Cape Mohican Restoration Projects Annual Report

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On October 28, 1996, the *SS Cape Mohican* discharged approximately 96,000 gallons of heavy bunker fuel oil into a floating dry dock at the San Francisco Drydock Shipyard. Approximately 40,000 gallons spilled into San Francisco Bay. Oil spread from Pier 70 south to Hunter's Point and north into the central Bay, extending to the Richmond-San Rafael Bridge and oiling shorelines of Alcatraz, Yerba Buena, Treasure, and Angel islands. The Tiburon Peninsula and San Francisco waterfront were also oiled. Oil traveled outside of the Golden Gate into the Gulf of the Farallones National Marine Sanctuary (GFNMS), oiling beaches as far north as Drakes Beach in the Point Reyes National Seashore (PRNS) and as far south as Pillar Point.

The Cape Mohican Trustee Council, composed of representatives from the National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA), California Department of Fish and Game (CDFG), and California Department of Parks and Recreation (CDPR), selected projects to mitigate or restore the injured natural resources. This report includes summaries of the status of each of the projects listed below as well as a summary of project budget data.

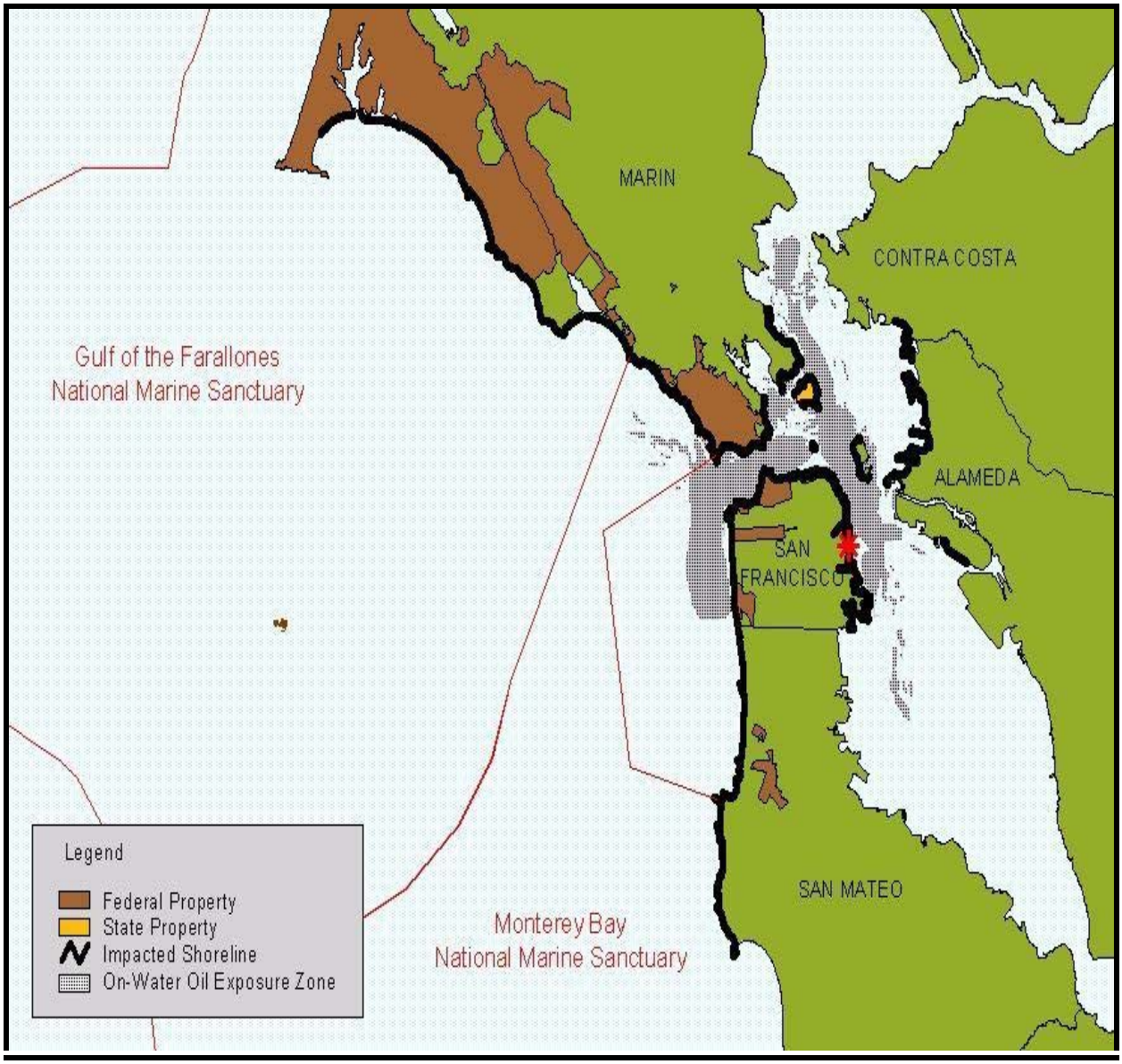
Bird Restoration:
- Shorebird Habitat Protection at the Golden Gate National Recreation Area (GGNRA)
- California Least Tern Habitat Enhancement at Alameda Point
- Restoration of Shorebird Foraging Habitat through Control of Exotic Cordgrass in San Francisco Bay Wetlands
- Farallon Seabird Restoration: Exotic Vegetation Control in Nesting Areas

Fisheries and Water Quality:
- Pacific Herring Spawning Habitat Enhancement in San Francisco Bay
- Wetland Restoration at Pier 98, India Basin, San Francisco
- Steelhead Stream Habitat Enhancement at San Francisquito Creek

Wetlands and Mudflats:
- Giacomini Coastal Wetlands Restoration

Sandy Beach and Rocky Intertidal Habitat Projects:
- Sandy Beach Habitat Restoration at Point Reyes National Seashore
- Protection of Duxbury Reef through Education

Human Use:
- Angel Island Foot Trail Enhancement
- Crissy Field Habitat Stewardship Program



Boundaries of Cape Mohican oil spill. (Red star indicates site of spill.)

Bird Restoration Projects

Shorebird Habitat Protection at GGNRA (Lead Agency: NPS)

Project Overview

Golden Gate National Recreation Area (GGNRA) previously installed 12 interpretive and regulatory signs at major beach entrances to inform the public of the presence of Western Snowy Plovers (*Charadrius alexandrinus*) and other shorebirds, and the vulnerability of the birds to disturbance by humans and recreational activities. In addition, an interpretive bulletin on protecting Western Snowy Plovers, shorebirds, and sandy beach habitat was distributed to the public. This project will allow updating and replacement of damaged or missing signs and updating and re-printing of interpretive bulletins for up to 10 years. This project has recently been updated to include design and installation of a broader range of signage and the implementation of a shorebird docent program.

Western Snowy Plover.

Project Status

GGNRA completed two printings of the plover/shorebird protection brochure and designed and installed portable windmaster signs. The brochures have been distributed by staff on park beaches. In 2008, we initiated a shorebird docent program with NPS interpretive staff leading a group of volunteer docents. In 2009, project funds again supported the NPS interpretive staff lead for the shorebird docent program, as well as the manufacturing costs of two new signs.

Funding

Approved project budget:	$23,500
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$7,000
Funds allocated in FY 2004:	$0
Funds allocated in FY 2005:	$8,000
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$8,500
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	$0
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$23,500
Funds spent to date:	$20,815

California Least Tern Habitat Enhancement at Alameda Point
(Lead Agency: USFWS)

Project Overview

This project has created new nesting habitat at Alameda Point for the endangered California Least Tern (*Sternula antillarum browni*) by enlarging the nesting area and installing protective fences. The newly created habitat is being monitored and enhanced by removing undesirable vegetation, repairing protective fencing, and adding nesting substrate where needed.

California Least Tern on new substrate.

Project Status

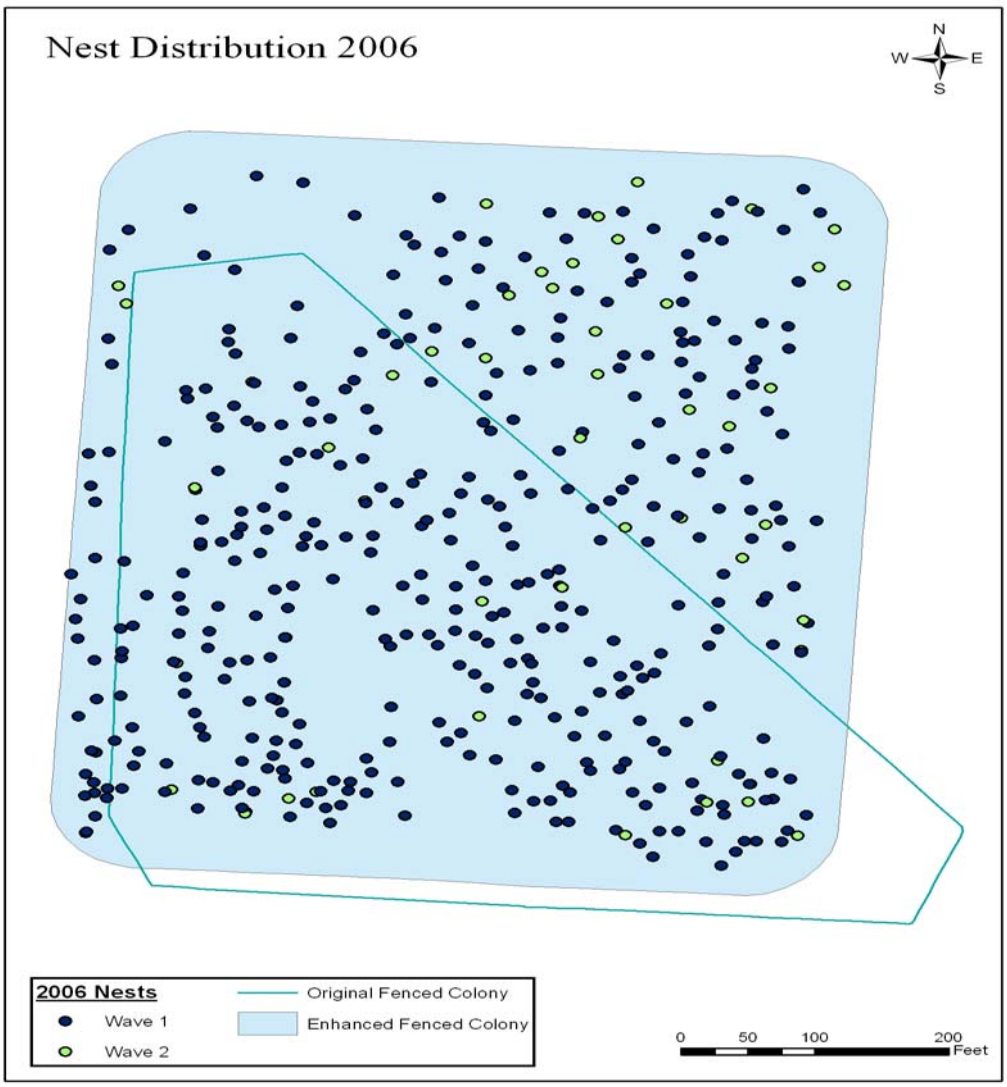
Major enhancements to the colony site were completed in spring 2004: The nesting area was enlarged from 6.0 to 9.7 acres, and the original non-functioning electrical fence was replaced with a chain link fence designed to deter avian and mammalian predators. A new plastic chick fence with small rounded openings was added to the bottom of the fence, replacing the old metal hardware cloth that had caused injury and death to several terns. Nesting substrate (a mixture of sand, small pebbles, and shell fragments) was spread over the new nesting area, and the monitoring grid was reestablished to encompass the entire 9.7 acres. Oyster shells and driftwood were also added to the colony to finish the beach appearance and provide cover for the chicks. Site-preparation activities conducted annually from 2005 to 2009 to maintain habitat included repair of fencing, replacement of chick shelters, and removal of invasive weeds by mechanical and chemical means.

Post-Project Monitoring: Cape Mohican funds have been used to monitor colonization of the new area, which occurred quite quickly. In 2005, 120 nests (22% of the total nests in the Alameda Colony) were found in the expanded area. Estimated nesting pairs in the colony increased from 379 to 424 in 2005, a 12-percent increase from 2004. In 2006, 160 nests (36% of the total nests in the Alameda Colony) were found in the expanded area. During 2007, terns continued to expand into the new substrate. In 2008, it was determined that terns were using the original and expanded areas equally for nesting, so comparisons between these two areas were discontinued.

The staff predator watch and the Tern Watch volunteer predatory monitoring program were conducted in 2010, as in previous years. In 2010, the terns again had high reproductive success

rates, with 320 nests, 619 eggs laid, and the average number of fledglings reaching 297 (0.97fledges/pair).

Volunteers and a student intern conduct a large portion of the weeding and tern monitoring throughout each breeding season. In 2009, 1.3 acres of Angel Island coarse sand were added to the south end of the tern colony, where sand cover had become sparse. This substrate matches that which was added in 2005 and is favored for nesting by the least terns. The addition of substrate is necessary as older substrate eventually breaks down and blows away, exposing the tarmac below. In March 2010, the remaining funds were used to apply a 3- to 4-inch layer of sand substrate over the entire site. This substrate is expected to provide high-quality tern nesting for several years.



Expanded California Least Tern nesting area (shaded rectangle) compared with original colony site (in hexagon) and nests.

Funding

Approved project budget:	$141,000
Funds allocated in FY 2002:	$88,000
Funds allocated in FY 2003:	$0
Funds allocated in FY 2004:	$19,000
Funds allocated in FY 2005:	$0
Funds allocated in FY 2006:	$17,000
Funds allocated in FY 2007:	$17,000
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	$0
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$141,000
Funds spent to date:	$140,083

Restoration of Shorebird Foraging Habitat through Control of Exotic Cordgrass in San Francisco Bay Wetlands (Lead Agency: USFWS)

Project Overview

This project involves the eradication of the invasive Smooth Cordgrass (*Spartina alterniflora*) and its hybrids from mudflats and tidal salt marshes in the central and south portions of San Francisco Bay and between the Bay Bridge and the Dumbarton Bridge. Removal of Smooth Cordgrass from tidal marshes and tidal sloughs will allow native plants to reestablish on the tidal marsh plain and restore shorebird foraging and fish nursery habitat in the tidal sloughs.

Project Status

In May 2005, the San Francisco Bay National Wildlife Refuge (Refuge) and California Coastal Conservancy completed Site-Specific Control Plans for each site targeted for control in 2005-2007. The Site-Specific Plans describe methods to be used at each site and summarize impacts and mitigation measures to be used during control. Information contained in the Site-Specific Plans was used to prepare an Environmental Assessment for the implementation of the Site Specific Plans, which tiered off the Programmatic EIR/EIS. An Internal Formal Section 7 consultation was also conducted with the USFWS resulting in issuance of a Biological Opinion with a non-jeopardy determination for listed species in the project area.

In 2008, an Internal Formal Section 7 consultation was conducted with the USFWS to amend the Biological Opinion for control activities to be conducted in 2008-2010. This action allows both helicopter and ground control work to be initiated as early as June 1, even in marsh habitat occupied by Clapper rail.

Habitat® herbicide, with the active ingredient imazapyr, was used for all control work in 2009. In July through September 2009, the sixth consecutive year of control work was conducted in the Southeast San Francisco Sub Areas (Site 12), with less than 1 acre of non-native *Spartina* needing re-treatment. In addition, the fifth consecutive year of treatment was conducted at two sites: West San Francisco Bay (Site 19) and Alameda/San Leandro Bay (Site 17), with 60 acres and 45 acres treated, respectively. A fourth site, Colma Creek/San Bruno Complex (Site 18), was treated for the fourth year, with 35 acres controlled.

Expanded foraging area available for clapper rail after invasive Spartina control.

Project Status

In 2010, follow-up control work will be conducted in all previously treated marshes under the scope of this project. Helicopter and ground control work is planned as early as June 1 in infested marshes. Most control work will be conducted by ground because the remaining non-native cordgrass exists only in small, disjunct patches which are not appropriate for aerial control.

In spring 2010, the Refuge will purchase additional equipment, materials, and contract labor to conduct the control work in targeted control areas for the 2010 season. Any equipment and materials purchased with funds allocated to this project will be stored at either the Coastal Conservancy or the Refuge for future use on this project. Coastal Conservancy or Refuge personnel will train land managers who conduct control work and will monitor the effectiveness of control.

Funding

Approved project budget:	$430,905
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$50,000
Funds allocated in FY 2004:	$0
Funds allocated in FY 2005:	$0
Funds allocated in FY 2006:	$110,000
Funds allocated in FY 2007:	$86,000
Funds allocated in FY 2008:	$89,775
Funds allocated in FY 2009:	$50,675
Funds allocated in FY 2010:	$44,455
Funds allocated through FY2010:	$430,905
Funds spent to date:	$360,928

Farallon Seabird Restoration: Exotic Vegetation Control in Nesting Areas (Lead Agency: USFWS)

Project Overview

This project involves restoring burrow and crevice nesting habitat for Cassin's auklets (*Ptychoramphus aleuticus*), ashy storm-petrels (*Oceanodroma homochroa*), and rhinoceros auklets (*Cerorhinca monocerata)* by controlling exotic vegetation, especially New Zealand spinach *(Tetragonia tetragonoides)* and cheeseweed *(Malva* spp.) at Farallon National Wildlife Refuge. These non-native species form dense mats inhibiting burrow nesters such as auklets from digging their burrows, and cover nesting crevices preventing storm-petrels and other crevice nesters from entering nesting sites. Combinations of manual and chemical methods are being used to control exotic vegetation. Seeds collected from native maritime goldfields (or, "Farallon weed;" *Lasthenia maritima)* are used to re-seed areas of bare soil created when large amounts of exotic plants are removed. The success of the re-seeding efforts is highly important because the plants are used for nesting material by Brandt's cormorants (*Phalacrocorax penicillatus*) and other seabirds. Increased monitoring of the relative success of the treatments will allow us to select the vegetation removal option and time reseeding to be most effective and efficient.

Cassin's Auklets (at burrow entrance, left) and Ashy Storm petrels (right) have benefited from this project. Invasive weeds cleared from nesting crevices and burrows allow Cassin's Auklets to find burrow entrances and enable nestling petrel chicks to flourish.

Test plot location. Lower portion reseeded with maritime goldfields.

Project Status

Work was largely conducted by a Farallon Wildlife Refuge Specialist and groups of temporary volunteers. A weed management plan for Southeast Farallon Island was first developed in early

2004 and has been updated periodically. Field efforts were mainly based on (1) hand-pulling combined with limited herbicide treatments of spinach and cheeseweed in winter and spring prior to the seabird breeding season; (2) a combination of herbicide treatments and hand-pulling in late summer and fall following the seabird breeding season; and (3) collection and spread of native goldfield seeds for natural propagation of cleared areas (started in 2005). Winter and spring efforts were geared towards clearing habitats of invasive plants to provide space for breeding seabirds, and late summer efforts were focused on killing plants that had grown during the late spring and summer months, hopefully before many plants had gone to seed. Unfortunately, intensive invasive plant control cannot be conducted in late spring and summer, when most plants go to seed, because of the high levels of disturbance to breeding seabirds. Also, chemical treatment is not possible in most areas after native plants begin to grow with the annual rains; herbicides are also less effective in wet or cool weather.

USFWS spraying Habitat® herbicide on New Zealand Spinach.

For spinach, the most heavily infested areas are on the south slopes of Lighthouse Hill and Little Lighthouse Hill, where cover can be close to 100 percent when uncontrolled. Lower cover is present on the marine terrace (south side of island), while scattered plants are present on other parts of the island. This plant has vigorous growth nearly year-round and may seed (abundantly) more than once per year. Cheeseweed occurs mainly on the marine terrace where cover varies from 3 to 60 percent. This plant also grows year-round, but many plants die back after going to seed in summer. Fortunately, cheeseweed seeds are less robust and long-lived compared with the relatively large, dense, and hard spinach seeds, which typically survive for decades. An extensive seed bank is present on the island. Thus, control of these plants has been very challenging. Despite efforts to control spread, spinach plants have been appearing in formerly uninfested areas.

Efforts resulted in a 40-precent reduction in spinach and cheeseweed cover prior to the seabird breeding seasons in 2006-2007 and a 60-percent reduction for 2008-2009. Despite these reductions, germinations from the abundant seed beds continue through the summer, and cover

is typically high again by late summer when control efforts resume. In 2007, we treated test plots with Habitat®, an imazapyr-based herbicide, which has pre-emergent qualities. Habitat® was found to kill plants very effectively. However, treated areas were left barren for about one year, and apparent seepage appeared to have killed plants downslope, indicating that the pre-emergent qualities of the herbicide persisted longer and had a more broad reaching effect than initially anticipated. Consequently, the hillside was de-vegetated of all plants, including natives. The following year, spinach cover had returned although plant morphological structures had been modified into a more low-growing, sprawling plant. Studies were also conducted in 2007 looking at the comparative effectiveness of our three treatment types: Habitat® (imazapyr-based); Roundup Pro® (glyphosate-based); and manual removal. Results indicated that the manual removal and glyphosate-based treatments are comparable as removal methods. However, manual removal is more prone to leaving mature seeds in a more viable state, may be less effective in rocky habitats where removal of roots is more difficult, and is more labor intensive.

Plans were for a very intensive winter-spring 2009-2010 control effort. However, major repair needs on the island's landing crane resulted in more restricted island access and reduced efforts. This, in conjunction with abundant spring rainfall, led to high cover of both spinach and cheeseweed. Efforts were intensified in late summer 2010. After applying only hand-pulling techniques in 2008-2009, herbicide treatments of plants were again conducted in 2010 in conjunction with hand-pulling. Using AquaMaster®, a glyphosate-based herbicide which deactivates in water, about 50 percent of the island populations of spinach and cheeseweed were treated. Herbicide treatment was re-instated because of high invasive plant cover, calm, dry weather conducive to spraying, and the known effectiveness of glyphosate-based herbicides. By the end of September, spinach cover had been reduced by about 70 percent.

Re-seeding of native goldfields has been conducted since 2005. In January 2006, seeds were spread into three areas that had been heavily infested with cheeseweed in 2005. Two of the three areas responded with dense carpets of goldfields, while the third remained mostly barren. The re-seeding effort was intensified in 2006 when seeds were spread just after the first winter rains in 2006. Modifications to our dispersal techniques and timing of seed spread continue.

In December 2006, efforts were initiated to control exotic grasses, which are outcompeting goldfields in some areas of the marine terrace and negatively impacting burrowing seabirds. Approximately 5 acres of grass were treated with a grass-specific herbicide in several different experimental plots. We are testing to see whether the herbicide can be used without damaging goldfields and whether controlling grasses increases goldfield re-seeding success. Control of exotic plants on Southeast Farallon Island is needed for years to come. Plants will continue to germinate from the abundant seed beds. Other methods must be tested and employed to improve success. Re-seeding efforts will also need to be intensified with the possible addition of nursery propagation of native plants for both seed stock and outplantings. These efforts are critical to the restoration and enhancement of seabird breeding habitat on the island.

Funding

Approved project budget:	$289,192
Funds allocated in FY 2002:	$25,000
Funds allocated in FY 2003:	$0
Funds allocated in FY 2004:	$25,000
Funds allocated in FY 2005:	$37,296
Funds allocated in FY 2006:	$37,296
Funds allocated in FY 2007:	$37,296
Funds allocated in FY 2008:	$40,218
Funds allocated in FY 2009:	$42,936
Funds allocated in FY 2010:	$44,150
Funds allocated through FY 2010:	$289,192
Funds spent to date:	$281,746

Fisheries and Water Quality Projects

Pacific Herring Spawning Habitat Enhancement in San Francisco Bay (Lead Agency: CDFG)

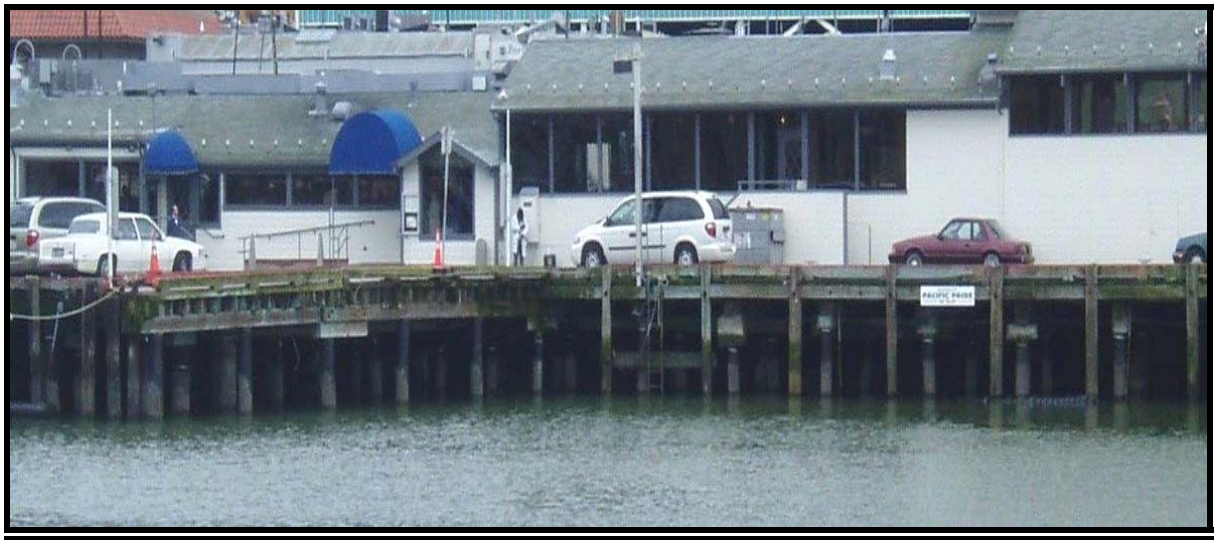
Project Overview

The Cape Mohican oil spill affected aquatic organisms along the San Francisco waterfront, including rocky shore and piling communities. Pacific herring (*Clupea pallasii*), which spawn on these substrates, were also affected: the substrates were coated with oil only a few weeks before the start of spawning.

This project at the Port of San Francisco's Pier 45 involves enhancing water quality by removing creosote-covered pilings and replacing them with polymer-coated wood piles, which provide a non-toxic surface for encrusting organisms to attach to and enhance spawning of herring. There is also a monitoring and research component to evaluate the suitability of different pile treatments as potential habitat for herring spawn. Project monitoring will evaluate the suitability of the new polymer-coated wood piles for herring spawning relative to other pile materials by comparing the growth of encrusting marine organisms (as an indicator of potential toxicity).

Wood pilings in San Francisco Bay are subject to damage from wood-boring marine mollusks (*teredinid bivalves*, called "shipworms"), crustaceans (*limnoriid isopods* called "gribbles") and an amphipod (*Chelura terebrans*). To deter attack by these organisms and increase the pilings' useful life, pilings have been treated prior to installation with toxic compounds— in earlier periods primarily with creosote, and more recently with ACZA (Ammonium Copper Zinc Arsenate) or related compounds, which are thought to be less harmful to marine life. In recent years, to further protect these pilings against attack by wood-boring organisms, and to address concern over potential release of ACZA into the water or contamination of organisms growing on pilings or eggs laid on pilings, many new pilings, including those installed at the Port's Pier 45 to replace creosote-treated wood piles, have been covered or coated with plastic materials. The Port now primarily uses a rigid plastic sheath banded to the piling to cover the piling throughout its intertidal and near-surface portions, and a flexible plastic sheath for the deeper subtidal parts of pilings where damage from contact with boat hulls or floating debris is less likely. Fender pilings are not sheathed or coated.

The potential for direct or indirect effects of wood treatments on herring spawning has been an environmental concern. The overall objective of the research is to determine whether there are significant differences in the amount or composition of the marine organisms that settle and grow on pilings that receive different biocide treatments and covering treatments, and, if so, whether these differences are an indicator of possible differences in toxicity and possible differences in the value of pilings receiving these treatments as substrate for herring spawning.



The new polymer-coated wood piles, which replaced the creosote-covered pilings, provide a non-toxic surface to which encrusting organisms can attach. This will enhance the spawning of herring.

Project Status

A total of 281 pilings were installed by the Port of San Francisco using Cape Mohican funds. The project is now in the process of evaluating the growth of encrusting marine organisms on piles treated in different ways to prevent damage from wood-boring marine mollusks and crustaceans.

Phase 1 of the monitoring and research component of this project compared the amount and composition of marine growth on wood panels deployed at Pier 45 receiving four types of treatments: untreated wood; vinyl-coated untreated wood; uncoated ACZA-treated wood; and vinyl-coated ACZA-treated wood. It found that the untreated wood panels were largely removed by wood-boring organisms. The panels receiving the other three treatments remained intact, with no differences in the coverage, biomass, or diversity of organisms growing on them. The full study report can be viewed at the following website under the Pacific Herring, San Francisco Bay heading: http://www.dfg.ca.gov/ospr/NRDA/restore_monitor_reports.aspx.

Phase 2 of the monitoring and research component of this project is now underway and will continue and complete the fouling panel studies begun in the first phase. Phase 2 will involve directly sampling the marine growth on pilings that have different biocide and covering treatments, and will include sampling the polymer-coated wood piles installed by the Port of San Francisco using Cape Mohican funds.

This project is scheduled for completion soon.

Funding

Approved project budget:	$456,500
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$408,500
Funds allocated in FY 2004:	$0
Funds allocated in FY 2005:	$0
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$0
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	$48,000*
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$456,500
Funds spent to date:	$438,860

* Funds allocated to CDFG in FY06 ($16,000), FY07 ($16,000), and FY08 ($16,000), were later returned to the NRDAR fund. In FY09 those funds (a total of $48,000) were transferred to NOAA to fund contracts to complete this project through a cooperative agreement with the National Fish and Wildlife Foundation.

Wetland Restoration at Pier 98 (Heron's Head Park), India Basin, San Francisco (Lead Agency: CDFG)

Project Overview

This project, intended to enhance a restored salt marsh, focused on the transition zone between wetland and upland. Heron's Head Park is an approximately 22-acre peninsula located on the Southern Waterfront of the Port of San Francisco (Port), bounded by Pier 96 to the north and India Basin to the south. The Port created the land in the 1970s by placing fill in the bay behind a debris dike, which was originally planned to construct a shipping terminal at the site. The Port later abandoned these plans and in 1998-99 undertook a major construction effort to enhance existing and create new salt marsh along the southern shoreline of the peninsula. The Cape Mohican Trustee Council is supporting this effort by funding restoration of the native habitat in the transition zone area. Community volunteer involvement is a key element of the project.

Project Status

Literacy for Environmental Justice (LEJ) is implementing the restoration project. LEJ is an organization that addresses the ecological and health concerns of Bayview Hunters Point and the surrounding communities of southeast San Francisco. In keeping with LEJ's mission to foster an understanding of the principles of environmental justice and urban sustainability, a significant component of the restoration effort has involved community volunteer days. The transition zone restoration area encompasses approximately one acre of habitat. LEJ guided volunteers in preparing the substrate by removing debris and loosening highly compacted soil over this area. Seeds were collected and plants cultivated in a nursery so that thousands of plants representing eleven native species have been planted. Plants grown up and planted include the federally endangered *Suaeda californica*. Non-native plants are being controlled to maintain less than 10% cover within the restoration area. Planting, maintenance, and monitoring plans are being followed to guide the restoration effort.

This project is scheduled for completion by September 30, 2011.

A new salt marsh is enhanced by propagating and planting rare transition-zone native plant species.

Funding

Approved project budget:	$146,920
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$70,648
Funds allocated in FY 2004:	$0
Funds allocated in FY 2005:	$0
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$0
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	$76,272*
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$146,920
Funds spent to date:	$104,359

* Funds allocated to CDFG in FY06 ($25,424), FY07 ($25,424), and FY08 ($25,424) were returned to the NRDAR fund. In FY09 those funds (a total of $76,272) were transferred to NOAA to fund contracts to complete this project through a cooperative agreement with the National Fish and Wildlife Foundation.

Steelhead Stream Habitat Enhancement at San Francisquito Creek (Lead Agency: CDFG)

Project Overview

This project increases the size and quality of habitat available for Steelhead trout (*Oncorhynchus mykiss)* spawning in the Bay Area by rehabilitating Steelhead spawning habitat in the San Francisquito Creek watershed. This was accomplished through fish barrier removal and native plant revegetation. The San Francisquito Creek watershed covers 47.5 square miles and extends from the Santa Cruz Mountains to the San Francisco Bay on the San Francisco Peninsula. The creek is rare in that it is unchannelized in most reaches and sustains one of the South Bay's only continuous native steelhead runs.

Project Status

The Steelhead Stream Habitat Enhancement at San Francisquito Creek project included conducting volunteer-based habitat restoration workdays and completing designs, permits, and environmental reviews for fish-passage improvement projects at two sites.

The San Francisquito Watershed Project hosted numerous volunteer workdays at seven restoration sites throughout the watershed to plant native plants, conducting maintenance activities (weeding, watering, replacing dead plants), removing targeted invasive weeds, and removing trash and debris. The Watershed Project's staff raised public awareness about the importance of the creek to quality of life on the Peninsula through education and outreach, and provided a personal connection to watershed stewardship through the volunteer workdays. The native restoration plantings are helping to stabilize the banks of the creek, shade and cool the water, and provide habitat structure and food for wildlife. Coordination with local government agencies was included to ensure continued success of the habitat restoration.

Culvert replacement at McGarvey Gulch to improve Steelhead passage.

The Watershed Council also investigated improving fish passage to Steelhead at four barriers. The McGarvey Gulch culvert replacement was completed in 2007. The project implementers were unable to move forward with the Los Trancos Creek double-box culvert modification because of insufficient support from key landowners, uncertainties about property ownership, and the lack of a public agency willing to do construction. The decision to terminate the Los Trancos Project could not have been made before project designs were completed because landowners used those designs as the basis for deciding whether to sign permit applications. The same was true of the public agencies, who would not decide whether or not to serve as construction lead until they evaluated project designs. The Trustee Council approved redirecting the balance of project funds to invasives removal and native revegetation.

Riparian restoration through removal of invasives and planting native vegetation.

Funding

Approved project budget:	$48,695
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$40,000
Funds allocated in FY 2004:	$0
Funds allocated in FY 2005:	$0
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$0
Funds allocated in FY 2008:	$8,695
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	$0
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$48,695
Funds spent to date:	$48,695

Wetlands and Mudflats Projects

Giacomini Coastal Wetlands Restoration Project (Lead Agency: NPS)

Project Overview

This project has restored tidal connection and hydrologic function to approximately 550 acres of former coastal salt marsh in Tomales Bay, which was diked in the 1940s to provide pasture for dairy cattle. Planning on the proposed project started in 2001, shortly after the purchase of the land in 2000. NPS and its partners, the Point Reyes National Seashore Association, California State Lands Commission, and Audubon Canyon Ranch, conducted extensive studies to characterize existing and potential future conditions in the project area, as well as extensive public scoping through meetings and workshops. Construction Phase I of the restoration component was completed in fall 2007. Phase II construction was completed in December 2008. Cape Mohican funds have been used in conjunction with funds from other sources to finalize planning, prepare construction specifications and final design, and construct Alternative D, which was the environmentally preferred alternative that was ultimately selected for implementation through the environmental review process.

Excavator removes final portion of levee, allowing creekwaters to flow into the Giacomini Ranch's East Pasture.

Project Status

The Environmental Impact Statement/Environmental Impact Report (EIS/EIR) was finalized in June 2006. The EIR was approved for certification by the board of the State Lands Commission on June 28, 2007, and the Record of Decision for the EIS was approved by the NPS Regional Director on August 16, 2006. Construction of Phase I of the restoration component was conducted in fall 2007. Phase I involves removal of agricultural buildings and infrastructure (e.g., pipelines, fencing), shallow excavation of areas used for manure disposal, close-out of manure ponds used for dairy waste, and construction of freshwater marsh and ponds as habitat for the federally threatened California red-legged frog (*Rana aurora draytonii*).

Phase II of the restoration component, the larger of the two phases, focused on marshplain and floodplain enhancement. Levees were removed, with small berms left to keep out tides until construction was completed. The material from levee removal was used to fill drainage ditches used for pasture irrigation when it was operated as a ranch and to restore more natural topographic conditions to the Dairy Mesa, where barns were located. The remaining soils are being hauled to quarries in another portion of the Seashore. The plan is for these quarries to be restored to more natural landscapes. One of the smaller leveed creeks was taken out of its

leveed alignment and routed into a new tidal channel slough network that moves through the restored pasture and connects to Lagunitas Creek. Some of the areas filled to improve pasturelands were excavated to lower elevations to improve hydrologic connectivity of marshplain and floodplain areas with Lagunitas Creek. The southernmost perimeter of the ranch has undergone a number of activities designed to improve riparian and creek habitat, including laying back the overly steepened banks to a more stable profile, removing riprap, and creating a low-elevation bench or terrace adjacent to the creek. Lastly, the spur trail that runs along the southern edge of the ranch is being rerouted 100 feet away from the creek to provide more room for riparian habitat and greater buffer for Lagunitas Creek.

By mid-November 2008, the final portion of the levees had been removed allowing tides to enter the former coastal wetlands area for the first time in 60 years (see photos). The only construction tasks currently being conducted are the recontouring of the Dairy Mesa, realignment and fencing of the new spur trail alignment, fencing of selected other areas, and completion of hauling to the quarries. Simultaneously, active revegetation is being conducted in some areas to promote establishment of native vegetation communities. This work being is being conducted primarily by a revegetation contractor with volunteer help from schools, organizations, and individuals. Invasives removal will also continue in December with re-treatment of areas where cape ivy (*Delairea odorata)* was removed in 2007.

Giacomini Ranch after levees were breached in the end of October 2008. (Photo courtesy of Robert Campbell Aerial Photography, Sonoma, CA.).

In the future, the park and its partners will continue to look for opportunities to (1) perform some expansion of restoration efforts in the East Pasture (e.g., lowering more filled areas to hydrologically interactive elevations) and Olema Marsh (an adjacent impounded freshwater system that is being adaptively restored), (2) expand invasives removal efforts or conduct re-treatment of areas already treated, followed eventually by revegetation with native plant species; and (3) expand revegetation efforts in other areas. The park will also move forward with post-restoration monitoring as part of its efforts to evaluate how successful these activities have been in restoring natural conditions, processes, and functions to the Giacomini Ranch, as well as improving conditions in the larger Tomales Bay Watershed system.

Funding

Approved project budget:	$435,000
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$0
Funds allocated in FY 2004:	$0
Funds allocated in FY 2005:	$435,000
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$0
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	$0
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$435,000
Funds spent to date:	$435,000

Sandy Beach and Rocky Intertidal Habitat Projects

Sandy Beach Habitat Restoration at Point Reyes National Seashore (Lead Agency: NPS)

Project Overview

This project was focused on increasing nesting habitat and reproductive success of shorebirds, especially Western Snowy Plover, at Point Reyes National Seashore (PRNS). This objective was accomplished by increasing habitat for shorebird foraging and nesting through the removal of invasive non-native European beachgrass and iceplant. A side benefit was improvement of habitat for federally endangered plant species (Tidestrom's lupine and beach layia) that depend on the same open sandy habitat as the Western Snowy Plover.

Project Status

This project funded ongoing European beachgrass and iceplant re-sprout removal throughout a 50-acre project area following initial treatment in 2004-2005. The northernmost section (north and immediately south of the Abbotts Lagoon mouth) was initially hand-dug, while the majority of the area was mechanically excavated. Much of the work was accomplished through volunteer efforts coordinated by a PRNS Conservation Corps North Bay (formerly Marin Conservation Corps) AmeriCorps habitat restoration volunteer coordinator partially funded through the Sandy Beach project. Invasive removal work done in 2009 focused on approximately 10 acres immediately north and south of the mouth of Abbott's Lagoon. The northern site shows excellent progress towards bringing European beachgrass to controlled status in the areas funded for follow-up through this project, as does the southernmost region that was mechanically excavated. While the southern hand-treated area has not responded as thoroughly, work accomplished through this project did reduce beachgrass cover and prevent seed set. Work included (1) continued monitoring of vegetation, dune formation profiles, and Snowy Plover breeding patterns; and (2) continued annual follow-up treatment of 50 acres to remove any remaining beachgrass re-sprouts (scheduled September-March, after plovers have finished breeding). Washington University assisted for three summers in re-reading monitoring plots (2007-2009), finding an average of less than 5% cover of European beachgrass in removal plots. Funds available in FY09 supported a vehicle for the FY09 volunteer coordinator, supplies to support volunteer-based invasive plant removal, and some staff time for dune monitoring.

Snowy Plovers were documented using restored dune habitat for six consecutive years. In 2009, one pair nested in the restored area but did not fledge any chicks. Four nests were located in beaches immediately adjacent to the restored areas (2 near the excavated and 2 near the hand-treated area). Two chicks fledged from these 4 nests. In 2008 4 nests were initiated in restored areas, 2 in the hand treated area north of Abbott's Lagoon and 2 in the mechanically treated area to the south of the lagoon. This is the same number of nests initiated in restored areas in 2007 and 2006. Although no chicks fledged in the restored area in 2008, of the 24 chicks fledged in 2007, 11 were raised in restoration areas─4 in the hand-treated area and 7 in the mechanically treated area. Of the 23 chicks fledged in 2006, 13 were raised in restoration areas─3 in the hand-treated area and 10 in the mechanically treated area.

Funding

Approved project budget:	$330,000
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$60,000
Funds allocated in FY 2004	$80,000
Funds allocated in FY 2005:	$190,000
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$0
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	$0
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$330,000
Funds spent to date:	$330,000

Protection of Duxbury Reef through Education (Lead Agency: NOAA)

Project Overview

This project uses education and outreach to prevent further injury to, and facilitate the natural recovery of intertidal rocky habitat at Duxbury Reef Marine Reserve. The Gulf of the Farallones National Marine Sanctuary has implemented an environmental education and stewardship

Visitors on Duxbury Reef, Bolinas, California, at lowtide. Photo: R.Johnson

program aimed at increasing public awareness of this sensitive habitat. In concert with this educational component, the sanctuary has undertaken monitoring of invertebrates and algae, as well as the human visitors on the reef. This project is increasing public awareness of intertidal natural history and sensitivity to intertidal habitat and tide pool etiquette at both Duxbury Reef and the California Academy of Sciences (Academy). It also includes monitoring intertidal populations to document changes resulting from this increased stewardship.

Project Status

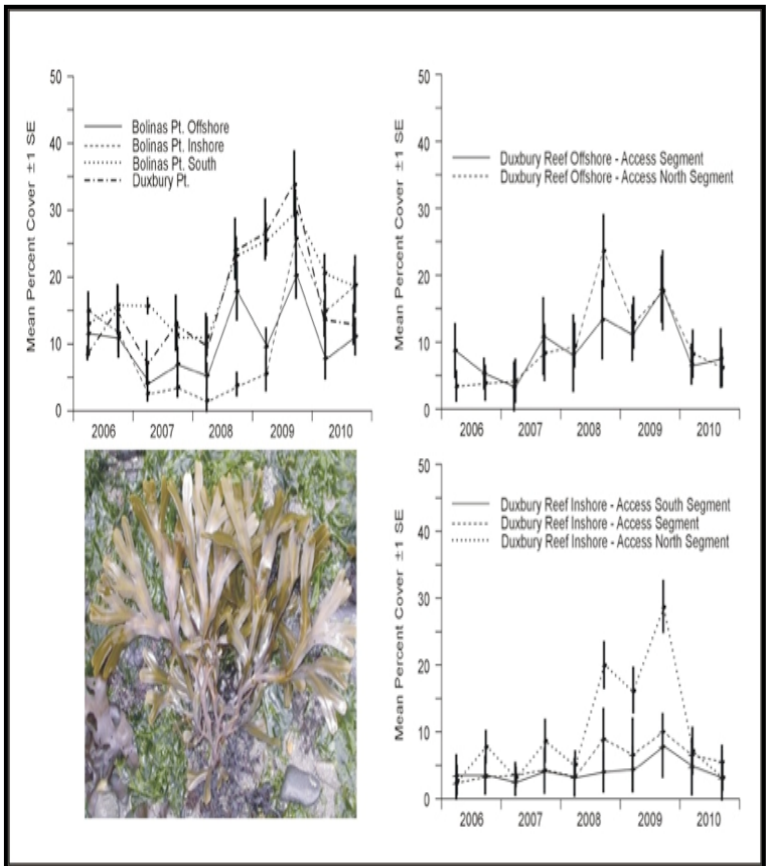
The Gulf of the Farallones National Marine Sanctuary (GFNMS) awarded a contract to Tenera Environmental for Phase I (Reef Characterization and Monitoring) of this project. Tenera has completed a habitat characterization, preliminary visitor use and impact assessments, and five years of baseline monitoring. Phase I was completed in November 2010. The resulting characterization and assessments informed the design of Phase II (Education and Stewardship). The contract for Phase II was awarded to the Academy in September 2008.

The Academy trains all museum docents on rocky intertidal natural history and stewardship and has implemented a more in-depth volunteer training class in May 2009. Two cohorts of volunteer Rocky Shore Naturalists (RSNs), totaling 30 people, have completed this course. The RSNs work as roving docents, conduct visitor counts, and monitor permanent research quadrates at Duxbury Reef. They deliver educational content about rocky intertidal ecology, natural history, and stewardship to museum visitors at the Academy. Phase II is ongoing.

Phase I ─ Reef Characterization and Monitoring

Tenera assessed baseline conditions at Duxbury Reef. They divided the reef into low-traffic, high-traffic, and control (no impact) sections based on visitor count data. Once a characterization of the reef was completed, Tenera monitored sample quadrats along transects twice per year (early spring/late summer) in control and impact (high-traffic and low-traffic) areas. They have completed eight baseline surveys (2006-2009) and continue to monitor along existing transects.

Using visitor data and the reef characterization, Tenera and GFNMS staff worked together to design a trail-routing system to keep visitors from trampling sensitive areas of the reef while allowing educational opportunities for visitors. Tenera scientists assisted with the set-up and design of monitoring sites and protocols for Rocky Shore Naturalists. These additional volunteer sites are located along the Tenera monitoring transects and provide continuous monthly monitoring of permanent quadrats in low-traffic, high-traffic, and control areas. To get a better picture of seasonal variation under different levels of visitor use, the Rocky Shore Naturalists will photograph permanent quadrats every month and measure algae in the same quadrats quarterly using the same protocols as Tenera scientists.



Phase II ─ Education and Stewardship

In Phase II, initiated in 2008, GFNMS and the Academy collaborated to create the Rocky Shore Partnership Program to maximize the Education and Stewardship efforts at Duxbury Reef. The partners created a three-hour introductory course that outlines the Duxbury Reef Project. The course includes information on invertebrate zoology, natural history, and ecology; on monitoring at Duxbury to assess trampling and extraction impacts; and on interpretation techniques

and how to become a Rocky Shore Naturalist. As of November 2009, over 500 volunteers had taken this course. The volunteers staff the rocky intertidal touch tank at the Academy and educate visitors about intertidal life and responsible tide-pool behavior.

The Rocky Shore Partnership Coordinator led two enrichment field trips to Duxbury Reef for Academy docents who had completed the introductory three-hour training. On these trips, docents increased their knowledge of intertidal organisms, stewardship, and the mission of GFNMS. Some of these volunteers took the inaugural 18-hour Rocky Shore Naturalist Course, which includes more in-depth intertidal natural history and was specific to Duxbury Reef and outdoor interpretation techniques. It also included a 6-hour field component on how to engage visitors to the reef and how to conduct visitor counts and permanent quadrat monitoring. These Rocky Shore Naturalists now serve as roving docents during low tide days, conduct visitor counts, and perform the monthly monitoring of sites at Duxbury. They educate visitors on responsible tide-pool viewing and leave visitors with a greater understanding of the importance of caring for intertidal habitat. The Rocky Shore Naturalists will work on implementing the trail system during the spring and summer busy season the reef.

Rocky Shore Naturalists conduct monitoring.
Photo: R.Johnson

To summarize, site characterization and mapping has been completed. Baseline visitor-use patterns have been completed, and monitoring by Tenera and docent/volunteers is ongoing. Initial baseline for percent cover, density and growth of *Fucus* has been completed. The baseline assessment of biodiversity has been completed. The baseline assessment, interrupted due to impacts from the November 2007 *Cosco Busan* spill, has been integrated into the current baseline evaluation. Monitoring continues by Tenera and docents/volunteers. Docents and citizen-science volunteers, who have been recruited and trained, began collecting data and providing natural history interpretation to reef visitors. The trail system to curb foot traffic and extraction impacts has been planned, and construction is anticipated.

Funding

Approved project budget:	$487,000
Funds allocated in FY 2002:	$0
Funds allocated in FY 2003:	$90,000
Funds allocated in FY 2004:	$90,000
Funds allocated in FY 2005:	$0
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$90,000
Funds allocated in FY 2008:	$93,000
Funds allocated in FY 2009:	$49,000
Funds allocated in FY 2010:	$37,450
Funds allocated through FY 2010:	$449,450

Funds spent to date: $436,015

Human Use Projects

Angel Island Foot Trail Enhancement (Lead Agency: CDPR)

Project Overview
This project involves the construction of stairways, walkways, and trail improvements to enhance public access to beaches on Angel Island that were closed to the public because of the oil spill.

Project Status
All work has been completed. The Quarry Beach accessible path and ramp providing a hardened surface access onto the beach is complete. At Perles Beach, the rickety wooden stairway traversing the 50-foot cliff has been replaced with a weather-resistant fiberglass stairway. Both areas are being enjoyed by the public.

Stairs to Perle's Beach.

ADA ramp construction at Quarry Beach.

Funding

Approved project budget:	$180,000
Funds allocated in FY 2002:	$180,000
Funds allocated in FY 2003:	$0
Funds allocated in FY 2004:	$0
Funds allocated in FY 2005:	$0
Funds allocated in FY 2006:	$0
Funds allocated in FY 2007:	$0
Funds allocated in FY 2008:	$0
Funds allocated in FY 2009:	*(-$27,933)
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$152,067
Funds spent to date:	$157,840

*$27,933 was returned to NRDAR Fund in FY09

Crissy Field Habitat Stewardship Program (Lead Agency: NPS)

Project Overview

The project has been completed. This project consists of developing and operating a 4-year public stewardship and biological monitoring program whereby staff and participants will visually and quantitatively measure the biological and physical changes of the newly restored habitats and participate in a variety of habitat restoration activities. Specifically, the Cape Mohican funds will support an Ecologist, as the Stewardship and Monitoring Program Coordinator, a Restoration and Public Programs Coordinator, a Field Monitoring Coordinator, and career development internships.

Project Status

Cape Mohican funds that had been used to support a four-year stewardship and monitoring program at Crissy Field have been nearly expended. Remaining funds are being used to support one career development internship at Crissy Field. In FY08, this position assisted with water quality monitoring and stewardship activities at Crissy Field. Stewardship activities included

volunteer coordination, exotic plant removal, planting and seeding to enhance restored areas, fence repair, and trash and debris removal from the restored marsh. Funds were also used to support NPS maintenance personnel in replacing dilapidated post and cable fencing around sensitive dunes.

Funding

Approved project budget:	$850,000
Funds allocated in FY 2002	$200,653
Funds allocated in FY 2003	$215,330
Funds allocated in FY 2004	$213,143
Funds allocated in FY 2005	$220,874
Funds allocated in FY 2006	$0
Funds allocated in FY 2007	$0
Funds allocated in FY 2008	$0
Funds allocated in FY 2009:	$0
Funds allocated in FY 2010:	$0
Funds allocated through FY 2010:	$850,000
Funds spent to date:	$850,000

Cape Mohican
Financial Summary – January 2011

Funds from Settlement	$3,625,000
Interest earnings (as of 1/13/11)	$679,838
Total	**$4,304,838**
Project funds allocated through FY2010:	
Shorebird Habitat Protection (NPS)	$23,500
California Least Tern Habitat (USFWS)	$141,000
Restoration of Shorebird Foraging Habitat/Cordgrass (USFWS)	$430,905
Farallon Seabird Restoration (USFWS)	$289,192
Pacific Herring Spawning Habitat Enhancement (CDFG)	$456,500
Wetland Restoration at Pier 98 (CDFG)	$146,920
Steelhead Stream Habitat Enhancement (CDFG)	$48,695
Giacomini Coastal Wetlands Restoration (NPS)	$435,000
Sandy Beach Habitat Restoration at PRNS (NPS)	$330,000
Protection of Duxbury Reef through Education (NOAA)	$449,450
Angel Island Foot Trail Enhancement (CDPR)	$152,067
Crissy Field Habitat Stewardship Program (NPS)	$850,000
Total	**$3,753,229**
Administrative funds disbursed for restoration planning and council activities through FY2010:	
National Park Service	$217,000*
U. S. Fish and Wildlife Service	$61,500
National Oceanic and Atmospheric Administration	$79,800
California Department of Fish and Game	$99,174**
California Department of Parks and Recreation	$8,000
Total	**$465,474**
Remaining (unallocated) funds from settlement (including interest):	**$86,135**

* Includes $146,000 for development of RP/EA under contract to Harding Lawson/ESE.
** Includes $8,874 for newspaper reimbursement and $20,000 for land appraisal.