

**South Bay Salt Pond Initial Stewardship Plan  
& Related Bay Area Restoration Projects**

*A Status Report to Stakeholder and Other Interested Parties  
March, 2005*

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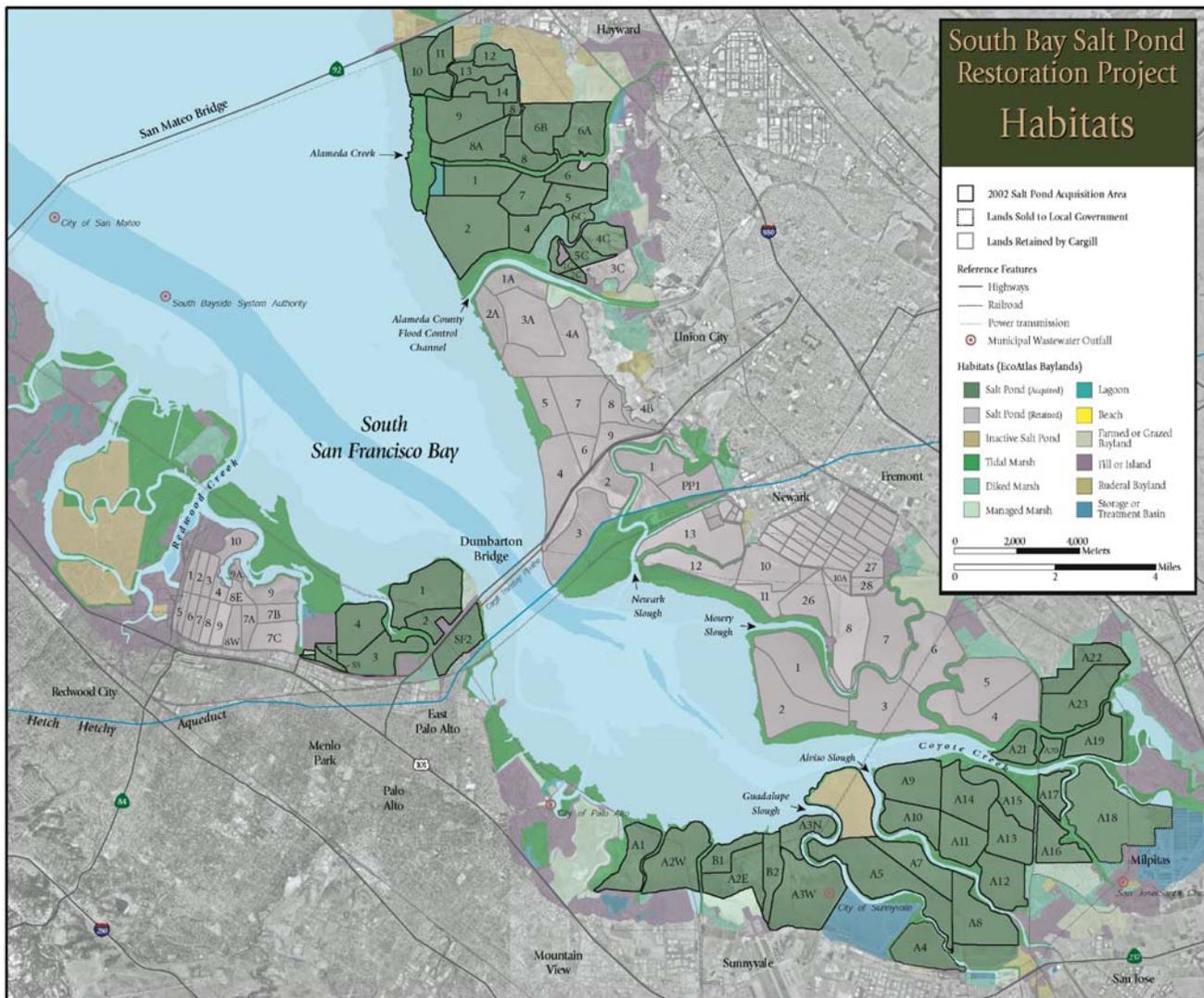
## Background

In 2003, 15,100 acres of South San Francisco Bay salt ponds were acquired from Cargill Salt in a negotiated agreement led by U.S. Senator Dianne Feinstein in conjunction with federal and state agencies. Over the next few decades, these salt ponds ringing the South Bay from Hayward in the East Bay to Menlo Park on the Peninsula, will be restored to a mix of tidal marsh, mudflat, managed ponds and other wetland habitats. The project is the largest tidal wetland restoration on the West Coast and is being managed jointly by the California Coastal Conservancy, the U.S. Fish and Wildlife Service and the California Department of Fish and Game. The goals of the project are to:

- Restore and enhance a mix of wetland habitats
- Provide wildlife-oriented public access and recreation; and
- Provide for flood management in the South Bay

The Initial Stewardship Plan for the South Bay Salt Pond Restoration Project outlines a process to reduce the salinity of the existing salt ponds and to manage the site while the long term restoration plan is being developed. The process, which will take one to five years to complete, involves circulating Bay waters through the pond system and restoring a limited number of ponds to tidal influence. To accomplish this goal the U.S. Fish and Wildlife Service and the California Department of Fish and Game have been installing a series of new tide gates to allow Bay water to circulate through the ponds. The levees of three ponds in Coyote Creek will be breached to allow tidal influence.

By circulating water through the ponds, managers are able to halt the salt making process and begin converting thousands of acres of high salinity ponds to habitat more suitable for fish, ducks, shorebirds, herons and egrets. This is helping to maintain the wildlife values of the ponds and enabling the Project to conduct studies of the site that will aid in the development of the long term restoration plan. This report highlights the Initial Stewardship Plan work to date and places the South Bay Salt Pond Restoration Project in context by summarizing activity at other wetland restoration projects around the San Francisco Bay.



## Progress to Date

### *California Department of Fish and Game Activities*

The California Department of Fish and Game (DFG) is managing approximately 5,450 acres of the South Bay Salt Pond Restoration Project site, comprising 22 of the 53 salt ponds. In addition to these ponds, DFG is also restoring 835 acres of former salt ponds which it acquired earlier from Cargill. The entire DFG property will be managed as part of the Eden Landing Ecological Reserve. DFG will complete construction of most of the water control structures required under the Initial Stewardship Plan (ISP) in Eden Landing by the winter of 2005. Water control structures are large pipes fitted with gates and weirs and placed in a levee. The structures enable project managers to manage the depth and salinity of a pond by controlling the water in and out of it. Because DFG will not manage salinities in all of the ponds, some of the ponds will be allowed to go dry during the summer.



**Construction at Eden Landing**  
photo by Rob Holt

In April 2005 DFG anticipates completing the first of three levee breaches required to introduce tidal action to 835 acres of the Eden Landing restoration site (see map on page 3). The first breach will connect the south end of the North Creek channel to Old Alameda Creek, allowing water to flow from this channel through Old Alameda Creek and finally to the Bay. In the fall of 2005, DFG anticipates breaching the upper reaches of North Creek, returning the southern portion of the Eden Landing restoration site to tidal flows and allowing the reestablishment of tidal marsh. The third breach on this site will restore tidal action in the former Mt. Eden Creek channel, providing tidal marsh restoration and tide water for use in the managed ponds. DFG is currently finalizing design details and expects to issue construction contracts for the final phase of the Eden Landing restoration site in the summer of 2005.

Construction activities should be completed in October or November, 2006.

With the major construction on the ISP and Eden Landing Restoration Project completed by the end of 2006, DFG will continue to monitor and fine tune the ISP pond hydrology in preparation for implementation of the first phase of the South Bay Salt Pond Restoration Plan commencing in 2008.

The Eden Landing ponds are good candidates for early restoration because of their potential use for flood protection and tidal habitat restoration. The Alameda County Flood Control District has been studying the benefits of tidal marsh restoration in this area as a means of conveying excess flood water. The County is required to maintain adequate flood water conveyance as part of the federal flood control project on Old Alameda Creek and the Alameda Creek Flood Control Channel. The Flood Control District's study provides a significant amount of the information that will be needed to implement restoration at the Eden Landing ponds.

### ***U.S. Fish and Wildlife Service Activities***

The U.S. Fish and Wildlife Service (USFWS) is managing 9,615 acres of the restoration site comprising 31 of the 53 ponds. These include 1,618 acres of ponds in the West Bay, referred to as the Ravenswood ponds and 7,997 acres of ponds in the South Bay referred to as the Alviso ponds.

USFWS worked in 2004 to stop the salt making process on ponds A1 through A8 by installing a series of new tide gates on the Alviso portion of the site (see map on page 3). In July of 2004 the Project assembled stakeholders, the media and members of the public to witness the first mixture of tide water and pond water on the site with the opening of levee gates near Moffet Field. This initial lifting of the gates marked the first time since the

1940's that the 1,350 acres of salt ponds behind the gates were open to the Bay. Water from this section of salt ponds flowed into the Bay through three four-foot pipes installed in the spring of 2004.

The USFWS will complete the remainder of the hydrology and construction work on ponds A9 through A17 this spring, opening those ponds in April of this year. In March of 2006, USFWS will breach the levees surrounding ponds 19, 20 and 21 (known as the Island Ponds). These ponds will be the first to be restored to tidal action as part of the Initial Stewardship Plan and will serve as early models for future tidal restoration of other ponds.



**Opening of gates near Moffet Field, July 2004**  
photo by Rob Holt

Because of higher salinity levels left from the salt production process, the Ravenswood Ponds and Alviso Ponds 22 and 23 will require a lengthier phase-out period than other ponds in the project area. USFWS will continue to work with Cargill to ensure that salinity levels are reduced before taking on ownership and management of those ponds.

### ***Changes in Habitat and Species***

As the Initial Stewardship Plan progresses, the movement of water through the ponds will reduce salinity and increase dissolved oxygen levels and, may also introduce small fish into the ponds. All of these factors could increase the habitat value for piscivorous, or fish-eating birds such as Forster's and Caspian terns.

By late July 2004, ponds A2W, A3W, A7, E2, and E10 were opened to Bay circulation. Although ponds A3W and A7 began at salinities greater than the receiving waters, they attained near-slough salinity by November 2004. Bird species are opportunistic when it comes to feeding and landing near the ponds which makes it difficult to track total numbers from year to year. However, anecdotal observations by USGS scientists suggest that the use of ponds A3W and A7 by birds such as terns, pelicans, and egrets increased after circulation was initiated and was higher during the fall of 2004 than the two previous years. In addition to habitat changes brought about by water level and salinity, short-term changes may also occur in the receiving waters during the initial release of pond water. During the initial release of pond A2W for example, a low salinity pond, USGS observed dozens of snowy and great egrets congregated on the mudflat outside the discharge point during low tide. These birds were foraging on small fish that were carried out of the pond by discharge waters, but bird numbers and composition inside the pond, where salinity and water level were relatively unchanged, were similar to pre-discharge conditions.



**White pelicans and gulls on levee near pond A1**  
Photo by Judy Irving

Although ponds A2W, E2, and E10 were initially low salinity ponds and their habitat value was not expected to change appreciably during this period, lower water levels in E10 and E1 (discharged through E2) resulted in increased low tide use of these two ponds by shorebirds from July through November 2004. When the gates were open to the Bay, tidal action was partially restored to the ponds, which allowed them to partially drain and create temporary mudflat habitat during low tides. In 2004, the bird counts at Pond E10 in

September and November (when water levels were low) were dominated by shorebirds. Overall bird use at E10 was over 10,000 shorebirds in September and 18,000 in November-- an order of magnitude greater than the previous two years when the pond was dominated by dabbling and diving ducks. USGS observed similar changes in pond E1 during October, when the pond was dominated by shorebirds (especially western sandpipers) as opposed to piscivorous cormorants and pelicans during 2002 and 2003.

The USGS has been surveying bird populations on a monthly basis since October 2002 and monitoring water quality since August 2003 at all 53 ponds. They are currently analyzing data from fish surveys conducted in some of the ponds during March, June, September, and December 2004. More detailed data from the USGS is available in their summary report which is posted on the SBSP Project web site.

## Challenges and Opportunities for Future Study

Wetland restoration is both an art and a science, requiring project managers to learn and adjust their management practices as the system evolves over time. Below are just a few of the challenges and opportunities facing project managers as they continue to implement the Initial Stewardship Plan.

**a. Dissolved Oxygen-** Shortly after the levee gates near Moffett Field were opened in July of 2004, water quality sampling revealed that the dissolved oxygen level in some of the slough channels adjacent to the ponds was below the limits set by the Regional Water Quality Control Board. Based on monitoring and observations at the site, managers believe the dissolved oxygen problem was due to algal growth and high temperatures during this period. The area contains elevated levels of nitrogen and phosphorous concentrations and is particularly conducive to algal growth. These conditions combined with warm temperatures and good light conditions in late summer and early fall, resulted in algal growth which caused large daily fluctuations in dissolved oxygen levels in the Pond A2W and A7 systems. Recent research in tidal Coyote Creek and Artesian Slough has shown that daily fluctuations in dissolved oxygen levels are common in this part of the Bay, with the

lowest levels at night. Based on this new information, the Water Board had decided to re-examine its discharge standards to ensure that the ISP activity can move forward without compromising the dissolved oxygen supply for marine life.

Pond A3W had a more serious issue with dissolved oxygen than the ponds mentioned above. Monitoring revealed that A3W had consistently lower dissolved oxygen in its discharge to the slough channels than the other ponds. While the other ponds had high oxygen in the discharges during the day due to algal photosynthesis, the Pond A3W discharge had little to no oxygen in the water throughout the day and night. It is believed that this was caused by dead algae being blown to the portion of the pond in front of the discharge point. As the algae decomposed, it reduced the oxygen level in the water before it moved into the slough. The rest of Pond A3W did not have lower oxygen levels. If left unchecked low levels of dissolved oxygen ultimately undermine the viability of marine aquatic life. To prevent unacceptable impacts to the Bay, managers temporarily closed the gates at pond A3W. The gates were re-opened in October to prevent flooding from heavy rains predicted that month. The levels of dissolved oxygen had risen in A3W by this time so marine life was not compromised. To permanently address the problem, the Refuge is installing a new baffle system in pond A3W. This will ensure that oxygen rich water is discharged through the control gates to the Bay sloughs. Given the hydrological dynamics of the rest of the project, it is unlikely that a situation similar to the pond A3W problem would occur in other ponds. Nonetheless, the Refuge continues to work with the Water Board, USGS, and DFG to actively monitor dissolved oxygen levels to prevent similar water quality problems in the future.

This has been a good example of adaptive management. What actually occurred with the discharges from the ponds was somewhat different from what was predicted. The Water Board is working with the land managers to adjust operations to meet these challenges. This experience confirmed that active monitoring and management of pond systems is necessary to ensure there is enough oxygen for aquatic life of the Bay. More information about dissolved oxygen and other water quality issues related to the ISP is contained in the annual self monitoring reports prepared by the USFWS and DFG on the project web site.

**b. Equipment Failures-** As project managers re-route water through the gate and levee system they have encountered a few equipment problems. Most of these are attributed to the age of the existing water control structures inherited from Cargill. For example, this year the USFWS is replacing the old intake structure at pond AB1 which failed to close properly during water releases last year. The Santa Clara Valley Water District has also fixed an old pump used to transport water from one pond to another which failed during ISP operations at the Refuge last year. Shortly after DFG used Cargill's original water control structure to open up pond E10 to tidal influence, one of those control gates broke, resulting in muted tidal influence in the pond. This has limited DFG's ability to actively manage the pond according to the ISP. Nonetheless, the fluctuating water levels formed a large mudflat in the pond which is now used by thousands of shorebirds. The E10 water control structure will be abandoned and a new structure will be constructed as part of the 835 acre Eden Landing restoration project. The new structure will be located in the new Mt. Eden Creek channel and should improve the circulation of tidal water. The final

phase of the 835 acre Eden Landing restoration project should be completed by the winter of 2006.



**Egret at Eden Landing**  
photo by Rob Holt

**c. Early Models** - The USFWS will open ponds A9 through 17 to the Bay in April of 2005. Some of these ponds will be managed at a higher salinity than other ponds. The higher salinity will create habitat suitable for brine flies and brine shrimp, providing an ideal food source for certain migratory and wintering species including eared grebes and phalaropes. Lesson learned from this experiment in pond management under the ISP will be applied to the final South Bay Salt Pond Restoration Project. The USFWS is also planning to open the Island ponds (ponds A19-21) to tidal action in 2006. Returning these ponds to full tidal action will create an excellent opportunity to conduct adaptive management experiments which will inform the design of tidal marsh restoration on the rest of the project site.

**d. Invasive Spartina** - Atlantic cordgrass (*spartina alterniflora*) and its numerous hybrid forms have been invading San Francisco Bay tidal marshes since the species was planted here in the 1970s. It differs from native West Coast cordgrass in its aggressive growth patterns. Once established, Atlantic cordgrass can grow so densely that it chokes off sloughs and alters tidal marshes and mudflats, turning the rich mosaic of wetland habitats into a biological monoculture which may no longer support local species including the endangered California clapper rail. Major concentrations of invasive *Spartina* have been found in the middle and southern reaches of San Francisco Bay, including marshes near the salt ponds in Eden Landing and Ravenswood. To reduce the risk of spreading the plant, Initial Stewardship Plan managers have been working with the Invasive *Spartina* Project, led by the California Coastal Conservancy, to control this exotic plant, thereby enhancing the area's mudflats and tidal marshes for the rails and shorebirds.

## Related Wetland Restoration Projects in San Francisco Bay

In addition to the South Bay Salt Pond Restoration Project, the California Coastal Conservancy, the California Department of Fish and Game and the U.S. Fish and Wildlife Service are managing a number of other related restoration projects around the Bay. All of these projects are helping to reverse the dramatic decline in tidal marsh habitat in the San Francisco Bay Estuary (see map on page 11).

**a. Bair Island-** Bair Island once included thousands of acres of unspoiled tidal salt marsh, tidal sloughs and mudflats. In the 1940s, Leslie Salt built levees that divided the island into three sections - known today as inner, middle and outer Bair Island - and used the islands as salt ponds until the 1960s. Mobil Oil bought Bair Island in the 1970s and donated half the outer island to the Don Edwards San Francisco Bay National Wildlife Refuge. In 1982, Redwood City approved its plan to develop the rest of the island into homes, a shopping center and corporate offices. Opposition from local residents brought these plans to a halt in 1997. Then, with federal funding secured by the nonprofit Peninsula Open Space Trust and with the help of Congresswoman Anna Eshoo, Bair Island was purchased and ultimately management responsibility was transferred to the Refuge, paving the way for its restoration. The California Department of Fish and Game currently owns the majority of Bair Island and will manage the area in cooperation with the Refuge. In 2005, the USFWS expects to complete the Environmental Impact Statement and Environmental Impact Report and begin developing final construction drawings for the restoration. Before Bair Island can be open to tidal action however, managers are focused on controlling the spread of *Spartina alterniflora*. This will be the second year of a program to control the growth of this invasive exotic plant in the island's wetland habitats.

**b. Napa Marsh-** Construction on this 10,000 acre site in the North Bay will begin in summer or fall of 2005. The property was purchased from Cargill in 1994 after the company ceased salt making operations there. As an early example of successful restoration in the Napa Marsh, pond 2A was opened to the tide in 1995 and is now restored to almost 100% vegetated tidal marsh. The California Department of Fish and Game and the California Coastal Conservancy expect to complete construction work in the majority of the remaining ponds by May of 2006. This first phase of the Napa Marsh Restoration project is to restore 3,000 acres of salt ponds to tidal habitats to support a wide variety of species including the California clapper rail and Dungeness crab. The project will also enhance 1,600 acres of ponds on the site as managed habitat for shorebirds and ducks. The second phase will be constructed by the U.S. Army Corps of Engineers beginning in 2007, contingent on authorization by Congress. The Corps will enhance another 2,000 acres of managed pond habitat and dilute and discharge the bittern (a byproduct of salt production) stored in one pond.

**c. Hamilton Airfield/ Bel Marin Keyes** - Once part of an extensive tidal wetlands area in San Francisco Bay, the Hamilton Airfield and surrounding areas were drained and leveed in the late 1800s and then converted to a military airfield in the 1930s. As part of base closure and land re-use activities, the Hamilton Airfield/ Bel Marin Keyes Project



**Related Wetland Restoration Projects in San Francisco Bay**  
 map courtesy of SFEI

will restore 2,598 acres to tidal and seasonal wetlands. When complete, this project will create a diverse array of wetlands and wildlife habitats benefiting a number of endangered species including the California clapper rail, Salt marsh harvest mouse and the Chinook salmon, as well as other migratory and resident species. In 2004, the Army Corps of Engineers, in partnership with the California Coastal Conservancy, completed construction of several levee segments and soil management on the Airfield parcel (622 acres). The Corps and Conservancy expect to complete the wetland design for the Airfield wetlands, apply for and obtain permits for wetland construction and complete construction of remaining levees in order to deliver sediment fill from the Port of Oakland in late fall of 2005.

**d. Sonoma Baylands** -The 320-acre Sonoma Baylands project, completed in 1996, is the largest salt marsh restoration project on the Pacific Coast to use dredged material in its site preparation. Sonoma Baylands was once part of an extensive natural tidal marsh on the northern margin of San Francisco Bay. The area was diked about 100 years ago for agricultural use. Over the years, the area subsided about six feet, lowering the site to below low tide level. Therefore, before breaching levees and reopening the site to tidal action, project managers raised the elevation of the land using clean dredge materials from the Port of Oakland. This was the first time that dredge material from deepening shipping channels was used to advance ecological restoration goals in the Bay. In addition because of its large size and windy environment, the design incorporated features to limit wind wave energy within the site. The project was opened by Vice President Al Gore in 1996, who declared it be a “win, win, win” project: for the environment, shipping and jobs.

**e. LaRiviere Marsh-** This 100 acre site adjacent to the visitor’s center of the Don Edwards San Francisco Bay National Wildlife Refuge is an excellent example of the transformation that can take place once commercial salt ponds are restored to tidal marsh. In the 1970s the US Fish and Wildlife Service acquired the property from Cargill which used the area as part of its salt making operations in the South Bay. USFWS graded the site to a more natural topography and breached the levees that separated it from the Bay. Over the years, the site has progressively returned to a functioning tidal marsh providing excellent habitat for California clapper rail and salt marsh harvest mouse. The marsh also serves as a working laboratory enabling managers to observe changes in salt pond restoration projects over time.

**f. Petaluma River Marsh-** In 1994, the Sonoma Land Trust in partnership with DFG opened 48 acres of diked agricultural land at the mouth of the Petaluma River to tidal action. Three years later pickleweed and cordgrass began to colonize the area, marking the gradual return of this site to tidal marsh. Today the area is well on its way to developing into a mature marsh. Recent studies indicate that is now provides important habitat for the California clapper rail and California black rail.

**g. Cullinan Ranch-** The Cullinan Ranch Unit of the San Pablo Bay National Wildlife Refuge is located north of Highway 37 next to Vallejo, California. The goal of this restoration project is to restore 1,500 acres of fallow hayfields and seasonal wetlands to tidal salt marsh for the benefit of endangered species and migratory birds. The project involves one mile of levee construction and several miles of armoring to protect Highway 37 from

flooding as well as improved visitor access. Interpretive structures and trail access will also be provided at the site. The Refuge expects to complete the draft Environmental Impact Statement and Report for this project by mid - 2005 and to begin restoration activity in 2007.

**h. Tolay Creek-** The Tolay Creek floodplain between Novato and Vallejo along Highway 37 is host to numerous fish, birds and other animals. In December 1998, the USFWS removed three levees on the property, launching the restoration of former hay fields to tidal marsh. The project's goal was to restore a total 306 acres of diked, historic wetlands to tidal salt marsh, providing critical habitat for threatened and endangered species like the salt marsh harvest mouse and the California Clapper rail. To date all 306 acres of the project have been restored to tidal marsh.