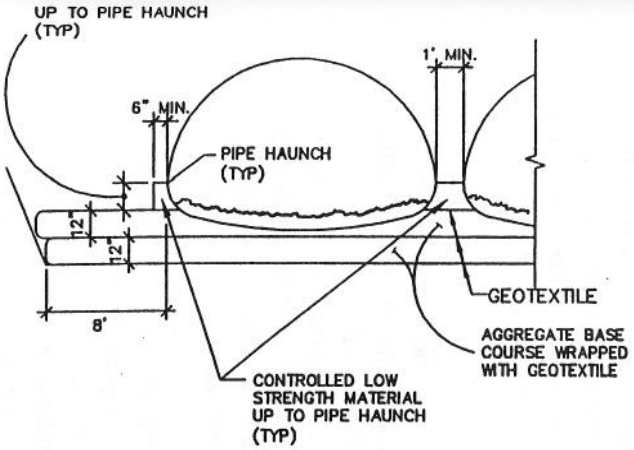
elevation set at 0.0 feet msl, with a v-notch bottom elevation set at -5.0 feet msl. Breaches would be constructed at the end of the second year and final phase of the project after completion of interior earthwork. The timing of all breach work on the waterside of Miner Slough levee areas would be limited to a construction window between August 1 and November 30 due to endangered species constraints. Breach work would be phased to maximize construction in the dry before actual breaching. After breaching, the remaining excavation work and placement of rock protection would be scheduled to tidal cycles to minimize in-water work. All work would be in conformance with the National Pollution Discharge Elimination System criteria and other environmental protection requirements. Excavated materials would be used to build out the interior side of the levee at each end of the breach to allow for turn around areas.

As previously described, the two alternatives differ only in the details of the breach at the north end of the project area along Miner Slough and the manner in which they address the issue of access to private property south of the opening. The two alternatives and the no-action alternative are described in the following sections.

2.3 North End - Open Breach (40-foot-wide) Alternative. This alternative would be a shortened version of the 300-foot-wide breach described above, except that it would not have a v-notch. At the discretion of the contractor, the construction of this breach would either be completed in the dry by use of a waterside sheet pile wall or phased and scheduled to tidal cycles to minimize in-water work, as described above for the 300-foot-wide breach. This alternative includes the purchase of either the property located along Miner Slough between the proposed breaches or the right of access to that property.

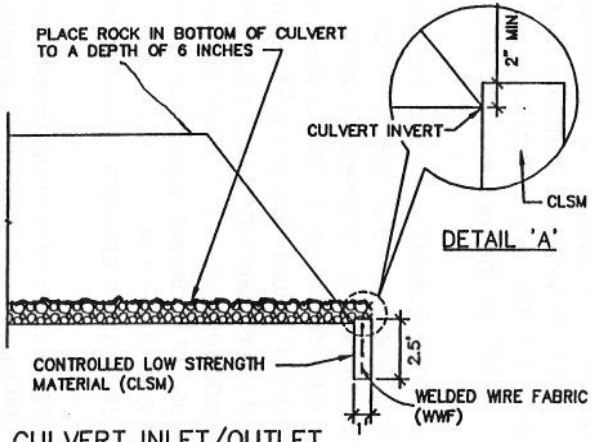
2.4 North End - Dual Arched Culvert Alternative (Proposed Action). This alternative would provide a connection between the interior of Prospect Island and Miner Slough through dual pre-fabricated metal 20-foot-wide by 13-foot-tall arched culverts (Figure 3). Rock would be placed on the face of the levee slope around the culverts for protection of the slope and in the bottom of the culverts. This alternative would be completed in the dry by use of a waterside sheet pile wall. The bottom elevation of the culverts would be set at –5 feet msl. Fill would be placed over the top of culverts to match the levee road and meet load requirements to allow road access to the private property.





CULVERT FOUNDATION

SCALE: NONE



CULVERT INLET/OUTLET

SCALE: NONE

Prospect Island

Dual Arched Culvert Through the Miner Slough Levee

Not to Scale

Figure 3

8

2.5 No Action. The July 1999 EA/IS assumed that Prospect Island would continue to be maintained in a dry state for agricultural production. The document assumed that the Federal and State Governments would continue to repair levee breaches, pump water out of the island, and lease the land to farmers for agricultural land use. However, this assumption has been changed in this EA/IS for the following reasons.

Since federal acquisition of the Island, flood events and Prospect Island levee breaches, causing flooding of the Island and extended periods without agricultural use, have changed the existing conditions on the Island to low-value wildlife habitat. The island was last farmed in 1994. The 1995 and 1997 flood events called attention to the high cost of returning the island to a condition suitable for agriculture. Because Prospect Island is located in the Yolo Bypass and its levees are required to be maintained at lower elevations than surrounding Delta islands, Prospect Island will flood more frequently than these other islands. The costs to resume and maintain agricultural use of Prospect Island would be higher than for other islands in the Delta. Therefore, the Corps and DWR now assume that a more accurate description of the existing conditions is that the property is an open space serving as low-value wildlife habitat.

To better understand the economic feasibility of resuming agriculture on the federal property at Prospect Island, DWR economists prepared an economic analysis of farming on the Island (Attachment F). The analysis concluded that the risk of future flooding, the suitability of the site for only low value crops, and current market conditions combine to make it economically infeasible to return the site from its existing condition to agricultural production in the foreseeable future. That the agricultural value of Prospect Island is compromised due to frequent flooding is supported by the following:

- As part of the Yolo Bypass, levee height has been restricted on Prospect Island since 1916.
- The 1995 lawsuit by the agricultural lessee against Reclamation demonstrates significant agricultural losses on Prospect due to flooding.
- Repairing levee breaches and pumping out the island is estimated to take between 2-6 months (or longer) and delays agricultural activities on the island
- Repairing levee breaches and pumping out the island for agricultural reclamation is costly; many of the costs have been borne by the government
- As a consequence of the frequent flooding of Prospect, only low–value agricultural crops have been grown on Prospect.

<u>Levee Height Restriction on Prospect Island.</u> In 1916 the Prospect Island Reclamation District applied to the State Reclamation Board to construct a tide levee on the lower portion of Prospect Island. Because Prospect was in the Yolo Bypass, the Reclamation Board granted approval for the levee but limited its height to 11 feet U.S.E.D. in order not to impede flows of the Bypass. The construction of tidal levees (to reclaim the land from tidal action) was not supposed to impede flood flows in the Yolo Bypass flood control system.

In 1963, after the Sacramento Deep Water Ship Channel was built separating Prospect Island from the rest of the Yolo Bypass, the Sacramento-Yolo Port District which owned Prospect Island, granted and conveyed to the Sacramento and San Joaquin Drainage District (State Reclamation Board) a right and easement without recourse to damages for the passage

of all flood waters of the Yolo Bypass on Prospect Island. This grant revised the height restrictions on Prospect Island levees to be 15 feet in the north and 13 feet in the south. The northern portion of Prospect Island was then sold to a private landowner.

Lawsuit by Lessee. When Reclamation acquired Prospect Island in January 1995, it assumed an existing agricultural lease for the property. Prospect Island flooded in March 1995. The lessee (Slater Farms Inc.) then sued Reclamation for losses incurred for site preparation and lost profits for 1996 and 1997 (Reclamation decided to buy-out the lease). Reclamation repaired the levee and pumped out the island in March-November 1996 and settled the lawsuit in August 1996. The lessee alleged that Reclamation should have repaired the levee breaches and reclaimed the land sooner so that a crop could have been planted in 1995. Reclamation paid nearly $400,000 in settlement for 1995 site preparation (herbicide application, grading) and 1996 and 1997 buy-out of lease (profits they might have made had the lease not been bought out).

Time to Repair Levees. After flooding, there is usually 2-6 months delay in planting in order to repair levees, pump out the island, clean ditches, repair pumps, etc. In the case of the 1995 flooding, the delay was even longer because Reclamation had to find funds to pay for these repairs. According to the agricultural lease for Prospect Island, after flooding, the farmer was not expected to grow crops that year.

Levee Repair Costs. In general, when Prospect Island was in private ownership (1963-1995), Reclamation District No. 1667 and DWR paid most of the costs to repair the non-project levees (Miner Slough and the north and south cross levees) and the Corps paid to repair the Sacramento Deep Water Ship Channel levee. Since at least the 1980s, the federal government reimbursed the Prospect Island landowner and Reclamation District No. 1667 for some of the share of the levee repair and island pump-out costs. These reimbursements were made under various federal programs, some of which were activated for the Delta by official declarations of disasters. Most of these federal flood fight and recovery programs were administered by Federal Emergency Management Agency.

Since 1980, there were levee breaches and flooding in the following years: 1980, 1981, 1983, 1986, 1995, 1997. Expenditures for the Public Law 93-288 program for the 1981 and 1983 flood events show $314,592 in federal funds, $77,599 in State funds, $27,264 paid by Reclamation District No. 1667 and $71,452 paid by the landowner (Source: DWR economic analysis, Attachment F). In 1986, Reclamation District No. 1667 (Prospect Island) was denied FEMA funding for flood-related damages due to the fact that the Ship Channel levee was not designed to withstand 100-year floods. Reclamation District No. 1667 then applied and was reimbursed $444,070 from Solano County Office of Emergency Services (AB2536 Cortese Act 1986 State Disaster Assistance Funds) for flood-related damages. The District also attempted to be reimbursed for another $34,033 of expenses from 1986 flood-related damages, though it is not clear if this was reimbursed by the government. Note that these data are incomplete since they do not cover all flood years and may not include all the private landowner levee expenditures.

Since the federal government acquired the property in January 1995, the US Bureau of Reclamation has spent $196,000 to repair damages from the 1995 floods. Approximately $1,700,000 in CALFED funds and $622,000 in Reclamation funds were used to repair extensive damage from the 1997 floods including levee breaches on Port of Sacramento property. Note

that it was necessary to repair the Port of Sacramento levee breach in order to pump the entire Island out and repair breaches on Reclamation property. The government acquired funds to repair the Port of Sacramento levee breach and pump out its property because the Port did not have funds to do the work itself.

In addition, the following data are available. The Corps has spent $655,812 from 1980-2000 in maintenance and repairs to the Sacramento Deep Water Ship Channel levee on Prospect Island. For the period 1981-1999, the DWR Levee Subventions Program has spent $494,661 ($181,124 State funds and $313,537 local funds) for maintenance and rehabilitation of non-project Delta levees.

In conclusion, the large majority of costs to repair levees, pump out Prospect Island, and maintain the levees was borne by State and federal governments, although the private landowner also spent considerable money for these tasks. Construction of the project should improve the condition of the levees. Conversion of the land to wetland should be compatible with frequent flooding.

Historically low-value crops were grown on Prospect Island. Low-value agricultural crops such as corn, wheat and safflower have historically been grown on Prospect Island. Higher-value crops such as vineyard and alfalfa, were presumably not grown because these are multi-year crops that would be subject to damage during the frequent flooding of Prospect Island. In 1994, the average gross crop revenue per acre for Prospect Island was $430 as compared to $1,017 for Ryer Island which grows higher-value crops. Ryer Island has not flooded since at least 1930 and produces in addition to low-return field crops, higher-return crops including truck, orchard, vineyard, sugar beets, and alfalfa hay. Prospect Island had low-return field crops in 1994 (wheat, grain corn and safflower). These crops were surplus crops-- overproduced crops that the federal government paid farmers not to grow. According to papers obtained in the 1995 lawsuit of the lessee against Reclamation for losses due to flooding, in 1992, 103 acres of tomatoes and 288 acres of safflower were grown on Prospect Island for approximately $243,800 in revenues. DWR's economic analysis states that these agricultural revenues are much less, on a per acre basis, than the per acre revenues of neighboring agricultural islands and the Delta as a whole.

Under the no-action alternative, there would be no Federal participation in environmental restoration in the study area. The 1,228-acre area would continue to be in Federal ownership. Due to the designed height of the levees around Prospect Island and its history of flooding, it is assumed that levees will breach again in the near future, probably in the southern part of the island. The Federal Government is not likely to propose any changes to existing conditions nor to take any actions to repair breached levees, unless necessary to provide access to the private property within Prospect Island. These assumptions also apply to the without-project condition. Certain activities such as operation and maintenance would continue, but may be modified.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the baseline and future without-project environmental resources of the project area, including resources that would not be adversely affected by the project (Section 3.1) and resources that would be affected by the restoration project (Sections 3.2 through 3.12). The baseline condition for this EA/IS is dry conditions in the interior of Prospect Island with upland and seasonal wetland habitat. Without the project, however, the island would eventually flood naturally, causing a change in the types and distributions of cover types. This section also analyzes the effects on these environmental resources that would result from implementation of the proposed restoration alternatives. The effects of the No Action alternative are compared against the baseline dry conditions, while the effects of the Proposed Action alternative are compared against the without-project condition of a naturally flooded Prospect Island. Finally, this section identifies mitigation measures to avoid, minimize, or offset adverse effects to the environment that would result from implementation of the alternatives.

3.1 Environmental Resources Eliminated from Detailed Analysis This section describes the resources in the project area that would not be adversely affected by the project. These resources are presented here to add to the overall understanding of the project area.

3.1.1 Climate. The project area is situated in the eastern portion of the Delta where there is a transitional climate zone between the coastal and inland extremes. The prevailing winds are from the south primarily because of marine breezes through the Carquinez Strait, although the sea breezes diminish and winds from the north occur more frequently during the winter. During the summer, the predominant winds come from a south-southwest direction. Clear skies predominate throughout much of the year, but storms and tule (ground) fog frequently occur during the winter months.

Most of the precipitation in the area derives from air masses moving in from the Pacific Ocean during the winter months. These storms usually move through the area from the west or northwest. Variations in the climate can occur seasonally and from year to year, affecting freshwater flow patterns, fish and wildlife habitat, and Delta hydrology (Corps, 1993). Within the Delta, precipitation can vary greatly, with the wettest areas receiving about 60 inches of rain and the driest areas receiving 10 inches. The proposed project would have no effects on the regional or local climate in the area.

3.1.2 Geology/Geography The Delta is located along the western edge of California's Central Valley. This valley was formed in the basin of a large sea between 175 and 25 million years ago. During this period, the area presently occupied by the Sierra Nevada was the continental margin. A second island mountain island chain lay to the west of this margin. As these mountains rapidly uplifted, huge volumes of sediment filled the basin. Mountain building and sedimentation continued to the Miocene (26 to 5 million years ago). Regional subsidence and deposition in a marine environment ended about 40,000 years ago during the late Eocene. From the late Eocene to the Pleistocene, continental alluvial deposits accumulated in the basin. During the Quaternary period, phases of glaciation caused sea levels to fluctuate, as well as alternating cycles of deposition and erosion.

The Delta began to take on its present form during the end of the last glacial period about 11,000 years ago as the sea began to rise, filling the alluvial valley of the Sacramento River. Rivers and streams draining into the area formed a complex network of channels, islands

and sloughs. Alluvial materials accumulated along the banks of channels, forming natural levees around islands. Spring rains and high tides caused floods, which easily overtopped these natural levees forming a network of large, shallow lakes. Highly productive soils formed behind these levees as detritus from marsh areas accumulated and as nutrient-rich detritus was deposited by floodwaters. During the period in which hydraulic mining debris was deposited in channels, increased flooding occurred, and the natural levees were raised. Agricultural activities in the Delta have resulted in further raising and strengthening of the natural levees and construction of new levees. The proposed project would have no effects on the geology or geography in the area.

According to the CALFED document, “Seismic Vulnerability of the Sacramento – San Joaquin Delta Levees”, dated April 2000, Prospect and Ryer Islands are located in an area of the Delta where the levees are considered to have low susceptibility to earthquake-induced failure. Flooding Prospect Island should have no effect on the seismic vulnerability of the adjacent island levees.

3.1.3 Water Supply. Availability of water supplies in the Delta varies with natural conditions and upstream development. Natural hydrologic variations cause extreme fluctuations in monthly and yearly inflows. Winter floods produce Delta flow rates of several hundred thousand cubic feet per second (cfs), while summer conditions can decrease rates to a few thousand cfs. The total annual volume of inflow can also vary substantially.

The North Bay Aqueduct delivers water to Solano County and Napa County. Water contractors who receive this water are concerned about the potential effect on the Barker Slough pumping plant (which serves the North Bay Aqueduct) from an increase in the Delta smelt population. Currently, DWR is required to discontinue or reduce pumping whenever concentrations of smelt larvae exceed a certain threshold. The DWR, Solano County Water Agency, U.S. Fish and Wildlife Service (FWS), Reclamation, and Corps met to discuss the water contractors’ concerns. As a result, the FWS's field supervisor for Sacramento sent a memo to Reclamation to address the water contractors' concerns. The following is an excerpt from that memo:

> It is the Service’s intent that increased larval production associated with Prospect Island not cause additional pumping restrictions when risk to the overall population of delta smelt is low. In the 1994 draft Recovery Plan, wide distribution and high numbers of rearing juveniles have been shown to lower risk to delta smelt. If these conditions exist, no additional Barker Slough pumping restrictions will occur due to increased larval production from Prospect Island.

Farmers on Ryer Island expressed a similar concern that additional restrictions may be placed on their diversions for irrigation. The Corps contacted the Endangered Species Office of the FWS about the Delta smelt. The FWS informed the Corps that no new additional restrictions would be placed on Ryer Island as a result of Prospect Island restoration (Thabault, 1998). Therefore, the proposed project would have no effects on the water supplies in the Delta.

3.1.4 Water Elevations and Tidal Action. Historically, natural Delta islands may have had less tidal influence as the riparian perimeter thickened, restricting outlet channels. Such natural islands probably did not support large expanses of open water (deeper than -3 feet

mean water level) in the interior, and probably had limited tidal action in much of the tule regions.

Water elevations in the ship channel and Miner Slough are influenced by the daily tide and periodic flooding events. Tidal information was estimated considering 19 years of record at the Rio Vista tidal gage in the Delta and using those values (adjusted for location) for the Prospect Island site. These stage values represent the 1929 National Geodetic Vertical Datum. The tidal elevation data for the southern tip of Prospect Island are as follows:

	Feet (msl)
Mean high-high	4.1
Mean high	3.5
Mean	2.0
Mean low	0.2
Mean low-low	-0.3

3.1.5 Traffic and Circulation The roads in the project area are not public roads and provide access for only three of the four landowners on Prospect Island. The four landowners include Reclamation, the Port, and two private parties with properties along the Miner Slough levee. There are no permanent inhabitants on Prospect Island. All construction will occur within the project area and will not impact any public roads. The two-lane public access road to the project area will be used for mobilization, demobilization, and worker access. Delivery of supplies would be minimal, primarily fuel for the construction equipment and plant material. Rock for armoring the breaches would probably be delivered by barge. Since the need for access along or across public roads would be minimal, the project would have no effect on traffic and circulation.

3.1.6 Noise Existing noise levels in the project area are very low, as would be expected in the rural setting found there. As mentioned previously, there are no permanent inhabitants on Prospect Island. There are two private parcels on the island with dwellings that are occupied seasonally. One of the properties is over 2000 feet from the project area, and the other property is that far from all but a small part of the project area. Due to the lack of sensitive human receptors, the noise generated by construction of the project would have no effect on the human environment. Impacts on wildlife would be short-term and minimal, particularly when compared to the benefits of the project.

3.1.7 Esthetics An area's visual character is determined by the variety of the visual features present, the quality of those features, and the scope and scale of the scene. The visual components of a particular area consist of such features as landforms, vegetation, manmade structures, and land use patterns. The quality of these features depends on the relationship between them and their scale in the overall scene.

Visual analysis involves a degree of subjective evaluation based on the perception of the observer. Variety in a particular landscape and the relative value of the feature components differ according to the perceptions of the individual observer. For example, areas with the greatest variety of features (steep slopes, large sharp exposed ridges, varied vegetation, and a

large variety of water forms) are commonly considered to have the highest relative value among observers.

Existing esthetic conditions surrounding Prospect Island include agricultural land surrounded by levees and restored Delta wetlands at Cache Slough and Little Holland Tract. The visual effects of the proposed project are considered to be beneficial to the surrounding area because the island would be restored to its historic fish and wildlife habitat.

3.1.8 Hazardous, Toxic, and Radiological Materials When Reclamation purchased Prospect Island, there were no hazardous, toxic, or radiological waste sites present within the project area. Since the purchase, no new sources of contamination have been introduced. Since there are no hazardous materials or other sources of contamination present on the site, implementation of the proposed project would have no effects on environmental exposure to hazardous, toxic, and radiological materials. Standard requirements to conduct fueling and lubrication of equipment in a manner that affords maximum protection against spills and evaporation will be enforced. The contractor will be required to prepare an environmental protection plan, which will include spill control and contaminant prevention components. UC Davis researchers have ongoing research in the Delta sponsored by CALFED to determine whether restoration of wetlands will exacerbate the mercury methylation and introduce harmful levels of mercury into the food chain. Preliminary sampling has shown that mercury levels in Prospect Island sediment are lower than in the western part of the Yolo Bypass and Central Delta (Slotton et al., 2000); however the Prospect Island monitoring team supports continued research in this area.

3.2 Land Use

3.2.1 Basis of Significance. An alternative would be considered to have a significant effect on land use if it would result in land uses that are incompatible with existing and planned land uses in the area, or if it would result in an inconsistency with land use designations and policies.

3.2.2 Baseline Conditions. The current land use in the project area is low value wildlife habitat. Surrounding land uses are agriculture and wildlife habitat. The area is designated as intensive agriculture, a non-essential agricultural land use designation, in the Solano County General Plan (Glass, 2001).

Prior to Reclamation acquiring Prospect Island, land use in the project area was predominantly agriculture. In 1994, about 380 acres of wheat, 586 acres of field corn, and 184 acres of safflower were grown on Prospect Island. About the same proportions of these crops were rotated annually, but may have included about 100 acres of sugar beets in some years. Processing tomatoes and Sudan grass were also grown in some years. A minor portion of the land was used for machinery paths and irrigation ditches. The irrigation ditches were generally free of vegetation although a few very small, scattered patches of young willow scrub-shrub and emergent marsh survived. An unscreened diversion withdrew several thousand acre-feet of water to support the crops.

Active farming operations took place on Prospect Island until the spring of 1995. The project site flooded in March 1995 due to breaks in the south Miner Slough levee and the cross

levee separating the Port's property from the project area. The breaches in the cross levee and Reclamation's Miner Slough levee were repaired, and Reclamation's property was pumped dry in July 1996. In January 1997, the island flooded when the levees breached again. Repair of the Miner Slough levee breach was completed in November 1998, and repair of the cross levee was completed in January 1999. Farming operations have not resumed in the area since repairs were completed.

During the preparation of the ERR, the assumption was that the project area would remain in agriculture if the proposed project was not constructed. As a result, the National Resources Conservation Service (NRCS) was consulted in accordance with the Farmland Protection Policy Act of 1981, as amended in 1994, to address the conversion of 1,316 acres of Prospect Island from agricultural use to other higher value wildlife habitats (Attachment D). The relative value of the site as farmland, provided by the NRCS, was 64 on a scale of zero to 100. Using the site assessment criteria set forth in the Farmland Protection Policy Act, the site received 115 out of 160 possible points, for a total combined rating of 179 for Prospect Island.

Although the rating of 179 was over 160, a threshold for concern, the Farmland Conversion Effect Rating is meant to be only advisory. The 1981 Act asks Federal agencies to consider and avoid, if possible, effects to farmland, but the Act does not require mitigation for effects to farmland. However, such effects were considered in the development of the project design. Alternative sites and designs were considered in the reconnaissance report; however, these alternative sites and designs did not meet project objectives and were not considered further. In addition, the purpose of the acquisition of Prospect Island was to "restore wetlands and fisheries," as described in the House Reports accompanying the Energy and Water Development Appropriations Acts of 1994 and 1995. Because the island was specifically purchased for restoration at the direction of Congress, the types of alternatives considered were affected. As a result, it is not appropriate to consider the types of alternatives listed in the regulations governing the Federal Farmland Protection Policy Act.

Furthermore, other considerations are not taken into account in the Farmland Conversion Effect Rating. For instance, Prospect Island has flooded at least six times since 1979. Repair of levee breaches and pumping the island dry cost hundreds of thousands of dollars, in addition to the repair of ditches, culverts, and other farming structures. Periodic flooding and subsequent repairs limit the economic viability of farming on Prospect Island and thereby substantially diminish its importance for agricultural use.

As recommended in the CEQA guidelines, a State Land Evaluation and Site Assessment (LESA) was also performed by DWR during preparation of the ERR (Attachment D). The final LESA score indicated the potential for significant agricultural effect; however, DWR noted several reasons why the LESA does not apply to this land conversion decision. As described in the previous paragraph, Prospect Island has a historic and current propensity to flood, limiting the value of the land for agriculture. Also, the restored wetlands would be a less intensive use that would be compatible with agriculture on surrounding lands. The primary purpose of the LESA seems to be to evaluate the effects of converting agricultural land to urban development, not to restored habitat. Restoring wetland habitat on Prospect Island would not increase the potential for future urban development of Prospect Island. The CEQA guidelines include LESA as an option in determining whether a project may significantly affect agriculture; however, other site-specific analyses may also be used for such determinations.

These two evaluations highlighted the need to conduct an economic analysis to assess the economics of agriculture on Prospect Island. This analysis, performed by DWR economists, determined that it would be very difficult to return Prospect Island to profitable agricultural production without large government subsidies (Attachment F). The expense that would be required to prepare the site for agriculture, the risk of flooding and associated costs to repair levees and pump the island dry, the suitability of the site for only low-return field crops, and current market conditions combined to make it unlikely that Prospect Island would be returned to agriculture in the foreseeable future. Therefore, the existing land use for the project area is low value wildlife habitat. Additional discussion of how the agricultural value of Prospect Island is compromised due to frequent flooding can be found in Section 2.5.

3.2.3 Effects

No Action. Based on the preceding discussion, the assumptions about what would happen at Prospect Island if the restoration project was not implemented were reevaluated. The project area portion of the island would likely remain in Federal ownership, and the land use would be poor quality wildlife habitat. The Federal Government is not likely to propose any changes to existing conditions nor to take any actions to repair breached levees, unless necessary to provide access to private in-holding property. No effects would be associated with this alternative.

Proposed Action Alternative. Since the existing land use on Prospect Island is wildlife habitat, the restoration of tidal wetlands would not have any effects on land use in the project area. The restoration of tidal wetlands on Prospect Island is consistent with the policy in the Solano County General Plan stating that lands within the “Agriculture” land use designations may be redesignated as “Watershed” or “Marsh”. Potential effects to agriculture on Ryer Island are described in the section on socioeconomics.

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative.

3.2.4 Mitigation. Since the proposed project would have no effect on land use, no mitigation will be required.

3.3 Vegetation and Wildlife

3.3.1 Basis of Significance. An alternative would be considered to have a significant effect on vegetation and wildlife if it would result in the net loss or degradation of native vegetation, or net loss of wildlife habitat.

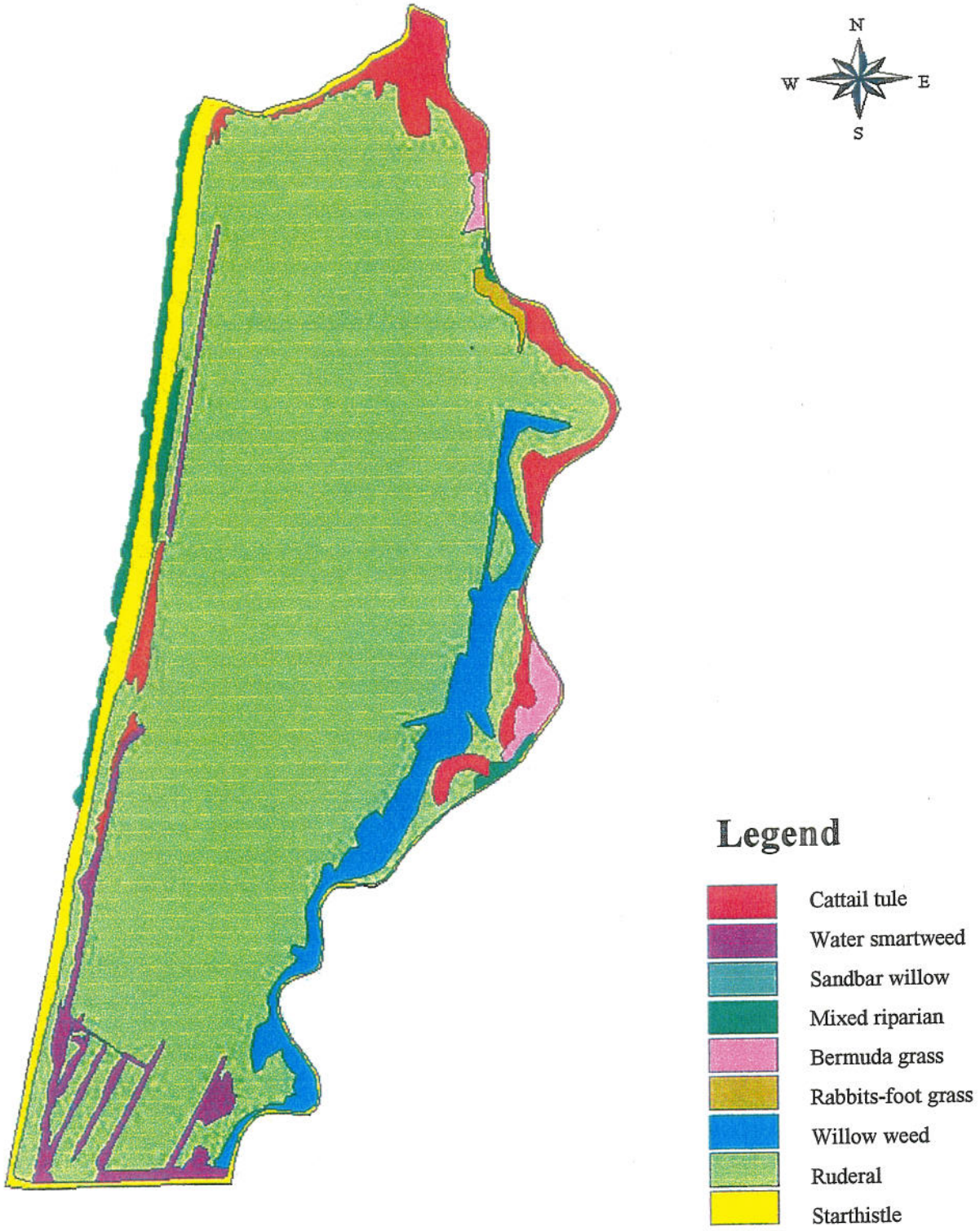
3.3.2 Baseline Conditions. The project area was intensively cultivated until 1995, providing relatively low values to wildlife. The perimeter levee around Prospect Island was breached in 1995, repaired in late 1996, breached again in January 1997, and repaired in late 1998. While the island was flooded and since being drained in 1999, the vegetative cover on the island has changed. Vegetation types, acreages, and representative species of nine cover types found on Prospect Island during surveys by DWR in the fall of 1999 and spring of 2000 are listed in Table 1. The locations of these types are depicted in Figure 4. Some shaded riverine aquatic cover also occurs along the edge of the levees in the ship channel and Miner Slough.

The most abundant cover type found by DWR is ruderal vegetation, which provides a relatively low value habitat for wildlife. Star thistle, another cover type with low value for wildlife, occurs along the ship channel levee. The most abundant of the other cover types occurring around the margins of the site include mixed riparian, cattail/tule, water smartweed, and willow weed.

Table 1. Vegetation Cover Types on Prospect Island

Cover Type	Approximate Acreage	Species Represented
Cattail/tule	59.05	Dominants: *Typha latifolia, Scirpus acutus* with *Salix lasiolepis, Juncus effusus, Epilobium ciliatum, Sonchus, Polygonum amphibium*
Water smartweed	43.76	Dominant: *Polygonum amphibium* with *Cyperus spp., Crypsis shoenoides, Polygonus lapthifolium*?
Sandbar willow	0.23	Dominant: *Salix exigua*
Mixed riparian	22.29	Dominants: *Salix goodingii, Populus fremontii, Platanus racemosa* with *Melilotus alba, Cynodon dactylon, Lepidium latifolium, Rubus discolor, Salix exigua*
Bermuda grass	11.39	Dominants: *Cynodon dactylon, Lepidium latifolium, Melilotus alba* with *Foeniculum vulgare, Centaurea solstitialis*
Rabbits-foot grass	3.92	Dominants: *Polypogon monspeliensis* with *Epilobium ciliatum, Populus fremontii seedlings, Conyza, Rumex crispus, Lactuca*
Willow weed	68.37	Dominant: *Polygonum lapthifolium*
Ruderal	1030.28	Dominants: *Epilobium ciliatum, Conyza floribunda, Lactuca serriola, Rumex crispus, Xanthium strumarium, Crypsis shoenoides, Abutilon theophrasti, Polygonum spp.*
Starthistle	76.71	Dominants: *Centaurea solstitialis* with *Conium maculatum, Lepidium latifolium, Raphanus sativa*
Total	**1316.00**	

Figure 4: Existing Vegetation Cover Types



The levees along the ship channel and Miner Slough are riprapped. The large rock riprap applied to the ship channel supports no vegetation. However, a bench of up to 40 feet wide is present outside the levee toe on the northern two-thirds of the ship channel. Stands of mature cottonwoods and willows are growing on the benches. Smaller trees, primarily willows up to 15 feet high and shrubs such as blackberry, grow through the riprap along the outer slope of the Miner Slough levee. The levees on site provide foraging for California quail, mourning dove, common crow, yellow-billed magpie, and ring-necked pheasant. Waterfowl such as migratory Canada goose, mallard, wood duck, and common merganser use the ship channel and the slough.

The small area of riparian forest and scrub-shrub vegetation located along the ship channel and Miner Slough provides minimal habitat and cover for mammals such as raccoon, opossum, and various species of bats. Because river otter, muskrat, and beaver are common in the Sacramento River, it is likely that these species also use the ship channel and the slough. Predators such coyote and gray fox may forage on the island in search of small mammals such as deer mouse, California vole, and black-tailed hare. The seasonal levee maintenance activities of the past probably discouraged common reptiles and amphibians from inhabiting the levees. It is also unlikely that gopher snake, common garter snake, western fence lizard, and western toad are found in the area due to the past cultivation practices.

The cattail/tule, water smartweed, and willow weed cover types developed on the site when it was flooded and are persisting at the site due either to shallow groundwater or drainage ditches with perennial water, particularly at the south end of the island where the ground surface is lowest. According to a former lessee of the property and reported in the FWS's Coordination Act Report (CAR) (FWS, 1999; Attachment A), a small, variable area in the southern portion of the site floods seasonally and provides habitat for winter bird use. FWS estimated this area to be 120 acres.

3.3.3 Effects. The analysis of cover type composition and distribution on the site with the project is based on coordination with the FWS, as documented in the CAR (FWS, 1999).

No Action. Significant changes in vegetation and wildlife are not expected with the no-action alternative as long as the levees remain intact. Once levees are breached during a major flood event, some of the cover types would persist, but others would change. The main changes would be an initial loss of the ruderal, water smartweed, and willow weed cover types. These would initially be converted to tidal open water habitat and mudflats. Over time, emergent wetlands and submerged aquatic vegetation would be expected to expand at the site, replacing some of the tidal open water and mudflats.

Proposed Action Alternative. Creation of interior islands and additional berms/benches on sections of the ship channel and Miner Slough levees followed by levee breaching would result in increases, relative to existing conditions, in highly important cover types such as tidal emergent marsh, tidal open water (including submerged aquatic vegetation), shaded palustrine aquatic cover, riparian forest, riparian scrub-shrub, and mudflats (FWS, 1999). These regionally scarce cover types would provide high-value habitat for a diverse collection of fish and wildlife, including waterfowl, shorebirds, and other species typical of the historic Delta wetlands. The existing cover types that would be directly affected would be the ruderal, water smartweed, and willow weed cover types. Table 2 shows the changes in acreage by vegetation cover types.

Table 2. Changes in Vegetation Cover Types.

Cover Type	Acres	
	Baseline	With Project
Cattail/Tule*	59.0	0.0
Water Smartweed	43.8	0.0
Sandbar Willow	0.2	0.2
Mixed Riparian	22.3	84.4
Bermuda Grass	11.4	0.0
Rabbits-foot Grass	3.9	0.0
Willow Weed	68.4	0.0
Ruderal	1030.3	0.0
Starthistle**	76.7	0.0
Bare Ground	0.0	15.8
Upland	0.0	45.9
SPA Cover***	0.0	18.0
Tidal Marsh	0.0	503.7
Tidal Open Water	0.0	594.0
Mudflat	0.0	54.0

* With the proposed project, the cattail/tule cover-type will be included in the tidal marsh cover-type.

** The starthistle cover-type is mapped in areas assumed to be bare ground under the with-project condition. Some of the starthistle will persist in the upland cover-type unless management efforts are taken to eradicate it.

*** SPA = shaded palustrine aquatic. This cover- type was included in the FWS's CAR.

The seasonal, shallow flood cover found under existing conditions would be replaced by permanent, shallow water habitat. Compared to the no-action flooded condition, the proposed project would increase the same cover types as above except for tidal open water and mudflats. These types would be reduced in favor of a greater diversity of cover types, as listed above. The added diversity of habitat with this alternative would greatly benefit wildlife use at the site. An additional benefit compared to the no-action flooded condition is that tidal flooding would be restored to the site sooner with the intentional breaching of the levee.

Waterfowl habitat created by the proposed project would include tule marsh, which would provide nesting habitat for dabbling and diving ducks. Tule marsh is used extensively by diving ducks and other crustacean- and fish-eating birds such as grebes, coots, and great blue herons. All waterfowl except for some diving ducks prefer marsh habitats. Creation of mudflat and SPA vegetation would provide loafing areas safe from predators. Designated upland habitat on the interior islands would provide escape and nesting cover, and food for breeding waterfowl.

Shorebird habitat would include mudflats flooded to depths of zero to 2 inches. The mudflats would provide an invertebrate food source required by shorebirds. Loafing areas for shorebirds would be located near the mudflats, with the optimal shorebird habitat located more that 150 feet from any manmade disturbance such as footpaths.

Temporary construction impacts to wildlife, caused by habitat disturbance and noise, would be offset by long-term improvements in habitat values.

The restored wetland area may provide habitat for intrusion by the water hyacinth, an invasive exotic plant that develops quickly in slow moving backwater areas. Such an invasion would impair the quality of the restored habitat, but would not be considered an effect to surrounding areas since other suitable sites for the establishment of this species currently exist near Prospect Island. Water hyacinth is a problem in the San Joaquin River system where tidal influence is minimal. Although the plant is not seen in the Cache Slough area, it has been sighted south along Decker Island. The project would not significantly increase the probability that the water hyacinth would invade this portion of the Delta. However, since water hyacinth is an ongoing issue in the Delta, DWR would include monitoring for the presence of water hyacinth as a part of their Prospect Island monitoring program, under the vegetation monitoring component. The Corps would monitor for the presence of exotic species, including water hyacinth, within shallow-water, planted areas during the 3-year plant establishment period.

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative.

3.3.4 Mitigation. Since this restoration project is designed to provide environmental benefits and there would be no net adverse effects on vegetation and wildlife, no mitigation will be required.

3.4 Special Status Species

3.4.1 Basis of Significance. An alternative would be considered to have a significant effect on special status species if it would adversely affect a Federally or State-listed threatened

or endangered species, destroy or adversely affect designated critical habitat, or substantially affect any other special status species, including degradation of its habitat.

3.4.2 Baseline Conditions A list of Federally listed threatened, endangered, and proposed species was received from the FWS for the Liberty Island and Rio Vista USGS quadrangle maps in December 2000. According to this list, the Federally listed species that may occur within, or be affected by projects within, the two quads include the Aleutian Canada goose, bald eagle, riparian woodrat, riparian brush rabbit, giant garter snake, California red-legged frog, winter-run chinook salmon and its critical habitat, Delta smelt and its critical habitat, Sacramento splittail, Central Valley ESU spring-run chinook salmon and its critical habitat, Central Valley steelhead, Conservancy fairy shrimp, vernal pool tadpole shrimp, vernal pool fairy shrimp, valley elderberry longhorn beetle, and delta green ground beetle. Federally listed plants that are on the Solano County list and may occur within the project area include Suisun thistle, salt marsh bird's beak, soft bird's beak, Contra Costa goldfields, Solano grass, Colusa grass, and showy Indian clover. The only Federally proposed species is the mountain plover. In addition, two candidate species and 48 species of concern were included on the list (Attachment B).

A search of the Natural Diversity Database (NDDB) revealed no occurrences in the project area of the Aleutian Canada goose, riparian woodrat, riparian brush rabbit, giant garter snake, California red-legged frog, Conservancy fairy shrimp, vernal pool tadpole shrimp, vernal pool fairy shrimp, delta green ground beetle, or of any listed plants. In addition, there is no suitable habitat in the project area for these species. Potential roosting habitat for bald eagles, and elderberry shrubs, the host for the valley elderberry longhorn beetle, were found in the area. The NDDB search did reveal three State species near but not within the project area: Mason's lilaeopsis, Delta tule-pea, and Swainson's hawk. Foraging habitat for the Swainson's hawk was available in the project area when it was farmed (FWS, 1999). The existing vegetative cover limits access for foraging by the Swainson's hawk. The California black rail and greater sandhill crane are additional State-listed species that may occur in the project area. Currently, there is no suitable habitat for the California black rail.

The listed fish species and their critical habitat which are likely to occur, at least occasionally, near the project area include the Sacramento splittail, Sacramento River winter-run chinook salmon and its critical habitat, Central Valley steelhead, Delta smelt and its critical habitat, and Central Valley spring-run chinook salmon and its critical habitat. The presence of these special status fish would vary seasonally and between years. During operation of the Yolo Bypass, the FWS expects Delta smelt to use the site for spawning and early life stage rearing. The positive relationship of splittail year-class strength to flooding of this bypass (FWS, 1999) suggests that splittail spawn predominantly on newly flooded lands within the bypass, upstream of the restoration site. As bypass floodwaters recede, larval splittail would likely seek out shallow emergent marsh areas such as provided by the proposed restoration project, where they would experience better growth and survival. Some juvenile salmonids (salmon and steelhead) could also be present in the site during wet years; during dry years, they would probably be absent not only due to absence of conveyance through the floodway, but also because most rearing would occur in the rivers rather than the Delta region.

3.4.3 Effects The effects of the restoration project on special status species were analyzed and coordinated with the FWS, the National Marine Fisheries Service (NMFS), and the State Department of Fish and Game (DFG) for this EA/IS. These effects were originally discussed in the Biological Assessment prepared in October 1998 and included in the 1999 EA/IS. The FWS and NMFS prepared Biological Opinions in July 1999 and September 1999, respectively. In February 2000, the DFG issued a Consistency Determination stating that the Federal Biological Opinions were consistent with the California Endangered Species Act. This Consistency Determination was followed by a letter in March 2000 in which DFG indicated that the California black rail, Swainson's hawk, and greater sandhill crane would not be adversely affected by the project.

The change in the project was described in amended Biological Assessments in January 2001. The NMFS responded in April 2001 with an amendment to their Biological Opinion. The USFWS responded with two letter amendments to their Biological Opinion in May 2001, addressing separately each of the two alternatives under consideration. DWR submitted a letter, dated June 7, 2001, to DFG requesting a determination that the Federal Biological Opinions are consistent with the California Endangered Species Act. These documents are included in Attachment B to this EA/IS. The effects to special status species are summarized below.

No Action. Under this alternative, habitat for special status species would remain in its current condition until Prospect Island floods again and the levee breaches. This has occurred frequently enough in the past that this is part of the baseline. The difference is that future breaches would not necessarily be repaired. Special status fish species would be expected to use the shallow water habitat that would be made available in the interior of Prospect Island. While this habitat could be beneficial to these species, poor water quality may limit the ability of these species to exploit the habitat and could even cause mortality. An uncontrolled breach could occur anywhere on the island. However, due to the condition of the levees, the breach would most likely occur in the southern part of the island. Such a location would mean that the northern part of the island would be subject to poor circulation, and thus, potentially, low dissolved oxygen and high temperatures. The special status species are not tolerant of these conditions and may either avoid using the habitat or become trapped and killed during times when these conditions develop rapidly. Uncontrolled breaching could also result in scouring of deep holes near the mouth of the breach, which would favor predators and perhaps expose these native species to increased predation.

Proposed Action Alternative. Although the act of breaching Prospect Island levees in two places may have a few minor effects on habitat for listed fish species, the proposed construction and restoration of habitat would not adversely affect any Federally or State-listed or proposed species or critical habitats in the project area. In fact, the project would benefit the Delta smelt, Sacramento splittail, Central Valley steelhead, and chinook salmon species.

However, some conditions that may be harmful to these listed species could develop within portions of the restored habitat. As a result, a monitoring program has been established to determine the ecological success of the project (Attachment C). During monitoring, listed fish species, including Delta smelt, Sacramento splittail, Central Valley steelhead, and chinook salmon, may be taken. This potential take may reduce by an insignificant amount the benefits of the project. For the current design described in this EA/IS, the Biological Opinions from FWS and NMFS included incidental take permits, which would allow for this take.

If the monitoring shows that listed species are being exposed to environmental hazards, corrective actions would be identified, and the steps necessary to obtain funding would be taken. The information obtained from the monitoring would be used to evaluate the project benefits to listed species. This information would be used in the design of future restoration projects, which would provide a less tangible, but important, additional benefit to these species.

The amended BO's conclude that the proposed restoration project would likely benefit the listed fish species and is not likely to jeopardize the continued existence of any listed species, or result in the destruction or adverse modification of critical habitat for any species.

The State found in its original consistency determination with the Biological Opinions from FWS and NMFS (letters dated February and March 2000) that the project would not adversely affect State species and may provide benefits to delta smelt, California black rail and greater sandhill crane. DWR and the Corps have consulted with DFG regarding the design change. DWR has requested concurrence from DFG.

While there is potential roosting habitat for bald eagles, they would only be occasional transient visitors and would not likely be adversely affected by the proposed project. The restored habitat is expected to be suitable habitat for the California black rail. The project may also provide valuable, undisturbed roosting habitat for the greater sandhill crane. The species and their critical habitats that may be affected, but would not be adversely affected, are discussed in the following paragraphs.

Critical habitat for Delta smelt. No adverse effects of the restoration plan on critical habitat for Delta smelt have been identified. In fact, the proposed project is expected to increase the area of shallow water habitat with good tidal action that is preferred by delta smelt for spawning and rearing.

Delta smelt. No adverse effects of the restoration plan on Delta smelt have been identified. Habitat that may be beneficial for Delta smelt would be created with shallow water (3 to 8 feet deep) along the edges of rivers, channels, and sloughs (FWS, 1999). The shoal regions would be created with submerged substrate such as vegetation, rocks, and roots. Dead end sloughs would be created on the northern section of the site.

It is possible, but unlikely, that a large proportion of the Delta smelt population from throughout the Delta would migrate to Prospect Island to spawn as a consequence of the restoration. Surveys during the last few years have shown that in some years, Delta smelt congregate in specific areas in the Delta. In other years, small populations of the fish are found dispersed throughout the Delta. The FWS expects that the local adult Delta smelt population found in Cache Slough would most likely compose the population that would use Prospect Island and be attracted to a more favorable shallow water environment conducive to early life history stages (FWS, 1999).

*Central Valley steelhead***.** No adverse effects of the restoration plan on the steelhead have been identified. Low-elevation riparian areas created by the restoration plan could benefit this species by increasing spawning habitat. Monitoring in the project area may result in potential take of this species; however, steelhead would likely benefit from the general increase in productive shallow-water rearing habitat, particularly during wetter years (FWS, 1999).

Sacramento splittail. No adverse effects of the restoration plan on the Sacramento splittail can be identified at this time. Habitat that may be beneficial to the Sacramento splittail would include riparian areas, dead end sloughs, and newly flooded vegetation. Low-elevation riparian areas created by the restoration plan could benefit this species by increasing splittail spawning habitat. Monitoring in the project area may result in potential take of splittail; however, this species would benefit from the general increase in productive shallow-water rearing habitat (FWS, 1999).

Critical habitat for chinook salmon. Winter-run, Central Valley spring-run, and Central Valley fall-run chinook salmon would probably benefit from the project due to an increase in the overall area of productive shallow-water habitat in the Delta. Monitoring in the project site may result in potential take of salmon; however, the extent to which salmon would use the site for rearing would likely be limited by the indirect connection to the Sacramento River through Miner Slough and the Yolo Bypass. In addition, monitoring information would be used to evaluate the project benefits to chinook salmon. This information would be used in the design of future restoration projects, resulting in an overall benefit to chinook salmon.

During wet years, there may be sufficient flows to carry young salmon into the project site. Salmon juveniles do not necessarily require strong tidal action to stimulate outmigration. Outmigration occurs naturally in association with the physiological changes during smolting. Therefore, muted tidal action for part of the area, rather than maximum tidal action, may be a benefit in that it might retain the salmon in an area of relatively high productivity and provide habitat for other fish species which depend on deeper, less tidally influenced areas (FWS, 1999).

Chinook salmon. No net adverse effect on the listed winter-run and Central Valley spring-run chinook salmon is anticipated. Habitat that may be beneficial to salmon would include a migratory resting corridor with deep pools for juvenile salmon to mature in while migrating downstream from Miner Slough. Shaded riverine aquatic (SRA) vegetation would provide cooling, cover, and terrestrial insects. This vegetation type would also improve the nursery value of the Delta and could improve survival and natural production upstream. The largest potential benefit to anadromous fish would be the contribution of detritus and food to juvenile fish. The open water would provide crustaceans for juvenile salmon (FWS, 1999).

Valley elderberry longhorn beetle. The valley elderberry longhorn beetle, or its habitat, is restricted to the thin band of riparian habitat bordering the northern portion of the ship channel. Because construction is not planned for this area, the proposed plan would likely have no adverse effect on this species. The shrubs would be fenced off during construction to avoid any damage to the plants. The establishment of riparian vegetation may actually benefit this species if the host elderberry plant continues to grow at this site (FWS, 1999).

Swainson's hawk. The proposed action would replace 1,117 acres of lands that were used as foraging area by the Swainson's hawk when the island was used for agriculture. However, frequent flooding over the last 20 years has compromised the importance of Prospect Island as a foraging area. In addition, when farmed, the value for foraging was minimized by a cropping pattern that included large acreages of corn and safflower. The foraging value of the land under current conditions is minimized by a dense, primarily ruderal vegetative cover. Observations of this State-listed species are recorded along the Sacramento River, on Miner

Slough, and on the southern part of Prospect Island (DFG, 1997). Agricultural lands that can be used by Swainson's hawk for foraging are abundant in the Delta; yet this species' population is low in the area. Nest site availability is more likely to be the limiting factor for Swainson's hawks in the project area. The densest nesting areas are riparian corridors with many large cottonwoods mixed with oaks and willows. The creation of such areas on Prospect Island with the proposed project would likely improve nest site availability for the species, resulting in a net benefit. Potential nesting habitat does occur on the north half of the ship channel levee. Potential impacts to nesting will be avoided by conducting nesting surveys and following proper protocols if nesting activity is found.

Mason's lilaeopsis. Mason's lilaeopsis is a State-listed rare plant species. It has been observed near the project area, but not in the project area. An individual specimen has recently been found in the ship channel adjacent to the project area.

Open Breach Alternative. The effects associated with this alternative would be similar to the effects associated with the proposed action alternative. The difference is that an open breach might provide a safer passage into and out of the project area for listed fish species.

3.4.4 Mitigation. The Biological Opinions from FWS and NMFS have provided measures that will be implemented to ensure compliance with the ESA. The FWS has identified the following terms and conditions, which implement reasonable and prudent measures, that must be complied with in order to take listed species during the monitoring program:

1. Minimize the effects on normal behavioral patterns of Delta smelt and splittail including, but not limited to, feeding, breeding, and sheltering. The Corps will ensure compliance with the following terms and conditions, which implement this reasonable and prudent measure:

    a. The use of siltation prevention devices and erosion minimization practices shall be employed during any in-water work prior to levee breaching.
    b. Stockpiling of construction materials shall be restricted to the designated construction staging areas and exclusive of the wetland areas.
    c. Refueling of construction equipment and vehicles within the wetland area shall occur only within a designated, paved, bermed area where possible spills will be readily contained.
    d. Equipment wash-down shall not occur within the wetland area.
    e. Equipment operated within the wetland area shall be checked and maintained daily to prevent leaks of fuels, lubricants, or other fluids.
    f. Litter and construction debris shall be removed from below the ordinary high water line daily and disposed of at an appropriate site.
    g. Any spills of hazardous materials within delta smelt habitat shall be cleaned up immediately. Such spills shall be reported in post-construction compliance reports.
    h. No permanent hard structures shall be established on Prospect Island.

2. Prior to construction, the Corps will develop a remediation plan that contains various strategies to deal with negative environmental issues, such as low dissolved oxygen, that may result from this habitat restoration project.

In its Biological Opinion for the project, the NMFS identified the following reasonable and prudent measures. The Corps will ensure compliance with the terms and conditions, which implement the reasonable and prudent measures.

1. Measures shall be taken to identify and reduce the risk of take associated with the fisheries monitoring program.

2. Measures shall be taken to reduce the exposure and physiological stress associated with capture and handling to minimize decreases in survival after release.

3. Measures shall be taken to reduce injuries and effects to salmonid survival or steelhead spawning success associated with capture by electrofishing.

4. Measures shall be taken to monitor the incidental take of listed species.

The Corps will ensure that elderberry shrubs, occurring in a thin band of riparian habitat bordering the northern portion of the ship channel, will be fenced off during construction to avoid any damage to the plants.

In order to mitigate potential effects to Mason's lilaeopsis, the Corps will conduct surveys prior to construction. If any individual plants are in an area that would be affected by construction, the Corps will either ensure that construction activities avoid these plants or will move plants to suitable areas where they will not be affected. The Corps will then fence all specimens of the plant within the project area to ensure they are not disturbed inadvertently during construction.

3.5 Fishes

3.5.1 Basis of Significance. An alternative would be considered to have a significant effect on fisheries resources if it would result in a reduction in fish populations or substantially degrade the water quality of a fish habitat.

3.5.2 Baseline Conditions When the site was cultivated, the land was dry, and there was no surface water to provide habitat for fish. Water from irrigation drained in the ditches towards the southeast corner of the site, where there was a larger, open-water canal and a 60-horsepower drain pump that emptied into Miner Slough. Patches of riparian and SRA vegetation growing along the ship channel side of Prospect Island levees provide minor amounts of habitat. Overhanging riparian vegetation and undercut banks provide protective cover for fish.

During major flooding, the study site has provided significant shallow water habitat for fish. At such times, the island contains fish species of the Sacramento River. As the largest river in California, the Sacramento River supports the most diverse assemblage of fish in the State. Of the 91 species known to occur in the Sacramento-San Joaquin River system, at least 28 species of fish occur at or near the site. These fish include resident and anadromous species. The anadromous fish species include chinook salmon, steelhead trout, striped bass, American shad, white and green sturgeons, and Pacific lamprey. The resident fish can be divided into warmwater game fish (largemouth bass, sunfishes, and catfishes), coldwater game

fish (rainbow trout and brown trout), and nongame fishes (squawfish, carp, and suckers) (FWS, 1999).

The FWS monitors fish at the Cache Slough mitigation area, upper end of Steamboat Slough, and North Bay Aqueduct. From the Cache Slough site, the most common of the 23 species collected include inland silverside, yellowfin goby, threadfin shad, hitch, Sacramento squawfish, prickly sculpin, Delta smelt, bigscale perch, fathead minnow, and mosquitofish. Sacramento splittail and chinook salmon have also been identified in Cache Slough. At the upper end of Steamboat Slough, juvenile chinook salmon have been documented. Adult chinook salmon have been documented in the upper end of the ship channel, even though this channel is not along a direct migration route to spawning tributaries. Sacramento splittail have also been captured at the northern end of the ship channel (FWS, 1999).

3.5.3 Effects. The effects of the restoration project on fish were analyzed and coordinated with the FWS, NMFS, and DFG. The effects of the proposed project are discussed below.

No Action. The site would provide significant shallow water habitat for fish after a major flood event that results in breaching of the levee surrounding Prospect Island. Since the island is not expected to be used for agriculture, future breaches may not be repaired, leaving the island available as shallow water habitat for fish. The use of the site by special status fish species was discussed in the previous section. Although an abundance of fish would likely use the site, the diversity of the species using it may be limited. Poor circulation and localized, long residence times may result in a preponderance of warmwater species in the area.

Proposed Action Alternative. Special status fish species are discussed in section 3.4. Although the act of breaching Prospect Island levees in two places may have a few minor effects on habitat for fish species, the proposed construction and restoration of habitat would have a net benefit for most species. Fish use of the restored habitat is expected to begin immediately after construction and increase as the vegetation develops. Species would be similar to those observed at the Cache Slough mitigation area, including silverside, goby, shad, hitch, squawfish, sculpin, Delta smelt, tule perch, and others. Compared to the no-action alternative, this alternative would improve the circulation of water in the project area, thereby improving water quality and the diversity of species that would use the site effectively.

The use of culverts, even very large culverts, raised concerns about access into and out of the site and exposure to predation, both of which could limit the ability of some species to effectively use this restored habitat. As a result, the culvert has been designed to minimize access and predation problems. The length of the culvert (65 feet) is below the guideline threshold of 100 feet. Velocities in portions of the culvert would be below 1 cfs to allow most fish to control their movements through the culvert. Finally, rock work in the bed of the culvert would be of uniform size to avoid creating hiding places for predators.

Open Breach Alternative. The effects associated with this alternative would be similar to the effects associated with the proposed action alternative. The difference is that an open breach might provide a safer passage into and out of the project area for fish species.

3.5.4 Mitigation. Since this restoration project is designed to provide benefits for fish, no mitigation will be required.

3.6 Soils

3.6.1 Basis of Significance. An alternative would be considered to have a significant effect on soils if it would cause substantial loss of soils through removal or natural erosion or introduce contaminants into surface or subsurface soils.

3.6.2 Baseline Conditions. Soils in the Delta range from a variety of alluvial fan deposits to organic peat. Organic soils are associated with freshwater marshes and river channels. Mixed mineral and organic soils and accumulated mineral sediments are found in elevated and drained areas. The soil types on Prospect Island include Sacramento silty clay loam, Ryde clay loam, Columbia fine sandy loam, Valdez silt loam, and dredged spoil. The surficial organic soil includes peat, varying in thickness from 2 feet at the north end of the island to 21 feet at the south end. These soft and compressible soils average 10 feet thick. This surface layer is typically underlain with a firm clay layer, which varies from 4 to 29 feet thick and averages 12 feet deep. Sand is found below the clay layer. The sand varies from 5 to 10 feet thick and averages 8 feet deep. The ground-water table varies between 1 and 4 feet below the surface, and the coefficient of permeability ranges from 0.2 to 10 feet per day.

The Corps conducted soils explorations in September 1999, including 20 trenches from 5 to 10 feet deep, excavated at locations scattered throughout the interior of Prospect Island. No major sand layers were found, and the explorations revealed that the near surface soils are predominantly fine grained and that a high plastic clay underlies much of the island (Attachment G, 12 July, 2000 memo).

Agriculture in the Delta has contributed to the loss of soil through erosion and oxidation. Oxidation of peat soils on most Delta islands causes levees and levee foundations to subside. This subsidence causes uneven settling and further weakening of the levees. Delta soils have a high to very high shrink/swell potential and low strength for supporting the load of embankments, dikes, and levees. The soil volume is decreased substantially under load.

Levees line the perimeter of Prospect Island to protect the property from flooding. However, Prospect Island levees are tidal levees that are maintained at a lower elevation than neighboring levees specifically to allow floodflows onto Prospect Island. Levee heights around the Prospect Island project area range from 10.7 to 13.3 feet along the ship channel, 10.9 to 16.7 feet along Miner Slough, and as low as 10.2 feet along the southern cross levee. Levees around the Port's property to the south of the project area range from 8.8 to 12.4 feet (Attachment G, Levee Assessment for Prospect Island). The fill material and foundation of these levees were found to be weak. The levee on the east side of Miner Slough, along Ryer Island, ranges in height from 22.7 to 24.2 feet and is part of the flood control project. Prospect Island flooded in 1980, 1982, 1983, 1986, 1995, and 1997. The ship channel levee is maintained by the Corps. Prior to the purchase of Prospect Island by Reclamation, the other levees were maintained by Reclamation District 1667. Since the purchase, Reclamation has maintained these levees. These levees are subject to damage by floodflows, wind and tidal action, and vessel wave wash.

Ryer Island farmers claim that every time that Prospect Island has flooded, 6 times in the last 20 years, Ryer Island experiences seepage. Analyses of seepage and groundwater data by experts from the Corps, DWR, and a contractor hired by the U.S. Department of Justice have concluded that there is no evidence of a link between Prospect Island flooding and Ryer Island

groundwater levels or seepage (Appendix H, I and J in the ERR). They found a much better relationship between the stage in Miner Slough and groundwater levels on Ryer Island.

An additional evaluation of the Prospect-Ryer Island seepage issue prepared at the request of Reclamation District 501 is found in the GEI report entitled "Geotechnical Report, Evaluation of Potential Effects on Ryer Island Associated with Flooding Prospect Island," July 1999 (GEI, 1999). For this report, the authors conducted a field investigation, evaluated groundwater level data, conducted preliminary seepage modeling, and analyzed levee stability on Ryer Island. The new geologic information obtained from borings taken in this study reveals that Miner Slough appears to be in direct connection with the permeable deposits underlying Ryer Island (Attachment G, Office Memo dated September 1, 1999) The study does not confirm the existence of a hydraulic connection between Ryer and Prospect Islands nor does it claim to prove that there is a direct seepage effect. The monitoring data and the linear regression analysis in the report support the hypothesis that Ryer Island groundwater levels are controlled by Miner Slough.

3.6.3 Effects. The effects of the restoration project on soils were analyzed for the EA/IS and are discussed below.

No Action. Most soil loss on Prospect Island in the past, both mineral soil and organic (peat), has been due to agricultural practices, exposing soil to wind erosion and oxidation of peat soils. Since the island is no longer being farmed, the loss of soil due to wind erosion is greatly reduced. However, until a major flood event causes a breach in the perimeter levee and flooding of the island, the oxidation of the peat soils on Prospect Island will continue.

Once a breach occurs in the perimeter levee, erosion of the breach would occur until a stable condition is achieved. The initial breach would move sediment into the island. Subsequent tidal flows would probably move more sediment out of the island and into Miner Slough. Once flooded, the interior sides of the Prospect Island levees would be subject to erosion from wind-generated waves. These waves could also move through the breach and cause erosion of the project levee on Ryer Island. The size and location of the breach and the fetch distance would be uncontrolled, thereby exposing the project levee to an unknown risk. The risk to the Ryer Island levee would also be raised due to the increased potential for deterioration of the Prospect Island levee by wave action. Under this alternative, the Prospect Island levee would not be protected by berms, plantings, and barrier islands. Under the no-action alternative, the future flooded condition of Prospect Island would also have the potential to result in seepage of water from Prospect Island to Ryer Island. Analysis of this potential, however, indicates that any seepage from Prospect to Ryer would be insignificant. See the discussion under the proposed action alternative for more information.

Proposed Action Alternative. Peat soils could be a factor in project construction efforts to create the islands since consolidation of the material is needed to establish specific elevations for the island and berms. In consideration of consolidation, the project would be constructed over 2 years to allow for subsidence.

Soil erosion due to the construction equipment on the Miner Slough levee is not expected to cause severe damage. During construction, equipment would be located in the interior of the island and not on the levees.

The project could affect sediment deposition and transport processes in Miner Slough. Sediment deposition occurs when velocities decrease, causing the suspended sediment to be deposited. With the breaching of the Miner Slough levee, some of the sediment load from Miner Slough would be diverted into Prospect Island. This sediment could accumulate on the site, but the rates of accumulation are expected to be very low. This sediment is not likely to move back into Miner Slough because velocities within the island are very low.

Tidal flows could cause scouring within the project site and redistribution of sediment into Miner Slough. The main factors affecting scouring and sedimentation are water velocity and sediment size, shape, density, and cohesiveness. The results of the hydrodynamic modeling indicate very low velocities within Prospect Island and through the constructed levee openings for both the tidal and flood simulations (Attachment G, Hydraulic Design Assessment for Prospect Island). Due to these low velocities and short distances, the potential for scouring and sedimentation would be negligible. Furthermore, the islands and levees would be stabilized by biotechnical plantings, and the levee breaches would be lined with rock to further reduce the potential for erosion due to tidal flows in and out of the island. Nevertheless, DWR would monitor the bathymetry of the project to measure the success of project features with regard to erosion and sedimentation.

Another potential effect to soils in the project area as a result of the proposed project is the exposure of the interior sides of the levees to erosion by waves. Wind blowing across large stretches of open water would generate waves that could erode the levees. However, the effect with this alternative would be less than the effect for the no-action alternative since this alternative includes the construction of islands that have been designed to reduce fetch lengths and the associated wind-generated waves (Appendix G of the ERR and Attachment G, Hydraulic Assessment). The project also includes modification of the slope of these levees to a gentler slope that would better dissipate the wave energy. Use of biotechnical plantings would also help to stabilize the soil on the levees.

There is some potential that the proposed project would affect the integrity of the project levee on Ryer Island. However, the risk with this alternative would be less than the risk with the no-action alternative. This risk would come from waves that move through the breaches or from deterioration of the Prospect Island levee on Miner Slough. Except for the designed openings, the levees surrounding Prospect Island would be left intact and protected with berms and plantings on the interior of the Prospect Island levee and with the construction of islands to break up the wind fetch. The Miner Slough levee would protect the project levee on Ryer Island from wave damage. The risk due to the designed openings allowing wind-generated waves to move through the openings, across Miner Slough, and up against the Ryer Island project levee is considered to be minimal. The north opening would only be 40 feet wide, and emergent vegetation in the very shallow waters of the north part of the island would help to dissipate the wave energy. In the south, the breach would be wider, and a barrier island would be constructed in the interior of Prospect Island to shorten the fetch. In addition, as in the north, emergent vegetation would also moderate the wave energy.

The restoration of tidal wetlands on Prospect Island could potentially cause an increase in seepage onto Ryer Island when compared to the past when the island was farmed, and compared to the existing condition with levees intact. However, when compared to the future condition under the no-action alternative with the levee breached, there is no effect on seepage, other than a possible short-term temporary effect from causing the breach to occur sooner.

Based on the data collected to date and reasonable assumptions about subsurface conditions, the Corps and DWR have concluded that seepage on Ryer Island originates from Miner Slough. They have further determined that a reasonable study could not be designed to provide conclusive evidence to prove or disprove a hydraulic connection between Prospect Island and Ryer Island. The Corps' soils explorations support the conclusion that a flooded Prospect Island has little effect on Ryer Island seepage. The high plastic clay layer encountered in this exploration appears to have a very low permeability and separates a shallow, perched groundwater condition from deeper water bearing layers. The impact of this high plastic clay aquaclude is to inhibit or reduce the effects of island flooding on deeper pervious layers that were modeled in the GEI report as the hydraulic connection to Ryer Island (Attachment G, 12 July 2000 memo).

Nonetheless, the GEI report also represents a reasonable interpretation of conditions that may exist at least along a portion of the two islands. The report's analysis can be accepted as an indication of the possible hydraulic connection between a flooded Prospect Island and Ryer Island. The report's determination of the potential for increased seepage (zero to 6.4 percent increase in seepage from Prospect into Ryer) is deemed to be a "worst case" estimate of the overall hydraulic effect.

The worst case results from the GEI report can be used to determine whether the estimated increase in seepage is a significant environmental effect. The GEI report concluded that the maximum effect to seepage was only 12 gallons per day per 1,000 linear feet of levee. Over the 16,000 feet of Miner Slough adjacent to Prospect Island, the seepage would be 192 gallons per day. To put this number in perspective, this amount of water spread over a 10-foot-wide area along the length of the levee would have a water depth of only about 0.05 millimeter. Such a minimal volume of seepage would not be a significant adverse environmental effect. The pumps operating on the island would likely have no difficulty handling this additional volume.

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative.

3.6.4 Mitigation. Because of the continuing Ryer Island studies, the Corps recommended a 1,000-foot setback zone of minimal excavation from the toe of the interior Miner Sough levee. The only excavation that will be allowed to take place in this zone would be for grubbing and channel grading.

3.7 Air Quality

3.7.1 Basis of Significance. An alternative would be considered to have a significant effect on air quality if it would violate any ambient air quality standard, contribute on a long-term basis to an existing or projected air quality violation, expose sensitive species or humans to substantial pollutant concentrations, or not conform to applicable Federal or State standards.

3.7.2 Baseline Conditions The State has been divided into 14 air basins for air quality monitoring. Solano County is located within the Sacramento Valley Air Basin. This air basin is composed of Butte, Colusa, Glenn, Placer, Sacramento, Shasta, Solano, Sutter, Tehama, Yolo, and Yuba Counties. Prospect Island is located in Solano County. The air quality in Solano County is monitored by the Yolo-Solano Air Quality Management District (AQMD). According to this agency, air quality in Solano County is in attainment for all Federal and State criteria pollutants except ozone and particulate matter less than 10 microns in diameter (PM_{10}), which exceed State standards.

Airborne dust (PM_{10}) is the predominant air quality concern for the Prospect Island site. The topographic boundaries of the basin, coupled with light winds and atmospheric stability, make the basin susceptible to the accumulation of air pollutants. The typical summer circulation system allows transport of pollutants for long distances. Particulate monitoring stations near the study area are located in Walnut Grove, Isleton, Bethel Island, Vacaville, and Elk Grove.

High concentrations of oxidants and suspended particulate matter are the major air pollution problems in the Sacramento Valley Air Basin. Both pollutants frequently exceed air quality standards. The largest source of oxidants is motor vehicles, and the major source of suspended particulates is agriculture. Agricultural burning is a widely practiced procedure for cropland waste disposal and levee maintenance. In addition, tillage of agricultural lands within the air basin is producing an ongoing source of dust. However, current management of the project area has resulted in reduced production of air pollutants as compared to the historic agricultural conditions.

3.7.3 Effects. The State and Federal air quality parameters were analyzed using information from the Yolo-Solano AQMD for the EA/IS. The effects of the proposed project are discussed below.

No Action. This alternative would have no short- or long-term effects on air quality.

Proposed Action Alternative. Restoration of habitat in the project area would have no long-term effects on air quality.

Short-term effects due to construction activities would occur during the 2-year construction period. Construction activities are expected periodically and would take place from July through November, weather conditions permitting. Construction emissions including fugitive dust and worker vehicle emissions would not exceed Federal *de minimis* thresholds for any criteria pollutants nor hinder the attainment of air quality objectives in the local air basin. However, NOx and PM_{10} emissions would occasionally exceed the daily local threshold levels. Mitigation measures set by the Yolo-Solano AQMD to minimize emission, shown below, would be used during construction to reduce the emissions. The relatively short duration of the impacts and the implementation of mitigation measures would reduce the impacts to air quality to a level that is a less than significant impact. Table 3 shows total construction emissions, annual emissions, and maximum daily construction emissions calculated using emission factors found in the CEQA Air Quality Handbook (SCAQMD, 1992). Table 4 compares total daily construction emissions with local and Federal thresholds.

Table 3. Total, Annual, and Daily Construction Emissions for the Prospect Island Restoration Project.

Equipment (ID Number)	Total Hours	Pounds of Emissions				
		CO	ROG	NOx	SOx	PM10
Crane, barge mounted, 60 ton	16	2.9	0.8	7.0	2.3	0.5
Excavator	112	75.6	16.8	190.4	16.0	15.7
Grader, cat-12	192	28.8	7.5	10.4	16.5	11.5
Loader, 5.35 CY capacity	440	250.8	101.2	836.0	80.1	74.8
Scraper, 14-20 CY, 24 ton	3,000	3750.0	810.0	11520.0	1380.0	1230.0
Dozer D-7	4,568	3083.4	685.2	7765.6	1598.8	730.9
Truck, rear dump 8 CY	440	297.0	66.0	748.0	62.9	61.1
Water truck	880	1584.0	167.2	3669.6	396.0	228.8
Truck, pickup	440	792.0	17.6	413.6	44.0	26.4
Truck, 3 axle	440	792.0	83.6	1834.8	198.0	114.4
Automobiles, workers	4400	1056.0	44.0	176.0	6.6	13.2
Other:						
Fugitive dust						33,000.0
Totals						
	lbs	11,712.5	1,999.9	27,171.4	3,801.2	35,507.3
	lbs/yr	5,856.3	1,000.0	13,585.7	1,900.6	17,753.7
	lbs/day	53.2	9.1	123.5	17.3	161.4
	tons/yr	2.9	0.5	6.8	1.0	8.9

Table 4. Comparison of Project Construction Emissions with Local and Federal Thresholds.

Criteria Pollutant	Project Emissions		Threshold Levels	
			Solano County	Federal
	lbs/day	tons/year	lbs/day	tons/year
CO	53.2	2.9	550	100
ROG	9.1	0.5	82	100
NOx	123.5	6.8	82	100
SOx	17.3	1.0	82	100
PM_{10}	161.4	8.9	82	100

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative.

3.7.4 Mitigation. Best available control practices will be used to minimize the adverse effects of construction on the air quality in the region. All standard practices and procedures that are set by the Yolo-Solano AQCD to minimize emissions will be used during construction. The Corps will ensure that the following measures to minimize construction equipment and materials emissions will be implemented:

a. Properly maintain all equipment and engines.
b. As a general rule all equipment and engines will keep idling below 10 minutes.
c. Develop a comprehensive construction emissions management plan that, over the entire construction period, demonstrates a fleet-average 10% NOx emission reduction from heavy-duty off-road vehicles used in construction when compared to an unregulated/uncontrolled fleet. This can be achieved by improving efficiency and thereby reducing the hours of operation of individual pieces of equipment, by increasing the use of cleaner equipment (i.e., 1996 and newer equipment), and/or by using either aqueous emulsified fuel verified by the California Air Resources Board to have the greatest NOx and PM10 reduction benefit available for heavy duty construction equipment or low sulfur diesel fuels in combination with NOx absorbers and particulate traps. Presently, PuriNOx by Lubrizol Corporation, BP AMOCO (low sulfur diesel) and Equilon (gas to liquid low sulfur diesel) are three available products. Equipment emissions can be calculated using emission factors found in the EPA, Office of Transportation and Air Quality publication AP-42, “Compilation of air pollution emission factors for mobile sources, Vol. 2, 5th edition, April 1998. Alternative fuel use can achieve a 14% reduction in NOx.
d. Develop and implement an Enforcement Plan to ensure air quality mitigation measures are met. Such an enforcement plan would require weekly evaluation of project related heavy-duty off-road vehicle engine emission opacities, using standards as defined in California Code of Regulations, Title 13, Sections 2180-2194. The contractor will provide an Environmental Coordinator, California Air Resources Board certified to perform Visible Emissions Evaluations (VEE), to routinely (once every two weeks) evaluate project related heavy-duty (50 hp or greater) off-road equipment for compliance with this requirement. The Environmental Coordinator will maintain a current VEE rating for the duration of the project. Vehicles found to exceed opacity limits must be repaired immediately (within 72 hours).
e. Use new technologies to control ozone precursor emissions, as feasible.
f. Avoid construction-related burning by using chipping, composting, and recycling.

g. All gasoline-powered equipment should be equipped with catalytic converters.

The following mitigation to minimize construction dust will also be implemented:

a. Use water trucks or sprinkler systems to reduce airborne dust from leaving the site. Require increased watering frequency whenever wind speeds exceed 15 miles per hour. Emphasis should be placed on the watering of unpaved roadways during periods of high vehicle movement.
b. Water all soil piles as needed.
c. Limit the speed for all construction equipment to 10 miles per hour on any unpaved surface.
d. Water all haul roads at least twice daily, and/or pave all haul roads.

3.8 Water Quality

3.8.1 Basis of Significance. An alternative would be considered to have a significant effect on water quality if it would substantially degrade water quality, contaminate a public water supply, substantially degrade or deplete ground-water resources or interfere with ground-water recharge, or expose sensitive species or humans to substantial pollutant concentrations.

3.8.2 Baseline Conditions. Although there are no water quality monitoring sites in Miner Slough or the Sacramento Deep Water Ship Channel, there are other government water quality monitoring sites in the greater North Delta area. Reclamation and DWR monitor water quality parameters such as salinity and water temperature at Cache Slough, Shag Slough (near Liberty Island), the Sacramento River at Hood and Greenes Landing (upstream of Prospect Island), and the Sacramento River at Rio Vista (downstream of Prospect Island). Approximately five miles east of Prospect Island (on Barker Slough, which emanates from Lindsey Slough) is the Barker Slough Pumping Plant, which diverts water from the Delta to North Bay SWP (State Water Project) contractors. The DWR Municipal Water Quality Investigations Program conducts water quality investigations including organic carbon analyses in the Barker Slough watershed (DWR 1997). In addition, the DWR MWQI Program monitors dissolved organic carbon, pH, and total dissolved solids approximately 5 miles northeast of Prospect Island on the Sacramento River at Greenes Landing (near Courtland) and the Sacramento River approximately 6 miles downstream of Prospect Island at Rio Vista (DWR 1997). In general, Delta water quality is considered to be poor due to upstream urban inputs and high inputs of organic matter, nutrients, and pesticides from agricultural drainage waters that are discharged into the Delta.Taking advantage of 1997 flood conditions, the DWR collected water quality data on Prospect Island from May through November 1997 and June through September 1998. A map of the survey sites is shown in Figure 5 and some of the data collected are listed in Table 5. Monitoring results indicate no apparent degradation of water quality conditions (dissolved oxygen, temperature, and electrical conductivity) from the spring through summer period in the northern reach of Prospect Island. For the limited conditions of the sampling period and the limited locations sampled, water circulation resulting from tidal and wind mixing appears adequate with a southern breach.

3.8.3 Effects. The effects of the restoration project on the water quality near the project site were coordinated with the Central Valley Regional Water Quality Control Board for the EA/IS. The effects for the proposed project are discussed below.

No Action. Water quality is not expected to change significantly with the no-action alternative as long as existing conditions persist. However, the next major flood event could cause a breach in the levee surrounding Prospect Island, probably in the southern part of the Miner Slough levee. Future breaches may not be repaired, which would result in the establishment of a permanent, shallow-water, tidal wetland. These wetlands could result in the improvement of water quality in the vicinity. A healthy wetland system would have a beneficial effect on water quality. Wetlands can improve water quality by retaining pollutants or delaying their movement as water circulates through the system. These pollutants include excess nutrients, toxic chemicals, and disease-causing microorganisms. Some pollutants may settle out in the marsh and be converted by biochemical processes to less harmful forms. Some pollutants may remain trapped in the sediments or be taken up by plants and recycled or transported from the marsh. The FWS's CAR indicates that the high surface-to-volume ratio of the shallow wetlands would improve water quality by enhancing oxygen levels and providing for the absorption of excess nutrients by sediments and emergent plants (FWS, 1999).

Wetlands may result in an increase in dissolved organic carbon concentrations in the water of channels in the vicinity of Prospect Island. There is a potential that this dissolved organic matter could increase the cost of treating drinking water for North Bay Aqueduct water users. Research on this issue is ongoing and not conclusive at this time.

As mentioned in the discussion of effects to fish (Section 3.5.3), water quality in the interior of Prospect Island, particularly in the most northern portion of the island, could suffer due to poor circulation if the breach occurs, as expected, in the southern part of the island. The data reported by DWR in Table 5 indicates that under some conditions this may not be a problem, but the potential for problems to develop under other conditions still exists.

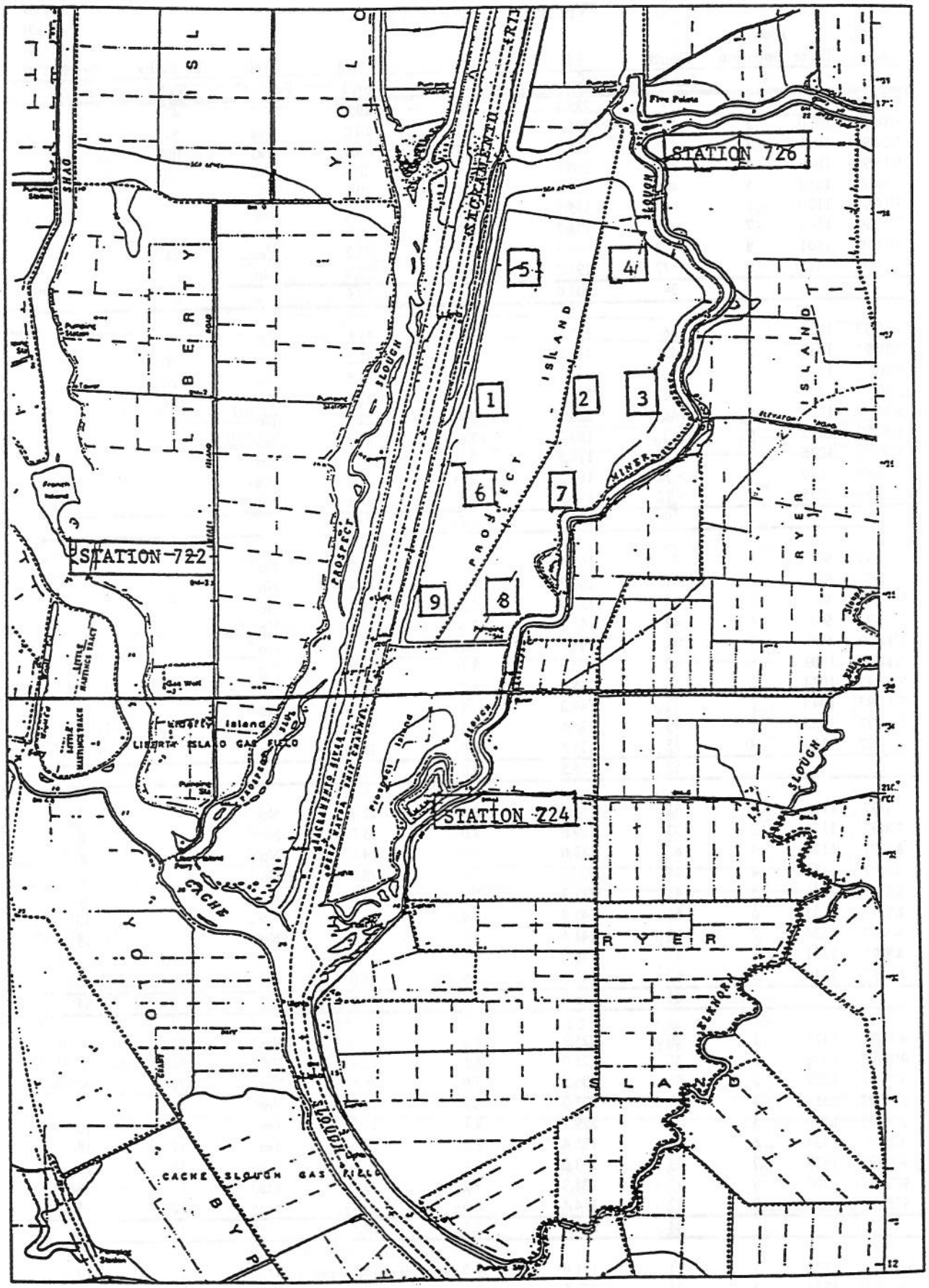


Figure 5: DWR Water Quality Survey Sites

Table 5

Prospect Island
Water Quality Field Data

Date	Time	1997 Location	Depth (inches)	EC (µS/cm)	DO (mg/L)	Temp (oC)	Grab Sample?	Turbidity (NTU)	Secchi (inches)
5/14/97	1000	1	34	223.8	7.6	20.8	Yes	40	
5/14/97	1020	2	28	205.4	8.2	20.0	Yes	52	
5/14/97	1031	3	16	225.1	7.4	20.4	Yes	108	
5/14/97	1040	4	48	210.5	7.4	20.5	Yes	116	
5/14/97	1050	5	42	229.0	7.8	20.1	No		
5/14/97	1120	6	> 72	175.8	7.3	21.1	No		
5/14/97	1143	7	> 72	174.7	6.9	20.9	Yes	36	
5/14/97	1401	8	> 72	191.4	8.3	22.2	Yes	24	
5/14/97	1413	9	> 72	191.3	8.9	22.0	No		
			34	203.0	7.7	20.9		63	
5/30/97	1025	1	36	207.5	7.6	21.8	Yes	52	
5/30/97	1039	2	42	210.4	7.5	22.5	Yes	68	
5/30/97	1046	3	30	223.6	7.2	23.5	Yes	120	
5/30/97	1101	4	18	225.2	7.3	22.6	Yes	104	
5/30/97	1109	5	48	223.2	7.4	22.3	No		
5/30/97	1212	6	60	186.3	7.6	23.7	No		
5/30/97	1226	7	> 72	174.8	7.9	22.6	No		
5/30/97	1246	8	> 72	163.2	7.1	21.8	Yes	12	
5/30/97	1255	9	> 72	183.3	7.2	22.4	No		
			39	199.7	7.4	22.6		71	
7/11/97	909	1	24	165.5	7.8	21.5	No		
7/11/97	918	2	41	156.7	8.0	21.4	No		
7/11/97	927	3	26	133.9	8.2	21.1	No		
7/11/97	936	4	42	161.9	7.8	21.4	No		
7/11/97	950	5	44	191.4	8.1	21.4	No		
7/11/97	1003	6	40	192.0	8.1	21.4	No		
7/11/97	1034	7	56	135.0	8.1	22.2	No		
7/11/97	1045	8	52	147.2	8.1	22.1	No		
7/11/97	1125	9	99	136.6	8.1	22.7	No		
7/11/97	1133	10	68	134.8	8.0	22.9	No		
			52	155.5	8.0	21.8			
8/8/97	1106	1	88	150.8	8.2	22.6	No		
8/8/97	1113	2	33	159.8	8.0	23.0	No		8
8/8/97	1124	3	67	183.0	6.9	24.9	No		4
8/8/97	1137	4	44	190.3	7.1	25.0	No		4
8/8/97	1146	5	43	181.3	7.9	23.8	No		6
8/8/97	1255	6	66	142.8	8.0	23.3	No		16
8/8/97	1224	7	66	141.6	8.2	22.9	No		15
8/8/97	1241	8	77	138.6	7.9	23.0	No		18
8/8/97	1249	9	67	142.2	7.9	23.0	No		16
			61	158.9	7.8	23.5			11
9/25/97	1413	1	20	225.3	8.3	25.1	Yes	56	8
9/25/97	1348	2	30	225.0	8.5	25.7	Yes	56	8
9/25/97	1339	3	36	234.5	7.9	26.4	Yes	72	8
9/25/97	1356	4	27	235.0	8.2	26.5	Yes	62	7
9/25/97	1400	5	20	229.7	8.4	25.5	Yes	56	10
9/25/97	1434	6	60	185.4	8.0	22.3	Yes	17	16
9/25/97	1538	7	63	183.0	7.8	22.4	Yes	15	18
9/25/97	1500	8	72	188.3	9.2	23.1	Yes	14	16
9/25/97	1456	9	72	194.4	8.6	23.4	Yes	17	16
			44	211.2	8.3	24.5		41	12
10/27/97	1322	1	31	171.0	9.5	15.9	Yes	44	10
10/27/97	1334	2	36	172.5	9.3	15.6	Yes	76	7
10/27/97	1341	3	45	181.1	9.4	15.5	Yes	61	6
10/27/97	1354	4	30	183.8	8.8	16.4	Yes	68	8
10/27/97	1402	5	26	174.0	10.0	15.7	Yes	56	5

Table 5 (cont)

10/27/97	1509	6	60	168.7	8.4	16.1	Yes	13	22
10/27/97	1431	7	61	166.9	8.3	16.1	Yes	12	20
10/27/97	1442	8	73	161.0	8.3	17.1	Yes	14	15
10/27/97	1459	9	71	161.5	8.9	17.0	Yes	16	21
			48	171.2	9.0	16.2		40	13
11/24/97	1318	1	30	183.9	9.2	14.1	Yes	36	10
11/24/97	1331	2	46	182.6	9.5	14.1	Yes	28	14
11/24/97	1415	3	46	183.3	9.8	13.8	Yes	24	15
11/24/97	1401	4	32	182.4	11.8	14.5	Yes	26	12
11/24/97	1349	5	19	183.5	10.7	15.0	Yes	36	12
11/24/97		6	not sampled due to imminent rain						
11/24/97		7	not sampled due to imminent rain						
11/24/97		8	not sampled due to imminent rain						
11/24/97		9	not sampled due to imminent rain						
			35	183.1	10.2	14.3		30	13

1998

Date	Time	Location	Depth (inches)	EC (µS/cm)	DO (mg/L)	Temp (oC)	Grab Sample?	Turbidity (NTU)	Secchi (inches)
6/3/98	1340	1	34	141.3	8.6	18.4	Yes	62	5
6/3/98	1350	2	50	136.4	8.8	18.2	Yes	74	6
6/3/98	1355	3	50	146.3	8.6	18.6	Yes	66	6
6/3/98	1305	4	32	154.5	8.7	18.4	Yes	70	5
6/3/98	1324	5	37	142.4	8.6	18.3	Yes	70	4
6/3/98		6	not sampled due to time limitation						
6/3/98		7	not sampled due to time limitation						
6/3/98		8	not sampled due to time limitation						
6/3/98		9	not sampled due to time limitation						
			41	144.2	8.7	18.4		68	5
7/8/98	1117	1	42	141.6	7.9	22.7	Yes	81	5
7/8/98	1128	2	48	144.4	7.0	23.3	Yes	102	5
7/8/98	1140	3	48	140.4	7.3	23.9	Yes	102	5
7/8/98	1050	4	30	157.3	7.5	22.0	Yes	84	8
7/8/98	1100	5	36	156.5	8.1	22.7	Yes	87	8
7/8/98	1233	6	62	135.3	7.4	21.9	Yes	57	7
7/8/98	1158	7	53	131.2	7.9	22.9	Yes	72	6
7/8/98	1216	8	68	117.8	8.1	22.1	Yes	36	8
7/8/98	1225	9	66	112.9	7.9	22.0	Yes	18	13
			50	137.5	7.7	22.6		71	7
8/28/98	1301	1	23	171.9	8.0	21.1	Yes	70	7
8/28/98	1230	2	24	180.3	6.8	21.8	Yes	87	7
8/28/98	1223	3	23	181.7	7.3	22.8	Yes	84	6
8/28/98	1239	4	18	179.8	7.7	24.8	Yes	99	5
8/28/98	1251	5	24	178.4	7.3	22.2	Yes	87	7
8/28/98	1326	6	45	165.6	6.3	21.5	Yes	72	7
8/28/98	1405	7	55	162.2	9.4	25.0	Yes	36	7
8/28/98	1356	8	57	156.1	8.2	25.4	Yes	33	11
8/28/98	1344	9	55	153.7	7.3	20.3	Yes	45	9
			36	170.0	7.6	22.8		68	7
9/29/98	1150	1	28	169.5	8.5	17.5	Yes	108	4
9/29/98	1320	2	40	172.4	7.8	18.4	Yes	108	6
9/29/98	1225	3	24	182.7	8.1	18.4	Yes	124	5
9/29/98	1215	4	24	181.5	8.4	18.1	Yes	144	4
9/29/98	1207	5	33	173.5	8.4	17.7	Yes	124	4
9/29/98		6	not sampled due to high winds						
9/29/98		7	not sampled due to high winds						
9/29/98		8	not sampled due to high winds						
9/29/98		9	not sampled due to high winds						
			30	175.9	8.2	18.0		122	5

Table 5.2

Proposed Action Alternative. The proposed action alternative would have some of the same benefits and consequences as the no-action alternative. There would be two main differences. First, the effects would probably occur sooner since the levee would be breached intentionally. Second, the location of the breaches would be controlled and could be located to minimize the potential for water quality problems developing in the interior of the island. As designed, circulation of water in the island would likely be conducive to maintaining good water quality in the island. The overall residence time of water in the island would be 1.5 days, with no areas having residence times that are substantially greater than 1.5 days. The flow through the northern breach would always be into the island. This would result in a net flow from north to south that would also tend to improve water quality, including oxygen concentrations and temperatures, in the interior of the island compared to the conditions likely to occur under the uncontrolled breach scenario of the without-project future condition.

The production of dissolved organic carbon by wetlands would occur under this alternative as well as under the no-action alternative. Under this alternative, however, an effort to monitor this production would be undertaken. As part of the proposed monitoring plan, DWR plans to monitor dissolved organic carbon concentrations in water discharged from Prospect Island to better understand the contribution of wetlands to concentrations of dissolved organic carbon compounds in Delta channels.

Construction of the Prospect Island Ecosystem Restoration Project would take place primarily under dry conditions (before the interior of the island is converted to wetlands), which would not require a section 404 permit, pursuant to the Clean Water Act, nor a section 10 permit, pursuant to the Rivers and Harbors Act of 1899. Levee berms and islands would be constructed prior to the breaching in two places of the Prospect Island perimeter levee. The breaching process for the southern breach would require some dredging type activities, which also do not require a 404 permit. The armoring with rock of the breach area would likely require the placement of some rock into areas that are newly exposed to tidal influence. This work would be the type of activity that would require section 404 and section 10 permits. However, in this case, construction activities would fall under Nationwide Permit #13, for bank stabilization work. The installation of culverts in the northern opening would require the placement of a sheet pile wall in Miner Slough to isolate the construction area and allow for dewatering. This work would also be the type of activity that would require a 404 permit. In this case, these activities would fall under Nationwide Permit #33, for temporary construction, access and dewatering. The proposed project meets the conditions of the nationwide permits and is in compliance with the 404(b)(1) guidelines.

The Central Valley Regional Water Quality Control Board was consulted for their analysis of the effect of the project on water quality. The Board found that the project would benefit the water quality in the area and would have no adverse effects.

Open Breach Alternative. The effects associated with this alternative would be very similar to the effects associated with the proposed action alternative. The only difference is that the northern breach could be constructed in the same manner as the southern breach, instead of using a sheet pile wall. If so, the work would still be covered under Nationwide Permit #13.

3.8.4 Mitigation. Since this restoration project is designed to provide environmental benefits and there would be no net adverse effects on water quality, no mitigation will be required.

3.9 Public Health

3.9.1 Basis of Significance. An alternative would be considered to have a significant effect on public health if it would interfere with local public health services or practices, or substantially increase the exposure to human health hazards such as disease vectors or chemical contaminants.

3.9.2 Baseline Conditions. Historically, tidal marshes in Solano County were prolific sources of mosquitoes. In addition to direct abatement, water management practices have been developed by the Solano County Mosquito Abatement District to minimize the production of mosquitoes in tidal marshes. The principal control method consists of the construction of ditches to circulate tidal water into sloughs and bays to avoid ponding. Most mosquitoes in California are relatively harmless, causing no threat to public health. There is the potential for at least three common species of mosquitoes (A*edes melanimon, Culex tarsalis, and Culiseta inornata) to be produced on Prospect Island. Culex tarsalis* is a vector of western equine encephalitis and St. Louis encephalitis (Litchtenberg and Getz, 1985). Both the Solano County Mosquito Abatement District and the Sacramento-Yolo Mosquito and Vector Control District advise that the mosquito *Aedes melanimon* has demonstrated the ability to vector both western equine encephalitis and California encephalitis. Evidence of Western Equine Encephalitis has been found in Solano County during five of the last ten years. *Anopheles punctipennis* is found within Solano County and is a secondary vector of Malaria. This species could be produced at the project site if proper vegetation and water management practices are not followed. *Anopheles freeborni* (primary vector of Malaria) adults are known to migrate into Solano County from rice field areas during the late summer and early fall where they overwinter then re-emerge during the late winter. Other mosquitoes may also be capable of transmitting diseases to humans.

Several types of land use in Yolo, Solano, and Sacramento Counties produce habitat suitable for mosquitoes. These uses include rice fields, irrigated pasture, and seasonal, permanent, and tidal wetlands. In well-functioning wetland ecosystems, mosquito populations are controlled by mosquito predators, parasites, and diseases that occur naturally in mosquito breeding habitats (Garcia, 1983). Conditions that may lead to high mosquito populations are water habitats with high levels of organic matter, fluctuating water height and shallow margins, full exposure to the sun, excessive amounts of emergent vegetation, and few predators.

Mosquito abatement districts are very active in mosquito control efforts in the Delta. Integrated pest management combines cultural practices and biological control with the use of chemicals. The main biological control agent for mosquitoes is the mosquitofish (*Gambusia affinis*). This fish is particularly effective in mosquito control when alternative fish foods (vegetation and microfauna) are limited. Chemical treatments rely heavily on regular inspections to determine when the appropriate threshold mosquito levels have been reached and chemicals should be applied.

Under existing conditions, the collection of rainfall within Prospect Island could cause seasonal ponding that can provide habitat for mosquito breeding. The ditches may actually

have perennial water. Ditches are generally not as much a concern as the ponding since water in ditches is usually moving. However, at Prospect Island the ditches are not currently being used for moving water in and out of the island, and the water in them may be more stagnant than normal. The need for treatment for mosquito abatement at Prospect Island will be determined by sampling (Erkhanian, 2001).

3.9.3 Effects. The effects of the restoration project on mosquito production as related to public health were analyzed and coordinated with the Solano Mosquito Vector Control for the EA/IS. The effects for the proposed project are discussed below.

No Action. No change in mosquito production is expected with the no-action alternative as long as existing conditions persist. Major flood events in the future would cause a breach of the levee that may result in a permanent change in conditions on the island. The freshwater wetlands that would result from this change would affect potential mosquito breeding habitats and mosquito populations at the project site. Poor circulation that is likely to result from an uncontrolled breach would make the mosquito problem worse.

Proposed Action Alternative. The proposed project would also restore freshwater wetlands and affect potential mosquito breeding habitats and mosquito populations at the project site. However, the project was designed to replenish the water supply every 1.5 days and eliminate stagnant pools of water. A significant increase in the mosquito population is not expected because of this restoration project. Relative to the no-action alternative, this alternative would probably improve water circulation and, therefore, could actually reduce the potential for a mosquito problem. In March 2000, the DWR provided the 1999 ERR to the Solano County Mosquito Abatement District. District staff determined that as long as there was adequate water exchange (less than 2 days residence time), there would likely be no adverse effects with regard to mosquitoes.

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative.

3.9.4 Mitigation. Since the proposed project would not interfere with local public health services or practices, nor substantially increase the exposure to human health hazards such as disease vectors or chemical contaminants, no mitigation measure will be required.

3.10 Recreation

3.10.1 Basis of Significance. An alternative would be considered to have a significant effect on recreation if it would result in loss of recreational facilities, cause a substantial disruption in a recreational activity or opportunity, or substantially diminish the quality of the recreational experience.

3.10.2 Baseline Conditions. Prospect Island is divided into three primary ownerships, Port, Federal (Reclamation), and a privately owned parcel. None of these properties are open to public recreation, although recreational boaters use the channels surrounding the island. Prospect Island may occasionally be trespassed for activities such as fishing access to the ship channel and hunting waterfowl. Although the ship channel is used by recreational boaters, there are no recreational facilities such as docks, launching areas, picnic grounds, or restrooms

on the ship channel near Prospect Island. Recreational boaters also use Miner Slough. One commercial marina, the Arrowhead Harbor, is located along Miner Slough at Five Points.

Recreational opportunities near Prospect Island are minimal due to limited public recreational facilities, as well as private levees and farmlands surrounding the public waterways.

3.10.3 Effects

No Action. No change in recreation is expected with the no-action alternative. Land ownership and limited public access would remain the same, and no new recreational facilities are planned.

Proposed Action Alternative. The restoration of tidal wetlands on Prospect Island would increase the habitat of many species of fish and wildlife, and under FWS management, increased recreational opportunities such as fishing, hunting, and wildlife viewing are possible. However, no facilities are planned as a part of the proposed project to accommodate these recreational activities. No adverse effects on recreation are anticipated**.**

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative.

3.10.4 Mitigation. Since the proposed project would have no adverse effects on recreation, no mitigation will be required.

3.11 Cultural Resources

3.11.1 Basis of Significance. An alternative would be considered to have a significant adverse effect on cultural resources if it would diminish the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Types of effects include physical destruction, damage, or alteration; isolation or alteration of the character of the setting; introduction of elements that are out of character with the property; neglect; and transfer, lease, or sale of the property.

3.11.2 Baseline Conditions. A records check was requested from the Northwest Information Center in 1997 for previously identified cultural resources sites in the project area. No sites were identified during the records check. Surveys were also conducted on a limited portion of Prospect Island. No cultural resources were discovered.

3.11.3 Effects

No Action. There are no cultural resources that could be affected by the no-action alternative.

Proposed Action Alternative. There are no cultural resources that would be affected by the proposed action alternative. Coordination with the State Historic Preservation Officer resulted in a letter concurring with the Corps' determination that the proposed project would not affect any historic or cultural resources (Attachment E).

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative.

3.11.4 Mitigation. Since there are no cultural resources that would be affected by the proposed action alternative, no mitigation will be required.

3.12 Socioeconomics

3.12.1 Basis of Significance. An alternative would be considered to have a significant effect on socioeconomics if it would result in population changes, residential relocations, business losses, job losses, changes in public services, and/or losses of local tax revenue that are incompatible with local agency goals or projections.

3.12.2 Baseline Conditions. Prospect Island is located in Solano County. The existing land use in the project area is low value wildlife habitat. There are no permanent inhabitants on Prospect Island, but there are four landowners, two of which access their property along Prospect Island levees. The four landowners include Reclamation, the Port, and two private parties with properties along the Miner Slough levee. There is also a marina located northeast of the island at Five Points.

According to the Solano Economic Development Corporation, the total population for Solano County as of 2000 was 401,300, and the county's population will reach 481,700 by the year 2010 (SEDCORP, 2001). The only city near the project area in Solano County is Rio Vista, and in 2000, the population of Rio Vista was 5,100. Sacramento, Rio Vista, and Clarksburg are the closest populated areas to Prospect Island. The main sources of employment near the project area are provided by agriculture and by service jobs related to summer recreation. A 1994 land use survey by DWR indicated that 11,490 acres of Ryer Island were in agricultural production. The ship channel runs along the western side of Prospect Island and continues north to the Port. The Port makes a significant economic contribution to the greater Sacramento area.

3.12.3 Effects

No Action. Under the no-action alternative, land use in the project area would be low value wildlife habitat. As discussed above in Section 3.2.2 on Land Use, DWR economists performed an evaluation of the expense to prepare the site, under existing conditions, for agriculture. The economic analysis concluded that given the risk of future flooding, the suitability of the site for only low-return field crops, and current market conditions, it would be economically infeasible to return to agricultural production in the foreseeable future without large government subsidies (Attachment F).

Under the no-action alternative, there would be no potential for socioeconomic effects until after a major flood event that caused a breach in the levee surrounding Prospect Island. In the past, breaches have been repaired, thus minimizing the socioeconomic effects. In the future, breaches may not be repaired. Under certain subsurface geological conditions, it is conceivable that flooding on Prospect Island could cause an increase in seepage onto Ryer Island and thus cause an increase in their agricultural production costs. (See previous discussion in section 3.6.) This would be a socioeconomic effect.

The worst case results from the GEI report, as discussed in section 3.6, can be used to evaluate the socioeconomic effects to agricultural production costs. Using these results (an additional seepage of 192 gallons per day) and an assumed capacity of the existing pump in the Ryer Island drainage ditches (about 140 gallons per minute for a 25-HP pump), it would take about 1.5 minutes per day to remove the additional seepage from Ryer Island. Assuming that irrigation takes place 365 days per year, the cost of operating these pumps would be about $250 per year (assuming the pumps use 75 kwh per hr and the cost of electricity is a high $0.35 per kwh). A 1994 land use survey by DWR indicated that 11,490 acres of Ryer Island were in agricultural production. Since all landowners on the island are members of the Ryer Island Reclamation District, the cost of pumping the additional seepage off of Ryer Island would be about $0.02 per acre per year. This would not be a significant effect on agricultural production costs.

Besides the direct cost of pumping, there is a concern that pumping would not be able to control the seepage and that saturated soil conditions would develop that would make the soil unworkable with mechanized equipment. However, as discussed in the previous paragraph, the pumps would only be required to operate an extra 1.5 minutes per day to remove the assumed worst case volume of additional water. To put this amount of seepage in perspective, if the daily additional seepage was spread over a 10-foot-wide area along the length of the levee, there would be a depth of water of only about 0.05 mm. This amount of water would not significantly contribute to the development of saturated soil conditions.

An uncontrolled levee breach could occur anywhere on Prospect Island, but would most likely occur in the southern part of the island, along Miner Slough. This location would not affect access to any properties on the island. A breach in the ship channel levee would require some work by the Corps to stabilize the breach, but would not necessarily require a complete repair. A breach in the Miner Slough levee in the north part of the island may require a repair by the Federal owner to maintain access to the most northern private holding, unless access could still be provided along the ship channel levee and the cross levee.

Proposed Action Alternative. Under the proposed action alternative, the breach in the Prospect Island levee and the flooding of the project area would probably occur sooner than under the no-action alternative, and thus the potential for effects to seepage could occur sooner. However, as shown for the no action alternative, the worst case analysis indicates that such impacts would be physically and economically insignificant. Furthermore, because of the likelihood of eventual flooding under the no action alternative, there would be no long-term effects on seepage as a result of the proposed action.

The levee breaches required for the restoration project could affect access to a private holding between the two breaches. To avoid this effect, the proposed alternative would include two arched culverts to create the levee opening instead of an open breach. There would be no effects on the other ownerships in the area.

Open Breach Alternative. The effects associated with this alternative would be identical to the effects associated with the proposed action alternative except that access to the private in-holding property would be lost. To avoid an effect, this alternative would not be implemented unless the landowner agrees to sell the property.

3.12.4 Mitigation. Since the proposed action alternative would not substantially increase seepage and would not affect access to private property, no mitigation will be required.

4.0 CUMULATIVE EFFECTS

Cumulative adverse effects would not be a concern for most of these resources because either (1) the effects from the proposed project are either absent, minimal, beneficial, or short-term; or (2) there are no proposed or recently completed projects with similar effects to the resources adversely affected by this project. The two exceptions could be land use and socioeconomic conditions (agricultural production), where other restoration projects such as those proposed by the CALFED Bay-Delta Program could have similar effects. The “Related Projects” section in the ERR includes a description of these projects. However, there would not be a significant cumulative adverse effects because of the limited economic viability of farming on Prospect Island. The CalFed Programmatic EIS/EIR (FEIS/FEIR) gives mitigation measures for potential cumulative effects on agricultural lands. Prospect Island complies with these measures to the extent feasible. The socioeconomic impacts to the Ryer Island agricultural operations are too small and limited in area to present any concerns for cumulative impacts. Together with other restoration projects, the proposed Prospect Island project could have cumulative beneficial effects on environmental resources in the Delta.

5.0 COMPLIANCE WITH ENVIRONMENTAL STATUTES

5.1 Federal

Clean Air Act of 1972, as amended, 42 U.S.C. 7401, et seq. Section 176c of this act prohibits Federal action or support of activities that do not conform to a State Implementation Plan. The proposed project is not expected to violate any standard, increase violations in the project area, exceed the U.S. Environmental Protection Agency's general conformity *de minimis* threshold, or hinder the attainment of air quality objectives in the local air basin. The Corps has determined that the proposed action would have no adverse effect on the future air quality of the project area and is in compliance with this act.

Clean Water Act of 1972, as amended, 33 U.S.C. 1251, et seq. Construction of the Prospect Island Habitat Restoration Project would take place primarily under dry conditions, before the interior of the island is converted to wetlands, which would not require a 404 permit. Levee berms and islands would be constructed prior to the breaching in two places of the Prospect Island perimeter levee. The breaching process would require some dredging type activities, which also do not require a 404 permit. The armoring with rock of the breach area would likely require the placement of some rock into areas that are newly exposed to tidal influence. Also, the installation of culverts may require the placement of a sheet pile wall in Miner Slough. This work would be the type of activity that would require a 404 permit. However, construction activities fall under Nationwide Permit #13, for bank stabilization work, and Nationwide Permit #33, for temporary construction, access and dewatering. The proposed project meets the conditions of the nationwide permits and is in compliance with the 404(b)(1) guidelines. The proposed action is in compliance with the Clean Water Act.

Endangered Species Act of 1973, as amended, 16 U.S.C. 1531, et seq. In accordance with section 7(c), the Corps has submitted amended biological assessments to the FWS and NMFS to address the change in design. The FWS and NMFS have responded with amendments to their Biological Opinions. Habitat restoration is expected to assist the recovery of listed fish species.

Fish and Wildlife Coordination Act of 1958, as amended, 16 U.S.C. 661, et seq. The FWS participated as an active member of the study team in formulating the original project. The FWS prepared a CAR, which describes the anticipated effects of the project and FWS's recommendations. The FWS anticipates that the project would benefit biological resources in the area. The FWS supports implementation of the project as expressed in their CAR.

National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, et seq. This EA/IS and associated documents are in compliance with this act.

National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470. In accordance with 36 CFR 800, the implementing regulations for section 106 of the act, the Corps has determined that there are no cultural resources that would be affected by the proposed action alternative. Coordination with the State Historic Preservation Officer resulted in a letter concurring with the Corps' determination that the proposed project would not affect any historic or cultural resources (Attachment E).

Farmland Protection Policy Act of 1981, as amended in 1994. The proposed action would restore the entire 1,316-acre project site to fish and wildlife habitat. Although the Federal Conversion Effect Rating exceeds 160, there would be no significant adverse effect to farmland resulting from implementation of the proposed action as discussed in Section 3.2.2.

Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Executive Order 12898. The basic premise of the executive order is that Federal agencies should identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. In addition, the order requires all Federal agencies to develop agency-wide strategies to implement these principles. This project would not adversely affect minority and low-income populations since the study area is predominantly uninhabited agricultural and Delta wetlands.

5.2 State

California Environmental Quality Act, California Public Resources Code, Section 21000, et. seq. This act requires the lead governmental agency to identify potential significant adverse effects of the project on the environment through preparation of an IS or environmental effect report. If the IS shows that the project would have no significant effects on the environment, the lead agency uses the study to document reasons to support its findings and prepares a Negative Declaration for the project. This EA/IS would be adopted as a joint document and would fully comply with the requirements of this act.

California Endangered Species Act. The DFG issues permits for compliance with this act. The director of DFG can also choose to concur with Federal biological opinions and issue a consistency determination with the act. On January 20, 2000, DWR requested concurrence from DFG on the Federal Biological Opinion for the 1999 project design. DFG provided the Consistency Determination on February 18, 2000, and followed with an additional letter on March 28, 2000, specifying that additional State species would not be affected by the project. After receiving the updated Biological Opinions for the new project design, DWR requested an amended Consistency Determination from DFG.

Porter-Cologne Water Quality Control Act, California Water Code, Secs. 13000-13-13999.18; California Code of Regulations, Title 23, Chapter 23. This act regulates discharges of water that may affect the quality of the State's waters. The State Water Resources Control Board and nine regional water quality control boards are responsible for exercising the powers of the State in the field of water quality. The regional boards also issue waste discharge requirements and water quality certification on behalf of the Federal Government for the Clean Water Act. In a letter dated September 1999, DWR requested the Waiver of Clean Water Act Section 401 Water Quality Certification from the Central Valley Regional Water Quality Control Board. On February 29, 2000, the Board issued the Waiver of Waste Discharge Requirements and Water Quality Certification for the Prospect Island project for the previous project design. DWR notified the board of the change in project design and issuance of new CEQA documentation and requested a new or amended water quality permit. On May 9, 2001, the Board issued a technically-conditioned Water Quality Certification.

Fish and Game Code, Section 1601, Streambed Alteration Agreement. This code requires a State or local entity to notify the DFG before it begins a construction project that will

(1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; (2) use materials from a streambed; or (3) result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake. The DFG determines whether a lake or streambed agreement is required. In December 1999, DWR applied to DFG for the Streambed Alteration Agreement for the planned breaches on the ship channel and Miner Slough levees. DFG issued Streambed Alteration Agreement No. II-660-99 for the project in January 2000. DWR will contact DFG and submit the revised Streambed Alternation Agreement application based on the new project design.

State Lands Commission Code, Section 1900. The State Lands Commission has jurisdiction over State lands. These include submerged lands, which are subject to a public navigational easement. This easement provides that the members of the public have the right to navigate and exercise the incidences of navigation (which may include, but are not limited to, boarding, rafting, sailing, rowing, fishing, fowling, bathing, skiing, and other water-related public uses) in a lawful manner on State waters that are capable of being physically navigated by oar, sail, or motor-propelled craft. The term “submerged land” means the area lying below the elevation of ordinary low water in the beds of all tidal and nontidal navigable waters. In a letter dated March 15, 2000, DWR requested that the State Lands Commission issue a permit to breach the exterior levee per the 1999 project design. The State Lands Commission responded in a letter dated March 16, 2000, that a permit was not judged to be necessary at this time for breaching levees; however, if the project involved relocating utility lines underneath Miner Slough, such a permit would be necessary. DWR will reconsult with the State Lands Commission if utility lines will be relocated underneath Miner Slough. DWR will also inform the State Lands Commission of the new project design.

Water Code Section 8710 and Title 23 California Code of Regulations Section 136. The California Reclamation Board has responsibility for approving work in overflow basins of the Sacramento River, such as Prospect Island that is within the Yolo Bypass. The Board's policy is to permit the development of suitable wetlands within the Yolo Bypass and, by regulation, the Board has established standards to protect the flood control function of the Yolo Bypass and guide the development of proposed wetlands. DWR intends to enter into a Cooperative Management Agreement with the Board providing assurances that the Project would be managed compatible with the operation and maintenance of the Sacramento River Flood Control Project.

6.0 COORDINATION AND REVIEW OF THE DRAFT EA/IS

Public involvement and coordination for this project began in April 1994. Several scoping meetings and site tours were held throughout the study. A multidisciplinary team in the Sacramento District, other experts in various biological and engineering fields, and local interests participated in project design development. Team members made site visits to verify site conditions, determine the need for habitat restoration, and formulate possible alternatives.

Early in the study, the Corps met with many separate interest groups including the FWS, Reclamation, Bureau of Land Management, NMFS, DWR, DFG, Port, California Urban Water Agencies Category III, Solano County Water Agency, the Trust for Public Lands, and private landowners. A multi-agency panel participated in the formulation of this study and met about once a month to discuss issues. Furthermore, consultations were held with other participants including Ducks Unlimited, Wildlife Conservation Board, Department of Boating and Waterways, University of California at Davis, University of Washington, Aquatic Habitat Institute, and Coastal America.

Coordination with local landowners included a scoping meeting on April 7, 1997, to discuss the concerns of farmers on Ryer Island.

An earlier version of the draft EA/IS and FONSI/Negative Declaration was circulated in 1997 for 30 days to agencies, organizations, and individuals known to have a special interest in the project. Copies of the draft EA/IS were made available for viewing at several local libraries. All comments received during the comment period were considered and incorporated into the final EA/IS, and a FONSI and Negative Declaration were signed in July 1999. In June 2000, the need for a design change was discovered. A second draft EA/IS and FONSI/Negative Declaration addressing the effects associated with the required design changes was completed in March 2001. This document was circulated for 30 days to agencies, organizations, and individuals known to have a special interest in the project. Copies of the draft EA/IS were made available for viewing at several local libraries. All comments received during the comment period have been considered and incorporated into this final EA/IS, as appropriate. The comments and our response to the comments are included as Attachment H.

7.0 FINDINGS

Adverse effects of implementation of the restoration project are not considered to be significant. The proposed mitigation measures are sufficient to compensate for any potential adverse effects. In accordance with Federal and State environmental protection and environmental quality requirements, a FONSI/Negative Declaration are appropriate; therefore, an Environmental Impact Statement/Environmental Impact Report will not be prepared.

8.0 LIST OF PREPARERS

Numerous Corps and DWR personnel were involved in the design of the proposed project and in the development, preparation, and review of the EA/IS. A wide range of experience and subject matter expertise was represented, including engineering, biology, geology, hydrology, ecology, and social science. The following individuals have been involved:

Jerry Fuentes, Historian/Social Scientist, Corps
Robert Koenigs, Biologist, Corps
Lynne Stevenson, Environmental Writer, Corps
Miki Fujitsubo, Landscape Architect, Corps
Michael Ramsbotham, Geologist, Corps
Wilbur Huang, Hydrologist, Corps
Matt Davis, Biologist, Corps
Elizabeth Dyer, Environmental Resource Planner, Corps
Tom Catarella, Civil Engineer, Corps
Jeff Harris, Hydrologic Engineer, Corps
Don Twiss, Hydraulic Engineer, Corps
Ken Patterman, Geotechnical Engineer, Corps
Katie Wadsworth, Environmental Specialist, DWR
Collette Zemitis, Environmental Specialist, DWR
Leo Winternitz, Environmental Program Manager, DWR
Barbara McDonnell, CEA, Environmental Program Manager, DWR
Delores Brown, Environmental Program Manager, DWR
Robert Niblack, Senior Engineering Geologist, DWR
James Rich, Research Program Specialist (economist), DWR

9.0 REFERENCES

California Department of Water Resources (DWR). 1997. Five-Year Report of the Municipal Water Quality Investigations Program Annual Report.

California Department of Fish and Game (DFG). 1997. Natural Diversity Data Base. Computer search of the USGS 7.5-minute Rio Vista and Liberty Island quadrangles.

Garcia, R. 1983. Mosquito Management: Ecological Approaches. *Environmental Management*, 7(1): 73-78.

GEI Consultants, Inc (GEI). 1999. Geotechnical Report, Evaluation of Potential Effects On Ryer Island Associated with Flooding Prospect Island. Solano County, CA.

Litchtenberg, Erik R. and Wayne Getz. 1985. Economics of Ricefield Mosquito Control in California. *BioScience*, 35(5):292-297.

Slotton, D., T. Suchanek and S. Ayers. 2000. Delta Wetlands Restoration and the Mercury Question: Year 2 Findings of the CALFED UC Davis Delta Mercury Study. IEP Newsletter, Volume 13, number 4, pp. 34-44.

Solano Economic Development (SEDCORP). 2001. Solano. Internet address: www.sedcorp.org/facts

South Coast Air Quality Management District (SCAQMD). 1992. CEQA Air Quality Handbook.

U.S. Army Corps of Engineers (Corps). 1993. Sacramento-San Joaquin Delta Investigation Environmental Evaluation.

U.S. Army Corps of Engineers (Corps). July 16, 1999. Final Ecosystem Restoration Report and Environmental Assessment/Initial Study, Prospect Island, California.

U.S. Fish and Wildlife Service (FWS). 1999. Fish and Wildlife Coordination Act Report for the Prospect Island Restoration Project. Sacramento, CA.

CalFed Bay-Delta Program. August 28, 2000. CalFed Programmatic EIS/EIR (FEIS/FEIR).

Personal Communications

Erkhanian, C. Solano County Mosquito Abatement District. March 2001.

Glass, R. Solano County Department of Environmental Management. March 2001.

McIntire, H. Biologist, Department of Fish and Game, June 1997.

Thabault, M. Biologist, Fish and Wildlife Service. March 1998.