MONTROSE SETTLEMENTS RESTORATION PROGRAM

DRAFT PHASE 2 RESTORATION PLAN ENVIRONMENTAL ASSESSMENT/INITIAL STUDY

October 2011

Natural Resource Trustees:
National Oceanic and Atmospheric Administration
U.S. Fish and Wildlife Service
National Park Service
California Department of Fish and Game
California Department of Parks and Recreation
California State Lands Commission

Cover Photo Captions and Credits (Top and left to right):

Scorpion Rock with blooming *Coreopsis* (Karen Flagg, Growing Solutions)
Volunteers planting on Scorpion Rock (Gabrielle Dorr, NOAA)
Diver removing urchins for kelp restoration project (David Witting, NOAA)
Adult Bald Eagle in nest with chicks (Kevin White, Fullframe Productions)
Girl fishing on Seal Beach Pier during a Fishing Derby (Gabrielle Dorr, NOAA)
Several species of fish swimming among kelp canopy (David Witting, NOAA)
Peregrine Falcon chicks in nest (Brian Latta)
Xantus's Murrelet chicks in nest (Darrell Whitworth, CIES)
First Bald Eagle chick to hatch on Santa Cruz Island (MSRP)
MSRP at SEA Lab for Earth Day Celebration (Jennifer Boyce, NOAA)

Cover Design: Gabrielle Dorr, NOAA

MONTROSE SETTLEMENTS
RESTORATION PROGRAM

DRAFT PHASE TWO RESTORATION PLAN AND ENVIRONMENTAL ASSESSMENT/INITIAL STUDY

Natural Resource Trustees:

National Oceanic and Atmospheric Administration (lead Federal agency)
U.S. Fish and Wildlife Service (cooperating agency)
National Park Service (cooperating agency)
California Department of Fish and Game (lead State of California agency)
California Department of Parks and Recreation (cooperating agency)
California State Lands Commission (cooperating agency)

October 2011

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Copies

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EXECUTIVE SUMMARY

The Natural Resource Trustees for the Montrose Case (Trustees) have developed this Phase 2 Draft Restoration Plan to restore natural resources injured and natural resource services lost due to historic releases of DDTs and PCBs into marine waters of the Southern California Bight. The Trustees are comprised of six federal and state agencies: National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, National Park Service, California Department of Fish and Game, California State Lands Commission, California Department of Parks and Recreation. To satisfy the requirements of the National Environmental Policy Act (NEPA) (42 U.S.C. Section 4321 et seq.) and the California Environmental Quality Act (CEQA) (Public Resources Code Parts 21000–21178.1), the Trustees are combining the restoration planning process provided for under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. section 9601 et seq.) with the development of an Environmental Assessment (EA) and Initial Study (IS). This EA is tiered off of the 2005 Final Restoration Plan and Programmatic Environmental Impact Statement and Environmental Impact Report (hereafter referred to as 2005 RP). This RP is specifically analyzing the environmental impacts of proposed actions in Phase 2 of the Montrose Settlements Restoration Program. The proposed Phase 2 projects consist of restoration actions aimed at restoring resources impacted by the historic releases of DDT; specifically the projects address fish habitat, Bald Eagles, Peregrine Falcons, California Condors and seabird species

This document serves as the Phase 2 Restoration Plan and Environmental Assessment/Initial Study for the Montrose Settlements Restoration Program (MSRP). The 2005 RP allocated approximately half of the available restoration funds for Phase 1 projects. This Phase 2 Restoration Plan has incorporated public and professional opinion to develop, evaluate, and select specific actions to restore injured resources and the lost services that the natural resources provide. Some actions will be initiated in the near-term. Other actions have been selected conditionally, because they must await the outcome of further study, testing, and public review prior to final selection and implementation. Thus, this Restoration Plan has a range of selected restoration actions that together will form the basis of a comprehensive program to restore the natural resources and services affected by the DDTs and PCBs at issue in this case. This document will guide the restoration effort as a whole, as well as the specific restoration actions selected for near-term implementation. This Restoration Plan establishes a process for adaptive decision-making for the remaining years that the Trustees are implementing restoration actions.

The natural resource restoration projects to be undertaken constitute federal and state actions for the purposes of environmental impact assessment. In addition to serving as a natural resource restoration plan as required under CERCLA, this document is an EA/IS in order to satisfy the requirements of NEPA and CEQA.

DDT and PCB Contamination and Natural Resource Injuries in the Southern California Bight

From the late 1940s to the early 1970s, Los Angeles area industries discharged approximately 2,000 metric tons (about 2,200 U.S. tons) of DDTs and PCBs into the ocean waters off the southern California coast. Almost all of the DDTs released to the southern California marine environment originated from the Montrose Chemical Corporation (Montrose) manufacturing plant in Torrance, California. The Montrose plant discharged waste into the Los Angeles County Sanitation Districts (LACSD) sewer collection system. Wastewater treatment methods employed at that time did not capture the DDTs prior to their discharge through ocean outfall pipes that empty into the Pacific Ocean off of White Point on the Palos Verdes Shelf. Montrose also dumped DDT-contaminated waste from barges into deep ocean waters in the San Pedro Basin near and possibly en route to Santa Catalina Island. In addition, large quantities of PCBs from numerous sources throughout the Los Angeles Basin were released into ocean waters through the LACSD and City of Los Angeles wastewater outfalls and the regional storm drain systems.

The CERLA provides a mechanism for addressing the nation's hazardous waste sites: states and the federal government may sue polluters for the cleanup and restoration of sites. CERCLA provides for the designation of "natural resource trustees," who are federal, state, or tribal authorities who represent the public interest in natural resources. These Trustees may seek monetary damages from polluters for injury, destruction, or loss of natural resources resulting from releases of hazardous substances.

At the end of October 2000, after ten years of litigation, the federal and state governments and the remaining defendants signed the last of a series of settlements in the Montrose case. The court approved the final settlement in March 2001. Under the terms of the four separate settlement agreements, Montrose Chemical Corporation and the other defendants agreed to pay $140.2 million plus interest to the federal and state governments. The Trustees for the Montrose case received $63.95 million. The Trustees have used $35 million to reimburse past damage assessment costs and are using the remainder plus the accumulated interest to plan and implement the actions necessary to restore the natural resources and their services that were injured by the DDTs and PCBs.

Restoration Goals and Objectives

The overarching goals of the MSRP have been constant throughout the damage assessment and restoration effort, and appear in the final consent decree for the case. The overall goals of the MSRP are to:

- Restore, replace, rehabilitate, or acquire the equivalent of the injured natural resources and the services those resources provide; and

- Provide compensatory restoration for the interim lost services of the injured natural resources.

The Trustees used this planning process to develop an appropriate mix of primary and compensatory restoration actions to be conducted using the settlement funds. For restoration actions that are compensatory in nature, the Trustees sought restoration approaches that benefit the same or similar natural resources as those that sustained injury as a result of the DDTs and PCBs released in the Montrose case.

Restoration Objectives: The final consent decree for the Montrose case states: "The Trustees will use the damages for restoration of injured natural resources, including Bald Eagles, Peregrine Falcons and other marine birds, fish and the habitats upon which they depend, as well as providing for implementation of restoration projects intended to compensate the public for lost use of natural resources." The restoration objectives for the MSRP (i.e., the specific targets or milestones that help accomplish the overall goals) have been formulated with this consent decree provision in mind and with consideration of input from the public during the restoration planning workshops. The MSRP restoration objectives are:

- Restore fishing services within the Southern California Bight (SCB);
- Restore fish and the habitats on which they depend within the SCB;
- Restore Bald Eagles within the SCB;
- Restore Peregrine Falcons within the SCB;
- Restore seabirds within the SCB.

Funding Allocations

For the Phase 2 Restoration Plan, the Trustees are allocating the remaining funds of the settlement. The total settlement is approximately $38 million plus interest. In the 2005 RP, the Trustees allocated approximately $25 million for restoration projects. In this Phase 2 Restoration Plan, the Trustees are allocating the remaining approximately $15 million plus interest. The Trustees propose to allocate the following amounts to the different restoration projects:

- Fish and Fish Habitat Restoration- $9 million
- Bald Eagle and Peregrine Falcon Restoration- $4 million
- Seabird Restoration- $3 million

The settlement funds reside in the DOI Natural Resources Damage Assessment and Restoration Fund. This fund is an interest earning fund. Due to the fact the total amount of funds available is increasing due to the interest earned, estimating the total amount of funds available is difficult. If settlement funds remain after the funds outlined above are spent the program will reevaluate both preferred and non-preferred projects outlined in both Montrose Restoration Plans for funding. In addition to the funds allocated to the

restoration projects, the Trustees will have ongoing operation costs (program staff and Trustee Council) for the duration of the program. These costs will be expected to decrease as the program nears completion of its restoration actions.

Outreach activities are vital to the restoration program and the Trustees will continue to provide funding for these activities on an annual basis. Funding for general outreach is included in ongoing administrative costs and project-based outreach is funded through the specific restoration categories.

Restoration Alternatives

NEPA, CEQA, and CERCLA require consideration a range of possible restoration alternatives, including a natural recovery alternative with minimal management actions (i.e., a "No Action" alternative).

No Action Alternative

For the purposes of this Restoration Plan, the No Action Alternative assumes that the Trustees would not intervene to restore injured natural resources and compensate for lost services for any of the affected resources of the Montrose case. Instead, the Trustees would rely on natural processes for the gradual recovery of the injured natural resources and would only take the limited action of monitoring natural recovery.

The principal advantages of this approach are the ease of implementation and the absence of monetary costs. Although natural recovery may eventually occur for many of the injured resources, the recovery may take a significantly longer period of time than would recovery under an active restoration scenario. Also, the public would not be compensated for interim losses of natural resource services under the No Action Alternative. In addition, certain events, such as the extirpation of Bald Eagles and the introduction of exotic species in the Channel Islands, have led to consequences for other natural resources that may not be addressed under a natural recovery alternative. Because feasible restoration actions have been identified that would address the injuries and lost services of the case, the No Action Alternative as an overall approach across all resource categories does not fulfill the goals of this Restoration Plan. However, this does not preclude selection of natural recovery as an option for specific resources (e.g., Peregrine Falcons) within the overall framework of a comprehensive restoration alternative.

Preferred Alternatives

Fishing and Fish Habitat

Kelp Forest Restoration on the Palos Verdes Shelf: Hundreds of acres of fish habitat on the Palos Verdes Shelf are impaired by the presence of DDTs and PCBs in the sediments. These habitats produce fish and other marine species that contain high concentrations of these contaminants in their tissues, resulting in human health impacts as well as impacts to seabirds and other wildlife. This project category proposes to restore critical Palos Verdes Shelf fish habitat to compensate for interim losses in fish habitat

services. Palos Verdes Peninsula has historically supported large, productive, and stable kelp beds but current acreage does not compare to historical abundance. Kelp is still absent from some areas on the Palos Verdes Shelf, largely due to the extensive urchin barrens that have formed in these areas. Urchin barrens have remained a limiting factor to kelp growth in southern California partly due to the lack of sea urchin predators: sea otters, large sheephead, and large lobster. When urchin populations are left uncontrolled, they consume kelp holdfasts, which anchor kelp plants to the seafloor. Once the holdfasts have been consumed, the kelp plant floats away, resulting in large-scale deforestation. The primary restoration approach for this proposed project will be urchin relocation.

Subtidal Reef Restoration on the Palos Verdes Shelf: The goal of this project is to restore impaired subtidal rocky reef habitats that lie directly adjacent to the White Point Wastewater Outfalls. This project proposes to build artificial reef modules within the targeted restoration sites that will be designed to mimic the high relief reef habitats that have withstood the chronic impacts of sedimentation and turbidity and remain productive reefs to this day. In addition, these reefs will be designed to increase offshore transport of sediments, which will reduce sediment loads on reef habitat beyond the reef modules footprint.

Bald Eagles

Monitor Bald Eagles on the Channel Islands: Bald Eagles historically nested throughout the Channel Islands prior to releases of DDTs and PCBs, but by the early 1960s had disappeared from the islands (Kiff 1980). As part of the MSRP, the Trustees have been funding Bald Eagle restoration work since 2001 in hopes of establishing a self-sustaining population on the Channel Islands. Section 2 provides a summary of those efforts and results to date. In Phase 2, the Trustees propose to continue funding the Bald Eagle restoration program on the Channel Islands. Since 2006, the restoration program has shifted from reintroductions on Santa Cruz Island and artificial manipulation on Catalina Island to a comprehensive monitoring program across the Channel Islands. The recent successful hatchings on both the northern Channel Islands and Catalina Island are encouraging signs that a self-sustaining population is feasible. However, additional years of monitoring are necessary to determine if the population as a whole will be self-sustaining based on the eventual size and distribution of the breeding population, level of nesting success, and juvenile survival.

Peregrine falcons

Monitor the Recovery of Peregrine Falcons on the Channel Islands: The goal of this project is to monitor the recovery of Peregrine Falcons on the Channel Islands. Data collected in 1992 in the SCB demonstrated severe (>15 percent) eggshell thinning in Peregrine Falcons (Kiff 1994). Peregrine Falcons were extirpated from the Channel Islands by the mid-1950s, largely due to DDT contamination that led to eggshell thinning and reproductive failure (Kiff 2000). The proposed project is to conduct two additional comprehensive monitoring efforts on the Channel Islands during Phase 2. Active Peregrine Falcon territories will be monitored to determine breeding chronology, location of nest cliff and eyrie (nest ledge), egg laying and incubation periods, reproductive

success/failure, recycling attempts, and number of young produced. In order to assess any ongoing effects of DDT contamination, biologists will collect eggshells, eggshell fragments, and addled (dead or infertile) eggs for contaminant analysis. Prey remains will also be collected from active sites for identification. Biologists will also enhance suitable Peregrine Falcon nest ledges by removing sharp stones or adding suitable substrate that reduce the chance of eggs breaking in the nest.

Seabirds

The Trustees have evaluated a range of seabird restoration projects for Phase 2. The projects are divided into Tier 1 and Tier 2. The Tier 1 projects are priority for implementation during Phase 2. However, if restoration funds remain or if the Trustee Council is able to secure additional funds (through partnerships, grants, etc.), then the Tier 2 projects will be considered for implementation.

Tier 1 - Restore Alcids to Santa Barbara Island: The goal of this action is to re-establish an active Cassin's Auklet breeding population on Santa Barbara Island through social facilitation and habitat improvement, and to improve recruitment and productivity of Xantus's Murrelets through habitat restoration. Ashy Storm-Petrels may also be targeted for restoration on Santa Barbara Island during this next phase of the project.

Tier 1 - Restore Ashy Storm-Petrels on the Channel Islands: The goal of this action is to restore Ashy Storm-Petrel populations on the Channel Islands. Given the limited distribution and rarity of this species, the Ashy Storm-Petrel is a priority for restoration. Overall restoration actions that will be considered for the Ashy Storm-Petrel during Phase 2 include: 1) habitat improvement (e.g., stabilizing habitat areas against erosion), 2) social attraction, 3) placement of artificial nesting habitat, 4) annual monitoring at nesting sites, and 5) contaminant analysis of eggs. The goals of these activities are to: (1) increase recruitment, (2) increase reproductive output, (3) decrease egg and chick mortality by providing safe breeding habitat, and (4) establish or enhance additional Ashy Storm-Petrel breeding locations.

Tier 1 - Restore Seabirds to Scorpion Rock: The goal of this project is to restore habitat for the Cassin's Auklet, Ashy Storm-Petrel, and other nesting seabirds on Scorpion Rock located off Santa Cruz Island. This project is a continuation of the restoration work begun on Scorpion Rock in Phase 1. Restoration efforts undertaken during Phase 1 have resulted in the establishment of numerous native plants on the rock and the reduction in cover by non-native vegetation, principally iceplant. Despite aggressive efforts to remove iceplant on the rock, continued effort is needed to restore the site until the native plants can fully establish and outcompete the iceplant and other exotic vegetation. Habitat restoration work will include removing exotic vegetation and revegetating the rock with native plants. These plants will be propagated in a nursery from local seed at Scorpion Ranch on Santa Cruz Island. Restoration actions will also include enhancing the nest boxes used by the Cassin's Auklet and monitoring their reproductive success.

Tier 1 - Reduce Seabird Disturbance on the Channel Islands: The Channel Islands provide essential breeding and roosting habitat for seabirds in southern California. The goal of this project is to reduce human disturbance to both breeding and roosting seabirds on the Channel Islands. Seabirds that nest on cliffs, within seacaves, and on offshore rocks are highly susceptible to human disturbances. This project will build upon on-going seabird disturbance reduction efforts such as the Seabird Colony Protection Program in San Mateo and Monterey County by the Gulf of the Farallones National Marine Sanctuary (GFNMS). The Torch/Platform Irene Trustee Council is collaborating with the GFNMS to extend the program south into Santa Barbara County. This project will consider actions on the Channel Islands such as: placing signage, positioning buoys around sensitive areas, reducing light impacts, increasing public awareness (e.g., presentations), creating and distributing educational outreach materials, and enforcement. The education and outreach strategies will target identified audiences for each type of disturbance. Information will be provided about the sensitive nature of seabird colonies and the importance of maintaining a specified distance from breeding colonies and roost sites.

Tier 2 - Restore Seabirds to Baja California Pacific Islands: The Baja California Pacific Islands support a wide range of seabirds that nest in or use the SCB. Restoration efforts on these islands will target a suite of seabird species. In the 2005 RP, the project "Restore Seabirds to Baja California Pacific Islands" was identified as a Preferred Project and the Trustee Council approved of $1,042,000 to implement restoration on the Coronado and Todos Santos Islands in Phase 1. A Request for Proposals was released in May of 2011 in coordination with the Luckenbach Trustee Council that also had dedicated funds for work on the Baja California Pacific Islands. The remaining islands that were included in the 2005 RP, but not funded by either the Montrose or Luckenbach Councils are Guadalupe and San Benito Islands. In 2005, the last remaining goats were removed from Guadalupe Island and the restoration focus has now shifted to the eradication of the feral cat. During Phase 2, the Trustee Council will consider the following restoration actions on Guadalupe Island: feral cat eradication, social attraction, use of artificial nests and burrows, habitat enhancement, light shielding, and environmental education.

Tier 2 - Restore Seabirds to Prince Island: The goal of this project is to enhance seabird nesting habitat on Prince Island, located off of San Miguel Island within the Channel Islands National Park. Restoration activities could include: removal of non-native vegetation, stabilizing the soil, establishment of prickly pear and other native vegetation, and improvement and installation of nest boxes for Cassin's Auklets (and potentially Ashy Storm-Petrels). These activities aim to: (1) increase recruitment, (2) increase reproductive output, and (3) decrease egg and chick mortality by providing safe breeding habitat.

California Condors

The Trustees funded a data gap study in 2010-2011 related to California Condors and the potential exposure to Montrose DDE through contaminated marine mammal carcasses. The results of this study will be reported to the Trustees in 2011 and 2012. Based on the

results of the study and other relevant information, the Trustees may decide to fund further research or restoration activities for the California Condor, if appropriate.

Non-preferred Alternatives

The following projects were considered but were not selected as a Preferred Project at this time.

Palos Verdes Kelp Restoration – Outplanting Kelp

Subtidal Reef Restoration on Palos Verdes Shelf – Sediment Removal

Enhance California Brown Pelican Roost Habitat

Restore Seabirds to San Miguel Island

Reduce Impacts to California Brown Pelicans and Western Gulls from Fishery Offloading Operations

Reduce Seabird Mortality from Natural Petroleum Seeps

Release Additional Bald Eagles to the Channel Islands

Environmental Consequences

The NEPA and CEQA analysis of environmental consequences of the alternatives is presented in Section 5. The effects of the restoration will be largely beneficial given its fundamental purpose, and no significant impacts are anticipated. However, not all issues are ripe for final analysis given that certain actions such as construction of artificial reefs are only developed to a conceptual level at this stage.

Public Involvement

As mentioned above, the restoration planning process is guided by NEPA and CEQA regulations. These regulations require significant public involvement to support and direct the planning process. Public review is an integral component of the MSRP. This document is being widely disseminated, including individuals, organizations, and government agencies, and was posted to the program website.

The Trustees encourage public review and comment on this Draft RP/EA/IS. A 45-day comment period has been opened on the draft Restoration Plan which will end on December 19, 2011. Comments should be sent to:

Jennifer Boyce, Program Manager
Montrose Settlements Restoration Program
501 W. Ocean Blvd., Suite 4470
Long Beach, CA 90802
562-980-4086
msrp@noaa.gov

The Trustees are also conducting two public meetings in the affected locations to accept comments on the draft Restoration Plan. The locations and dates of the MSRP public meetings are as follows:

- **Wednesday, October 26, 2011:** 6:00 – 8:00 p.m.
  Channel Islands National Park
  Robert J. Lagomarsino Visitor Center Auditorium
  1901 Spinnaker Dr.
  Ventura, CA 93001

- **Wednesday, November 9, 2011:** 6:00-8:00 pm
  Point Vicente Interpretive Center
  31550 Palos Verdes Drive
  Rancho Palos Verdes, CA 90275

The Public is also encouraged to follow the MSRP by accessing the web site at www.montroserestoration.gov or by contacting program staff at the phone number or email above.

1.1. ADMINISTRATIVE RECORD

The Trustees have opened an Administrative Record (Record) for restoration activities. The Record includes documents relied on by the Trustees during the restoration planning process.

The Record is on file at the MSRP Long Beach office. Arrangements may be made to review the Record by contacting:

Jennifer Boyce
Program Manager
501 W. Ocean Blvd., Suite 4470
Long Beach, CA 90802
(562) 980-4086

Section 1. PURPOSE

1.1. PROPOSED ACTION

For more than five decades, DDTs and PCBs have contaminated the southern California marine environment. Although the major point source discharges of these chemicals were curtailed in the 1970s, large amounts of DDTs and PCBs persist in ocean water and sediments, and certain fish, birds, and other wildlife continue to accumulate DDTs and PCBs in harmful amounts. The state and federal governments investigated these problems and in 1990 filed an action in U.S. District Court against several of the parties responsible for the discharges of DDTs and PCBs.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund," Title 42 United States Code [U.S.C.] Section 9601 et seq.) provides a mechanism for addressing the nation's hazardous waste sites: states and the federal government may sue polluters for the cleanup and restoration of sites. CERCLA provides for the designation of "natural resource trustees," who are federal, state, or tribal authorities who represent the public interest in natural resources. These trustees may seek monetary damages from polluters for injury, destruction, or loss of natural resources resulting from releases of hazardous substances. These damages, which are distinct from cleanup costs, must be used by the natural resource trustees to "restore, replace, rehabilitate, or acquire the equivalent of" the natural resources that have been injured.

At the end of October 2000, after ten years of litigation, the federal and state governments and the remaining defendants signed the last of a series of settlements. The court approved the final settlement in March 2001. Under the terms of the four separate settlement agreements, Montrose Chemical Corporation and the other defendants[1] agreed to pay $140.2 million plus interest to the federal and state governments. Of this amount, the U.S. Environmental Protection Agency (EPA) and the California Department of Toxic Substances Control (DTSC) received a total of $66.25 million; the Natural Resource Trustees for the Montrose case (the Trustees)[2] received $63.95 million; and $10 million was set aside in a special account (swing money).[3] The EPA and DTSC are using their recovery funds to address the contaminated sediments offshore and for institutional controls. The Trustees have used $35 million to reimburse past damage assessment costs and are using the remainder plus the accumulated interest to plan and implement the

[1] The other defendants were Aventis CropScience USA, Inc. (formerly Rhone-Poulenc, Inc., and corporate successor to Stauffer Chemical Company); Chris-Craft Industries, Inc.; Atkemix Thirty-Seven, Inc.; CBS Corporation (formerly Westinghouse Electric Corp.); Potlatch Corporation; Simpson Paper Company; and County Sanitation District No. 2 of Los Angeles County, and 150+ local governmental entities.

[2] The Trustees for the Montrose case are the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service, the National Park Service, the California Department of Fish and Game, the California Department of Parks and Recreation, and the California State Lands Commission.

[3] The swing money goes to the Natural Resource Trustees in the event that EPA makes a decision not to select any in situ response or remedial action for the Palos Verdes Shelf.

actions necessary to restore the natural resources and their services[4] that were injured by the DDTs and PCBs.

Once the case was settled, the Trustees established the Montrose Settlements Restoration Program (MSRP) to plan and conduct the natural resource restoration work called for under the settlement agreements. In 2005, the Trustees published the Final Restoration Plan and Programmatic Environmental Assessment. This document allocated approximately half of the restoration funds for Phase 1 projects. To satisfy the requirements of the National Environmental Policy Act (NEPA) (42 U.S.C. Section 4321 et seq.) and the California Environmental Quality Act (CEQA) (Public Resources Code Sections 21000 et seq.), the Trustees are combining the restoration planning process provided for under CERCLA with the development of an Environmental Assessment (EA)/Initial Study (IS) that is tiered off of the 2005 Final Restoration Plan and Programmatic Environmental Impact Statement and Environmental Impact Report (hereafter referred to as 2005 RP). This RP is specifically analyzing the environmental impacts of proposed actions in Phase 2 of the Montrose Settlements Restoration Program. The proposed Phase 2 projects consist of restoration actions aimed at restoring resources impacted by the historic releases of DDTs and PCBs; specifically the projects address fish habitat, Bald Eagles, Peregrine Falcons, California Condors and seabirds. The specific impact analysis for the proposed Phase 2 projects can be found in Section 5. This RP represents the complete analysis for all the proposed projects except for two projects (see Section 5).

This document serves as the Phase 2 Restoration Plan and Environmental Assessment/Initial Study for the MSRP. This Restoration Plan has incorporated public and professional opinion to develop, evaluate, and select specific actions to restore injured resources and the lost services that the natural resources provide. Some actions will be initiated in the near-term. Other actions have been selected conditionally, because they must await the outcome of further study, testing, and public review prior to final selection and implementation. Thus the Restoration Plan has a range of selected restoration actions that together will form the basis of a comprehensive plan to restore the natural resources and services affected by the DDTs and PCBs at issue in this case. This document will guide the MSRP restoration effort as a whole, as well as the specific restoration actions selected for near-term implementation. This Restoration Plan establishes a process for adaptive decision-making for the remaining years that MSRP is implementing restoration actions.

1.1.1. Need for Action: DDT and PCB Contamination and Natural Resource Injuries in the Southern California Bight

From the late 1940s to the early 1970s, Los Angeles area industries discharged approximately 2,000 metric tons (about 2,200 U.S. tons) of DDTs and PCBs into the

[4] The "services" that a natural resource provides are the functions performed by a natural resource for the benefit of another natural resource and/or the public.

ocean waters off the southern California coast. Almost all of the DDTs released to the southern California marine environment originated from the Montrose Chemical Corporation (Montrose) manufacturing plant in Torrance, California. The Montrose plant discharged waste into the Los Angeles County Sanitation Districts (LACSD) sewer collection system. Wastewater treatment methods employed at that time did not capture the DDTs prior to their discharge through ocean outfall pipes that empty into the Pacific Ocean off of White Point on the Palos Verdes Shelf. Montrose also dumped DDT-contaminated waste from barges into deep ocean waters in the San Pedro Basin near and possibly en route to Santa Catalina Island. In addition, large quantities of PCBs from numerous sources throughout the Los Angeles Basin were released into ocean waters through the LACSD and City of Los Angeles wastewater outfalls and the regional storm drain systems. Although DDTs were also released into the Southern California Bight (SCB) through agricultural runoff and atmospheric deposition, these sources were found to be insignificant in comparison to the Montrose discharges.

In 1992 and 1993, surveys by the U.S. Geological Survey (Lee et al. 2002) found that more than 100 metric tons (110 U.S. tons) of DDTs and 10 metric tons (11 U.S. tons) of PCBs still remained in the sediments on the ocean bottom of the Palos Verdes Shelf. The highest concentrations of DDTs and PCBs were centered near the ends of the White Point outfalls, ranging between water depths of 40 to 80 meters (130 to 260 feet). Surveys conducted as part of the SCB 1994 Pilot Project (Schiff and Gossett 1998) showed that elevated concentrations of DDTs and PCBs in bottom sediments extended beyond the Palos Verdes Shelf into Santa Monica Bay and were also present in Los Angeles and Long Beach Harbors. The discharge and fate of these chemicals in the SCB is further described in Section 2 of the 2005 RP.

1.1.1.1. Geographic Target Area

The geographic focus of the Trustees' natural resource damage assessment and restoration efforts is the marine region bordering the Southern California mainland known as the SCB (Figure 1-1). For the purposes of the Restoration Plan, the SCB is defined as the area between Point Conception (north), Cabo Colonet, located south of Ensenada, Mexico (south), outside of the Cortez and Tanner Banks (west), and coastal watersheds (east). The SCB includes the northern and southern Channel Islands and surrounding waters. The SCB is a unique, discrete marine ecosystem. Although the SCB has been significantly affected by human activities, it has numerous environmental restoration, preservation, and enhancement opportunities. The SCB has been studied extensively at the ecosystem level, and a large body of data is available to evaluate environmental issues at both the local and the regional levels.

The portion of the SCB known as the Palos Verdes Shelf is located off the Palos Verdes peninsula, which separates Santa Monica Bay and San Pedro Bay. The Palos Verdes Shelf is generally defined as the offshore area extending from Point Vicente in the northwest to Point Fermin in the southeast. This sub-region contains the most significant deposits of DDTs and PCBs in sediments from historical discharges and is also the focus of Superfund cleanup activities by the EPA. However, DDTs and PCBs have come to be

distributed over a wide region (through movement of sediments, water, and uptake by mobile biological organisms) beyond the immediate area of the Palos Verdes Shelf. Also, as further described in Section 2 of the 2005 RP, the natural resource injuries and lost services caused by the DDTs and PCBs discharged by the defendants have occurred over a broader area of the SCB. For this reason, the SCB, rather than just the Palos Verdes Shelf, forms the primary geographic area of focus for the Trustees' natural resource restoration actions. In addition, because some affected animals migrate out of the SCB, some restoration projects may be considered outside the SCB.

1.1.1.2. Overview of Injuries to Natural Resources

Numerous independent studies have shown that DDTs and PCBs are still found at harmful levels in the marine life and birds of southern California (e.g., Hickey and Anderson 1968, Risebrough et al. 1971, Gress et al. 1973, Lee and Wiberg 2002). During the Montrose litigation, the Trustees carefully evaluated the evidence of injury to a number of resources. From this evaluation, the Trustees narrowed their claim at trial to focus on: (1) reproductive problems in Bald Eagles and Peregrine Falcons, and (2) PCB/DDT contamination of fish that resulted in a commercial fishing ban and fish consumption advisories. Although the Trustees recognized that DDTs had adversely affected a variety of other species in the past, notably California Brown Pelicans and Double-crested Cormorants, the priority was to focus the trial and the damages claim on those injuries that were continuing.

DDTs and PCBs degrade slowly in the environment and biomagnify (become more concentrated) in animals at higher levels in the food web. When feeding on prey contaminated with DDTs and PCBs, animals at the top of the food web, such as Bald Eagles and Peregrine

Figure 1-1. Geographic extent of the Southern California Bight.

Falcons, can accumulate injurious concentrations of these chemicals, even when levels in the water column appear to be very low. DDTs in particular cause these birds to produce eggs with shells that are so thin that they break when the adults sit on them during incubation, or allow the developing embryos to dry out. Many common sport fish caught from the ocean in the Los Angeles area (eight species or species groups) have levels of DDTs high enough that the State of California has issued fish consumption advisories, which are recommendations that people limit or avoid consumption of certain fish. A number of these sports fish also have concentrations of PCBs high enough to be of concern for human consumption. Consequently, the State of California has issued health advisories to limit or avoid consumption of these fish when caught at certain coastal locations in Los Angeles and Orange Counties. In addition, because of especially high levels of DDTs and PCBs in the white croaker, the State of California has imposed a recreational bag limit for this fish and has banned commercial fishing for white croaker in the vicinity of the Palos Verdes Shelf.

1.2. PURPOSE OF ACTION: RESTORE INJURED NATURAL RESOURCES AND LOST SERVICES

The Trustees propose to undertake actions aimed at restoring habitats, species and human uses injured by the historic releases of DDTs or PCBs. The Trustees further propose to undertake additional natural resource restoration actions to compensate the public for the lost natural resource services from December 1980 (when CERCLA provisions became effective) until the time when those injured resources have recovered to as close to baseline as possible given available restoration funds. These actions are referred to as compensatory restoration. One key criterion in the planning of compensatory restoration is that the restoration approaches benefit the same or similar natural resources as those that sustained injury as a result of the DDTs or PCBs releases addressed in the Montrose case. Restoration actions implemented under this plan would thereby accelerate recovery of the injured natural resources and the services they provide and provide compensation for the interim losses of resources and services.

To accomplish these restoration objectives, the Trustees will implement a series of actions directed at a range of natural resources and services. The settlement agreements call for the Trustees to use settlement funds to restore, replace, or acquire the equivalent of the injured natural resources and/or the services provided by such resources. The final consent decree for the Montrose case further specifies that "[t]he Trustees will use the damages for restoration of injured natural resources, including Bald Eagles, Peregrine Falcons and other marine birds, fish and the habitats upon which they depend, as well as providing for implementation of restoration projects intended to compensate the public for lost use of natural resources".

In keeping with the settlement agreements and the laws and regulations governing natural resource damage assessment and restoration, the Trustees will target the following natural resource restoration actions: (1) primary restoration of specific natural resources still being injured by DDTs and PCBs (i.e., the Bald Eagle population that historically inhabited the Channel Islands); (2) primary restoration/replacement of human use services that continue to be harmed (i.e., the public's ability to fish for clean fish where certain marine species are contaminated to levels that have prompted the State of California to issue consumption advisories); and (3) compensatory restoration for interim losses of resources and services, as well as the seabirds and fish and their habitats for which there is evidence of past harm from DDTs or PCBs.

As an overarching element of the restoration program, the Trustees will conduct active public outreach and education aimed at informing and engaging the public on ways to participate in, benefit from, and enhance the restoration of the environment injured by the DDTs and PCBs that were the subject of these settlements. The Trustees will also continue to undertake a limited amount of study and monitoring to ensure that the restoration actions ultimately taken represent an efficient and effective use of settlement funds and maximize benefits to natural resources and their services.

Section 2 of the 2005 RP provides the background and context necessary for understanding the natural resource restoration planning process for the MSRP.

1.3. COORDINATION WITH THE EPA

The Trustees and the EPA were co-plaintiffs in the Montrose case, and have continued their coordination since the final settlements, collaborating on and co-funding baseline studies and outreach activities. MSRP staff work closely with EPA to ensure consistency in their respective programs, and to avoid duplication of effort.

The EPA has a two-pronged approach to its Superfund responsibilities for the offshore areas of DDTs and PCBs stemming from the Montrose releases. The first is an "institutional controls" program that uses non-engineering measures to address the human health risks associated with consumption of contaminated fish from the Palos Verdes Shelf. Non-engineering measures include public outreach and education. The second is an "in situ" response program that is currently at the remedial investigation/feasibility study stage.

On September 30, 2009, the EPA signed an interim Record of Decision (ROD) that selected an initial remedial action for the PV Shelf of capping, monitored natural recovery, and institutional controls. The selected remedy is an interim action that allows an iterative approach to remediation. After assessing the feasibility and effectiveness of the interim remedy, additional actions may be planned in a final Record of Decision.

The selected remedy for this interim action to remediate the Palos Verdes Shelf includes:

- Placement of an in situ isolation cap over the erosive edge of the deposit that also contains the most highly contaminated sediments,
- Continuing and strengthening the existing Institutional Controls (ICs) program, and
- Monitoring natural recovery to achieve specific Remedial Action Objectives.

The ICs Program provides immediate protection to the public. The ICs program relies on partnerships with other federal, state, and local agencies as well as community-based organizations to reduce exposure to consumers from Palos Verdes Shelf contaminated fish. There are three major components to the ICs Program:

• Public Outreach and Education – to increase awareness and understanding of the existing fish consumption advisories and fishing restrictions,

• Monitoring – to evaluate and track contaminant concentrations in fish (primarily white croaker) caught at or near the site as well as those sold in retail fish markets, and

• Enforcement – based on the existing commercial and recreational restrictions on white croaker fishing established by the California Department of Fish and Game (CDFG).

For more information on EPA's activities related to the Palos Verdes Shelf, please visit www.pvsfish.org

1.4. PUBLIC INVOLVEMENT

As mentioned above, the restoration planning process is guided by NEPA and CEQA regulations. These regulations require significant public involvement to support and direct the planning process. Public review is an integral component of the MSRP. This document is being widely disseminated, including individuals, organizations, and government agencies, and was posted to the program website.

The Trustees encourage public review and comment on this Draft RP/EA/IS. A 45-day comment period has been opened on the draft Restoration Plan which will end on December 19, 2011. Comments should be sent to:

Jennifer Boyce, Program Manager
Montrose Settlements Restoration Program
501 W. Ocean Blvd., Suite 4470
Long Beach, CA 90802
562-980-4086
msrp@noaa.gov

The Trustees are also conducting two public meetings in the affected locations to accept comments on the draft Restoration Plan. The locations and dates of the MSRP public meetings are as follows:

- **Wednesday, October 26, 2011:** 6:00 – 8:00 p.m.
  Channel Islands National Park
  Robert J. Lagomarsino Visitor Center Auditorium
  1901 Spinnaker Dr.
  Ventura, CA 93001

- **Wednesday, November 9, 2011:** 6:00-8:00 pm
  Point Vicente Interpretive Center
  31550 Palos Verdes Drive
  Rancho Palos Verdes, CA 90275

The Public is also encouraged to follow the MSRP by accessing the web site at www.montroserestoration.gov or by contacting program staff at the phone number or email above.

1.5. ADMINISTRATIVE RECORD

The Trustees have opened an Administrative Record (Record) for restoration activities. The Record includes documents relied on by the Trustees during the restoration planning process.

The Record is on file at the MSRP Long Beach office. Arrangements may be made to review the Record by contacting:

Jennifer Boyce
Program Manager
501 W. Ocean Blvd., Suite 4470
Long Beach, CA 90802
(562) 980-4086

Section 2. BACKGROUND AND SUMMARY OF PHASE 1

2.1. BACKGROUND

In 2005, the Trustees released a Programmatic Restoration Plan and Environmental Impact Statement. This Plan allocated $25 million of the settlement funds for Phase 1 among the four restoration categories: fishing and fish habitat, Bald Eagles, Peregrine Falcons, and seabirds. Considering the likely costs of the actions and various uncertainties, the Trustees allocated the initial $25 million on an approximately equal basis between fishing/fish habitat restoration and bird restoration as follows:

- $12 million for fishing and fish habitat restoration actions;
- $13 million for Bald Eagle, Peregrine Falcon, and seabird restoration actions.

Based on the detailed evaluations performed in 2005 RP (see Appendices A–D of the 2005 RP), the Trustees determined that the following subset of actions most effectively addressed the continuing injuries and lost services of the Montrose case and compensated for past injuries. These actions, which constituted the Trustees' preferred alternative included projects to restore fishing and fish habitat, Bald Eagles, and seabirds in the SCB, and a project to monitor the recovery of Peregrine Falcons in the Channel Islands. A summary of the specific projects, budgets, and accomplishments follows below.

The MSRP consists of the following dedicated staff members: Program Manager, Fish Biologist, Bird Biologist, Seabird Biologists, Outreach Coordinator, and Administrative Assistant. The Trustee Council, consisting of a Primary and Alternate Voting Member for each Agency, oversees the Program Staff and implementation of restoration projects. To support the program structure, the program incurs yearly operating costs. Program staff costs are primarily associated with project planning and implementation. In the 2005 RP, the Trustees stated that ongoing restoration costs are comparable to the interest the settlement funds accrue on a yearly basis. Based on a review of the status of the funds in the DOI NRDA Fund this assumption has remained accurate.

SUMMARY OF PHASE 1 PROJECTS

2.1.1. Fishing and Fish Habitat

2.1.1.1. Restoration Planning Studies

GOAL: The Trustees conducted several studies to support restoration planning for fish and fish habitat projects. These data gap studies are outlined in detail below.

ANGLER SURVEY

In 2002 and 2003, the MSRP and EPA interviewed 2,441 shore-based anglers at numerous sites from Malibu to Newport Beach to gather information on fishing and fish consumption practices from people who fish in coastal waters in Los Angeles and Orange

Counties. The resulting data filled information gaps that have not been the focus of other recreational fishing studies, such as:

- Ethnic and language issues, current awareness of fishing advisories and how anglers obtain that awareness;
- Catch preferences, parts of the fish consumed, and different ways people prepare fish for eating;
- Fishing preferences (types of fish and locations) that may assist in planning restoration projects to increase the availability of opportunities to fish for less contaminated fish.

A final report on the angler survey was issued in 2004 and can be found at http://www.darrp.noaa.gov/southwest/montrose/pdf/mon-dg2004b.PDF

FISH CONTAMINATION SURVEY

During 2002 to 2004, MSRP and EPA collected over 3,000 fish from 28 locations in southern California coastal waters, representing a wide variety of fish often caught by local recreational and commercial anglers. Approximately 900 fish were analyzed for DDTs, PCBs, dieldrin, chlordane, and mercury, to provide a comprehensive assessment of current levels of contamination across the different species and locations.

These data have been used by the Trustees to plan restoration projects to restore fishing opportunities that were lost due to fish consumption advisories, and to enhance the effectiveness of public outreach and education programs. In addition, the Office of Environmental Health Hazard Assessment (OEHHA) used these data to update fish consumption advisories for sport-caught fish from Ventura Harbor to San Mateo Point that were released in June 2009 (http://www.oehha.ca.gov/fish/so_cal/socal061709.html). The California Department of Fish and Game and OEHHA will also use these data to evaluate existing recreational bag limits for white croaker, and the commercial catch ban area for white croaker that exists off the Palos Verdes Shelf. Finally, EPA is using the data to evaluate current and future human health and ecological risks which play an important role in both the development of potential cleanup actions for the Palos Verdes Shelf as well as the implementation of the Institutional Controls program. A full report was issued about this study in July 2007 and can be found at http://www.darrp.noaa.gov/southwest/montrose/pdf/msrpEpaFishStudyReport.pdf.

PALOS VERDES SHELF FISH HABITAT USE AND MOVEMENT STUDY

Another partnership between the EPA and MSRP is the collaborative Fish Habitat and Movement Study. As part of the study, scientists from the California State University Long Beach are tracking the movement patterns of White Croaker and Barred Sand Bass on the Palos Verdes Shelf and between the Palos Verdes Shelf and Los Angeles Harbor. One of the goals of this project is to identify the home range of each species and to

determine if that range encompasses the contaminated areas of Palos Verdes. White Croaker and Barred Sand Bass are bottom-dwelling fish for which there are "Do Not Consume" advisories between the Santa Monica Pier and Seal Beach Pier due to PCB and DDT contamination in these two species. EPA is providing funds for the acoustic arrays and fish tagging activities. MSRP has provided technical guidance throughout the project and partial funding. Understanding the movement patterns of these fish will provide regulatory agencies with the scientific information they need to make informed decisions about updates to human consumption advisories. It will also enable the EPA to design remedial actions for sediment capping based on the amount of time that White Croaker spend in highly contaminated areas.

An extensive array of acoustic telemetry devices are being used by biologists to obtain detailed information about the geographic location of individual fish, the time spent in each location, the direction of their movement, distances traveled, and even travel speeds. Acoustic receivers are deployed in several arrays across the Palos Verdes Shelf. Fish captured on the shelf are fitted with acoustic transmitters and released back into the water. The receivers record data from the transmitters each time a fish swims within its range. Combining these data from an array of multiple receivers allows the biologists to track the movement patterns of individual fish. Biologists have also partnered with local charter fishing boats to carry and deploy receivers while on site at favored fishing locations such as the flats of Santa Monica and Huntington Beach.

2.1.1.2. Artificial Reef and Fishing Site Enhancements

GOAL:

The goal of this project is to restore and/or compensate for fishing opportunities that were lost due to fish contamination and subsequent consumption advisories. The fish consumption advisories impacted the sport angling community in Los Angeles and Orange County by limiting consumption of several fish species that were contaminated with harmful levels of DDT and PCBs. The fish species listed in the consumption advisories (Table 3.4-1 in 2005 RP) are all common targets for recreational and subsistence anglers within southern California. Ocean piers are a popular location for shore-based fishing due to the easy access to ocean fishing and because a California State fishing license is not required to fish from most California fishing piers. Seafloor composition within the vicinity of the piers in the SCB is typically sandy bottom and/or soft sediment, a habitat that is characterized by low species diversity, often dominated by species that are limited by fish consumption advisories (e.g., White Croaker). With a limited choice of fishing locations (i.e., piers) and the nature of the substrate surrounding the piers, shore-based anglers in the Los Angeles County area have limited access to fish that can be safely consumed at even a moderate level (e.g., 1-2 meals a week).

DESCRIPTION:

The Trustees approach to this project is to create rocky reef habitat adjacent to fishing piers that will, to some degree, displace contaminated species such as White Croaker, and

support a greater number of fish species, many of which can be consumed safely at a moderate level (Figure 2-1). Rocky reefs are known to support a diverse variety of fish and tend to include species that are not restricted by consumption advisories. White Croaker, one of the most contaminated fish species listed on the advisories, tends to avoid rocky reef habitats. Enhancing the habitat along piers through the use of artificial reefs will not only give anglers more options for fish consumption, but it will make it more difficult to catch fish that are highly contaminated.

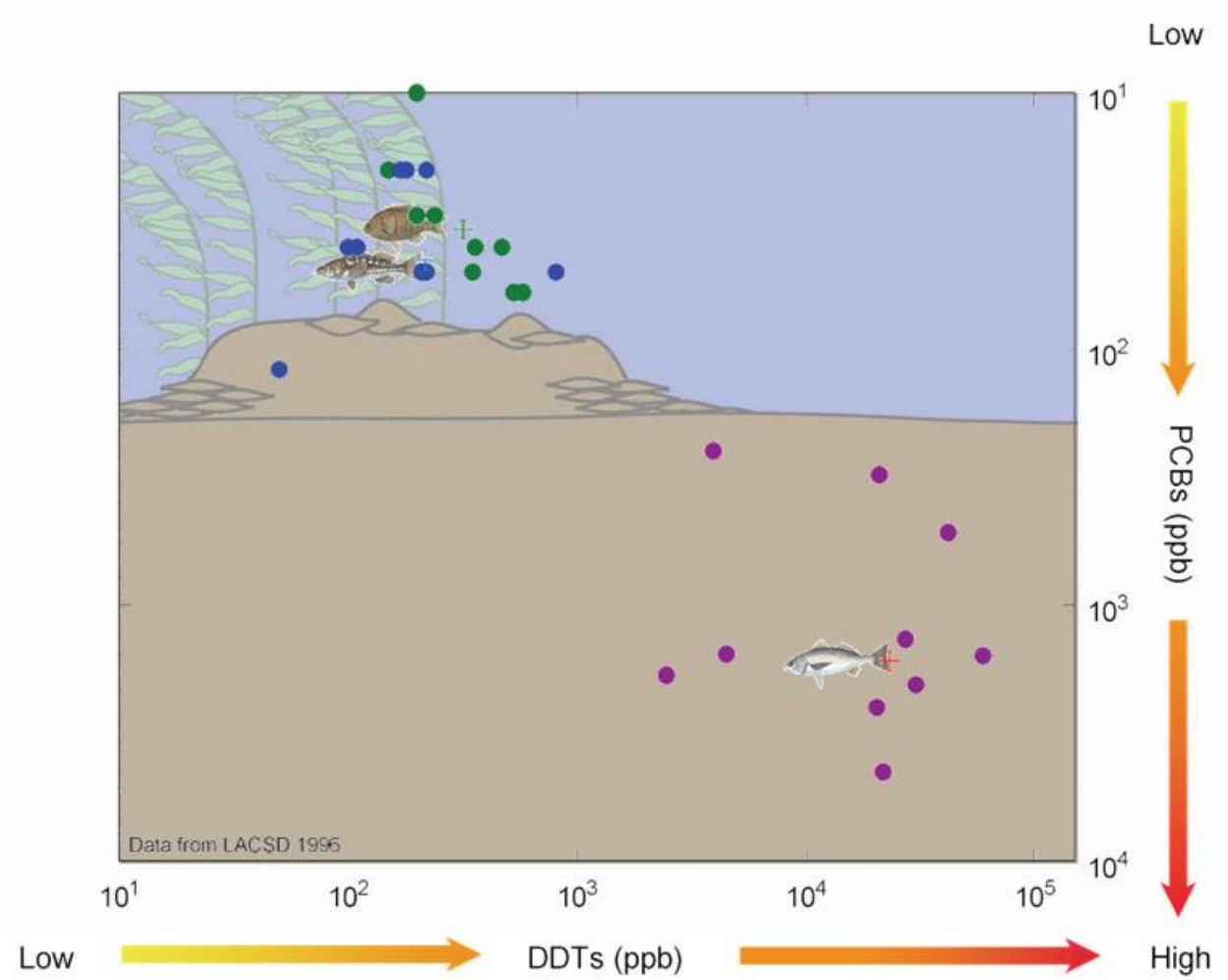

Figure 2-1. Illustration depicting the highly contaminated white croaker residing in soft sediments vs. the less contaminated reef associated species. Contamination levels are shown in purple dots for the white croaker, blue dots for Kelp Bass, and green dots for Black Perch (LACSD 1996). Concentrations of PCBs are indicated on the vertical axis (lowest values on top) and concentrations of DDTs are indicated on the horizontal axis (lowest value to the left).

ACCOMPLISHMENTS:

The Trustees considered every pier along the shoreline between Santa Monica and Huntington Beach for artificial reef construction. The approach in the 2005 RP was to proceed incrementally with the goal of constructing two or three artificial reefs adjacent to fishing piers. Thus, three fishing piers within the region were selected for further evaluation for artificial reef sites: Cabrillo Pier, Belmont Pier, and Redondo Pier. Cabrillo and Belmont Piers had the appropriate angler demographics (high fishing pressure and a surrounding low income population), met the criteria for being in close proximity to the fish consumption advisory "hot zone", and lacked exposure to significant wave energy. Although the Redondo Pier is within the advisory hot zone and is commonly used by sport and subsistence anglers, the area is exposed to high wave energy, which would complicate the design and construction of an artificial reef. As a result, the Redondo Pier was not considered for the initial artificial reef effort. The Trustees therefore selected the Cabrillo and Belmont Piers for more detailed evaluation.

Cabrillo Pier

The proposed site for the Cabrillo Artificial Reef was located in the marine waters adjacent to the Cabrillo Fishing Pier, south of Cabrillo Beach in the Port of Los Angeles (POLA), California. In 2007, a review of all literature pertaining to the proposed site (south of the pier) was reviewed and a several alternative designs were completed (e.g., Figure 2-2). In 2008, a survey of the sediments conditions determined that the proposed reef site was largely composed of unconsolidated fine sediments that would not support the weight of the artificial reef structure. Two additional designs for a fishing reef located to the north of western breakwall were also prepared, but both of these designs were dependent on the construction of a new fishing pier at a cost of $10-15 million. If funds become available to support the construction of this pier, the Trustees will revisit this project alternative.

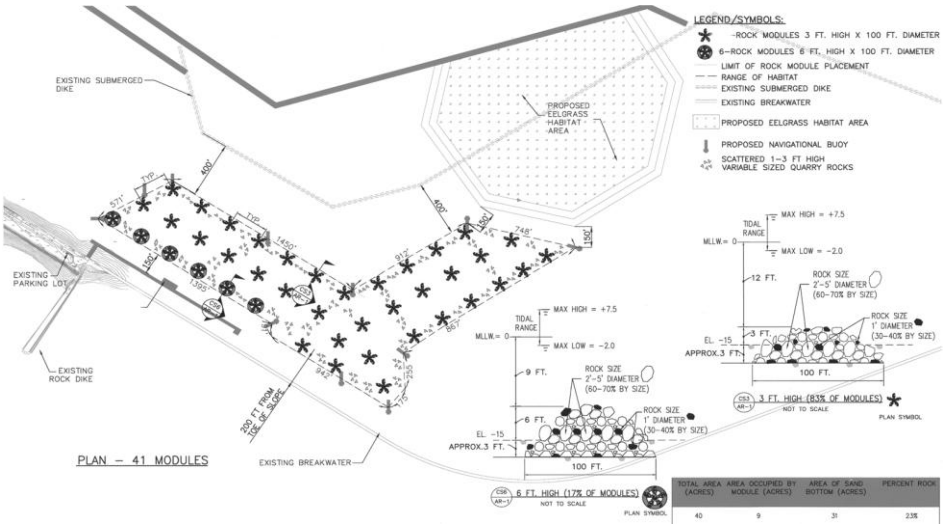

Figure 2-2. Conceptual reef design for the Cabrillo Pier Alternative

Belmont Pier

Site Assessment

The Belmont Pier is located near the Los Alamitos Jetty in Long Beach, California (Figure 2-3). The proposed site for the Belmont Pier Artificial Reef (BPAR) is located in the marine waters adjacent to and immediately west of the Belmont Fishing Pier. In 2009, a feasibility study (URS 2010) was conducted to confirm that the geotechnical, bathymetric, oceanographic, biological, and socioeconomic conditions at the Belmont site were conducive to supporting the construction and operation of an artificial reef. Seafloor sediments at the proposed site were found to be highly consolidated and capable of supporting the weight of an artificial reef with minimal settling (URS 2010). In addition, fishing activity from the Belmont Pier is high and it is within the area designated as "Do-Not-Consume" for several species including White Croaker and biological surveys of the region indicate that fish species that are safe to consume at moderate level (e.g., California Halibut, Surfperches, Kelp Bass) would be attracted to rocky habitats adjacent to the pier.

Figure 2-3. Map showing the location of Belmont Pier, the proposed location for the Belmont Pier Artificial Reef (BPAR).

Reef Design

The design for the BPAR is nearly complete (Figure 2-4), pending the completion of the environmental impact review under NEPA and CEQA, which are currently in draft. As currently proposed, the BPAR will be located within a 311,025 ft^2 (7.15 acres) roughly rectangular area of sedimentary seafloor immediately west and southwest (offshore) of the Belmont Fishing Pier. Within that area, the BPAR will comprise seven reef modules which will be constructed with rocks that range from 1.3 ft to approximately 2.5 ft in diameter. Approximately 117,000 ft^2 (2.7 acres) or 38 percent of the existing seafloor within the reef construction project site will be covered by rock. Each of the three square reef modules will cover 10,000 ft^2 and each for the four rectangular reef modules will cover between 19,000 and 20,000 ft^2 of sedimentary seafloor. Each of the 1 to 3 ft-high rock piles will cover between 25 and 75 ft^2.

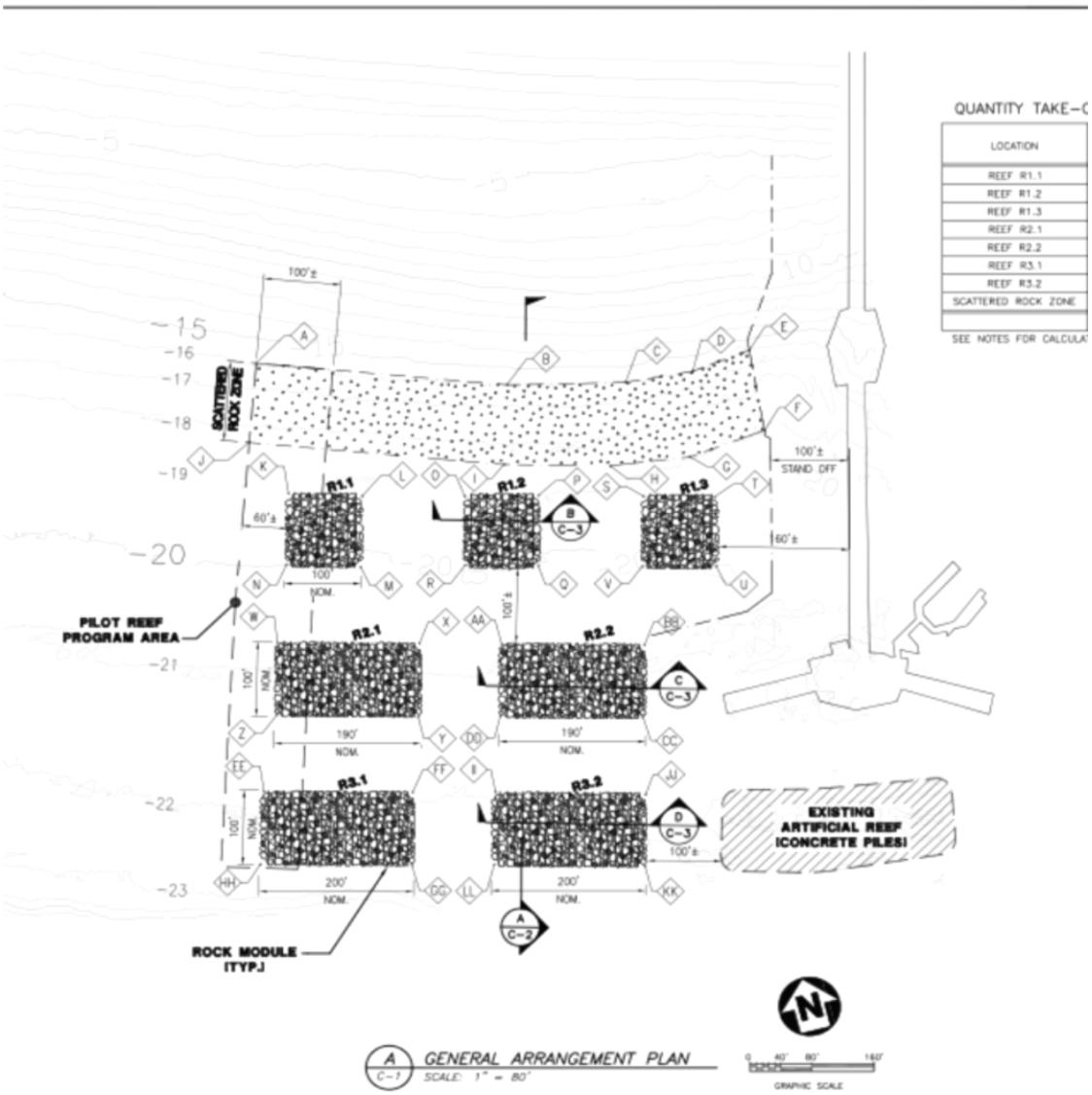

Figure 2-4. Detail of the Belmont Pier Artificial Reef design showing the reef module layout.

Timeline

As currently proposed, the BPAR will be built in two phases. First, a pilot reef will be constructed within the project area, a 550 ft.-long (shore-normal) by 100 ft.-wide (shore-parallel) area along the western boundary of the reef construction area (see Figure 2-4). Based on the results of the BPAR pilot reef, minor modifications to the proposed construction method may be instituted. Following approval of the pilot reef construction by the MSRP project manager, the remainder of the BPAR will be completed.

Environmental Documentation and Permitting

NOAA is the lead federal agency for environmental analysis under NEPA. The City of Long Beach is the lead State Agency for environmental analysis under CEQA and will facilitate local outreach for the project.

In 2010, contractors initiated physical and biological surveys of the proposed reef site that are required for environmental review and permitting. As described in the scope of work (dated February 2, 2009), contractors are preparing a combined Environmental Assessment (EA) under NEPA and an Initial Study (IS) under CEQA. The release of a draft NEPA/CEQA document to the public, along with a public meeting, is expected to take place by early 2012. Acquisition of all required permits and finalizing the required documents is scheduled to be complete in early 2012 and construction should commence in the winter of 2012.

Monitoring

A small artificial reef was constructed near the end of the Belmont Pier in the mid 1950s by the California Department of Fish and Game. This reef remains in place and will serve as an effective control site for evaluating the development of the BPAR after construction. Surveys of the fish and invertebrate communities that developed on the constructed reef will be conducted for three years post-construction.

BUDGET:

In the 2005 RP, approximately $6 million was allocated for projects within this category. Reef design and permitting of the BPAR reef will cost approximately $300,000 and construction is estimated to cost approximately $2.5 million.

2.1.1.3. Provide Public Information to Restore Lost Fishing Services

GOAL: The goal of this action was to build on the public outreach and education work initiated by the EPA's ICs Program. The primary outreach mechanism established by the USEPA is the Fish Contamination Education Collaborative (FCEC). The FCEC is a federal, state, and local partnership project that addresses public exposure to contaminated fish in the southern California coastal area. The FCEC focuses on educating the public about the human health hazards associated with DDT and PCB contamination in fish. In particular, the FCEC provides information to help people reduce their exposures to DDTs and PCBs from the fish they eat.

The Trustees augmented this ongoing effort by providing information to anglers that allows them to make sound decisions about where and for which species to fish, thereby helping anglers consume locally-caught fish in a manner that minimizes health risk. The Trustees developed outreach materials that establish the link between the ecology and life history of a particular species and its tendency to bioaccumulate contaminants. This information enables anglers to make informed choices about where, when, and for which species to fish and in doing so will minimize anglers' exposure to contaminants,

regardless of where they fish. In particular, the action identified the fish species that are free of consumption advisories and the locations where anglers can catch them. Thus, this action directly and effectively addressed the human use fishing losses associated with the Montrose case.

DESCRIPTION:

The Trustees focused on small educational components of this project but for larger-scale implementation decided to wait for the release of updated fish consumption advisories. The fish consumption advisories were updated and released to the public in June 2009.

ACCOMPLISHMENTS:

The Trustees are still implementing this project with the development of a recent fishing education plan. Several outreach products and actions have resulted from this project to date. These are presented and discussed below.

Outreach Products:

"What's the Catch?" Comic Book

An earlier version of this comic book was developed before the 2005 RP was released. The comic book went through some updates and was translated into Spanish and Mandarin during Phase 1. Additional language translations may be added in the future. Currently, 10,000 copies of the comic book are distributed annually through 15 different local education centers, education programs, aquaria, and events. An updated version of the comic book that includes new fishing advisory information will be considered in the future.

Southern California Fish Identification Card

An earlier version of the fish identification card was developed before the 2005 RP was released. During Phase 1, this card received several revisions including additional fish images, the addition of key sportfishing regulations, and updates to the general information on the back of the card. Currently, 10,000 copies of the fish identification card are distributed annually through 15 different local education centers, education programs, aquaria, and events.

Fish Webcam in Huntington Beach Wetlands

Following restoration of the Huntington Beach Wetlands, an underwater Fish Webcam was placed in the wetlands to educate the public about the value of wetlands as fish habitat. The Fish Webcam is an underwater camera that provides 360-degree live views of the underwater world. The Trustees hope to use this underwater camera as an introduction to the connection between wetlands and the many marine species that inhabit these ecosystems. Wetlands provide shelter and food to many juvenile fish species before they move out to the open ocean. The Fish Webcam is currently available on the internet

and accessible on ustreamtv.com and from the MSRP Facebook page. A live feed of the camera is currently available inside the Wetlands & Wildlife Nature Center which is located next to the Huntington Beach Wetlands.

Interactive Kiosk

The Trustees approved the development of four interactive kiosk exhibits (Figure 2-5) that are displayed in nature centers and aquaria throughout the southern California area. The kiosk content focuses on three of the four main areas of restoration (Bald Eagles, seabirds, and fishing). Each of the restoration themes will be associated with a 3-D animation scenario using Augmented Reality software technology and a short video about a specific restoration project. Participants pick up a brochure about each restoration area which initiates a 3-D animation scenario. As of 2011, there were three kiosks installed at different locations in southern California, including SEA Lab in Redondo Beach, Cabrillo Marine Aquarium in San Pedro, and at the California Science Center in Los Angeles.

Figure 2-5. Family uses MSRP kiosk located at the California Science Center (Photo credit: G. Dorr, NOAA).

Fishing Outreach Mini-Grants

In 2007, 2009, and 2011, the Trustees issued a Request for Proposals for outreach/educational programs that focused on teaching young people safe fishing practices. The educational programs utilize the comic book and have interactive components to their programs. Two to three projects were selected each year for funding. The programs/organizations that have received outreach mini-grant awards in Phase 1 are Cabrillo Marine Aquarium, SEA Lab, Asian Youth Center, Friends of Colorado Lagoon, City of Los Angeles, and United Anglers of Southern California. Below are descriptions of the outreach programs. MSRP will continue to provide funding through a mini-grant program on an annual or biennial basis.

"What's in your Catch?" - Implementing Practices for Safe Fish Consumption- Cabrillo Marine Aquarium (2007)

The Cabrillo Marine Aquarium (CMA) created a Fish Contamination Education Curriculum that is directed towards 4^{th}-6^{th} grades and incorporates the concepts of the comic book "What's The Catch?" Topics covered include history of DDT and PCB contamination, environmental impacts from contamination, fish species identification and safe preparation of fish for human consumption. CMA held teacher workshops that focus

on using the curriculum as well as community fishing workshops that teach families how to fish safely.

"Fun Fishing Program at SEA Lab"- Los Angeles Conservation Corps (2007/2009)

Figure 2-6. Conservation corpsmembers learning about fish identification on the Redondo Beach pier (Photo Credit: B. Scheiwe, SEA Lab).

Los Angeles Conservation Corps' (LACC) SEA Lab located is educating Los Angeles Corpsmembers (Figure 2-6) on the benefits of recreational fishing and the alternatives to consuming contaminated fish species. Five hundred Corpsmembers completed the program in 2007 and an additional 300 members will participate in 2011. Participants learn fish identification, engage in pier fishing, demonstrate proper handling and releasing of fish, and practice proper preparation of fish for consumption. SEA Lab developed an interactive outreach program for public school classrooms with a goal of reaching 600 students by the end of the program. This program involves students learning about fish contamination issues through the use of interactive games and activities. SEA Lab was awarded an outreach grant for two consecutive funding cycles. In 2011, the Trustees decided to fund this program separately from the Fishing Outreach mini-grant program and will review the program results annually for the possibility of continued funding.

"Your Day on the Water in Southern California" – United Anglers of Southern California (2009)

United Anglers of Southern California (UASC) teamed up with the CMA to hold a pier fishing event for children and their families. UASC developed an educational booklet that has information about fish, marine mammals, and seabirds that the children might see while fishing. The booklet also contains information about conservation issues for certain species and consumption alerts for fish species that are contaminated with harmful chemicals. The booklet was distributed to the children at the pier fishing event. UASC will also incorporate the booklet into their existing outreach program which includes boat fishing trips for classroom students and teachers.

"Fish for Health Project"- Asian Youth Center (2009)

The Asian Youth Center (AYC) located in the San Gabriel Valley area of Los Angeles County has been providing social services and health advice for the large Asian population in this area since 1989. Their goal for this project is to hold workshops for children in their afterschool program about safe fishing practices and fish contamination.

AYC translated the "What's the Catch" comic book and the "MSRP Fish Identification" card into Mandarin. These two products will be used for the workshops and to hand out at large outreach events. AYC is also planning on educating fishing tackle shop owners and their customers about fish contamination issues and safe fishing practices through media outreach and educating local fishing and tackle shops.

"Fishing Outreach Program"-Friends of Colorado Lagoon (2011)

The Friends of Colorado Lagoon (FOCL) located in Long Beach, California, provide wetland and nature education to the public visiting the Colorado Lagoon either recreationally in summer or on a field trip during the school year. FOCL is incorporating MSRP outreach materials and messages into their existing educational program. FOCL also developed new activities for their program based on MSRP products and messages. The goal is to reach an estimated 1,800 people during the summer and a large number of classes during the school year. Activities that FOCL will be engaging in for this program are beach seining for fish identification, comic book group reading, outreach to fishermen visiting the Lagoon, and demonstrating proper fish filleting techniques.

"Cabrillo Beach Pier Fishing Program"-City of Los Angeles (2011)

For over two decades, the City of Los Angeles, Department of Recreation and Parks, administered the Cabrillo Beach Pier Fishing Program in San Pedro, California. Budget constraints in 2010 caused this program to be canceled. In 2011, MSRP was able to provide funding for this program to continue on a limited basis. In 2011, youth participating in the summer camp run by the Department of Recreation and Parks, will be transported to the Cabrillo Pier for a three-hour fishing session which includes a one-hour educational program about safe fishing practices. Youth will also receive instructions on how to bait a hook, cast a fishing line, as well as catch and release techniques.

"Seal Beach Fishing Derby on the Pier"-United Anglers of Southern California (2011)

The United Anglers of Southern California (UASC) has a long track record of promoting fishing among families and youth in southern California. In 2011, UASC is partnering with the Rotary Club of Los Alamitos/Seal Beach to provide additional outreach support to their annual youth fishing derby. MSRP messages and materials will be disseminated to youth participants at the event. UASC is also providing give-aways, event coordination, and media relations for the event.

Partnership with FCEC

The Trustees are active partners with FCEC, participating in all strategic planning and partner meetings to date. During the fish consumption advisory updates, the Trustees provided statistical support for interpretation of the data that was used to develop the updated advisories. Following the release of the advisories to the public, the Trustees actively participated in a Messaging Work Group to provide feedback on the design and messages of a new angler tip card. The tip card was printed in early 2010 and is currently

being distributed. The group also completed a plan for pier fishing signs that are beginning to be posted throughout the contamination area.

BUDGET:

In the 2005 RP, approximately $1 million was allocated for Fishing Restoration Public Information projects. Approximately $500,000 has been spent in this category.

2.1.1.4. Wetland Restoration

GOAL:

The goal of this project category was to restore coastal wetlands that are important nursery and foraging habitat for commonly caught coastal marine fish (e.g., California Halibut, Barred Sand Bass, Topsmelt). Wetland restoration projects can be large in scale and very expensive. Therefore, it was determined that MSRP funds would augment existing projects that supported full-tidal restoration. Full-tidal exchange is a critical element for supporting nursery habitat of coastal marine fishes.

DESCRIPTION:

The Trustees' approach to this project category was to select wetland restoration projects that restored full-tidal wetlands to their historic state. In 2006, the Trustees released an Request For Proposals to solicit wetland restoration projects that would achieve their goals. Two projects were selected for funding based on the stated goals of the 2005 RP for wetland restoration. Funding was provided to the Huntington Beach Wetlands Conservancy (HBWC) for restoration of the Huntington Beach Wetlands and to the California State Lands Commission for dredging of the ocean inlet to the Bolsa Chica Wetlands (also located in Huntington Beach). Both projects are described in detail in the Accomplishments section below.

ACCOMPLISHMENTS

Huntington Beach Wetland Restoration

The HBWC is a non-profit organization that formed with the goal of restoring the Huntington Beach Wetlands, Orange County, California, back to historic conditions. Restoration of Huntington Beach Wetlands included funding to dredge Talbert Marsh, maintaining optimum tidal flow into the wetlands, and funding to support the restoration of tidal flow into Brookhurst Marsh. Talbert Marsh comprises 27 acres of wetland habitat and is located closest to the ocean inlet. It was originally restored in 1987 but since that time sand shoals formed in the marsh, restricting tidal flow (Figure 2-7). The Trustee-funded dredging of Talbert Marsh, conducted in 2008, removed these shoals, and restored full-tidal exchange to the Huntington Beach Wetlands. The ocean inlet channel connecting the marsh with the ocean was also cleared of sand to further enhance tidal exchange. This set the stage for the restoration of the two upstream components of the system: Brookhurst Marsh (Figure 2-8), partially funded by the Trustees; and Magnolia

Marsh, funded in 2010 by NOAA through the American Recovery and Reinvestment Act of 2009. Since the restoration of the two upstream parcels, Talbert Marsh now experiences significantly increased tidal prism flowing through it, which serves to increase tidal flushing and thus maintains the channel.

Figure 2-7. Huntington Beach wetlands prior to any restoration activities (left panel) showing a diverted inlet channel as well as a large sand shoal in Talbert Marsh Post-restoration image (right panel) shows open inlet and restored salt marsh habitat (Google Earth 2011).

Restoration of Brookhurst Marsh in 2009 included dredging of historical channels and reconnecting the ocean to the marshland by removing a levee along the flood channel. Brookhurst Marsh was separated from the ocean for more than 100 years due to the development of this flood channel. After the restoration in 2009, Brookhurst Marsh was completely transformed from a non-tidal (isolated from the tides) marsh to a fully tidal wetland (Figure 2-8). The site now experiences regular tidal inundation and flushing, and is well on its way to becoming a fully functioning salt marsh, as it was historically. Restoring tidal flow to Brookhurst Marsh opened up 67 acres of habitat for many species of seabirds and fish. New channels exist and planting of marsh plants has resulted in a significant increase in the quality of the habitat.

Figure 2-8. Huntington Beach Wetlands showing the effects of restoration in Brookhurst Marsh before (top panel) and after (bottom panel) restoration (Photo Credit: HBWC).

The Trustees funds were used to fill a funding gap by augmenting existing leverage obtained by HBWC. Funding for this project also came from the City of Huntington Beach, Orange County, AES Corporation, Wildlife Conservation Board, USFWS, and California State Coastal Conservancy. Another important aspect of this project was that all of the land had been previously acquired by HBWC in 1989 with help from some of the partners listed.

As part of the Huntington Beach Wetlands restoration project, the Trustees were interested in evaluating the rate of recovery of the wetland's function as fish foraging and nursery habitat. In collaboration with the California State University of Long Beach, the Trustees funded a monitoring study that investigated the use of the wetlands by coastal marine fishes. This work focused on California Halibut because of the high economic and commercial value of this species, and because the species uses coastal wetlands as nursery habitat during the juvenile stage and as foraging habitat when they are adults. The factors studied include abundance, short-term and long-term movements, diet analysis, and environmental variability. This work also collected general information about the diversity and species composition of fish, invertebrates and plants in the recovering wetlands. In addition, a GIS map of all the data collected will be generated to visualize trends in habitat use. These studies will generate indicators of wetland recovery. Distribution studies in both Brookhurst and Talbert Marshes revealed significantly different fish communities between, but not within, marshes (Figure 2-9). These differences were largely driven by higher abundances of Topsmelt and Northern Anchovies in the newly restored Brookhurst Marsh and Killifish and Diamond Turbot in the mature Talbert Marsh. California Halibut, Shiner Surfperch and Pipefish tended to be associated with seagrass habitat in the outer portions of both marshes.

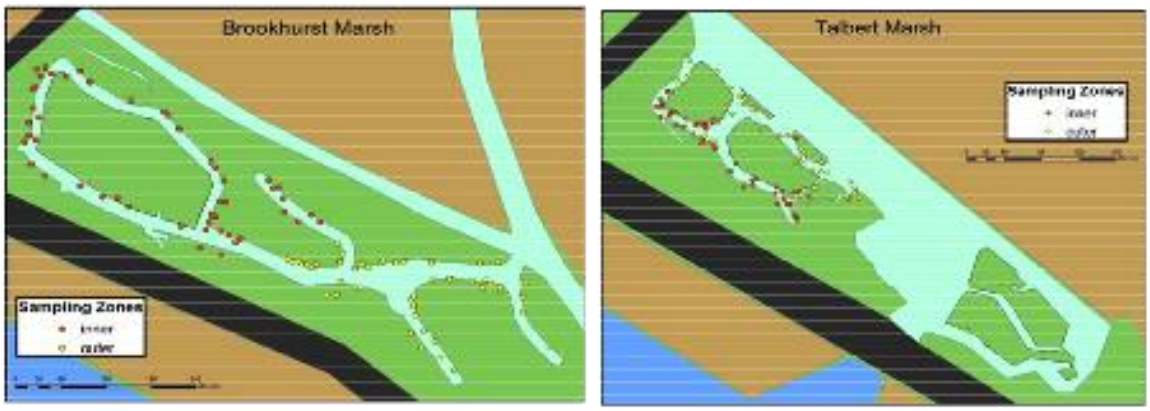

Figure 2-9. Locations of monthly fish abundance surveys with beach seines in Brookhurst and Talbert Marshes (red circles represent "inner" marsh locations, whereas yellow circles represent "outer" marsh locations, Allen et al. unpublished data).

California Halibut were externally fitted with acoustic transmitters and tracked to describe their home range and to determine fine-scale movement patterns. Tracking of short-term movement patterns (active tracking) in nine larger California Halibut revealed that these fish spend most of their time associated with seagrass in the main channel (Figure 2-10). In addition, individuals that were transplanted to the inner part of Brookhurst Marsh both made their way back to the channel within 15 hours, where they subsequently stayed.

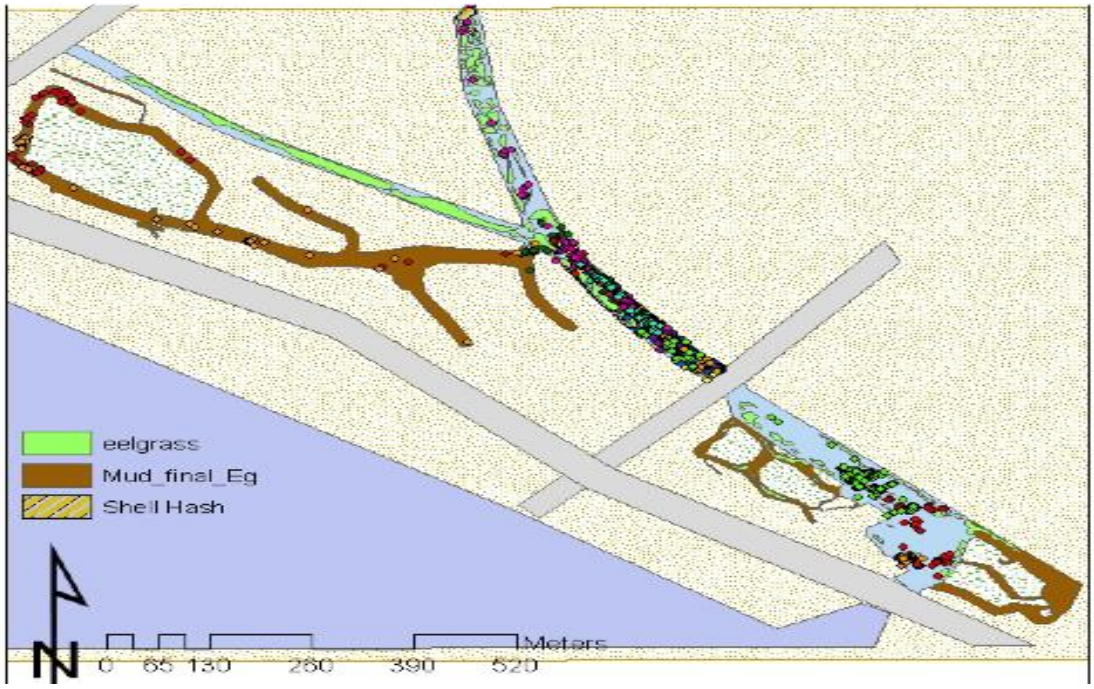

Figure 2-10. Activity spaces for nine California Halibut in the Huntington Beach Wetlands (different colored dots represent locations of each tagged fish at 15-minute intervals over three 24-hour intervals, Allen et al. unpublished data).

To determine seasonal residency and long-term movement patterns of California Halibut, a series of automated underwater passive acoustic receivers were deployed in the channel and marshes in the summer of 2010. Passive monitoring allows for continuous and simultaneous detection of many individuals over longer periods of time without requiring the presence of a researcher on site. Acoustic receivers will be positioned in a grid format array throughout the Huntington Beach Wetlands to monitor longer-term site fidelity, migratory behavior, movement patterns of individuals and habitat utilization within the area. A total of 16 California Halibut, in addition to those tagged for active tracking, were fitted with individually coded transmitters. As a fish swims through the detection zone of a receiver, the transmitter code and date and time of detection are recorded. Results from long-term movement studies are forthcoming.

To determine the relative importance of seagrass (channel) and salt marsh habitat as food sources to juvenile California Halibut in the Huntington Beach Wetlands, samples of gut contents, benthic invertebrates, and plants were collected from throughout the wetland system. In addition to instantaneous data on diet via stomach content analyses, stable isotope analyses were used to reveal patterns of feeding integrated over weeks to months. Samples of benthic invertebrates, vascular plants, and suspended particulate matter collected from both salt marsh and seagrass habitats were examined for natural abundance of stable isotopic composition to estimate proportional contributions of seagrass versus marsh derived material to the diets of California Halibut. Although many of these samples are currently being processed, preliminary data suggests that potential

food sources can be differentiated using stable isotope ratios and that juvenile California Halibut seem to feed primarily on seagrass-associated invertebrates (Figure 2-11).

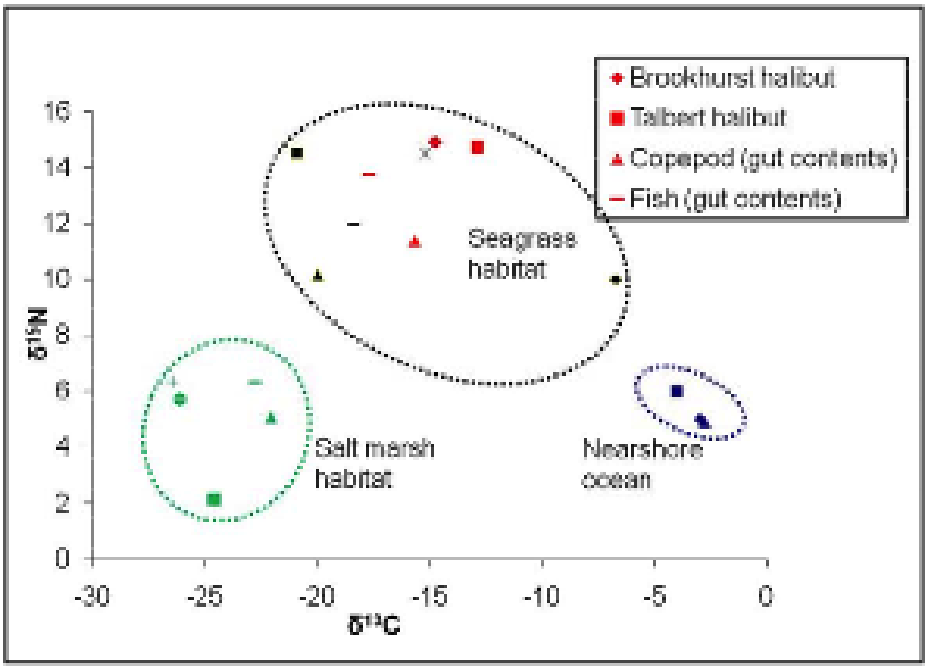

Figure 2-11. A dual isotope plot showing mean carbon and nitrogen isotopic ratios for invertebrate food sources found in sediment cores from different habitats within the Huntington Beach Wetlands, as well as California Halibut muscle tissue and gut contents (Allen et al. unpublished data).

Bolsa Chica Wetland Restoration

The Bolsa Chica wetlands restoration in Orange County, California, was the largest project of its type undertaken on the west coast and restored vital habitat of a type that has mostly been destroyed along this coast. Restoration of 607 acres of the Bolsa Chica area was achieved in late 2006. Through this project, 367 acres were restored to full tidal flow and 240 acres to muted tidal flow. Increasing the quality and quantity of open water habitat and intertidal mudflat habitat led to the recovery of a diverse aquatic community of marine fishes and invertebrates. The full tidal basin now provides nursery habitat for California Halibut and other fish that use the wetlands for reproduction.

Continued maintenance of the wetlands is necessary to maintain water quality and quantity to marine fish habitats and intertidal mudflats, ensuring proper wetland ecosystem function. Maintenance of the full tidal area and muted tidal area requires periodic dredging of the inlet channel to maintain marine water access to the site and the integrity of the berms and inland channels. Dredged material is deposited on the nearby beaches to maintain beach width. In 2009, MSRP provided funds for dredging of the wetlands. The dredging was completed in May 2009, removing approximately 200,000 cubic meters of sand that had accumulated in the tidal basin.

BUDGET:

In the 2005 RP, approximately $2.1 million was used to fund the HBW restoration project and $1.5 million was allocated to the Bolsa Chica lowlands restoration project.

2.1.1.5. Monitoring and Enforcement of Marine Protected Areas

GOAL:

The goal of this action is to improve fish habitat function in southern California by augmenting the funds needed to evaluate and implement Marine Protected Areas as part of an ecosystem-based management approach for fishery resources. The primary focus of this action was to provide needed funds for the implementation of the recently established Channel Islands network of Marine Protected Areas (MPAs) to ensure that they provide the best possible basis for further implementations of MPA networks throughout California. Although this action provided specific benefits to fish habitats adjacent to the northern Channel Islands, the action will also provide longer-term benefits for fish habitats and fishing throughout California by helping to generate sound empirical underpinnings for the site and design of future networks of MPAs. At the time the 2005 RP was complete, the recently established network of MPAs in the Channel Islands were the most appropriate area to direct such effort because they were specifically designed to evaluate the utility of using MPAs as a management tool.

DESCRIPTION:

The Trustees released a Request for Proposals for project ideas that conformed to the restoration goals outlined above and in the 2005 RP. Ten project proposals were submitted from which two projects were selected due to their alignment with the Trustees goals of addressing ecosystem-level monitoring with a focus of fishery resources. These projects were "Evaluating the Effectiveness of Channel Islands' MPAs Using a Long-term Ecological Monitoring Program" conducted by the National Park Service (NPS), and "Interpreting Changes in Community Structure in Marine Reserves in Light of Spatial and Temporal Patterns of Settlement" conducted by the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO). Both of these projects were initiated in 2007 and were complete in 2009.

ACCOMPLISHMENTS:

Evaluating the Effectiveness of Channel Islands' Marine Protected Areas Using a Long-term Ecological Monitoring Program.

The funding provided by the Trustees enabled the continuation of a critical long-term kelp forest monitoring (KFM) program at the Channel Islands from 2007-2010. This monitoring was essential for maintaining baseline and reference data to which MPA monitoring data will be compared. The data collected by KFM were used by CDFG to conduct a required five-year review of the Channel Islands MPA's in 2008. This review

indicated that the MPAs have positive ecological effects inside of the marine reserves. NPS has observed these trends and expects continued positive effects with respect to specific species such as lobsters. NPS is currently developing a scientific paper that evaluates the efficacy of the marine reserves with respect to fish populations. The KFM data is regularly (nearly annually) used by CDFG biologists to assess abalone and sea urchin abundances at the Channel Islands.

"Interpreting Changes in Community Structure in Marine Reserves in Light of Spatial and Temporal Patterns of Settlement"

The funding provided by the Trustees to PISCO contributed to research seeking to describe recruitment patterns of fish and invertebrates inside and outside of MPAs. The data collected by PISCO were used by CDFG to conduct a required five-year review of the Channel Islands MPAs in 2008. Regional fish settlement data collected across the Channel Islands from 2008 were incorporated into two scientific publications. The publications, currently in preparation, will present results from the local settlement data at Santa Cruz Island for fish, urchins and crabs/other invertebrates.

BUDGET:

In the 2005 RP, approximately $500,000 was allocated for projects within this category. All of these funds have been expended.

2.1.2. Bald Eagles

GOAL:

The overall goal of this project is to restore a self-sustaining population of Bald Eagles to the Channel Islands.

DESCRIPTION:

During the Phase 1 timeframe (2002-2011), Bald Eagle restoration efforts on the Channel Islands included the Santa Catalina Island program and the Northern Channel Islands Bald Eagle Feasibility Study (NCI Study), which are discussed below. In 2008, the two programs were combined and funding was allocated towards an overall Channel Islands Bald Eagle restoration program. However, for the purposes of highlighting the accomplishments from 2002-2011, this section describes the two programs separately.

The Trustees partnered with many organizations during implementation of this project, including the Institute for Wildlife Studies (IWS), Channel Islands National Park, San Francisco Zoo, The Nature Conservancy, and Ventura County Office of Education.

ACCOMPLISHMENTS:

Summary of Santa Catalina Island Program

The Bald Eagle reintroduction program on Santa Catalina Island was initiated in 1980. A total of 33 eagles were released from 1980-1986 and the first breeding attempt was made in 1987. High levels of DDE in the eggs caused this attempt to fail and an artificial incubation program was initiated in 1989. From 1989 to 2006, 101 eggs were collected from nests of which 22 hatched (22 percent). During this time, the majority of these eggs were incubated at the San Francisco Zoo, California. In 2005, an artificial incubation facility was built on Santa Catalina Island in hopes that the hatching success would improve with less travel time for the eggs (thereby reducing water loss and damage to the developing embryos). Starting in 2005, the hatching success of the incubated eggs improved significantly. Of the 30 fertile eggs that were collected from 2005-2008, 17 of them hatched (57 percent, Figure 2-12). The increased hatching success is likely due to reduced water loss during transport and improved incubation equipment and techniques on Santa Catalina Island.

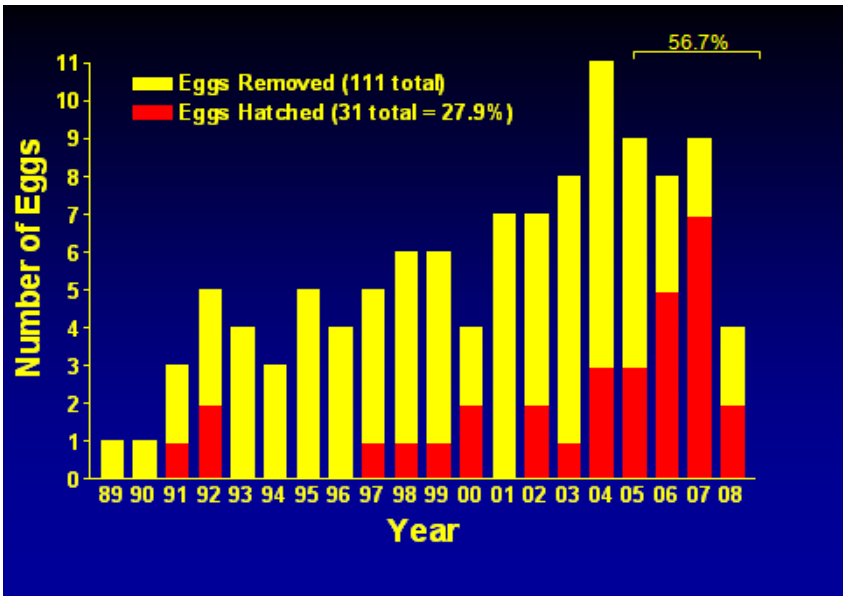

Figure 2-12. Summary of Hatching Success for Santa Catalina Island Bald Eagle Eggs from 1989 to 2008 (IWS Unpublished Data).

In light of the successful natural hatching of two Bald Eagle chicks on Santa Cruz Island in 2006 (see next section), IWS allowed the Seal Rocks (SR) and Pinnacle Rock (PR) pairs to keep their eggs in 2007. These pairs were selected because the SR eggs had consistently lower average DDE concentrations (6-8 ppm range) from 2001-2004 and the PR pair had the youngest breeding female on the island (and thus likely the lowest body burden of DDE). This decision resulted in the first natural hatchings on Santa Catalina Island in over 50 years with two chicks in the SR nest and two chicks in the PR nest. In 2008, eggs from four nests were left to hatch naturally (SR, PR, Twin Rocks, and Rattlesnake) and a total of four chicks hatched. IWS collected two eggs from the West

End nest and two eggs from the Two Harbors nest, of which two hatched in artificial incubation (50 percent hatching success). The two failed eggs were analyzed for contaminants and DDE levels in both eggs exceeded the threshold associated with reduced productivity (3-5 ppm; Figure 2-13).

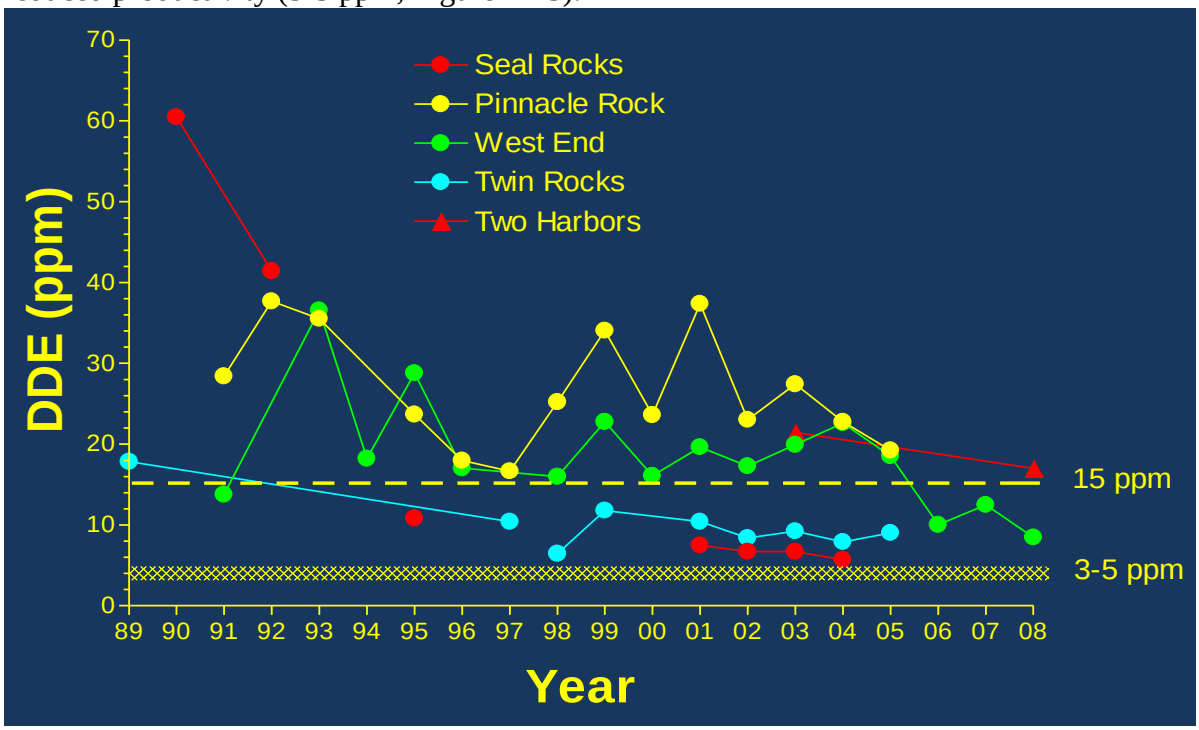

Figure 2-13. DDE levels (ppm) in fail-to-hatch eggs from Santa Catalina Island from 1989 to 2008 (IWS Unpublished Data).

Based on the natural hatching success in 2007 and 2008, all Santa Catalina Island Bald Eagle pairs were allowed to keep their eggs starting in 2009. There were six known nesting attempts in 2009 and a total of eight chicks successfully hatched and fledged on Santa Catalina Island. Only the Rattlesnake Nest failed in 2009 within a couple of weeks of egg laying. Those eggs were not able to be recovered for contaminant analysis.

In 2010, a total of seven known nesting attempts occurred on Santa Catalina Island, including a newer pair located at Middle Ranch which consisted of a male (K-93) released on Santa Catalina in 1999 and a female (A-37) released on Santa Cruz Island in 2005 (Sharpe 2011). Six of the nests were successful and a total of nine chicks hatched and successfully fledged. Single chicks were produced at the Pinnacle Rock, Middle Ranch, and Seal Rocks nests. The Two Harbors, Rattlesnake, and West End nests each produced two chicks. The Twin Rocks nest failed after about three weeks of incubation. In 2010, the first nesting attempt occurred in the Middle Ranch territory and the Rattlesnake territory was successful after several years of failure. All Santa Catalina Island chicks successfully fledged, but five of the fledglings unfortunately died within a day to a month of their first flight.

The 2011 season also proved very successful on Santa Catalina Island with a total of seven active pairs (Figure 2-14). The Pinnacle Rock and Twin Rocks pairs failed during incubation. The West End nest successfully hatched and raised three chicks. This was the first documented Bald Eagle nest with triplets in 60 years on the Channel Islands. A total of 8 chicks hatched and successfully fledged in 2011 on Santa Catalina Island.

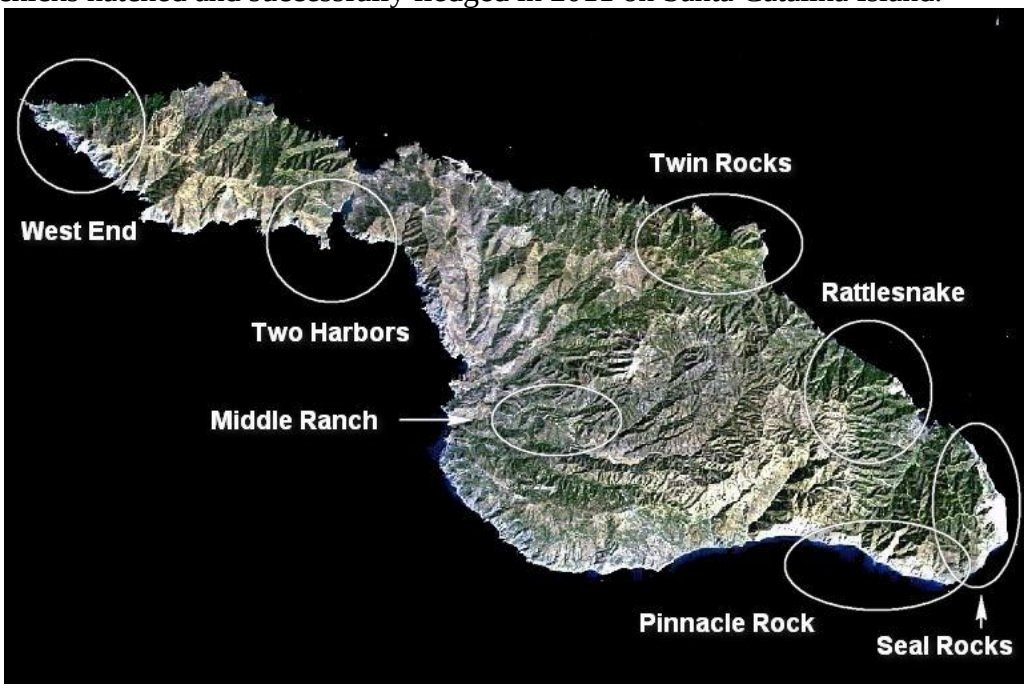

Figure 2-14. 2011 Catalina Bald Eagle Nesting Territories (IWS Unpublished Data)

Nesting success and productivity are important parameters by which to measure if a population is increasing or decreasing. Nesting success is defined as the percentage of occupied nests in a population in which at least one young fledged. Productivity measures the number of young produced per occupied nests. Sprunt et al. (1973) described that a minimum 50 percent nest success level and production value of 0.7 young per occupied nest is necessary in maintaining a stable Bald Eagle nesting population. As summarized in Table 2-1, nesting success and productivity on Santa Catalina Island from 2007-2011 exceeded thresholds considered necessary to prevent a Bald Eagle population from declining.

Table 2-1. Nest Success and Productivity for Unassisted Santa Catalina Island Nests (2007-2011).

Year	# of occupied nests unassisted	Total # of occupied nests that fledged at least 1 chick	Nest Success	Productivity (# young produced/ occupied nest)
2007	2	2	100%	2
2008	5	4	80%	1.2
2009	6	5	83%	1.3
2010	7	6	86%	1.3
2011	7	4	57%	1.1

Summary of Northern Channel Islands Feasibility Study

In 2002, the Trustee s released the Final Environmental Assessment for the Feasibility Study for Reestablishment of Bald Eagles on the Northern Channel Islands (MSRP 2002). The goal of the study was to determine the feasibility of successfully reestablishing a breeding population of Bald Eagles on the northern Channel Islands given the continued presence of DDE in the marine environment.

Figure 2-15. Hack tower on Santa Cruz Island (Photo Credit: IWS).

The first component of the study was the release of captive bred or translocated Bald Eagles on Santa Cruz Island. From 2002-2006, IWS released 61 Bald Eagles from two hack towers (Figure 2-15). Of those 61 Bald Eagles, 34 were hatched at the San Francisco Zoo, California; 23 were hatched in the wild in near Juneau, Alaska; and 4 were from California wildlife rehabilitation centers. The eagles were first brought to Santa Cruz Island when they were approximately eight weeks old and placed into one of two hack towers. The successful techniques used during the translocation and hacking process were similar to those used on Santa Catalina Island. Biologists monitored the birds in the hack tower using a video system and kept daily records of the health, behavior, and appearance. Once on Santa Cruz Island, the eagles were fed of a diet of local fish and feral pig from the island.

Prior to release at 12 weeks of age, each eagle was equipped with a backpack-mounted combination Global Positioning System (GPS) unit and VHF transmitter, patagial wing markers, and USFWS leg band. The GPS allowed biologists to track movements of the eagle for several years until the unit was no longer operational or became detached. The satellite transmitters record GPS locations of the bird approximately once per hour and then upload the locations to a satellite approximately once every three days. Biologists

can then download the information to a computer every few days and track the daily movements of the birds. The GPS data allowed biologists to relocate birds that would otherwise be difficult to detect using traditional VHF telemetry.

The NCI Study has an extensive monitoring program that addresses the following elements: dispersal and movement, mortality, breeding, dietary habits, contaminant levels in the eagles and their environment, and stable isotope analysis (Table 2-2).

Table 2-2. Summary of Completed Elements of NCI Study (2002-2011).

Element	Number	Years	Reference
Release Bald Eagles on Santa Cruz Island	61 eagles released	2002-2006	IWS Annual Reports 2002-2010
Comprehensive monitoring of reproduction, nest success and population status		2006-2011	IWS Annual Reports 2002-2010
Collect Bald Eagle baseline blood for DDT/PCB analysis from released eagles and natural-hatched chicks	61 released eagles, 15 natural hatched chicks	2002-2011	Little et al. in prep; MSRP unpublished data
Conduct Beach Walk surveys on Santa Cruz Island for marine mammal carcasses		2002-2005	Richards and Rich 2004, 2006; Rich and Richards 2005
Analyze fail-to-hatch eggs		2006-2011	MSRP unpublished data
Re-capture juvenile and adult bald eagles to collect blood sample	7 recaptured eagles	2004-2010	Little et al. in prep; MSRP unpublished data
Track bald eagle movement using VHF and satellite telemetry	61 released eagles	2006-2011	IWS Annual Reports 2002-2010
Collect prey samples for DDT/PCB analysis	11 California sea lions, 3 pigs, 20 fish	2003-2005	Little et al. in prep; MSRP unpublished data
Stable Isotope analysis of Bald Eagle baseline blood and breast feathers, marine mammal carcasses, feral pig, fish, invertebrates	70 eagle samples, 11 marine mammals, 5 pig, 11 seabird, 22 fish, 20 invertebrates	2002-2007	Dooley 2009; MSRP unpublished data; ongoing work by University of Wyoming
Collect and analyze prey remains in historic and active nests		2003, 2010-11	Collins et al. 2004; ongoing work by Santa Barbara Natural History Museum and University of Wyoming

GPS data is an important tool for understanding Bald Eagle movement and survival. The GPS data has shown that the Bald Eagles frequently move among the northern Channel Islands in seasonal patterns based on prey abundance. Subadult Bald Eagles spend more time on Anacapa Island during the spring and summer during seabird nesting season, and increased time on Santa Rosa Island during the late fall during the mule deer and elk hunting season. The GPS data has also shown movements of Bald Eagles across the western United States, with some travelling as far as British Columbia and Yellowstone National Park (Figure 2-16).

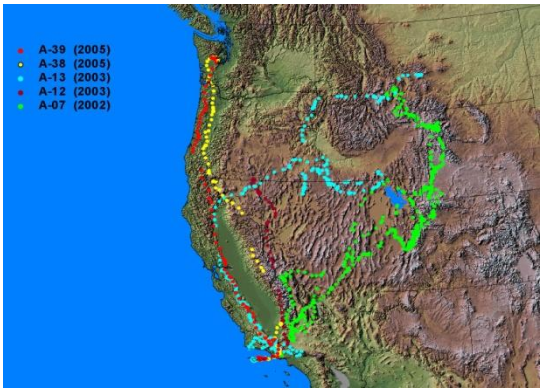

Figure 2-16. Movement of Bald Eagles across western United States (Photo Credit: IWS).

Of the 61 eagles that were released from 2002-2006, there was 100 percent survival to the fledgling stage. However, once birds fledged from the hack tower, first year survival was approximately 79 percent. As of April 2011, 28 of the original 61 released birds are confirmed to be alive and 10 of them are currently breeding on the Channel Islands. The GPS data has revealed that crossing over to the mainland is the primary source of mortality for young eagles just learning to fly (Figure 2-17). Other documented causes of death include a collision with a vehicle (A-63) and a territorial fight with another eagle (A-04).

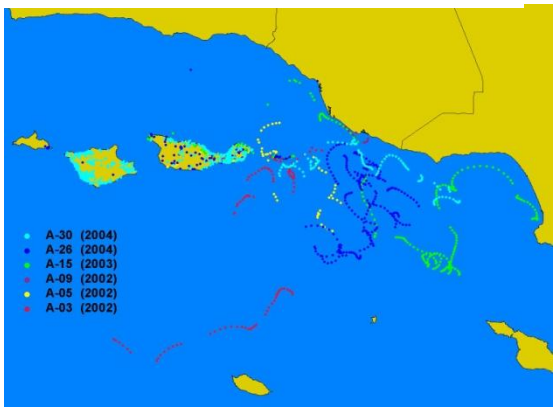

Figure 2-17. Mortality of Bald Eagles crossing to the mainland from the Channel Islands (IWS, unpublished data).

In 2006, the reintroduction program reached a significant milestone. An active Bald Eagle nest was confirmed on Santa Cruz Island in the vicinity of Pelican Harbor in February of 2006. The nesting pair was K-10 (a male fostered into the Twin Rocks nest on Catalina Island in 2001) and K-26 (a female fostered into the West End nest on Catalina Island in 2002). This event marked the first Bald Eagle breeding on the northern Channel Islands since the last known nest in 1950 on Santa Rosa Island. The chick (A-49) successfully fledged and is still residing on the northern Channel Islands (Figure 2-18). Also in 2006, the Malva Real pair comprised of male K-11 and female A-04 successfully raised a chick (A-60) on Santa Cruz Island. This chick is also still residing on the northern Channel Islands.

Figure 2-18.First Bald Eagle chick (A-49) successfully hatched on Santa Cruz Island (Photo Credit: J. Spickler, Eco-Ascension).

In 2007, the Pelican Harbor and Malva Real pairs nested on

Santa Cruz Island. The Pelican Harbor pair successfully fledged one chick (A-63) who was later struck and killed by a vehicle in Nevada. The Malva Real pair nested for the second time on the ground, but unfortunately both eggs broke in their nest.

In 2008, a third nesting pair was documented on Santa Cruz Island in Sauces Canyon (Figure 2-19). During this season, four chicks hatched from two nests. The two chicks from the Malva Real territory died in the nest when the female (A-04) was killed by another female Bald Eagle (A-17) who ended up taking over the territory. Two chicks hatched at the Pelican Harbor nest (a first for this nest), but were knocked out of the nest by a juvenile Bald Eagle.

These chicks were recovered by IWS biologists, rehabilitated, and later released back on Santa Cruz Island. The new nest at Sauces Canyon failed in 2008.

Figure 2-19.Sauces Canyon pair in 2008 (Photo Credit: IWS).

The program reached another milestone in 2008 with the discovery of a Bald Eagle nest on Santa Rosa Island in Trap Canyon. Even though this nest failed, breeding was now occurring on a second northern Channel Island and this was the first nest occupied by a female and male that were both released on Santa Cruz Island as part of the reintroduction program.

The 2009 season was not a productive one on the northern Channel Islands. Despite there being three active nests, only two chicks hatched in the Pelican Harbor nest on Santa Cruz Island, and these chicks died within the first few days (possibly due to an outbreak of demoic acid) (Sharpe 2010). The Sauces Canyon nest on Santa Cruz Island and the Trap Canyon nest on Santa Rosa Island also failed. Eggs were not recovered from either of the failed nests.

After a disappointing season in 2009, the 2010 season proved to be a successful one. The total number of active nests increased to six, with four on Santa Cruz Island and two on Santa Rosa Island. A record six chicks hatched and successfully fledged in 2010 on the northern Channel Islands. This year marked the first time that Bald Eagles successfully bred on Santa Rosa Island since 1950.

In 2011, another milestone for the program was reached with the discovery of a Bald Eagle nest on Anacapa Island. The last known breeding record on Anacapa Island was in 1949. Overall, a total of six nests were documented on the northern Channel Islands in 2011 (3 on Santa Cruz, 2 on Santa Rosa, 1 on Anacapa). A total of 5 chicks hatched and 4 successfully fledged. Figure 2-20 shows the known and potential nesting territories in 2011.

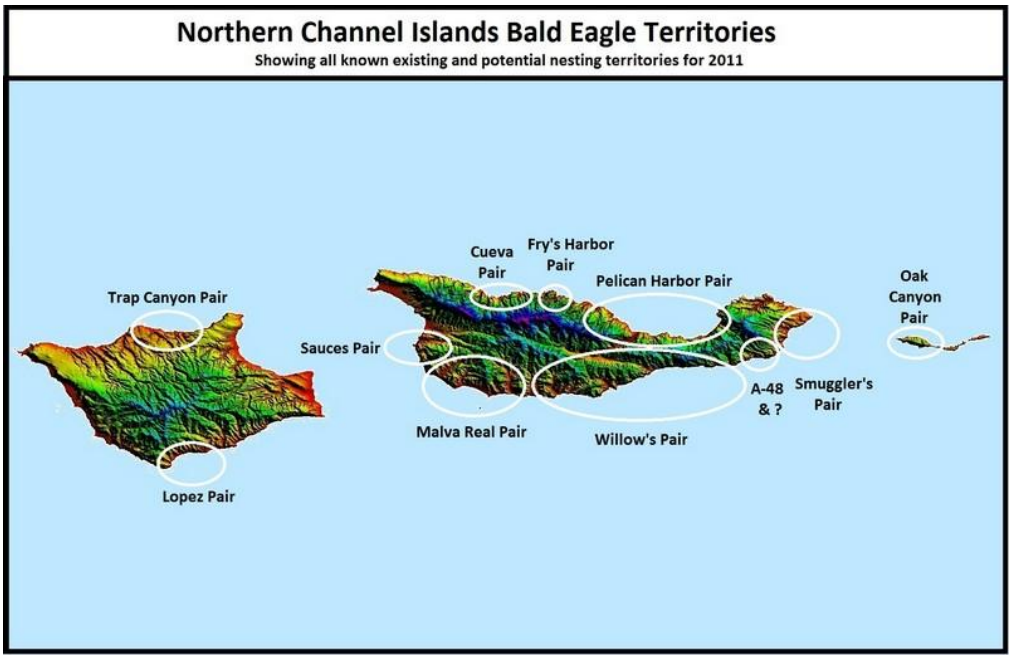

Figure 2-20. 2011 NCI Bald Eagle Nesting Territories (Photo Credit: IWS).

As described earlier in this section, nesting success and productivity are important parameters for evaluating the stability of a breeding population. Table 2-3 summarizes the breeding activity on the northern Channel Islands from 2002-2011. The nesting success has ranged from 0-100% and productivity has ranged from 0.5 to 1.0 chicks per active nest. Although nesting success and production has been variable, it is clear that the number and distribution of breeding Bald Eagle pairs is increasing across the northern Channel Islands. Continued monitoring will be necessary to determine if productivity is at levels sufficient to sustain a naturally reproducing, stable population over the long term.

Table 2-3. Summary of Bald Eagle Nest Monitoring on the Northern Channel Islands 2002-2011.

Year	Island	# of Active Nests	Eggs Laid	Chicks Hatched	Chicks Fledged	Hatching Success	Nest Success	Overall Productivty
2006	Santa Cruz	2	4	2	2	50%	100%	1.0
2007	Santa Cruz	2	4	1	1	25%	50%	0.5
2008	Santa Cruz	3	5-7	4	0*	57-80%		
	Santa Rosa	1	2	0	0	0%		
	Total	4	7-9	4	0		0%	1.0
2009	Santa Cruz	2	4	2	0	50%		
	Santa Rosa	1	2	0	0	0%		
	Total	3	6	2	0		0%	0.7
2010	Santa Cruz	4	7-8	4	4	50-57%		
	Santa Rosa	2	2-4	2	2	50-100%		
	Total	6	9-12	6	6		0	1.0
2011	Santa Cruz	3	4-6	3	3	50-75%	100%	
	Santa Rosa	2	2	1	0	50%	0%	
	Anacapa	1	2	1	1	50%	100%	
	Total	6	8-10	5	4			0.8
Totals 2002-2011		**21**	**30-35**	**15**	**13**			**0.8**
*** Two chicks were knocked out of nest, recovered, and subsequently released via hacking**								

Bald Eagles are opportunistic predators and scavengers that feed on a variety of pelagic fish, seabirds, marine mammals, and other items on the Channel Islands (Garcelon 1994a, 1994b, Sharpe and Garcelon 1999). As shown by the GPS data, juvenile Bald Eagle foraging across the northern islands largely corresponds to seasonal prey availability (seabirds, deer/elk, and marine mammals). During the reintroduction portion of the NCI Study, feral pigs were abundant on Santa Cruz Island and were an important food source for the eagles in the hack tower and for juveniles foraging on the island. Beach walk surveys and monitoring have documented Bald Eagles foraging on marine mammal carcasses across the northern Channel Islands.

As eagles mature and reside in specific territories, it is anticipated that food habits will reflect local food availability within a particular territory. After the 2006 hatch of the Pelican Harbor chick, a live web cam was installed on the nest. This camera enabled

continuous observations of the type of food being fed to the chicks. Systematic efforts are being made at several nests in 2011 to record the time and specific types of prey delivered to the nest. These observations, along with stable isotope and analysis of prey remains, will provide a detailed understanding of Bald Eagle diet at individual nests.

The study of stable isotopes is a useful tool to understand the origins and mechanisms of contaminant exposure to individual Bald Eagles. Certain signatures will reflect a diet more influenced by marine or terrestrial prey. Stable isotope analysis adds to the understanding of eagle diet, particularly when direct observation is not feasible. Several stable isotope studies have been funded by the Trustees over the course of the NCI Study. Dooley (2009) focused her master's research on creating a marine versus terrestrial stable isotopic gradient of potential Bald Eagle food sources, as well testing for spatial and temporal differences in Bald Eagle diets.

Dooley (2009) found that immature Bald Eagles captured on the northern Channel Islands showed a high degree of variation in their isotopic signatures within and among tissues. The isotopic signatures reflected the eagle's varied use of both terrestrial and marine resources, including fish, seabirds, marine mammals, and terrestrial carrion (Dooley 2009). Isotopic signatures of Bald Eagle chicks on the islands (both from Catalina and Santa Cruz Islands), however, exhibited a more marine signature that was consistent with studies on observations of nestling diets (Sharpe and Garcelon 1999, Sharpe 2006). Continued study of stable isotopes of recaptured eagles, adults, and chicks will further capture potential shifts in the Bald Eagle diet in the future due to changes in food availability.

An important component of the NCI Study is to monitor contaminants in the released birds, their eggs, and food to determine if concentrations of DDTs are present which may impact the ability of the eagles to successfully reproduce. A comprehensive program is in place to allow for the collection and analyses of various types of contaminate information. This includes baseline and recapture blood concentrations, fail-to-hatch egg concentrations, DDT levels in prey, and lead exposure.

Blood samples were collected from all birds released on Santa Cruz Island around 11-12 weeks of age. Samples were also collected from any wild-born chicks around eight weeks of age during banding. Blood monitoring provides the most direct measurement of DDE exposure to eagles and the baseline level provides a benchmark for which to compare future recapture samples.

Figure 2-21. recaptured Bald Eagle on Santa Cruz Island (Photo Credit: IWS).

In order to assess DDE exposure over time, efforts were made to recapture juvenile Bald Eagles throughout the study. Techniques used to recapture eagles included using a bow net baited with feral pig, net launcher, and floating fish noose. Once the feral pigs were removed from Santa Cruz Island, IWS focused on capturing eagles using the floating fish noose and net launcher. After an eagle was

captured, biologists replaced the GPS transmitter, performed a health assessment, and took a blood sample for contaminant analysis. A total of 7 recaptures (Figure 2-21) occurred between 2005-2010 (3 in 2004, 2 in 2002, 1 in 2005, and 1 in 2007). Despite attempts each year at trapping additional birds, successfully capturing a Bald Eagle proved difficult due to various factors such as rough ocean conditions.

Blood samples taken from the recaptured birds were analyzed for DDE and PCB concentrations. These values were then compared to baseline levels. Results from six samples indicate plasma concentrations of both DDE and total PCB increased dramatically after release (Little et al. in prep). DDE plasma concentrations increased over 40 times after 6 months, to over 500 times after nearly 3 years. Total PCB plasma concentrations were over 100 times baseline levels after 3 years. Increases in whole blood concentrations of DDE ranged from over 30 times after 6 months, to over 250 times after 3 years. Increases in whole blood concentrations of total PCB were nearly 200 times greater after 3 years.

It is clear that Bald Eagles continue to be exposed to DDE and PCB contamination in the food web, but how that ultimately affects reproduction is not fully understood. Two of the recapture samples are from females that have since become breeders on Santa Cruz Island. A-02, a female at the Sauces Canyon nest, was unsuccessful in 2008 and 2009. She later was found deceased in 2009. Unfortunately, eggs were not able to be recovered at the Sauces Canyon nest during either year so it unknown what role DDE played in the failure or whether the eggs were infertile to begin with. The second recapture female that has since bred on Santa Cruz Island is A-04 who nested at the Malva Real nest in 2006-2008. Paired with K-11, the pair successfully produced one chick in 2006, failed in 2007, and produced two chicks in 2008. A-04 died in 2008 due to a fight with another territorial female.

The recapture data indicates that Bald Eagles continue to be exposed to DDE in the marine environment. However, because only two female Bald Eagles have been recaptured and subsequently bred, the effect of the ongoing exposure to DDE on reproduction is not fully understood. Additional monitoring is warranted to understand what effects this exposure will have over the long-term.

In 2008, a Bald Eagle pair nested in Trap Canyon on Santa Rosa Island. This pair was A-08, a male released in 2002, and A-22, a female released in 2004. The two eggs from the nest did not hatch and were collected for contaminant analysis after the adults abandoned the nest. Lab results indicated that the DDE levels in the eggs were 15.1 and 17.6 ppm (µg/g). These DDE levels are above the threshold of 6.3 ppm at which productivity is considerably reduced (Wiemeyer et al. 1993). It is important to note that these eggs appeared to be infertile and showed no signs of development which is a common event with first-time breeders such as this pair. Although the DDE levels were high in the eggs, it cannot be determined as the sole cause of failure of this nesting attempt.

In 2009, one egg was also collected from the Trap Canyon nest on Santa Rosa Island. This egg will also be analyzed for contaminants, as will any others that fail-to-hatch in

future years. Because the sample size of eggs is small, additional samples are needed to understand the effect that ongoing contamination may have on overall productivity of the breeding population on the Channel Islands. It is anticipated that DDE levels in eggs will vary for each individual female based on territory location and foraging preference. For example, a female whose territory includes an active marine mammal haul-out will likely be exposed to higher contaminant levels if she prefers foraging on more contaminated marine mammal carcasses as opposed to cleaner sources such as fish.

A sample of certain Bald Eagle prey items around the northern Channel Islands were analyzed for DDE and PCBs in order to understand current contaminant concentrations and potential for exposure. Results indicated that fish had the lowest DDE levels, followed by feral pigs, and then marine mammals (Little et al. in prep). Feral pigs have been documented feeding on marine mammal carcasses which likely explains the higher DDE levels than fish. However, the DDE concentrations were still low in feral pigs and they were a relatively clean source of food for the eagles until they were eradicated from Santa Cruz Island in 2006.

Bald Eagles have been documented feeding on deer and elk carcasses on Santa Rosa Island on a seasonal basis. It is assumed that the deer and elk from Santa Rosa Island have low DDE levels because they are grazers and not feeding on marine-associated prey. The upcoming removal of deer and elk from Santa Rosa Island in 2011 will likely result in a shift of Bald Eagle foraging during the winter months. It is likely that the body burden of contaminants of young, scavenging Bald Eagles will increase with the removal of this terrestrial food source if they rely more heavily on marine mammal carcasses. It will be important to continue to monitor foraging behavior of immature eagles, changes in DDE concentrations in prey resources, and availability of food over time.

In July 2005, Bald Eagle A-35 was released on Santa Cruz Island. The following month, A-35 was documented on Santa Rosa Island and stayed there through December 2005. Alerted by the lack of movement of A-35 based upon the GPS data, an IWS biologist went to Santa Rosa Island on December 19, 2005 to check on the eagle. The eagle was easily captured and brought off island for veterinary care. It was determined that the bird had a fractured ulna and a blood lead concentration of 0.522 ppm which is within the classification of sub-clinical lead exposure (Garcelon 2006). The bird was immediately treated for lead poisoning and held until the wing healed. Based on the known locations of A-35, it was likely this bird was exposed to lead shot on Santa Rosa Island during the deer and elk hunt. In response to this incident and concerns expressed by the Trustees and National Park Service, the Vail and Vickers Company imposed a requirement for lead-free ammunition for all guided hunts starting in 2007. With this ban, Bald Eagles should no longer be at risk for lead exposure on Santa Rosa Island. However, the removal of deer and elk from Santa Rosa Island in 2011 will fully eliminate this potential threat.

In 1985, the Avian Conservation Center at the San Francisco Zoo acquired its first female Bald Eagle for a captive breeding program from a wild nest in California. Since 1991, more than 100 Bald Eagles from the San Francisco Zoo were re-introduced to the wild on

the Channel Islands. The San Francisco Zoo's program was the only large-scale captive breeding program for Bald Eagles in the western United States.

The San Francisco Zoo was an important partner during the NCI Study and provided 34 juvenile eagles for release on Santa Cruz Island. After the release component of the NCI Study concluded in 2006, there was not a need for a constant source of Bald Eagles for the reintroduction program. With the conclusion of the Bald Eagle releases and the successful natural hatching of two nests on Santa Cruz Island in 2006, maintaining a captive breeding program at the San Francisco Zoo was no longer necessary for the Channel Islands restoration program. Without other active reintroduction programs in place on the West Coast, the San Francisco Zoo concluded its captive breeding program in 2007. That year, a Memorandum of Agreement was signed between the U.S. Fish and Wildlife Service and the American Eagle Foundation (AEF) whom agreed to accept and care for five breeding Bald Eagle pairs from the San Francisco Zoo. In June of 2007, nine adult birds were flown on a donated FedEx plane to the AEF United States Eagle Center in Pigeon Forge, Tennessee. These pairs continued to support Bald Eagle reintroduction programs in the southeast. One eagle remained at the San Francisco Zoo.

Summary

The goal of the NCI Study was to determine whether the northern Channel Islands could support a self-sustaining population of Bald Eagles. During the NCI Study, 61 eagles were successfully released and a comprehensive monitoring program was conducted. Since the NCI Study began in 2002, significant strides have been made in the restoration of the Bald Eagle on the Channel Islands. Most notably, the first successful natural hatching in 2006 on Santa Cruz Island was a milestone for the overall effort to restore Bald Eagles to the Channel Islands that originally started in 1980. Bald Eagles are now successfully breeding on three of the five northern Channel Islands.

During the last five years, the Bald Eagle program on Santa Catalina Island evolved from being dependent on human manipulation to one of high natural success and high productivity. Bald Eagles are now breeding on four of the eight Channel Islands and approximately 65 eagles are residents. The Bald Eagle population is anticipated to continue to grow and new pairs are expected to establish breeding territories on across the Channel Islands.

As documented over the past several years, not every nest will be successful. However, the overall high nesting success and productivity throughout the Channel Islands is a promising indication that contaminant levels are not impairing reproduction on a population level and that a self-sustaining population is feasible.

BUDGET:

In the 2005 RP, approximately $6.2 million was allocated for Bald Eagle restoration. This amount included the estimated costs of the Catalina Program from 2001-2005 (~$1.2 million) and costs associated with the NCI Study through 2002-2008 ($3.3 million). With

approximately $4.5 million being spent on the two programs from 2001-2008, the Trustees anticipated having a remaining balance of ~$1.7 million. The Trustees decided to defer the decision on how to use these remaining funds once the results of the NCI Study were known, which was anticipated to be occur around 2008.

In 2005, the Trustees finalized the Restoration Plan. As explained in greater detail in that document, the Trustees preferred alternative included reducing the amount of funding allocated for the Santa Catalina Island program and focusing the restoration funds on the NCI Study. This decision was based upon the available information in 2004 regarding continued high DDE levels in fail-to-hatch eggs from Santa Catalina Island and the poor hatching success of those eggs even in a controlled artificial incubation environment. During 2006-2007, the Trustees limited the funding on Santa Catalina Island to nest monitoring and contaminant analysis of fail-to-hatch eggs.

With the successful hatching of the two nests on Santa Cruz Island in 2006 and two nests on Santa Catalina Island in 2007, the Trustees were encouraged by the success of both programs. Starting in 2008, the Santa Catalina Program and the NCI Study were combined into one overall Channel Islands Bald Eagle program. Consequently, the Trustees began in 2008 allocating funds towards the overall program which enabled IWS to utilize staff and resources more efficiently between the different islands.

In 2008, the Trustees also evaluated whether the results of the NCI Study were known and whether a decision on how to proceed could be made as originally anticipated in the 2005 RP. Although successful reproduction on Santa Cruz Island in 2006-2007 were encouraging signs for the program, it became clear that additional time was needed to monitor the sustainability of the program. Additional monitoring would allow for more of the released birds to mature, reach breeding age, and set up territories among the islands. The Trustees would also be able to evaluate multiple pairs over several years rather than solely rely on two years of nesting information for the pairs on Santa Cruz Island. Based on the need for additional time to evaluate the program, the Trustees decided to use the remaining $1.7 million to fund the overall Channel Islands program through 2011.

Table 2-4 shows the amount allocated for Bald Eagle restoration efforts during each annual budget cycle. The amount includes IWS costs, contaminant analysis, research studies, and contaminant analysis. The amounts shown represent the maximum amount that could have been spent in each year. In many cases, the funds actually spent are slightly less than was allocated.

Table 2-4. Amount Allocated for Bald Eagle Restoration on the Channel Islands (2001-2011).

YEAR	Catalina Island Program	NCI Study	Combined Channel Islands Program (Catalina + NCI)	Yearly Total
2001	$199,534	$0		**$199,534**
2002	$194,195	$581,518		**$775,713**
2003	$272,584	$768,129		**$1,040,713**
2004	$267,330	$539,274		**$806,604**
2005	$291,054	$425,140		**$716,194**
2006	$36,635	$539,417		**$576,052**
2007	$48,550	$479,378		**$527,928**
2008			$562,155	**$562,155**
2009			$576,036	**$576,036**
2010			$508,547	**$508,547**
2011			$550,875	**$550,875**
Grand Total	**$1,309,882**	**$3,332,856**	**$2,197,613**	**$6,840,351**

2.1.3. Peregrine Falcons

GOAL:

The goal of this project is to monitor the recovery of Peregrine Falcons on the Channel Islands. Data collected in 1992 in the Southern California Bight demonstrated severe (>15 percent) eggshell thinning in Peregrine Falcons (Kiff 1994). Peregrine Falcons were extirpated from the Channel Islands by the mid-1950s, largely due to DDT contamination that led to eggshell thinning and reproductive failure (Kiff 2000).

DESCRIPTION:

In 1977, the Santa Cruz Predatory Bird Research Group (SCPBRG) began a program of releasing captive-bred and captive-hatched peregrines throughout California and neighboring states. As part of this recovery program, Peregrine Falcon eggs were removed from nest sites with high eggshell thinning levels, hatched in a laboratory, and chicks were re-released through nest site manipulation or hacking. Over the course of several decades, SCPBRG released over 1,000 Peregrine Falcons, including 37 on the Channel Islands (12 on San Miguel, 17 on Catalina, 4 on Santa Rosa, and 4 on Santa Cruz). In the early 1990s, comprehensive surveys for Peregrine Falcons documented nine active peregrine territories on the northern Channel Islands. Since the conclusion of that survey effort in 1994, there were limited surveys done on the Channel Islands and the distribution and extent of breeding pairs was not known at the time we finalized our 2005 RP in 2005. The goal of this monitoring effort was to assess the current status of Peregrine Falcons on the Channel Islands and whether the recovery of Peregrine Falcons was still being affected by ongoing contamination in the local food web.

ACCOMPLISHMENTS:

In 2007, the U.S. Fish and Wildlife Service (USFWS) contracted with SCPBRG to conduct a comprehensive survey of Peregrine Falcons on the Channel Islands. Biologists conducted surveys from boats or on foot of known nesting territories and potential nesting territories to determine the presence or absence of Peregrine Falcons. Survey routes and locations were based on prior knowledge of the known and potential peregrine nesting habitat of the islands, reported peregrine sightings from knowledgeable observers, and from interpretation of topographic maps which were used to find the best possible nesting locations.

Biologists monitored active peregrine territories to determine breeding chronology, location of nest cliff and eyrie (nest ledge), egg laying and incubation periods, reproductive success/failure, recycling attempts, and number of young produced. Biologists also collected eggshells, eggshell fragments, addled (dead or infertile) eggs, and/or prey remains from 18 active nest sites. Feather and bone remains and regurgitated pellets of prey species from peregrine nest ledges were collected and placed into labeled zip-loc bags for later identification at the Western Foundation of Vertebrate Zoology located in Camarillo, California.

In a few cases, biologists enhanced or reconditioned existing nest ledges by removing sharp rocks from the substrate, building up the edges of sloping ledges with nearby rocks, and leveling existing substrate and/or adding additional native substrate to stabilize and/or slightly increase the size of the ledge floor. The goal of these enhancements was to decrease the chance of future egg breakage.

During visits to all eight Channel Islands, biologists documented and determined the status of 35 Peregrine Falcon territories (Table 2-5). Twenty-five territories (71.4%) were active with resident breeding pairs, including 7 pairs on San Miguel, 8 pairs on Santa Rosa, 7 pairs on Santa Cruz, 2 pairs on Anacapa, and 1 pair on Santa Barbara Island. Two territories (5.7%) were transitional (each with a sub-adult pair member). Based on observation of plumage characteristics, one territory (2.9%) was occupied by a single second-year peregrine throughout the breeding season. Three previously active territories (8.6%) were found to be inactive in 2007. Three territories (8.6%), two of which had previously been active (Santa Catalina Island), hosted winter resident peregrines that apparently migrated back to their summer territories in late February and March. The status of one territory could not be determined. Biologists documented 10 previously unknown or unconfirmed territories during this 2007 survey.

In 2007, bad weather, limited logistical access, and the presence of breeding California Brown Pelicans prevented a thorough survey of Middle and West Anacapa Islands, each of which have been known to support active peregrine pairs in recent years. Restricted access due to ongoing hazardous military activities prevented thorough surveys of San Clemente Island. A report of a pair of Peregrine Falcons near China Point on San Clemente Island remains unsubstantiated.

Table 2-5. Territory Status in 2007 on the Channel Islands (SCPBRG draft report).

TERRITORY STATUS:	Totals		Per island							
Islands visited	**8**		**SMI**	**SRI**	**SCI**	**ANA**	**SBI**	**SCA**	**SNI**	**SCL**
Territories visited	35		8	10	9	3	1	2	2	0
Active Territories	25		7	8	7	2	1	0	0	0
Transitional Territories	2		0	0	1	0	0	0	1	0
Occupied Territories	1		0	1	0	0	0	0	0	0
Wintering Territories	2		0	0	0	0	0	2	1	0
Inactive Territories	3		1	1	1	0	0	0	0	0
Status undetermined	2		0	0	1	1	0	0	0	0
New 2007 Territories	10		3	2	2	1	0	0	2	0
Unconfirmed Territories	3		0	0	2	0	0	0	0	1

SMI- San Miguel Island, SRI- Santa Rosa Island, ANA-Anacapa Island, SCA- Santa Catalina Island, SNI- San Nicolas Island, SCL- San Clemente Island

Sixteen pairs (69.6%) successfully hatched eggs, producing 35 young, an average of 1.46 young per active nest where outcome was determined (Table 2-6). Eight (33.3%) nests failed to produce young either due to egg breakage during incubation (n = 2), failure to hatch eggs (n = 1), or failure to lay a full clutch of eggs this season (breaking while laying)(n = 5). There was no evidence of recycling attempts (2^{nd} clutch laying) after failure where complete clutches had been laid even though renewed courtship activities were observed at three of those sites.

Table 2-6. Breeding Status and Reproductive Outcome in 2007 by Island (SCPBRG draft report).

BREEDING STATUS:	Totals	Per island							
		SMI	SRI	SCI	ANA	SBI	SCA	SNI	SCL
Outcome Determined	24	7	8	7	1	1			
Pairs Laid Eggs	20	7	6	5	1	1	0	0	0
Laying Undetermined*	4	0	1	2	1	0	0	0	0
Pairs hatched	16	3	6	5	1	1	0	0	0
Pairs Failed	8	4	2	2	0	0	0	0	0
Pairs Recycling	0	0	0	0	0	0	0	0	0
Number of Young	35	7	15	9	1	3	0	0	0
Young banded	26	3	15	4	1	3	0	0	0
Productivity**	1.46	1.00	2.14	1.29	1.00	3.00	0	0	0
% Failure	30.4%	57.1%	14.3%	28.6%	0.0%	0.0%	n/a	n/a	n/a
* Never reached hard incubation									
** Number of young per active territory where outcome was determined.									

Figure 2-22. Peregrine Falcon chicks on Santa Barbara Island in 2007 (Photo Credit: B. Latta).

Biologists banded 26 chicks (Figure 2-22) at 12 nests on 5 islands. A total of 35 nest entries were made, collecting 39 eggshell and eggshell fragment samples representing 32 distinct clutches (eighteen 2007 clutches, fourteen 2001-2006 clutches). Four addled eggs were collected from three territories during banding and sample collection climbs. In addition, 17 bags of prey remains were collected and 2 whole blood samples were taken from resident breeding adult female peregrines. Eggshell thinning >18% is considered sufficient to result in population declines, if that degree of thinning persists over years (Blus 2011). Eggshells collected from eyries in the Channel Islands in 1992-3 averaged 19.4% thinner than those collected in California prior to 1947 (Hunt 1994). Eggshell and eggshell fragments were again collected in 2007 and eggshell thickness was measured to the nearest 0.001 mm using a Federal model P61 dial indicator mounted on a Federal model 35B-21 comparator stand. The average of the clutch means for the 2007 samples was 0.299 mm or 17.97 % thinning. Individual clutch means ranged from 7.7% thinning at Santa Rosa Island Trancion site to 28.65% thinning at San Miguel Island Science/Millenium site (see Table 2-7 below). Clutch means averaged by island ranged from 12.07% thinning on Santa Rosa Island to 23.20% thinning on Santa Barbara Island. As shown in Table 2-7, there is considerable variation in the extent of eggshell thinning, even among territories on the same island. Although average eggshell thinning was slightly lower than in 1992-3, the average level continues

to exceed thresholds associated with declining populations. Eggshell thinning continues to be widespread on the Channel Islands and may in certain territories be at a level to cause reproductive failure.

In 2007, SCPBRG and the USFWS sent egg contents and whole blood samples to Alpha Woods Hole Laboratory (Mansfield, MA) for contaminant analysis. Four addled eggs were collected in 2007 from three different eyries, two located on Santa Rosa Island and one on San Miguel Island. The DDE concentrations exceeded total PCB concentrations by as much as 3.4 to 6.3-fold. This ratio reflects the influence of the local DDE source in the Southern California Bight from the historic Montrose discharges.

The DDE levels in the 2007 Peregrine Falcon eggs ranged from 3.4 parts per million wet weight (ppm ww) to 57.9 ppm ww, with an average of 18.6 ppm ww (Table 2-7). The geometric mean DDE concentration for 16 Peregrine Falcon eggs collected in 1992 was 19.6 ppm ww. Although the sample size is small and contaminant levels variable in 2007, monitoring results demonstrate that Peregrine Falcon females continue to be exposed to DDE in the local food web.

Table 2-7. Eggshell Measurements and Corresponding DDE Concentrations in 2007 Peregrine Falcon Samples from the Channel Islands (SCPBRG draft report, modified by USFWS).

		Clutch Means		
Island	**Territory**	**Thickness (mm)**	**% Thinning**	**p,p'-DDE (ppm ww)**
SMI	Hoffman Pt.	0.312	14.23	
	Bat Rock	0.287	21.04	
	Cardwell Pt.	0.318	12.75	
	Carbon	0.274	24.84	57.9
	Crooked	0.318	12.71	
	Salvador	0.291	20.03	
	Science/Millenium	0.260	28.65	
SRI	Carrington	0.322	11.58	
	Lime Pt. Alt. (Lobos)	0.301	17.39	
	Bee Rock Cyn (2 eggs)	0.325	10.82	4.2 / 2.6
	Krumhotz	0.300	17.71	
	Trancion	0.336	7.77	13.1
	Soledad	0.304	16.46	
SCI	Sea Lion	0.302	16.91	
	Bowen Pt.	0.283	22.28	
	Valley Anchorage	0.267	26.68	
ANA	East Anacapa	0.297	18.38	
SBI	Santa Barbara Island	0.280	23.20	
Total Average		**0.299**	**17.97**	**18.6**

Concentrations of total polychlorinated biphenyls measured in the Peregrine Falcon eggs ranged from approximately 0.5 – 13.7 ppm ww with the most contaminated egg coming from the San Miguel Island eyrie. While the total PCB concentration in the San Miguel Island egg is elevated, it does not exceed thresholds suggested by Harris and Elliott (2011) for impacts on hatching or fledging success (35 ppm ww) or productivity of multiple years (25 ppm ww) in raptors.

Biologists collected prey remains from 14 different eyries on 5 islands. Remains were taken to the Western Foundation of Vertebrate Zoology for identification. After identification, prey items were assigned to the category of Land birds, Shorebirds, or Seabirds, depending on where the pair primarily foraged while on or around the Channel Islands. This classification allowed biologists to look at the relative contribution from

each corresponding ecosystem to the nesting season diet. A total of 171 individual prey items were identified representing 48 species. Eighteen prey items could only be keyed out to genus and 8 were identified as "unknown passerine". Seabirds represented 72% of the biomass and 36% of the mean number of individuals (MNI). Land birds represented 21% and 56% and shorebirds 7% and 5% of the biomass and MNI respectively. When calculated using percent of total biomass as the metric, the most predominant prey species were Western Gull (18%), Pigeon Guillemot (15%), Cassin's Auklet((8%), and Xantus's Murrelet (7%). The predominant species (MNI) from the combined samples was Red Phalarope (n=19), followed by Black-Headed Grosbeak (n=12), Cassin's Auklet (n=10), Red-Necked Phalarope, (n=8), Western Tanager (n=8), and Western Meadowlark (n=7).

Overall Summary

The Peregrine Falcon population continues to increase on the Channel Islands in step with the recovery of the greater California subpopulation (Figure 2-23). However, the recovery is much more robust in the northern Channel Islands than the southern islands. One of the highlights of the 2007 survey was the documentation of a successful breeding pair on Santa Barbara Island. This event was the first documented breeding on the island in over 50 years. The 25 active territories documented on the islands in 2007 exceeds Kiff's (2000) historical estimate of 15-16 pairs and approaches the carrying capacity of 30 pairs predicted by Hunt (1994).

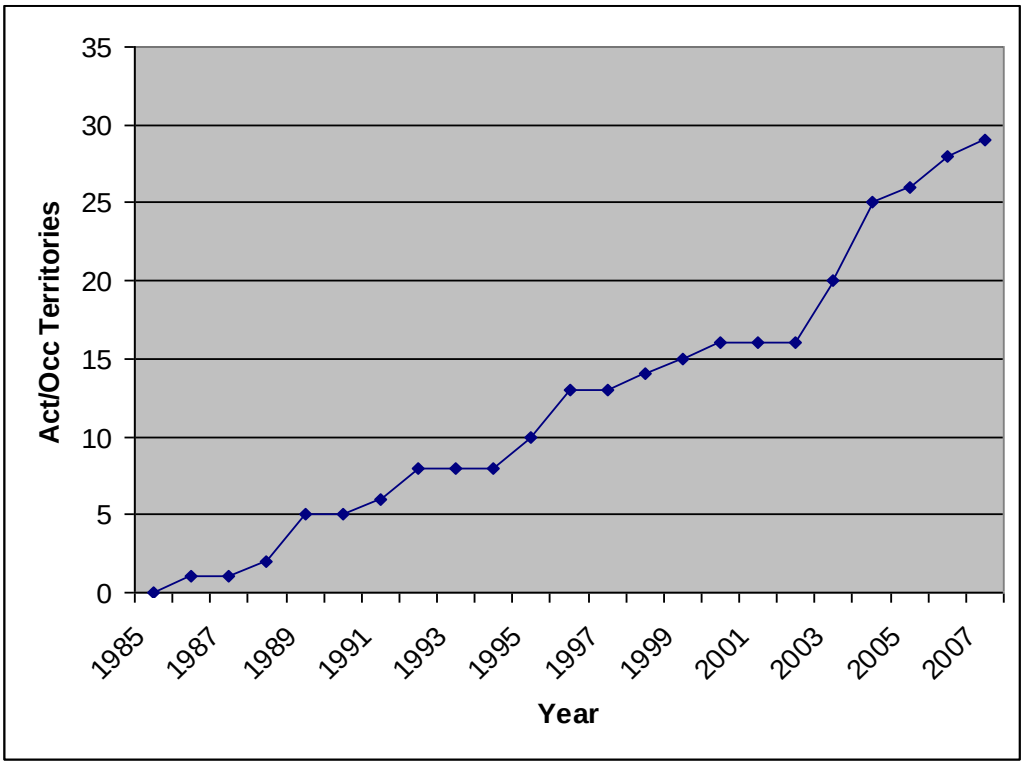

Figure 2-23. Active/Occupied Territories on the Channel Islands from 1985-2007 (SCPBRG draft report)

While significant eggshell thinning may be repressing productivity on the islands, recruitment from the mainland is likely buffering that effect (SCPBRG draft report). Analysis of Peregrine Falcon eggshell thinning has shown a trend towards improvement (e.g., thicker eggs); however, the current levels of eggshell thinning still exceed the 17 percent threshold characteristic of declining populations as reported by Peakall and Kiff (1988).

Seabirds continue to constitute the majority of the Peregrine Falcon diet during the nesting period and are likely still the major contributor in the continued DDE contamination and resultant eggshell thinning in Channel Islands peregrines. Long-term monitoring and sample collection will be necessary for accurately assessing the trends in recovery of the Peregrine Falcon, noting trends in source-sink population demography on the islands, and documenting changes in site-specific contaminant levels through time.

BUDGET:

In the 2005 RP, an estimated amount of $250,000 was allocated for two monitoring efforts. The total amount spent on the 2007 effort was approximately $175,000. The remaining funds from Phase 1 will be directed towards the next Peregrine Falcon monitoring effort planned for 2013.

2.1.4. California Condors

GOAL:

California Condors were not originally identified in the 2005 RP as a species for restoration. However, the USFWS presented to the Trustees a data gap study in 2009 regarding the endangered California Condor and potential exposure to DDT contamination specifically related to the Montrose discharges in the SCB. The purpose of the study is to investigate whether DDT associated with the Montrose release was impacting California Condor reproduction along the Big Sur coast via contaminated marine mammals. Preliminary data suggest that Montrose DDT may be causing ongoing injury to California Condors through feeding on contaminated beach-cast marine mammal carcasses. Based on this data, the Trustees decided it was appropriate to fund this investigation.

DESCRIPTION:

Marine mammals from the SCB are known to be highly contaminated with DDT and PCBs (Blasius and Goodmanlowe 2008) in ratios typical of the SCB (approximately 5 DDT: 1 PCB). Field observations of condors from the Big Sur population show consumption of marine mammals on the central coast. In 2008, the USFWS Condor Recovery Program reported that 4 of 6 condor eggs laid in Big Sur since 2006 failed to hatch. Eggs and eggshell fragments were collected and analyzed for contaminants. The resulting DDE:PCB ratios suggest that the Montrose site is the source of the DDE.

Based on the contaminant results, it is hypothesized that California Condors on the central coast are being injured by DDE from the SCB that is transported via the carcasses of migratory marine mammals, predominantly California sea lions. It is currently unknown how far northward marine mammals carry Montrose DDE at levels harmful to scavenging birds, such as the condor. Understanding the scope and magnitude of the Montrose DDT problem in relation to other environmental stressors could be critically important to the successful recovery of the California Condor.

ACCOMPLISHMENTS:

In 2010, the Trustees funded the University of California, Santa Cruz to conduct a study entitled “Examining Long-range Transport of Montrose DDE via Marine Mammals: Evaluating Risks to California Condors”. The study includes a literature review, coordination with marine mammal researchers, identification of data gaps, targeted sample analysis using existing marine mammal tissue archives, stable isotope analysis of marine mammals and California Condor samples, data interpretation and condor risk assessment modeling. This study will: 1) evaluate the potential for DDE discharged by Montrose to be transported via marine mammals; and 2) evaluate the risk from Montrose DDE to animals that scavenge along the California coast, including the California Condor.

BUDGET:

The Trustees allocated a total of $71,790 for this study. Based on the results of study, the Trustees may consider supporting further condor-related research or restoration during Phase 2.

2.1.5. Seabirds

Many seabird species, including the California Brown Pelican and the Double-Crested Cormorant, were severely impacted in the past by the discharges of DDTs to the coastal waters of the SCB. During Phase 1, the Trustees targeted seabirds that demonstrated severe or significant eggshell thinning and/or seabirds whose DDT egg residues were significantly elevated in their colonies within the SCB. The priority seabirds for restoration include: Double-Crested Cormorant, Brandt's Cormorant, California Brown Pelican, Western Gull, Ashy Storm-Petrel, Cassin's Auklet, Pelagic Cormorant, and Pigeon Guillemot. The Xantus's Murrelet is also a priority species for restoration due to its conservation status and small population size. Section 5.1.1 of the 2005 RP provides a detailed description of seabird injury and nexus.

The MSRP seabird restoration program within Channel Islands National Park is implemented by a team of biologists largely from the NPS, FWS, and USGS. The NPS Seabird Biologist oversees the implementation of the seabird restoration program within Channel Islands National Park and is supported by a team consisting of a field leader and several technicians. Additional support for the seabird restoration program has been provided by collaborators (including Carter Biological Consulting, California Institute of Environmental Studies, Growing Solutions) and universities (Simon Frasier University and Pomona College).

2.1.5.1. Restore Seabirds to San Miguel Island

GOAL:

This action aims to restore seabird nesting habitat on San Miguel Island in CINP by eradicating the introduced Black Rat. Target species for restoration include burrow/crevice nesting seabirds such as the Ashy Storm-Petrel, Cassin's Auklet, and Xantus's Murrelet, as well as other seabirds such as the Western Gull, Brandt's Cormorant, Pelagic Cormorant, and Pigeon Guillemot.

DESCRIPTION:

The goal of this action is to eradicate the introduced Black Rat, increase seabird populations, and prevent future rodent introductions. The eradication of rats from San Miguel Island will benefit a variety of seabirds by increasing the amount of available seabird nesting habitat and decreasing predation on eggs, chicks, and adults. A reduction in predation will lead to increased population size and breeding success of seabirds on San Miguel Island. Small crevice-nesting seabirds, such as the Ashy Storm-Petrel,

Cassin's Auklet, and Xantus's Murrelet, would benefit from the elimination of a predator that is known to take eggs, chicks, and adults.

ACCOMPLISHMENTS:

In 2007, the Trustees funded Carter Biological Consulting to conduct a survey of seven species of breeding seabirds at the San Miguel Island group in order to provide updated information on seabird abundance, distribution, and trends. In addition, the Trustees also funded a review of the historical literature and unpublished data on the abundance, distribution, trends, and conservation issues for all 15 species of breeding seabirds on San Miguel Island.

The Trustees consulted with experts about the various methodologies that could be used to implement this project. Currently, the only method that would be effective in successfully eradicating the introduced rats would be the use of a rodenticide applied through aerial broadcast. A similar method was used successfully to eradicate rats on Anacapa Island in 2002. However, this methodology presents a significant risk to the federally endangered San Miguel Island Fox. Impacts to the Island Fox and other non-target species may be reduced through protective efforts (e.g., holding Island Foxes during bait application and potential exposure period). However, these efforts would greatly increase the cost of the project and may not be acceptable from a risk standpoint. Based on these reasons, the Trustees have determined that the eradication of rats on San Miguel Island is not feasible at this time due to the potential risk to non-targets (in particular the Island Fox) and expense. The Trustees may consider this project in the future should suitable methods become available that is both feasible and cost effective. For example, a rat-specific toxicant may be developed that would reduce the potential impacts to non-targets such as the Island Fox.

BUDGET:

In the 2005 RP, approximately $2,453,000 was allocated for this project. $55,314 was spent on the baseline surveys in 2007. The remaining funds were re-allocated to other Phase 1 projects as described below.

2.1.5.2. Restore Alcids to Santa Barbara Island

GOAL:

The goals of this project are: 1) to re-establish an active Cassin's Auklet breeding population on Santa Barbara Island proper through social facilitation and habitat improvement; and 2) to improve recruitment and productivity of Xantus's Murrelets through habitat restoration.

DESCRIPTION:

In 1897, Cassin's Auklets bred in large numbers on Santa Barbara Island (Grinnell in Hunt et al. 1979). However, cats decimated this population and by 1908 no signs of the

species were seen (Howell 1917). Surveys conducted in the early 1990s demonstrated that this colony has not recovered from the impacts of cat predation (Carter et al. 1992). In 1991, Cassin's Auklets persisted in small numbers on the offshore islet of Sutil Island and in a bluff at Elephant Seal Point on Santa Barbara Island (Carter et al. 1992).

The Xantus's Murrelet is a rare seabird whose worldwide breeding range is restricted to the Channel Islands and the west coast of Baja California. Little historical information exists on the size of the Xantus's Murrelet population on Santa Barbara Island prior to the introduction of cats in the late 1800s. Similar to Cassin's Auklets, this species was preyed upon by cats (Sumner and Bond 1939), and likely only persisted in small numbers on Sutil Island and inaccessible cliffs on Santa Barbara Island. Research from the 1970s to 2001 documented a decline in Xantus's Murrelet numbers on Santa Barbara Island (Hunt et al. 1979, Hunt et al. 1980, Carter et al. 1992, Burkett et al. 2003). Due to the small population size and restricted range, this species was listed as a California state threatened species in 2004 and is a Candidate species for federal listing under the Endangered Species Act. Both the Xantus's Murrelet and Cassin's Auklet are California Species of Special Concern.

ACCOMPLISHMENTS:

During Phase 1, this project improved nesting habitat for Cassin's Auklets and Xantus's Murrelets on Santa Barbara Island by removing exotic vegetation from suitable nesting areas and revegetating the area with native plants. From 2007-2011, over 15,000 native plants were planted (Figure 2-24) in four different restoration areas totaling approximately 4.5 acres (Harvey et al. in prep). A permanent on-island nursery was built in 2011 (Figure 2-24) to support the revegetation efforts. All seeds for plants used in the revegetation efforts were collected and sown on island. Natural plant recruitment was observed in 2009 following improved rainfall. Over 10,000 volunteer hours have been contributed to this restoration project, including students from local community colleges.

Vocalization playback systems were also installed in two of the restoration sites to attract Cassin's Auklets. Although this social attraction system has been used for other seabirds, this project is the first time vocalizations have been broadcasted for Cassin's Auklets. Artificial burrows and nest boxes were installed for Cassin's Auklets and Xantus's Murrelets in order to facilitate recruitment and assist in monitoring efforts. Although it will take several years for the plants in the restoration areas to mature and provide fully functional habitat, there have been initial signs of birds colonizing the restored areas. In 2010, a Cassin's Auklet nested in the Elephant Seal Cove restoration area that was previously inaccessible due to dense ice plant cover. In 2011, approximately ten pairs of Cassin's Auklets nested in newly installed artificial habitat near a vocalization broadcast speakers located at the Landing Cove restoration site.

Figure 2-24. Left panel, outplanting at Elephant Seal Cove, Santa Barbara Island (Photo Credit A. Little, FWS). Right panel, permanent native plant nursery (Photo Credit: S. Auer, NPS).

In 2010, funds were provided to NPS and USGS to complete an updated vegetation map of Santa Barbara Island. This map will be used in planning future restoration areas and to quantify the success of the current revegetation efforts. Funds have also been provided to the California Institute of Environmental Studies to take aerial photographs of restoration areas for long-term characterization of vegetation changes.

Population Monitoring and Surveys

In addition to the revegetation work, the Trustees have funded annual population monitoring on Santa Barbara Island since 2007. Surveys for Cassin's Auklets, Xantus's Murrelets, and other species were conducted in order to: 1) assess baseline status of auklets and murrelets during plant restoration activities, especially using nest searches at selected locations; and 2) collect long-term population data for these species using several techniques, including plot monitoring, nocturnal spotlight surveys, diurnal boat-based radial surveys, and round-island boat surveys.

Figure 2-25. Cassin's Auklet incubating on SBI in 2009 (Photo Credit: L. Harvey, NPS).

In 2009-2010, biologists documented the first breeding by Cassin's Auklets (Figure 2-25) on Santa Barbara Island proper since 1994 (Whitworth et al. 2011). Direct evidence of breeding by Cassin's Auklets was found in five locations on the island in 2009-10, including: 1) a small colony on Sutil Island (~ 30 pairs); 2) a small colony on Elephant Seal Point (≥ 7 pairs); 3) two nests on the Arch Point North Cliffs; 4) one nest at Pinnacle Point; and 5) one nest at Elephant Seal Cove. In 2009-2010, Pomona College conducted two years of standardized at-sea surveys and prey sampling around Santa Barbara Island. The objectives of this study were to: 1) determine

the distribution and abundance of zooplankton and larval fish around Santa Barbara Island in the upper 50 meters where they are accessible to diving seabirds; 2) assess the physical properties of the water column (temperature and salinity); 3) compare current alcid abundance to historic surveys (Hunt et al. 1980); and 4) assist with the interpretation of abundance and distribution data of Xantus's Murrelets, Cassin's Auklets, and other seabirds in the waters surrounding Santa Barbara Island. In addition to habitat restoration, adequate availability of profitable prey to breeding seabirds within foraging distance from the colony is also necessary to provide conditions that will promote colony growth and use of restored nesting habitats. Consequently, the information gained from the prey sampling work is important to assess relative changes in population size to help interpret recruitment rates and understand the degree of success of the on-island restoration work.

BUDGET:

In the 2005 RP, approximately $602,000 was allocated for this project. The overall budget was increased with the redistribution of funds from the San Miguel Island Restoration Project. The Trustees estimate that the budget for this project from 2007-2011 is $1,041,218.

2.1.5.3. Restore Seabirds to San Nicolas Island

GOAL:

The goal of this project is to restore Western Gull and Brandt's Cormorant colonies on San Nicolas Island by removing feral cats. In addition to restoring the island's seabird populations protect other native fauna, including federally and state listed threatened species.

DESCRIPTION:

Feral cats are among the most detrimental of invasive species, causing population decline, extirpation, and extinction in a diverse array of animals, including insects, reptiles, birds, and mammals (Lowe et al. 2000, Nogales et al. 2004). The effects of feral cats are particularly severe on islands (Whittaker 1998). On San Nicolas Island, feral cats are known to kill Western Gulls, the federally threatened Island Night Lizard, and the endemic Deer Mouse. They also compete with the state threatened San Nicolas Island Fox for food and habitat. The control/removal of feral cats on San Nicolas Island is a recommended management action by the U.S. Navy in its Integrated Natural Resources Management Plan for the protection of native wildlife on San Nicolas Island (INRMP) (U.S. Navy 2003).

In May of 2008, a draft Environmental Assessment (EA) for the project was released for a 30-day public review (USFWS 2008). Shortly after the public comment period closed, the U.S. Fish and Wildlife Service (Service) engaged in discussions with The Humane Society of the United States (The HSUS). In December of 2008, the Service, U.S. Navy,

and The HSUS entered into a Memorandum of Agreement (MOA). This MOA outlined roles and responsibilities regarding a Pilot Program on San Nicolas Island that occurred in late 2008/early 2009. This MOA also outlined the conditions under which trapped cats could be transferred to The HSUS for permanent care and custody. During the Pilot Program, seven cats were trapped and provided to The HSUS. These cats were then transferred to a secure enclosure at the CARE Sanctuary in Little Rock, California. The Final EA for this project was completed in March 2009 (USFWS 2009).

As outlined in the Final EA, implementation of this project was based on an adaptive management approach using the following methodologies for detecting and removing feral cats: (1) padded leg-hold live trapping, (2) hunting, and (3) use of specialized tracking dogs. The Final EA included extensive measures to minimize and mitigate potential impacts to non-target species, particularly the endemic San Nicolas Island Fox. Island Conservation (IC) and the Institute for Wildlife Studies (IWS) were selected by the Trustee Council to implement the project.

ACCOMPLISHMENTS:

During the planning phase of this project, baseline monitoring activities were conducted for the Island Fox (2007-08) and Western Gulls and Brandt's Cormorants (2007-08). The baseline data provides a snapshot of conditions immediately prior to the start of the project. The U.S. Navy also has conducted surveys and monitoring for the island night lizard, deer mouse, snowy plovers and landbirds which will also be useful in evaluating the effects of feral cat removal on the island ecosystem.

Prior to the start of the trapping effort, substantial preparation on-island occurred from March-June 2009. This preparation included renovation of on-island facilities, trail building, dog quarantine, set-up of an on-Island Fox hospital, deployment of an automated trap monitoring system, and sign searching. Traps were placed during the last week of June 2009 and the first traps were opened on June 25, 2009. This timeframe coincided with the end of the Island Fox breeding season. Trapping progressed across the island in a systematic fashion and allowed for on-going evaluation of the project. In light of the MOA with The HSUS, removal efforts were focused on trapping so that cats would be removed alive from the island. From June 25-November 17, 2009, a total of 52 cats were trapped across the island (Figure 2-26). These cats were removed from traps and transferred to an on-island holding facility operated by IWS. Each cat was sexed, aged, vaccinated, inspected for injury, provided a health check-up, and tagged with a passive integrated transponder. The 52 cats, along with 10 kittens born on the island during the holding period, were flown off-island by The HSUS and transferred to The Fund for Animals Wildlife Rehabilitation Center in Ramona, California. The adults will live out the remainder of their lives in a secure, outdoor enclosure and all ten kittens were adopted as indoor-only pets. Funding for this aspect of the project was provided by HSUS.

All Island Foxes removed from traps were processed by IC in the field. Staff was trained in fox handling techniques to ensure safe removal and processing, including the identification of potential injuries. PIT tags were administered to all untagged foxes.

Animals with suspected injuries including fractures, dislocations, major cuts or body temperature related conditions were transferred to an on-Island Fox medical clinic staffed by IWS. All other foxes were safely released on-site.

A key component of this project was the telemetry-based trap monitoring system developed to remotely check trap status, decrease staff time spent checking traps, and decrease response time to captured animals. This system enabled a team of six IC staff to maintain daily checks of approximately 250 traps (at the peak) and have a response time to captures of less than 60 minutes during daylight hours.

Between June 25, 2009 and February 17, 2010, a total of 30,201 trap nights occurred. A total of 59 cats were removed, of which 52 adult cats (plus 10 kittens) were transferred to The HSUS. No cats were captured from December 2009-February 2010.

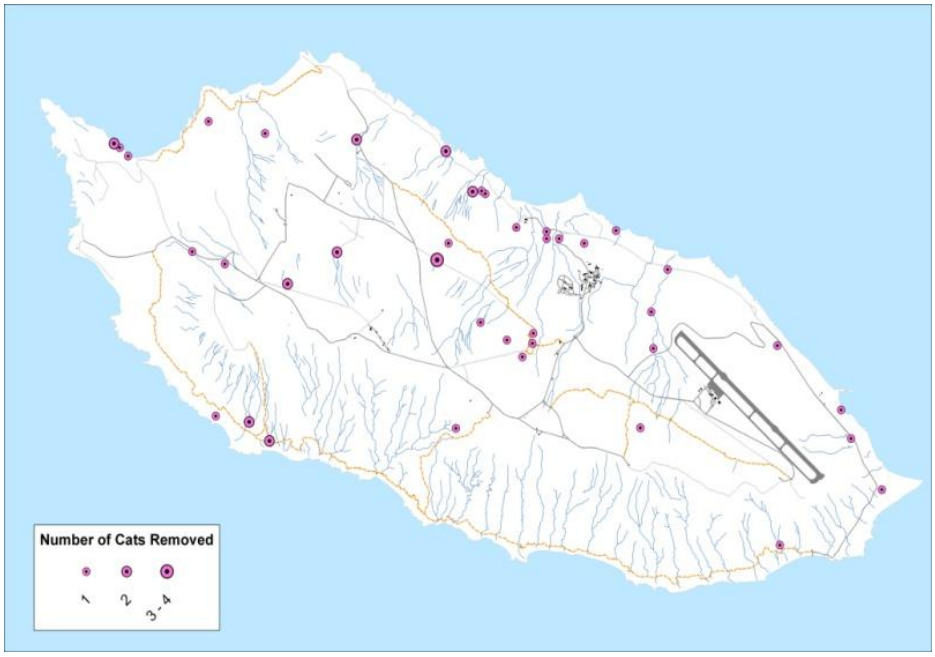

Figure 2-26. Cat capture locations on San Nicolas Island (Hanson et al. 2010).

In December of 2009, a series of infrared cameras were deployed across the island. A cat was detected in December of 2009 and efforts to trap that individual in January of 2010 were unsuccessful. Trapping ended in February of 2010 due to the start of the Island Fox breeding season. From January – June 2010, this same individual cat was detected at several camera locations across the island. A second cat was then detected by a camera in late June 2010 in the immediate vicinity of the first detected cat. Because of the restrictions with trapping during the Island Fox breeding season, these two individuals were lethally removed on island at the end of June 2010 (Hanson and Bonham 2011). Since that last cat removal in June of 2010, cameras were systematically placed across the island in order to ensure adequate coverage of the island. As of August 2011, over 21,000 camera trap nights and 240 km of sign search had occurred with zero cat detections (Figure 2-27).

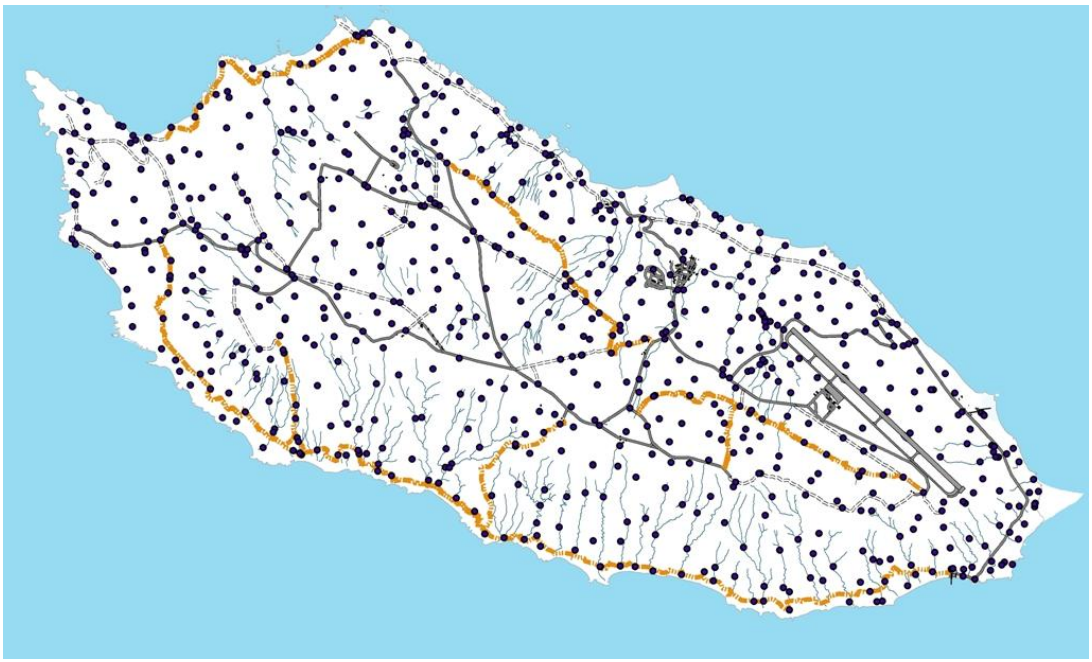

Figure 2-27. Map of camera locations across San Nicolas Island from June 2010-July 2011 (Island Conservation, Unpublished Data).

BUDGET:

In the 2005 RP, approximately $1.85 million was identified for costs associated with Years 1-3 of implementation. This original amount did not include the pre-implementation costs (e.g., NEPA compliance) or the extensive mitigation measures that were developed for the Island Fox. As of March 2011, approximately $2.7 million had been spent on the project. The Trustees estimate that the complete budget for this project from 2006-2012 will be approximately ~$3 million. This amount includes all the costs associated with planning, feasibility studies, NEPA compliance, mitigation, partnership with The HSUS, implementation, and monitoring. In order to cover the additional cost of this project, a portion of the funds dedicated to the San Miguel Island Restoration Project was reallocated to this project.

2.1.5.4. Restore Seabirds to Scorpion and Orizaba Rocks, Santa Cruz Island

GOAL:

The goal of this project is to restore seabird habitat on Scorpion and Orizaba Rocks through exotic vegetation removal, installation of artificial nest boxes, and disturbance reduction. This project also monitors the Ashy Storm-Petrel population in several sea caves on Santa Cruz Island and aims at reducing disturbance from kayakers entering the caves. This action provides benefits to the following nesting or roosting species: Cassin's Auklet, Ashy Storm-Petrel, Western Gull, Xantus's Murrelet, California Brown Pelican, and Double-Crested Cormorant.

DESCRIPTION:

Scorpion and Orizaba Rocks, located off of Santa Cruz Island, are important nesting islands for burrow and crevice-nesting seabirds in California. Both islets are under the jurisdiction of the National Park Service and are within the Channel Islands National Park. Scorpion Rock is the largest of a four-rock complex and supports a diverse community of breeding and roosting seabirds. Both Ashy storm-petrels and Cassin's Auklets are confirmed breeders on Scorpion and Orizaba Rocks.

The waters around Scorpion and Orizaba Rocks are popular destinations for sea kayakers. Although Scorpion Rock is closed to the public, kayakers occasionally land on the island. This human disturbance results in the flushing of roosting seabirds (e.g., California Brown Pelicans and cormorants) and harassment of nesting birds. Disturbance can lead to the abandonment of nests and decreased productivity. Disturbance by kayakers is also a significant issue for nesting seabirds in the sea caves on Santa Cruz Island.

ACCOMPLISHMENTS

Scorpion Rock, Santa Cruz Island: This project enhanced degraded habitat on Scorpion Rock through the removal of exotic plants and revegetation with native plants. Removal of exotic vegetation, primarily ice plant, was accomplished by hand removal without the use of herbicides. Several tons of iceplant have been removed from Scorpion Rock from 2008-2011. Once cleared, native plants were then used to restore the area. Over 7,000 plants were planted on Scorpion Rock from 2008-2011 (Figure 2-28). Soil was stabilized in erosion-prone areas with fibrous mats and native plantings. Volunteers were an important component of the outplanting efforts, with thousands of volunteer hours contributed to weeding and planting efforts on Scorpion Rock. A sign was installed on Scorpion Rock to inform unauthorized visitors that the area is closed.

For the first three years of the Scorpion Rock project, plants were grown from local seed at the Central Valley nursery on Santa Cruz Island because of the large number of plants that were grown and the lack of infrastructure at Scorpion Ranch. In summer of 2010, a small plant nursery was built at the Scorpion Ranch in order to support the revegetation efforts. With the nursery at Scorpion Ranch, the logistics of growing and transporting the plants to the rock were reduced.

Figure 2-28. Pre-restoration photo in March of 2007 compared with January of 2011 Scorpion Rock, Santa Cruz Island (Photo Credit: D. Mazurkiewicz, NPS).

In addition to the revegetation efforts, monitoring of the breeding success of Cassin's Auklets on Scorpion Rock and Prince Island was also conducted from 2007-2011. Prince Island off San Miguel Island supports the largest Cassin's Auklet colony within CINP and is an important reference site for Scorpion Rock. These sites are part of a long-term monitoring program for the Cassin's Auklet and continued monitoring at both sites is important for measuring population changes resulting from the restoration actions and other natural and anthropogenic factors. To assist with monitoring efforts, nest boxes have been used on Scorpion Rock and Prince Island. The boxes also provide a stable and secure nesting area for Cassin's Auklets. In 2007-2008, biologists replaced 35 temporary artificial burrows on Scorpion Rock and 47 burrows on Prince Island with an improved design.

Orizaba Rock, Santa Cruz Island: Artificial nest sites and social attraction equipment were first deployed at Orizaba Rock in 2008. During 2008-2009, a total of 26 artificial nests sites were deployed. Each artificial nest site was housed under a single concave cement roofing tile. Small bags filled with Ashy Storm-Petrel feathers gathered during monitoring in past years were placed inside each site to provide an olfactory cue of nest site suitability to further encourage storm-petrel prospecting of the interior of the site. Fine sand was placed around artificial nest sites to detect storm-petrel footprints that would indicate site use.

A vocalization broadcast system was used on Orizaba Rock from 2008-2011. This system had been developed previously by the National Audubon Society and used widely for social attraction purposes (e.g., Parker et al. 2007). An MP3 played ashy storm-petrel vocalizations during the night. Artificial nest sites were placed within 1- 7 m of the speaker to encourage storm-petrels originally attracted to vocalization broadcasts to then spend time in or near artificial site areas. Video cameras were also used on Orizaba Rock in 2010-2011 to document storm-petrel response to the vocalization system. Video footage documented that storm-petrels were responding to the broadcast vocalizations.

Monitoring efforts documented an increase in colony size with successful reproduction at Orizaba Rock from 2008-2010. In 2009, six active nests were found in the artificial nest sites and chicks fledged from four (67%) of six artificial nest sites. Starting in 2010, biologists documented disturbance at the artificial nest sites on Orizaba Rock. The use of motion detection cameras confirmed that common ravens were investigating the artificial sites and disturbing them. In response to the raven disturbance, a new type of artificial nest was deployed in 2011 with the hopes that ravens would be unable to disturb the nesting sites.

In addition to the artificial habitat and social attraction, efforts were made to reduce human disturbance on Orizaba Rock. In 2009, a sign was installed on Orizaba to inform unauthorized visitors that the area is closed (Figure 2-29).

Figure 2-29. Sign installed on Orizaba Rock to reduce human disturbance (Photo Credit: A. Little, USFWS).

Sea Caves, Santa Cruz Island: In addition to the habitat restoration, the Trustee Council funded nest surveys and monitoring for Ashy Storm-Petrels at five sea caves at Santa Cruz Island from 2006-2011. These surveys collected important continued data on population size, reproductive success, breeding phenology, and predation. In 2005, biologists discovered the decimation of the colony by island spotted skunks in Bat Cave, the largest known ashy storm-petrel colony at Santa Cruz Island. In 2008, predation by at least two island spotted skunks resulted in the documented deaths of 32 adult Ashy Storm-Petrels, complete reproductive failure, and a lack of use of artificial sites at Cavern Point Cove Caves. In order to prevent future predation events occurring in these fragile colonies, skunk traps were deployed in the sea caves in order to prevent or reduce further predation in these important colonies.

To address the threats to the colonies from human disturbance, signs were deployed in 2009 in order to prevent or reduce unauthorized human access. Signs were deployed at Bat Cave, Cave of the Birds Eggs, Cavern Point Cove Caves, and Dry Sandy Beach Cave.

BUDGET:

In the 2005 RP, approximately $326,000 was allocated for this project. This budget was increased with the reallocation of the funds originally allocated for the San Miguel Island Restoration Project. The Trustees estimate that budget for this project from 2006-2011 was $588,573.

2.1.5.5. Restore Seabirds to Baja California Pacific Islands

GOAL:

The goal of this action is to restore seabird populations on the Coronado and Todos Santos Islands. These islands are oceanographically considered part of the Southern California Bight. Restoration efforts will target a suite of seabirds including the Cassin's Auklet, Brandt's Cormorant, Double-crested Cormorant, California Brown Pelican, Ashy Storm-Petrel, and Xantus's Murrelet.

DESCRIPTION:

The Coronado Islands consist of four islands that lie 11 km (7 miles) offshore of the Mexican mainland near Tijuana, Baja California Norte. These islands total 2.5 km2 (1 mi2) in area. Historically, the Coronado Islands supported significant colonies of Cassin's Auklets, Xantus's Murrelets, and California Brown Pelicans (Grinnell and Daggett 1903, Howell 1910). In addition to negative effects from DDT contamination, seabird populations on the Coronado Islands also declined due to the presence of introduced animals (cats, goats, burros) and human disturbance. Efforts to remove introduced species from the Coronado Islands include the: 1) eradication of feral cats from North Island in 1995 and 1996; 2) removal of one cat from South Island in 2004; and 3) removal of goats and burros from South Island in 2004. With the eradication of these introduced species, suitable habitat is once again available to seabirds for nesting and roosting.

Historically, the Todos Santos Islands supported important colonies of seabirds, including the California Brown Pelican and Double-Crested Cormorant (Howell 1912). However, seabird colonies and island vegetation have been heavily impacted by introduced cats and rabbits, regular human use and development, and occasional human-caused wildfires. Xantus's Murrelets and Cassin's Auklets were extirpated from Todos Santos South likely due to cat predation. Recent non-native eradication efforts have been undertaken to restore the Todos Santos island ecosystem. Cats and rabbits were eradicated in 1998, and burros were removed in 2004. During the burro removal, illegal camps were cleaned up and more than two tons of garbage was removed from Todos Santos North. With the removal of these introduced animals, suitable habitat is once again available to seabirds for nesting and roosting.

On the Coronado Islands, restoration actions may include using social attraction techniques (including decoys and vocalizations), habitat enhancement, improving nesting

opportunities with artificial nests, and reducing human disturbance. Standard social attraction techniques that have been used successfully elsewhere would be employed on these islands. On the Todos Santos Islands, restoration actions may include social attraction techniques (e.g., decoys and vocalizations), habitat enhancement, improving nesting opportunities with artificial nests, shielding lights, and reducing human disturbance.

ACCOMPLISHMENTS:

The Trustees delayed implementation of this project during Phase 1 in order to partner with the Luckenbach Trustee Council which has $2,955,116 dedicated for seabird restoration work on the Baja California Pacific Islands. The availability of the Luckenbach funds was delayed due to negotiations with the Oil Spill Liability Trust Fund from whom the funds were awarded. The Trustees decided to wait until the Luckenbach Trustee Council was ready to partner with the Montrose funds in order to implement a larger and more comprehensive program. A Request for Proposals was released in May of 2011. Project implementation is likely to begin in early 2012.

BUDGET:

In the 2005 RP, $1,042,000 was allocated for restoration projects on Coronados and Todos Santos Islands. These funds are anticipated to be spent on seabird restoration projects on these island groups within the next 5-7 years.

2.2. PROGRAM OUTREACH

GOAL:

The goal of Program Outreach is to communicate program restoration milestones and the value of the resources that are being restored to the local public. Outreach products such as fact sheets, newsletters, and the website provide more detailed information about each restoration category and the restoration value of each resource. Attending events to reach specific audiences throughout the year allows the MSRP to reach a large and diverse group of the public. Outreach products relating to restoration projects help to reinforce the message about the value of a particular resource to the public and the importance of their continued protection and conservation.

DESCRIPTION:

Program Outreach encompasses many activities relating to the promotion of restoration milestones and continued protection and conservation of resources being restored. New outreach products are continually being developed as needed and distributed to target audiences.

ACCOMPLISHMENTS:

Program Website

The program website is hosted by NOAA but recognizes all of the Trustee Council members on several pages throughout the site. Many of the Trustee Council documents, project reports, publications, and outreach products are available on the website. The Trustees funded a new website design in 2011 that added some additional features. The added features to the website include a "Multi-media" tab where you can find a photo gallery, films, webcams, an educator's page, and a page featuring a link to download an Augmented Reality software program that features 3-D animation. The new website also links to social media sites that the MSRP manages. Another added feature of the new website is a "What You Can Do" tab which has information about volunteering, public events, and a calendar.

Project Films

The Trustees have funded four films (*Return Flight: Restoring the Bald Eagle to the Channel Islands, Santa Barbara Island, Scorpion Rock Restoration, Huntington Beach Wetlands Restoration – Protecting California's Coast!*) that feature restoration projects and milestones. These films are engaging, educational, and show restoration scientists and contractors in action. The MSRP funded the development of a 14-minute film released in 2011 chronicling the journey of the Bald Eagle's recovery on the Channel Islands. This film shows the dedication of biologists restoring these important top predators to an area where they had disappeared from by the 1960s. All of the films that have been developed by the MSRP can be found on our youtube channel. http://www.youtube.com/user/msrprestoration

Bald Eagle Webcam

In 2006, the Trustees began funding a web-based camera that would broadcast live views of the Pelican Harbor Bald Eagle nest on Santa Cruz Island. The National Park Service manages the webcam in partnership with the Ventura County Office of Education (VCOE) and The Nature Conservancy. The webcam has been continuously running since it was installed and has been very successful with the public. In 2010, there were over 160,000 unique visitors from over 145 countries worldwide to the webcam generating over 1.5 million hits. Shortly after the webcam was installed, there were many questions from the public about restoration and Bald Eagle behavior. To respond to these questions, VCOE established an online discussion forum that currently has 1,975 members and over 603,948 posts or observations have been made by discussion forum members. The forum also includes threads of nest observations, updates from wildlife biologists, a daily chat, and photos/videos. In 2010, the National Park Service broadcast the banding of two eagle chicks from the Pelican Harbor nest live on the webcam. The banding event was featured in press and media outlets nationally.

Nesting Seabird Information Card

Human disturbance to seabirds on the Channel Islands has been documented by restoration biologists working in the field. The MSRP decided to fund the development of a seabird information card that included illustrations and information of common nesting seabirds on the Channel Islands. The development of this card led to a product that also included tips to protect nesting seabirds. The card is designed to promote awareness and enjoyment of seabirds but also to provide guidance on protecting seabirds when visiting the islands. A strategy for reaching the target audience is being developed and the design of the card will continually be evaluated by the target audience for its effectiveness in reducing disturbance to seabirds.

Outreach Events

The MSRP attends an average of six local community outreach events each year. Some of the more notable events include Earth Day at the Aquarium of the Pacific in April and Sea Fair at the Cabrillo Marine Aquarium in October. The MSRP distributes fact sheets, fishing outreach materials, printed newsletters, and other educational products at each event. An interactive game wheel with different restoration categories makes the interaction with the public educational and engaging. At two of the events each year, the MSRP provides funding to the San Francisco Zoo to bring Sequoia, an educational Bald Eagle.

BUDGET

The costs for general outreach are included in the ongoing operating costs of the program.

Section 3. AFFECTED ENVIRONMENT

The study area is located within the Southern California Bight (SCB), an oceanic region bounded landward by the coast and seaward by the continental slope (Patton Escarpment). For the purposes of the Restoration Plan, the SCB is defined as the area between Point Conception (north), Cabo Colonet, located south of Ensenada, Mexico (south), outside of the Cortez and Tanner Banks (west), and coastal watersheds (east). The study area extends from Point Dume to Dana Point along the southern California coast and includes the California Channel Islands and those Baja California Pacific Islands that lie within the SCB. To facilitate NEPA analysis and descriptions, the United States portion of the study area has been divided into three subareas: coastal, the northern Channel Islands, and the southern Channel Islands (Figure 3-1).

The two subareas of the Channel Islands are separated geographically and geologically, which can also relate to species distribution patterns. The northern Channel Islands subarea includes four islands: San Miguel, Santa Rosa, Santa Cruz, and Anacapa.

The southern Channel Islands subarea also includes four islands: Santa Barbara, San Nicolas, Santa Catalina, and San Clemente.

Management and ownership of the Channel Islands falls under the jurisdictions of Channel Islands National Park, Channel Islands National Marine Sanctuary, U.S. Navy, Catalina Island Conservancy, and The Nature Conservancy. Section 3 of the 2005 RP provides a detailed analysis of the affected environment that is the subject of this Restoration Plan, and is incorporated here by reference.

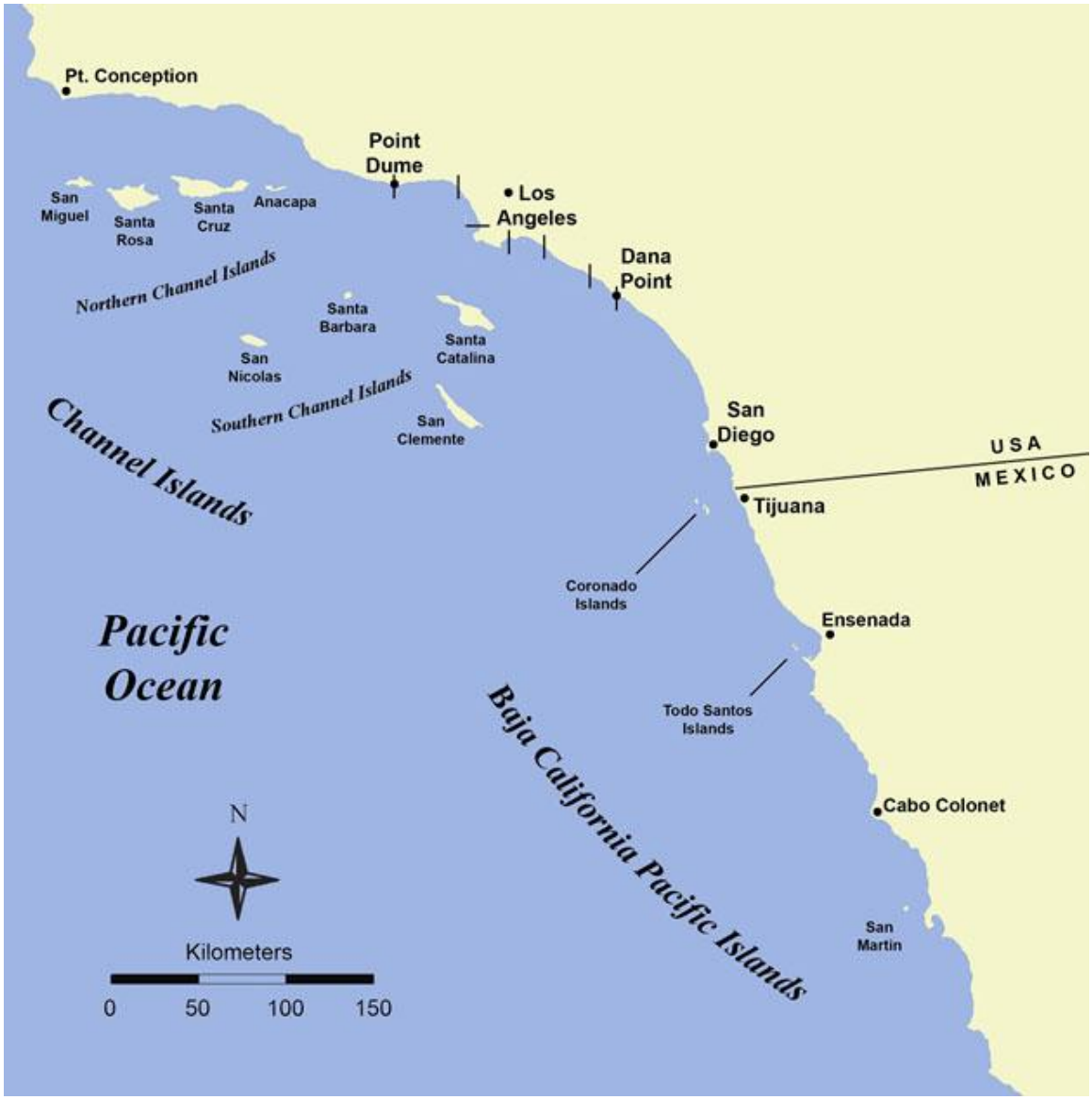

Figure 3-1. Study area for the Montrose Settlements Restoration Program with coastal and island subareas.

Section 4. GOALS AND PLAN DEVELOPMENT

4.1. GOALS OBJECTIVES AND STRATEGIES

The overarching goals of the Montrose Settlements Restoration Program (MSRP) have been constant throughout the damage assessment and restoration effort, and appear in the final consent decree for the case. The overall goals of the MSRP are to:

- Restore, replace, rehabilitate, or acquire the equivalent of the injured natural resources and the services those resources provide to their respective baselines (the conditions they would be in were it not for the injuries from the contaminants of the case); and

- Provide compensatory restoration for the interim lost services of the injured natural resources.

The Trustees give highest priority to the first goal, the primary restoration of resources that still show evidence of injury or lost services. However, it is not the Trustees' intent to forgo compensatory restoration actions until all injured resources have fully recovered to their respective baselines. In fact, the Montrose settlements made no distinction between settlement funds for primary restoration and settlement funds for compensatory restoration. Many of the potential approaches being considered to address the injuries and lost services of the Montrose case may serve as either primary or compensatory restoration, or as both (depending on the scale of the actions and whether they simply bring an injured resource back to baseline or go beyond it to make up for past losses).

The Trustees used this restoration planning process to develop an appropriate mix of primary and compensatory restoration actions to be conducted using the settlement funds. For restoration actions that are compensatory in nature, the Trustees sought restoration approaches that benefit the same or similar natural resources as those that sustained injury as a result of the DDTs and PCBs released in the Montrose case.

Restoration Objectives: The final consent decree for the Montrose case states: "The Trustees will use the damages for restoration of injured natural resources, including Bald Eagles, Peregrine Falcons and other marine birds, fish and the habitats upon which they depend, as well as providing for implementation of restoration projects intended to compensate the public for lost use of natural resources." The restoration objectives for the MSRP (i.e., the specific targets or milestones that help accomplish the overall goals) have been formulated with this consent decree provision in mind and with consideration of the input from the public during the restoration planning workshops. The MSRP restoration objectives are:

- Restore fishing services within the Southern California Bight (SCB);

- Restore fish and the habitats on which they depend within the SCB;

- Restore Bald Eagles within the SCB;
- Restore Peregrine Falcons within the SCB;
- Restore seabirds within the SCB.

Of the two fish-related objectives, one addresses human use (restoring anglers' ability to catch fish that are low in contamination), and the other aims for ecological results. When the Trustees initially sorted and categorized the many restoration ideas they had compiled, there was often little practical distinction between projects benefiting fish and fish habitat and projects benefiting fishing as a human use. Therefore, for the purpose of evaluating restoration ideas in categories, these two fish-related objectives have been combined into a single broad category labeled "fishing and fish habitat." Thus, the evaluation of restoration ideas is organized into four categories (fishing and fish habitat, Bald Eagles, Peregrine Falcons, and seabirds) that encompass the five restoration objectives listed above.

Restoration Strategies: In addition to restoration goals and objectives, the Trustees have identified three strategies that embody their approach for optimizing the results of the MSRP. These strategies are:

- Follow an adaptive approach to restoration through iterative planning, implementation, and monitoring to optimize restoration results;
- Promote public involvement in restoration planning and implementation;
- Coordinate with other regional resource management and restoration programs and take advantage of regional partnerships to gain efficiency and avoid duplication of effort.

Restoration planning is only one step in achieving the most effective natural resource restoration possible within the limits of available funding. The MSRP operates as an adaptive restoration program. This plan provides an overall framework for selecting and implementing restoration actions over the life of the MSRP. This plan will be followed by design, implementation, and monitoring of several restoration projects, leading to subsequent review and evaluation of results and other new information.

Throughout this iterative planning and implementation process, the Trustees will continually seek to involve the public, including interested groups and the expert scientific community. The Trustees will also coordinate MSRP efforts with other organizations that are conducting work of a similar nature and seek opportunities to collaborate.

4.2. RESTORATION PLAN DEVELOPMENT

The approach and assumptions used in developing this Restoration Plan have been derived from a number of sources: current conditions, including the ongoing injuries and the continued presence of contamination, the CERCLA regulatory framework, the

comprehensive analysis of restoration alternatives conducted in the 2005 RP, certain provisions in the Montrose settlements, and close coordination with EPA on the progress of its feasibility study on sediment remediation.

The CERCLA regulations (43 CFR Part 11) provide guidance on the restoration planning process, including the evaluation and selection of restoration alternatives. Under 43 CFR Part 11.82, these provisions require the authorized official (in this case the Trustees) to develop a reasonable number of possible restoration alternatives linked to the injured natural resources and the services those resources provide and then select the alternative determined to be the most appropriate based on all relevant considerations, including several suggested criteria. As was done in the 2005 RP, the Trustees are using the CERCLA regulatory framework as a guide and adapting the criteria and the evaluation approach to the specific circumstances of the case.

4.3. FUNDING ALLOCATION

For the Phase 2 Restoration Plan, the Trustees are allocating the remaining funds of the settlement. The total settlement is approximately $38 million plus interest. In the 2005 RP, the Trustees allocated approximately $25 million for restoration projects. In this Phase 2 Restoration Plan the Trustees allocated the remaining approximate $15 million plus interest. The Trustees propose to allocate the following amounts to the different restoration project categories:

- Fish and Fish Habitat Restoration- $9 million
- Bald Eagle and Peregrine Falcon Restoration- $4 million
- Seabird Restoration- $3 million

The settlement funds reside in the DOI Natural Resources Damage Assessment and Restoration Fund. This fund is an interest earning fund. Due to the fact the total amount of funds available is increasing due to the interest earned, estimating the total amount of funds available is difficult. If settlement funds remain after the funds outlined above are spent the program will reevaluate both preferred and non-preferred projects outlined in both Montrose Restoration Plans for funding. In addition to the funds allocated to the restoration projects, the Trustees will have ongoing operation costs (program staff and Trustee Council) for the duration of the program. These costs will be expected to decrease as the program nears completion of its restoration actions.

Outreach activities are vital to the restoration program and the Trustees will continue to provide funding for these activities on an annual basis. Funding for general outreach is included in ongoing administrative costs and project-based restoration is funded through the specific restoration categories.

Section 5. RESTORATION ALTERNATIVES

5.1. ENVIRONMENTAL CONSEQUENCES

This plan has been prepared as an Environmental Assessment/Initial Study for the purposes of NEPA and CEQA. The potential environmental consequences are considered within the following context:

• The fundamental purpose of the proposed action is to restore injured natural resources and the services they provide (i.e., to improve the natural and human environment).

•The DDTs and PCBs of the Montrose case are expected to persist in the marine environment of the Southern California Bight for many years.

•The alternatives presented in this Restoration Plan include actions that fulfill NEPA/CEQA requirements, as well as actions that will require further NEPA and/or CEQA analysis at a subsequent stage, after the details of the action are developed.

NEPA and/or CEQA also require the analysis of cumulative impacts and other mandated discussions, including irreversible and irretrievable environmental changes and commitments of resources, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term environmental productivity, growth-inducing effects, and identification of any substantial unavoidable adverse impacts.

The environmental impact analysis in this Restoration Plan focuses on the following categories considered to have the greatest potential for impacts related to the anticipated actions:

- Biological resources (fish, birds and other wildlife and vegetation).
- Physical resources (earth resources, including sediments, water resources, and oceanographic and coastal processes).
- Human use (recreation, socioeconomics, and aesthetics).

Effects in the following categories are considered not substantial or not relevant to the proposed actions:

- Agriculture: None of the project sites or anticipated sites are suitable for agricultural use.
- Noise: Restoration activities will not take place at sites near existing human habitation. Construction will involve equipment that produces noise similar to or below the levels already allowed by local ordinances governing normal construction activities. Social attraction as a method for restoring seabirds to islands involves production of recorded sounds in these remote areas, but these

activities have been successfully employed in the past and it is unlikely to result in adverse consequences to other biological organisms.

- Population and housing: The sites where actions will take place are not populated and are not considered viable areas for housing development.

- Soils, geology, and geologic hazards: Restoration activities do not involve any modification of the geology at any sites, and no geologic hazards will be increased by MSRP activities.

- Land use planning: The implementation of the Restoration Plan will not involve substantial changes in land use or be inconsistent with existing local and regional plans and policies on land use.

The potential effects in the following categories are not anticipated to be substantial at this point, but detail is not yet sufficient for final analysis in this EA because the actions that could affect these categories are still conceptual:

- Air quality: Except for the Subtidal Reef Restoration on Palos Verdes Shelf project, air quality impacts in any individual project will either be non-existent or minor (i.e., involve limited production of fugitive dust and emissions from construction vehicles). The impacts will be not substantial contributions, both individually and combined, when compared to impacts from other construction projects and from motor vehicle emissions on highways and streets in the areas where restoration actions take place, and will not represent a substantial contribution to regional air quality. In the case of the Subtidal Reef Restoration on Palos Verdes Shelf project, there is a potential for adverse air quality impacts as a result of increased barge or other transport activity as part of the construction process. However, a detailed analysis of air quality impacts (and whether or not any such impacts would be considered substantial) will be conducted in subsequent NEPA and/or CEQA documents once site evaluation and design for the project is complete.

- Navigation and navigation safety: The construction and final placement of material for artificial reefs as envisioned in this Restoration Plan will either have no impacts or substantial impacts to navigation and navigation safety. During the site selection and design of artificial reefs, the Trustees and other project proponents will consider potential effects on navigation and address these issues in site-specific environmental analyses. Numerous artificial reefs have been constructed in southern California coastal waters in recent decades, and potential impacts to navigation are avoided through consideration of the locations and depths of material placement. For example, in a Mitigated Negative Declaration that the Port of Los Angeles prepared for the proposed San Pedro artificial reef project (Los Angeles Harbor Department 2003), the Port proposed a minimum reef crest depth and proposed avoiding placement of reef material within shipping lanes or within a 200-yard radius around a navigational marker buoy to accommodate U.S. Coast Guard maintenance of the buoy.

- Transportation, traffic, and roadway safety: Existing transportation, traffic, and roadway systems will remain unaltered by any projects undertaken under the MSRP. A small amount of temporary traffic may result from moving equipment in and out of certain sites. The potential traffic impacts of transporting rock or concrete to potential reef may need to be addressed in a subsequent environmental analysis once greater details about site-specific activities are known. However, it is likely that the minimal number of truck trips to move material from source sites to barge-loading areas will simply replace truck trips of alternative uses of the materials (e.g., to crushers and landfills).

- Cultural resources: No substantial adverse impacts to cultural resources have been identified for any of the restoration actions. For projects that will involve construction and for which specific sites have not yet been identified (e.g., construction of reefs or modification to fishing facilities), a review of potential cultural resource impacts will need to be conducted once specific sites are identified.

This RP is specifically analyzing the environmental impacts of proposed actions in Phase 2 of the Montrose Settlements Restoration Program. The proposed Phase 2 projects consist of restoration actions aimed at restoring resources impacted by the historic releases of DDT; specifically the projects address fish habitat, Bald Eagles, Peregrine Falcons, California Condors and seabird species. This RP represents the complete analysis for all the proposed projects except for two projects: the Subtidal Reef Restoration on Palos Verdes Shelf project and the Restore Seabirds to Baja California Pacific Islands project.

5.2. EVALUATION CRITERIA

Federal natural resource damage assessment and restoration regulations at Title 43 Code of Federal Regulations (43 CFR) Part 11 provide guidance on the selection of restoration alternatives. Specifically, under 43 CFR Part 11.82, these federal procedures require the authorized official (in this case the Trustees) to develop a reasonable number of possible restoration alternatives linked to the injured natural resources and the services those resources provide, and then select the alternative determined to be the most appropriate based on all relevant considerations. The federal procedures list the following factors to consider:

- Technical feasibility.

- The relationship of the expected costs of the proposed actions to the expected benefits from the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources.

- Cost-effectiveness.

- The results of any actual or planned response actions.

- The potential for additional injury from the proposed actions, including long-term and indirect impacts, to the injured resources or other resources.

- The natural recovery period.

- The ability of the resources to recover with or without alternative actions.

- The potential effects of the proposed actions on human health and safety.

- Consistency with relevant federal, state, and tribal policies.

- Consistency with relevant federal, state, and tribal laws.

This list is not a fixed list of the factors required of all natural resource restoration plans, but rather is a list of the potentially relevant factors to consider in developing evaluation criteria that are tailored to each restoration planning effort. Additional factors may be considered. For instance, this list does not include an explicit factor for evaluating the nexus between a potential restoration action and the injuries of a case. The Trustees considered these factors and other evaluation criteria developed for previous natural resource restoration plans.

The Trustees applied the following criteria to the list of potential restoration projects. This criterion is the same used to identify preferred alternatives in the 2005 RP.

- **Criterion 1: Nexus**- relationship to the natural resource injuries and lost services of the Montrose case.

- **Criterion 2: Likelihood of Success/Feasibility**- likelihood that potential benefits will be achieved in actuality.

- **Criterion 3: Resource benefits**[1]**-** benefits to specific injured natural resources and lost services.

- **Criterion 4: Ecosystem benefits**- degree to which the actions lead to sustainable improvements to broader ecological functions.

- **Criterion 5: Environmental acceptability-** all of the restoration actions under consideration are intended to improve the natural and human environment. Nevertheless, there can be environmental trade-offs in any project and NEPA, CEQA, and other requirements mandate full consideration and disclosure of potential environmental consequences. Actions are evaluated to determine whether they have no substantial impacts to the environment, have impacts that may be easily mitigated to non-significance, or are likely to result in substantial impacts that require substantial mitigation commitments.

[1] Criteria 3-5 are addressed in the Environmental Benefits and Impacts section within each project description.

- **Criterion 6: Cost (Budget)-**Cost estimates were developed for each action. If an action being evaluated is still conceptual (e.g., an artificial reef program) and is scalable, estimates of incremental components were developed. For the actions ultimately selected, the Trustees may pursue partnerships to increase the effectiveness of the projects and reduce costs.

5.3. NO ACTION ALTERNATIVE

For the purposes of this plan, the No Action Alternative assumes that the Trustees would not intervene to restore injured natural resources and compensate for lost services for any of the affected resources of the Montrose case. Instead, the Trustees would rely on natural processes for the gradual recovery of the injured natural resources and would only take the limited action of monitoring natural recovery.

The principal advantages of this approach are the ease of implementation and the absence of monetary costs. Although natural recovery may eventually occur for many of the injured resources, the recovery may take a significantly longer period of time than would recovery under an active restoration scenario. Also, the public would not be compensated for interim losses of natural resource services under the No Action Alternative. In addition, certain events, such as the extirpation of Bald Eagles and the introduction of exotic species in the Channel Islands, have led to consequences for other natural resources that may not be addressed under a natural recovery alternative. Because feasible restoration actions have been identified that would address the injuries and lost services of the case, the No Action Alternative as an overall approach across all resource categories does not fulfill the goals of this Restoration Plan. However, this does not preclude selection of natural recovery as an option for specific resources (e.g., Peregrine Falcon) within the overall framework of a comprehensive restoration alternative.

5.4. PREFERRED ALTERNATIVES

5.4.1. Fishing and Fish Habitat

The Trustees have evaluated a range of fish habitat restoration projects for Phase 2. The following section outlines the Preferred Projects.

	Project Name	**Status**	**Budget**
1.	Kelp Forest Restoration on Palos Verdes Shelf	New	$2.5 million
2.	Subtidal Reef Restoration on Palos Verdes Shelf	New	$6.49 million
	Total		$8.99 million

5.4.1.1. Palos Verdes Kelp Forest Restoration

NEXUS

Hundreds of acres of fish habitat on the Palos Verdes Shelf are impaired by the presence of DDTs and PCBs in the sediments. These habitats produce fish and other marine species that contain high concentrations of these contaminants in their tissues, resulting in human health impacts as well as impacts to seabirds and other wildlife. The EPA is currently developing a plan to cap these contaminated sediments in an effort to halt the impacts of DDTs and PCBs on fish and the ecological services that fish provide. While EPA's efforts to cap or otherwise reduce the impacts of DDTs and PCBs to the ecosystem is occurring (see section 1.2 of this document), the interim losses in fish habitat services remain substantial considering the large area of impact and the long duration of time over which the impacts occurred. This project category proposes to restore critical Palos Verdes Shelf fish habitat to compensate for interim losses in fish habitat services. Our approach is to focus on restoring rocky reef and kelp forest habitat due to: 1) the observation that these habitats tend to produce fish that are lower in DDT and PCB concentrations; 2) the overall productivity in these habitats is known to be 6-15 times higher than in soft-bottom habitats (Bond et al 1999), thus providing the greatest level of compensation per acre of restored habitat; and 3) rocky reef and kelp forest habitats are critical and limited fish habitats not only on the Palos Verdes Shelf, but throughout the Southern California Bight (Graham et al. 2003).

DESCRIPTION:

The Palos Verdes Peninsula has historically supported large, productive, and stable kelp beds but current acreage does not compare to historical abundance. In 1911, Walter Crandall published a map of the extent of kelp canopy for the military in the interest of processing potash from kelp for gunpowder (Crandall 1911, Figure 5-1). In 2007, a composite of kelp forest extent maps was created that compiled data from 1911 to 1980 that showed the loss of kelp habitat that occurred during the first half of the 20th century (MBC 2007). The Wheeler North kelp restoration efforts of the early 1970s, coupled with the reduction of sources of turbidity, have resulted in some recovery of kelp on the Palos Verdes Shelf (North 2000). However, kelp is still absent from some areas on the Palos Verdes Shelf, largely due to the extensive urchin barrens that have formed in these areas (Figure 5-2).

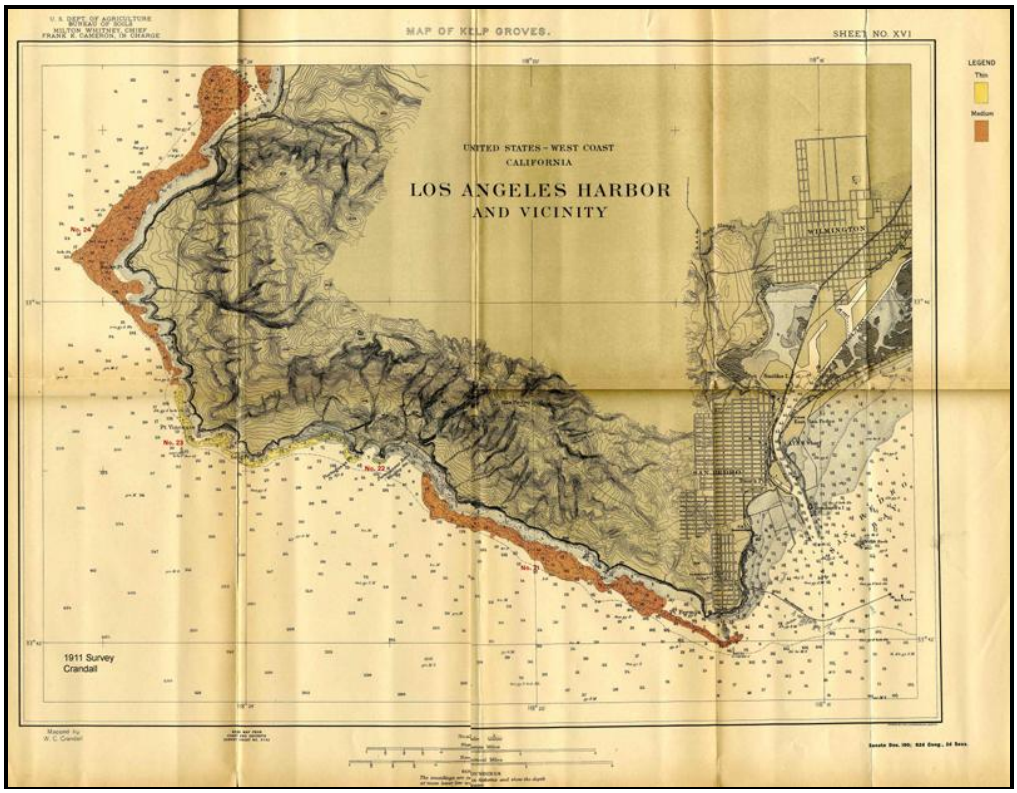

Figure 5-1. Palos Verdes kelp canopy extent coverage based on 1911 surveys (Crandall 1911). Light brown indicates medium kelp canopy, and light green indicates thin kelp canopy (2007 Central Region Kelp Survey Consortium Report, MBC Applied Environmental Sciences).

Figure 5-2. March-June 2009 kelp canopy shown in black from infrared aerial surveys. This image represents the documented maximal canopy of kelp for 2009 (2010 Central region kelp Survey Consortium report, MBC Applied Environmental Sciences).

Urchin barrens have remained a limiting factor to kelp growth in southern California partly due to the lack of sea urchin predators: sea otters, large sheephead, and large lobster. When urchin populations are left uncontrolled, they consume kelp holdfasts, which anchor kelp plants to the seafloor. Once the holdfasts have been consumed, the kelp plant floats away, resulting in large-scale deforestation (Figure 5-3). In this state, urchins continue to consume algae, including new kelp recruits, resulting in a loss of diversity and productivity. This degraded state comprised of urchins and bare substrate is commonly termed an 'urchin barren'. Once established, urchin barrens can be very stable and are well known to last for decades (Harrold and Reed 1985, Steneck et al. 2002)

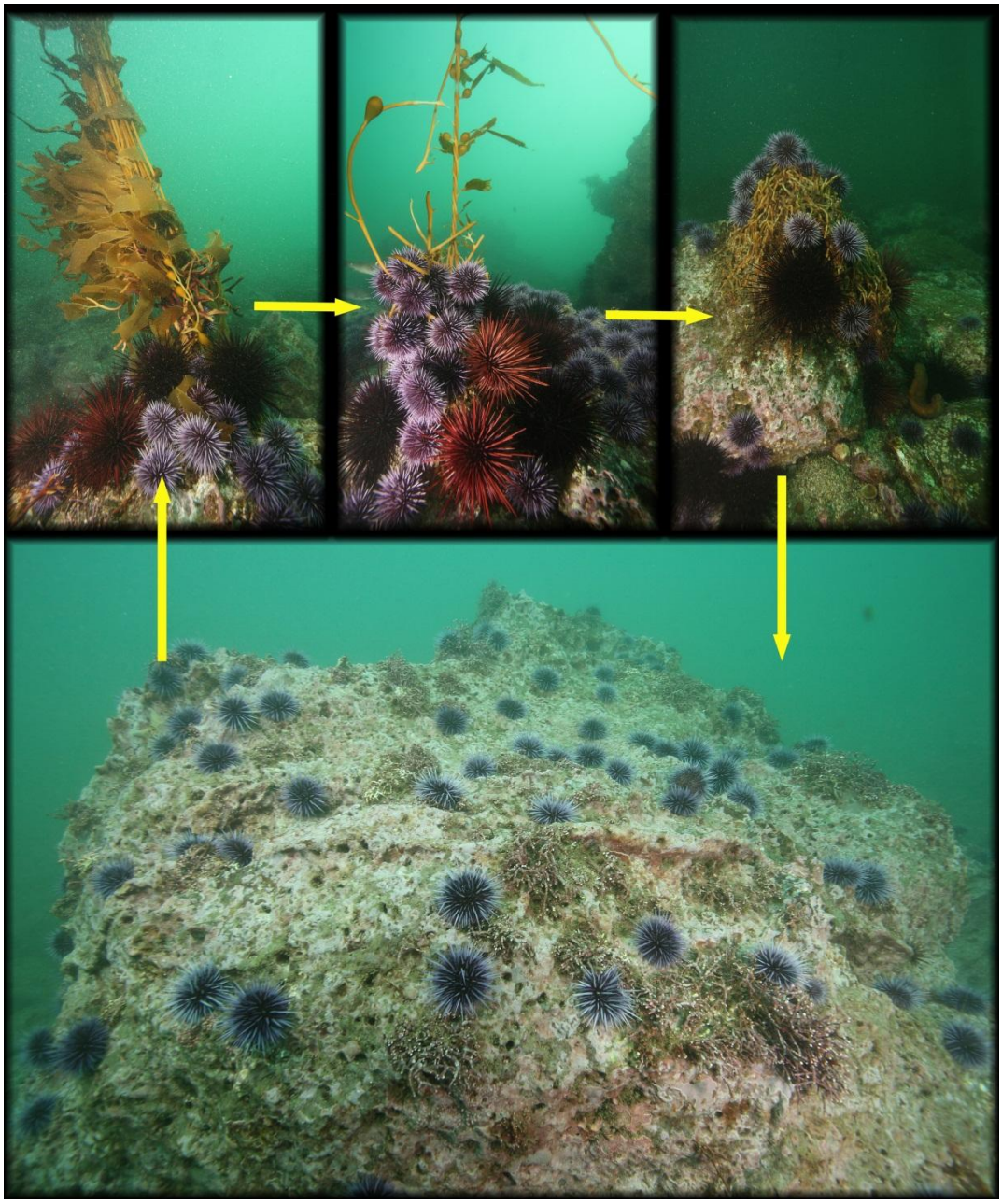

Figure 5-3. Photographic illustration of the cyclic process that results in the persistence and spread of urchin barrens (Photo credit: D. Witting, NOAA).

A comprehensive survey of rocky reef habitats of the Palos Verdes Shelf mapped approximately 1,940 acres of rocky reef habitat from Point Fermin to Rocky Point (Pondella et al. 2009). There were approximately 135 acres of urchin barrens within the area considered for kelp restoration (Figure 5-4) which represented 20 percent of the rocky reef habitat and nearly 100 percent of the shallow water reef habitat. This analysis identified seven priority sites for kelp restoration that included approximately 95 acres of urchin barrens (Figure 5-4).

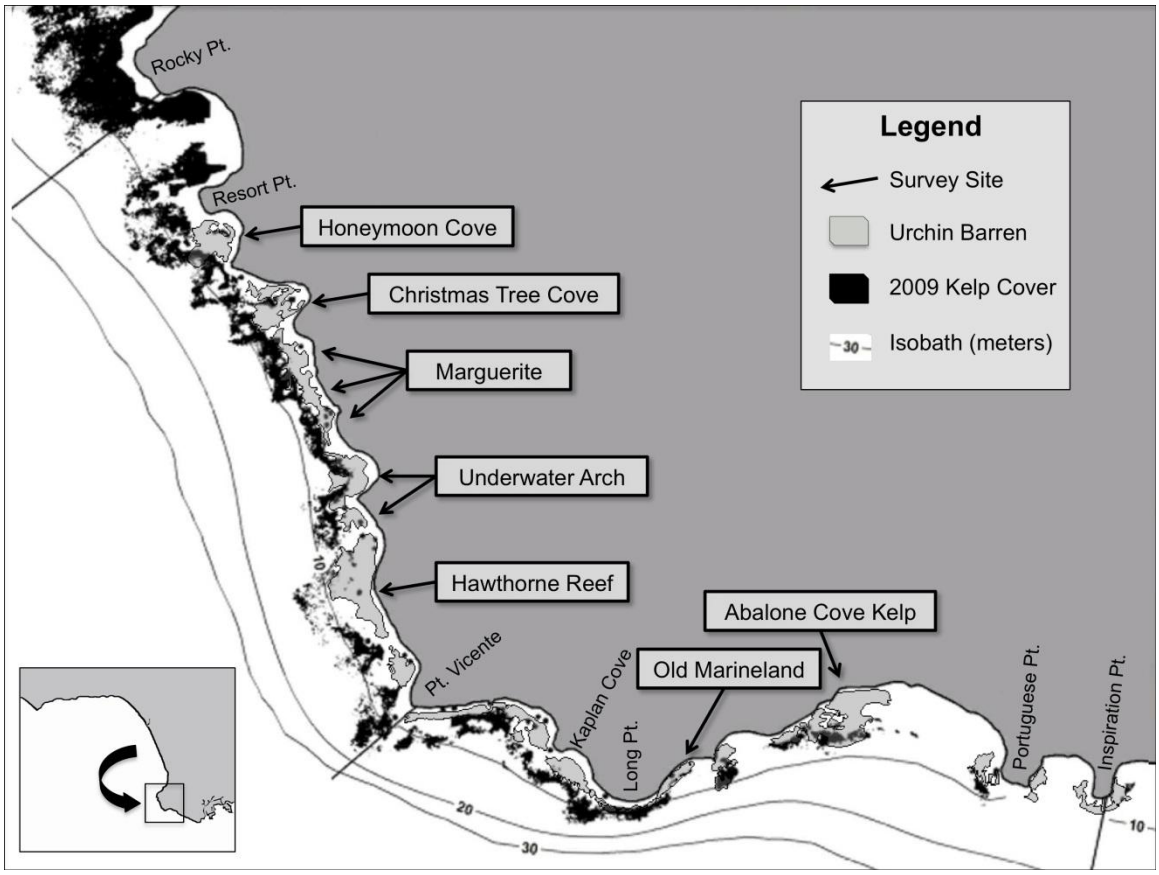

Figure 5-4. Southern section of Palos Verdes Peninsula showing proposed restoration sites where urchin barrens currently exist. Existing Kelp Cover and Rocky Reef are also indicated.

The seven proposed restoration sites exhibit urchin barren areas adjacent to kelp forest habitat. Reducing urchin density to natural levels will restore the barren areas to kelp forest habitat, and contribute to protecting and stabilizing the existing kelp forest habitat. This stability has been demonstrated by recent kelp forest restoration projects that have compared restored kelp habitat to reference and control sites. These projects have shown the restored sites persisting as healthy kelp forests for nearly ten years after restoration (Ford and Meux 2010, Ford et al. 2008). The restored kelp forests are more stable for two reasons: reduced predator density and a shift in urchin behavior.

Healthy kelp forests generally support a variety of fish and invertebrate species that prey upon kelp predators (Allen and Pondella 2006). To obtain specific information on differences in predator density between urchin barrens and healthy kelp forest, the Trustees initiated a survey that compared fish and invertebrate assemblages between the two habitats (Pondella et al., in prep). These surveys found significant differences in fish density and biomass between the two habitats, with significantly higher fish density and biomass found in the healthy kelp forest. In addition, these surveys found that principle urchin predators (adult California Sheephead and California Spiny Lobster) were significantly less abundant in the urchin barren habitat.

Urchin behavior differs between urchin barren and healthy kelp forest habitats (Harrold and Reed 1985). This difference in behavior has been shown to change the impact the urchin have on the surrounding kelp forest. In healthy kelp forests, urchins are less mobile and tend to remain in the crevices, feeding on the drift kelp. Urchins occupying urchin barrens tend to be more mobile, tending to feed on attached algae, perpetuating the urchin barren state. The recent baseline surveys of the urchin barrens have also found that the condition (measured by the proportion of the total urchin weight represented by the gonad) of urchins collected from urchin barrens was significantly lower than those collected from adjacent kelp forests. The lower condition indicates that the urchins that occupy urchin barrens lack sufficient food to maintain a healthy condition, and therefore are forced to become more mobile to survive.

Kelp forest restoration can be achieved through a variety of methods including urchin control (preferred alternative) and kelp outplanting (see non-preferred alternative). Urchin control can be achieved through two possible mechanisms: 1) urchin relocation, where urchins are collected from the reef by SCUBA divers and relocated over a wide area in the same geographic location, and 2) crushing urchins on site, where urchins are destroyed at the site by SCUBA divers using a hammer or some other similar tool.

The Trustees have determined that to maximize the amount of area restored, a partnership would be established between the Trustees, local non-profit organizations, and commercial urchin divers. By using this approach, kelp forest restoration at a much larger scale than has previously been accomplished will be possible. In this project the method employed will be urchin relocation. Initial monitoring of the reefs using CRANE methodology will provide baseline information for comparison and measure project success. Urchin relocation will be accomplished using SCUBA divers who will remove urchins from the seven existing urchin barrens one site at a time for three years.

The projected timeline of the project is three years in order to conduct restoration of all seven sites. The overall strategy using commercial urchin divers allows simultaneous work of three restoration sites during Year 1, three sites during Year 2, and two sites during Year 3. All sites will be monitored before and after restoration work is conducted.

ENVIRONMENTAL BENEFITS AND IMPACTS

This analysis addresses the environmental consequences of restoring kelp forest habitats using the methods described above.

Biological

Benefits

Similar to tropical coral reefs, kelp forests are highly productive ecosystems that support a wide array of life, providing food and habitat to over 700 species of fish and invertebrates (Graham 2004). Nearly 80% of Los Angeles County kelp forests have disappeared since the late 1960s (MBC Applied Environmental Sciences 2010) due to sea urchin grazing (Dayton et al. 1992, Tegner and Dayton 1991, Dayton et al. 1998, Steneck

2002, Edwards 2004), oceanographic conditions including light, temperature-nutrients, and storms (Edwards 2004) and sedimentation. Kelp forests are a critical habitat for a variety of federally- and state-protected species (e.g., Bocaccio, White, Black, Green and Pink Abalone, California Sea Otter). In addition, local commercial and recreational fisheries are dependent on the existence of large, stable kelp beds. Southern California's Red Sea Urchin, California Spiny Lobster, and Rock Crab commercial fisheries directly depend on healthy kelp forests. Non-consumptive uses such as SCUBA diving, wildlife viewing, research, and education also depend on healthy kelp forest habitat.

In addition to the benefits described above, kelp and reef-associated fish typically contain lower concentrations of DDTs and PCBs than soft-bottom species. Thus, restored kelp forests would benefit the biological organisms that prey on fish in the vicinity of the project site, as the organisms preying on fish would be exposed to reduced levels of these contaminants.

Impacts

In general, kelp forest habitat is one of the most important but least abundant habitats in the southern California coastal marine environment (Cross and Allen 1993). The Trustees do not foresee any substantial biological impacts associated with this project. All divers who participate in kelp restoration will be trained to minimize any impacts to the marine environment.

Physical

Benefits

Kelp forests provide a mechanism for damping ocean waves and may help to reduce shoreline erosion.

Impacts

The Trustees do not foresee any significant physical impacts associated with this project. All divers who participate in kelp restoration will be trained to minimize any impacts to the physical environment. The kelp restoration project will be implemented by divers who will travel to and from the restoration sites on small boats (maximum length of 45 feet). The number of trips by these boats will not be substantially more than what is normally experienced in the area by small commercial and recreational fishing boats. In addition, the boat engines will only be running while underway (i.e., boat engines will be turned off during restoration activities), so it is unlikely that the project will have significant air quality impacts to the region

Human Use

Benefits

Kelp forest restoration in will increase production of species of fish that are known to be less contaminated. This will provide direct benefits to anglers whose fishing opportunities have been impacted by fish consumption advisories. Kelp forests provide human use benefits beyond fishing, as they are also popular areas for SCUBA and free diving for purposes of recreation, hunting, and underwater photography.

Impacts

The Trustees do not foresee any substantial human use impacts associated with this project. The kelp restoration project will be implemented by divers who will travel to and from the restoration sites on small boats (maximum length of 45 feet). The number of trips by these boats will not be substantially more than what is normally experienced in the area by small commercial and recreational fishing boats.

LIKELIHOOD OF SUCCESS/FEASIBILITY

The restoration approach described in this plan has successfully restored over 3.5 acres of kelp forest off Escondido Beach, Malibu and over 3 acres off Long Point, Palos Verdes. To achieve efficient restoration, urchins were reduced to natural density from all sites and sporophyll bags were deployed in some sites that benefited from additional kelp spores. All of these restoration sites are now restored with kelp density levels at or above one kelp plant for every ten square meters. In addition, restoration sites are showing stability throughout significant disturbance. Escondido sites have been restored for six to seven years, and have persisted through significant red tides and a 200-year storm in 2005. Finally, all necessary permits for the project are in place and prior kelp restoration projects have received strong support from the public.

PERFORMANCE CRITERIA AND MONITORING

Approximately 60 acres of rocky habitat will be restored from urchin barrens to valuable fish habitat consisting primarily of *Macrocystis* beds, although the shallower sites may result in *Egregia* and *Phyllospadix* habitats which are also important fish habitats.

Several performance criteria will be used to evaluate the effectiveness of restoring kelp forest habitat in meeting the Trustees' restoration goals. At a minimum, a principle target at or above one plant per ten square meters will be used. Additional monitoring will assess algal, invertebrate, and fish community structure and size distribution. Monitoring will be conducted using methods compatible with protocols used in ongoing monitoring of rocky reef and kelp habitats in the Southern California Bight (e.g., CRANE). Kelp forest habitats are naturally dynamic with respect to species abundance and diversity, so a minimum of four years of monitoring will be needed to document recovery.

EVALUATION

The Trustees have evaluated this action against all screening criteria developed to select restoration actions and have concluded that this action is consistent with the selection factors. The Trustees determined that this type and scale of action will effectively provide long-term benefits to the fish habitat on the Palos Verdes Shelf. Kelp forest habitat is both a limiting habitat for fish production in southern California and is known to support species that tend to be lower in contaminants. This action will create high-quality fish habitat and increase fish production on the Palos Verdes Shelf.

BUDGET

The Trustees anticipate the kelp restoration project to cost $2.5 million.

5.4.1.2. Subtidal Reef Restoration on the Palos Verdes Shelf

NEXUS

Hundreds of acres of fish habitat on the Palos Verdes Shelf are impaired by the presence of DDTs and PCBs in the sediments. These habitats produce fish and other marine species that contain high concentrations of these contaminants in their tissues, resulting in human health impacts as well as impacts to seabirds and other wildlife. The EPA is currently developing a plan to cap these contaminated sediments in an effort to halt the impacts of DDTs and PCBs on fish and the ecological services that fish provide. While EPA's efforts to cap or otherwise reduce the impacts of DDTs and PCBs to the ecosystem, the interim losses in fish habitat services remain substantial considering the large area of impact and the long duration of time over which the impacts occurred. This project category proposes to restore critical Palos Verdes Shelf fish habitat to compensate for interim losses in fish habitat services. Our approach is to focus on restoring rocky reef and kelp forest habitat due to: 1) the observation that these habitats tend to produce fish that are lower in DDT and PCB concentrations; 2) the overall productivity in these habitats are known to be 6-15 times higher than in soft-bottom habitats (Bond et al. 1999), thus providing the greatest level of compensation per acre of restored habitat; and 3) rocky reef and kelp forest habitats are critical and limiting fish habitats not only on the Palos Verdes Shelf, but throughout the Southern California Bight (Graham et al. 2003).

DESCRIPTION:

The goal of this project is to restore impaired subtidal rocky reef habitats that lie directly adjacent to the White Point Wastewater Outfalls. Details regarding the source and status of degradation, the process by which the restoration sites were selected, and the restoration concept are provided below. This project will likely require separate and more detailed environmental review and documentation prior to implementation.

The nearshore environment of the Palos Verdes Peninsula has been intensively studied for decades. In particular, the shallow (less than 30 meters depth) subtidal reefs of this headland have garnered attention due to the impacts of a variety of anthropogenic activities (i.e., commercial and recreational fishing, establishment of Marine Protected Areas, giant kelp beds lost to pollution, landslides etc.). Historically the greatest deleterious impact to the reefs at Palos Verdes was the loss of their kelp beds due to pollution from the Joint Water Pollution Control Plant's White Point outfall. By 1960 due to untreated sewage, the only kelp left on the peninsula was at Abalone Cove and Portuguese Bend (North 1964). To exacerbate the situation, road construction on Palos Verdes Drive triggered the Portuguese Bend Landslide (PBL) in 1956 (Figure 5-5). From 1956 to 1999, approximately 5.7 to 9.4 million metric tons of sediment slid onto the inner shelf (Kayen et al. 2002). The release of sediments increased dramatically during the late 1970s due to unusually high rain fall that started in 1978. Efforts to stabilize the landslide were initiated in 1984, but were initially unsuccessful and the PBL continued to release sediments to the shelf through most of the 1980s, resulting in increased local sedimentation and turbidity plumes (Figure 5-6). A second effort to stabilize the landslide included the installation of dewatering wells, re-grading portions of the PBL and installation of surface drains that diverted surface run-off to the ocean. These efforts reduced landslide activity to the lowest levels since the PBL was originally activated in 1956.

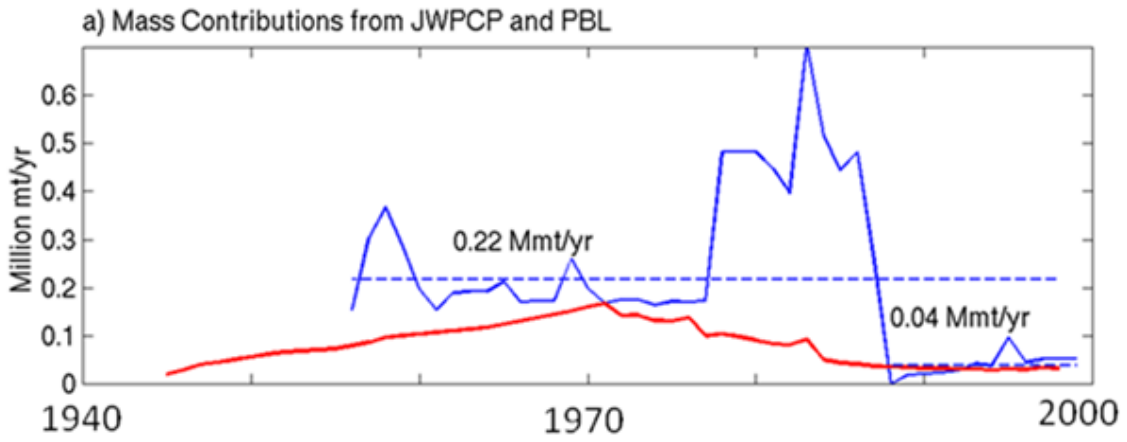

Figure 5-5. Mass contributions (millions of metric tons per year) of sediment by the Joint Water Pollution Control Plant indicated by the red line and sediments from the Portuguese Bend Landslide (PBL) indicated by the blue line from the mid 1940's to the late 1990's. Note the PBL was activated in 1956 by road construction activity.

Figure 5-6. Portuguese Bend and Bunker Point prior to the construction of the Trump National Golf Course, December 17, 1986. Turbidity plumes originating in Portuguese Bend can be observed.

By 1999, the landslide was dewatered and slowed appreciably, and now only releases sediment due to wave action. Nonetheless, the biological damage has been extreme, highlighted by the loss of the Portuguese Bend Kelp Bed that left only the Abalone Cove Kelp Bed by 1974. Due to infrastructure improvements of the White Point Outfall (i.e., expansion offshore and switch to secondary treatment) and the Wheeler North kelp restoration efforts of the early 1970s, giant kelp returned to some areas on the Palos Verdes Peninsula (see Figure 5-2) and remains present today.

While these restoration and enhancement efforts ameliorated the historical consequences of the sediment releases from PBL and Whites Point Outfall throughout the peninsula, sedimentation and associated turbidity continue to have chronic impacts. First, there is continued turbidity, sediment transport and scour associated with the sediment deposited in Portuguese Bend from the landslide. Further exasperating this influx of sediment was the 16-acre landslide on June 2, 1999 from the 18th hole of the Trump National Golf Club, which sits above Bunker Point. While this most recent landslide was stabilized relatively quickly, there was a large release of sediments over a brief timeframe, which added significantly to the sediments that had accumulated during the 1970s and 1980s. With these various chronic stressors, there are continued impacts to the nearshore rocky environment, especially from Portuguese Bend to Point Fermin (Stephens 1996).

In 2009, the Trustees initiated an assessment of the condition of the rocky reef habitats of the Palos Verdes Shelf to determine if fish habitat restoration was needed and feasible. The purpose of this assessment was to summarize and synthesize biological and physical sediment data for the Bunker Point to White Point. This study was designed to determine the status of the reef habitat in this region and to examine the potential for restoration. These data were combined with other literature-based data to generate an index of condition that provided a relative measure of the health of the reef based on the species composition and abundance of fish (see Bond et al. 1999, Pondella 1999 for details on the methodology). This analysis demonstrated that the relative reef quality was poorest east of Bunker Point to Point Fermin (Figure 5-7).

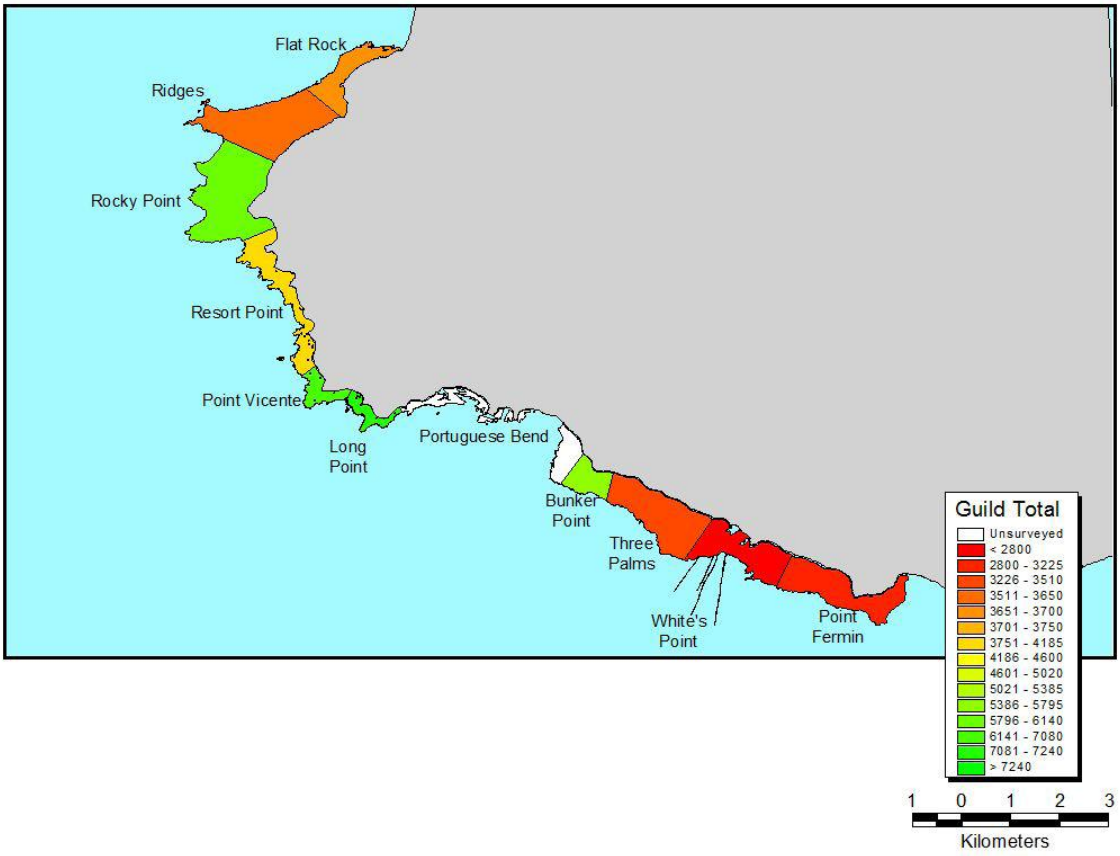

Figure 5-7. Red condition values (a.k.a. "Guild Index Values") for the Palos Verdes Peninsula (Pondella et al. 2009). Red indicates poor condition and green indicates healthier reefs.

The summary of reef condition provides an overview of the rocky subtidal habitats on the Palos Verdes Shelf and identifies the region between Bunker and White Point as impaired relative to other reefs in the region. The approach does not provide details regarding the nature of the impairment nor is it sufficient to determine the restoration approach that would be most effective. Recent surveys of the nearshore reefs (<30 m) of the peninsula have located buried reefs at Bunker Point with Southern Palm Kelp growing out of the sediment from where they were still attached to the buried reef (Figure 5-8). Considering that reef burial was not observed during the extensive surveys of this region in the 1990s

(Stephens 1996), this burial likely occurred in the last decade. The reef's proximity to the Trump National Golf Course landslide indicates it has likely been buried since 1999. This reef at Bunker Point remained buried through the spring of 2010. In addition, buried *Pteryogophora* reefs were observed at White Point as well (Figure 5-9).

Figure 5-8. Buried Southern Palm Kelp (*Pterygophora californica*) reefs at Bunker Point, October 22, 2008 (Photo Credit: D. Witting, NOAA).

Figure 5-9. Buried Southern Palm Kelp reef at White Point, June 3, 2009 (Photo credit: J. Williams).

Based on the reef condition analysis and the observations of buried reef described above, a proposed restoration region was established from east side of Bunker Point to the west side of the White Point Outfall (Figure 5-10). The western border was defined as the transition from the high relief reef at Bunker Point and Portuguese Bend. The eastern border was delimited to not include the White Point Outfall. The deep border is approximately the 30 m isobath and the inner border is the shoreline. The geographic extent and character of marine hard bottom/reef was mapped by combining several different spatial datasets into a preliminary habitat data layer. This layer was then groundtruthed with underwater field observations and analyses of aerial and satellite photography. Kelp canopy was a high precision polygon spatial layer created using a 2-meter rectangular grid to classify georeferenced aerial photography (Kelner 2005 15-8). Kelp canopy varies significantly over seasons and years. In this layer, three years (1989, 1999 and 2002) of data were used. Triple beam and sidescan data were obtained from the Sea Floor Mapping Lab at Cal State University, Monterey Bay (http://seafloor.csumb.edu/SFMLwebDATA.htm). This proposed restoration region consists of approximately 2.9 km^2 (2,899,280 m^2) of nearshore environment (Figure 5-10).

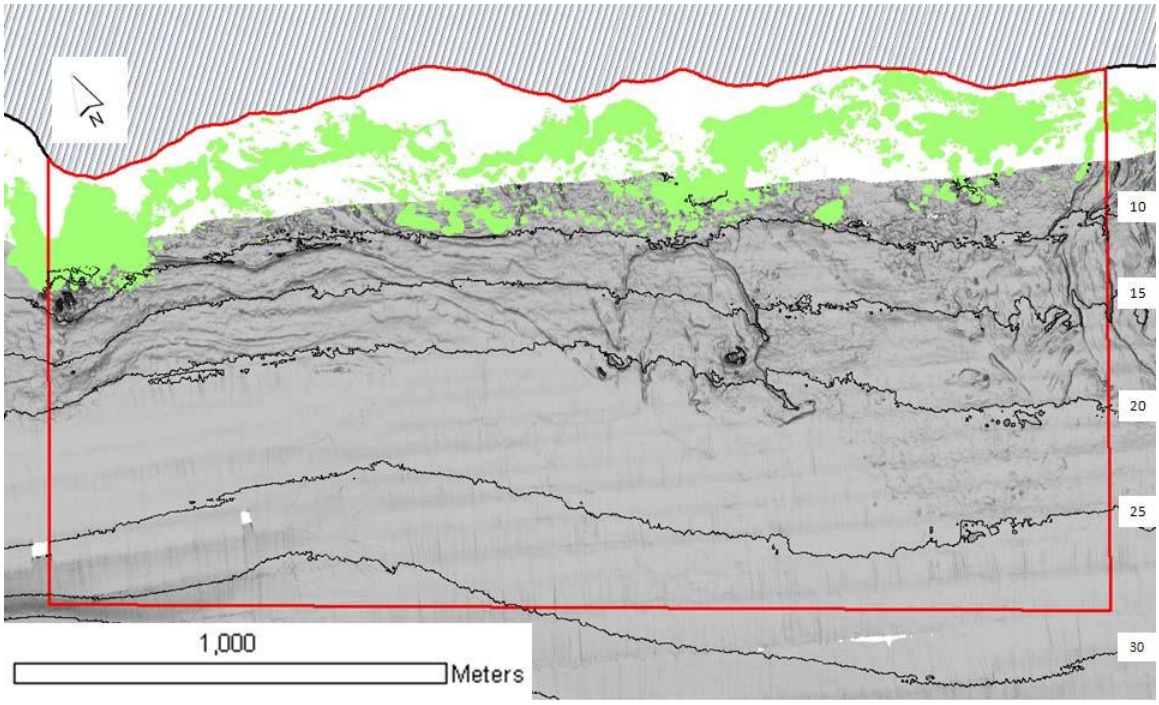

Figure 5-10. Bunker Point Restoration site study area, kelp canopy is in green, side scan imagery is in gray with the 10, 15, 20, 25 and 30 m isobaths (Pondella and Williams in preparation).

To determine the sediment depth over historic reef habitat throughout this area, SCUBA surveys were conducted at twelve locations (Figure 5-11). When buried reef habitat was discovered to the east of the outfalls, the proposed restoration region was extended to include the outfalls and the buried reef located to the east of the outfalls (transects 9-12). These surveys were conducted perpendicular to the coastline starting at the 20 m isobath, and divers measured sediment depth at 10 m intervals until completely uncovered and unbroken reef habitat was found. The initial sediment characterization was conducted in spring of 2009. After reviewing the data, a second survey was conducted in spring of 2010. Sites that were primarily rock were excluded from the second survey. With the exception of stations 11 and 12, all surveys were conducted in areas that had been classified by side-scan and triple beam sonar-based mapping efforts as rocky reef habitat. A winter dominated by cold El Niño storms associated with heavy rains occurred between these two study periods which set up a natural experiment of the effects of heavy swell and rain on the study site.

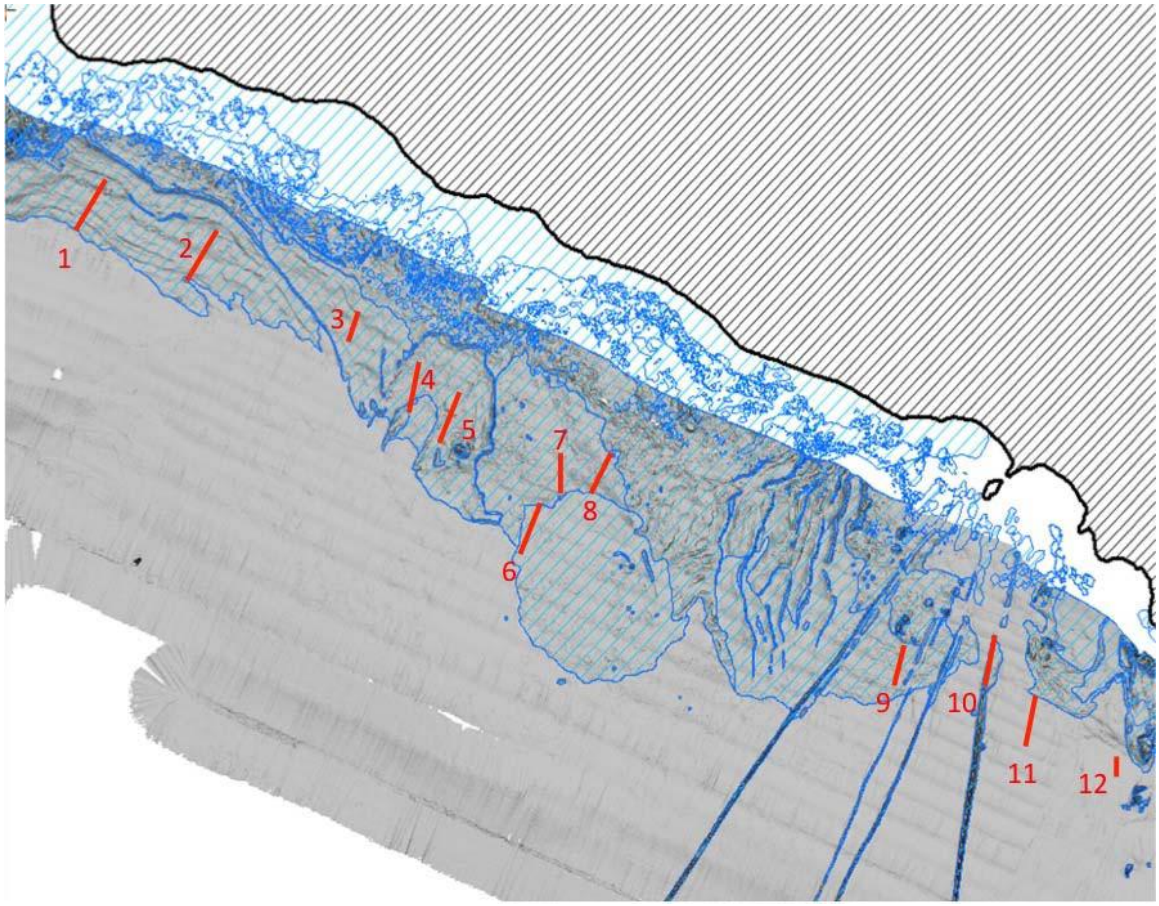

Figure 5-11. Mapped reef habitat and sediment survey transects (Pondella and Williams in preparation).

All transects in the study site (as originally defined, lines 1-8) were completed over mapped reef habitat. Two patterns emerged from the sediment depth and distribution analyses: the sediment depth and the percent of rock covered by sand increased from 2009 to 2010 (Table 5-1, Figure 5-12). At line 2 the average sediment depth increased from 3.5 to 3.8 cm, but the percent coverage of sand increased from 40% to 85%. At line 3, which was completely covered by sand, the sediment depth increased from 3.2 to 10.7 cm. Consistent with the visual observations of the buried Southern Palm Kelp beds, these findings indicated that reef habitat continues to be buried.

Table 5-1. Mean sediment depth (cm) and percent of rock versus sand at twelve stations from Bunker Point to White Point (Pondella and Williams in preparation).

	sediment depth		2009		2010	
Line	2009	2010	% rock	% sand	% rock	% sand
1	5.6		71%	29%		
2	3.5	3.8	60%	40%	15%	85%
3	3.2	10.7	0%	100%	0%	100%
4	2.1	3.5	22%	78%	42%	58%
5		21.3			0%	100%
6	1.8		38%	62%		
7	3	5	0%	100%	8%	92%
8	1.2	4.6	40%	60%	0%	100%
9	2.6	2.5	22%	78%	10%	90%
10	19.9		0%	100%		
11	36.6	25.4	0%	100%	18%	82%
12	19	1.3	0%	100%	0%	100%

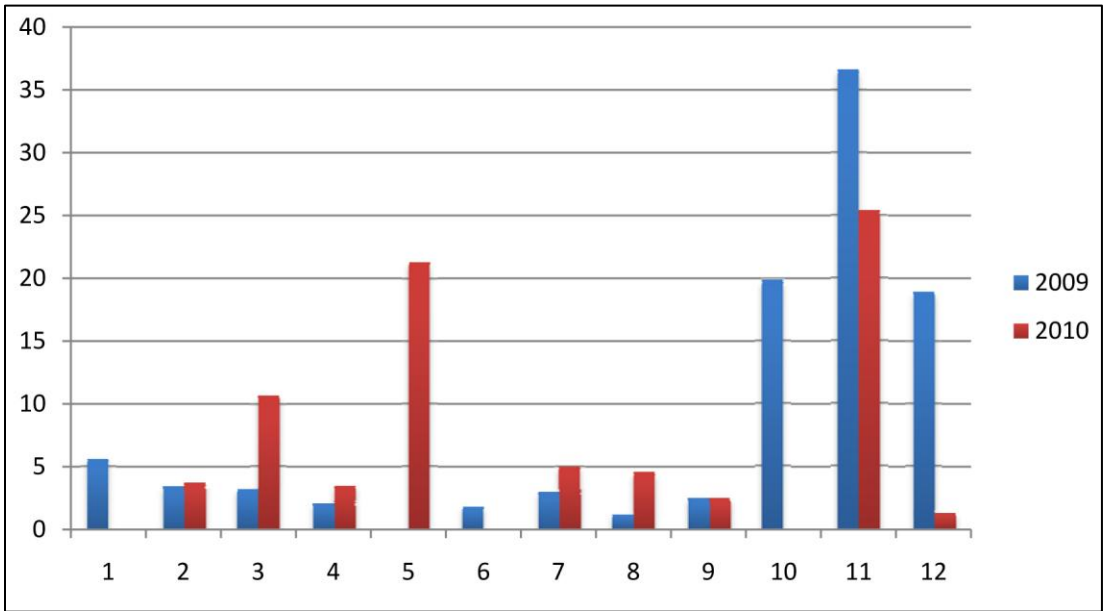

Figure 5-12. Mean sediment depth (cm) at 12 stations during spring 2009 and 2010 (Pondella and Williams in preparation).

The results from the transect data displayed above was used to generate a map of the buried reef area and to delineate proposed restoration sites (Figure 5-13).

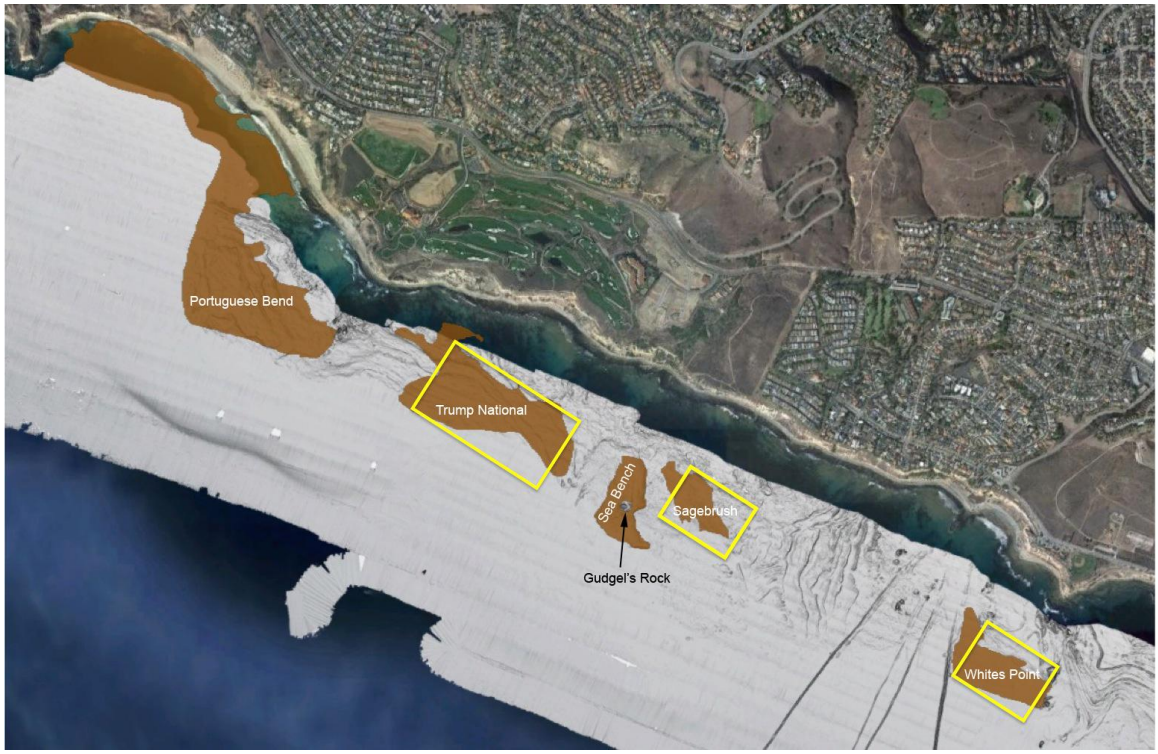

Figure 5-13. Map of buried reef habitat (indicated as brown shading) adjacent to Bunker and White Point. Proposed restoration sites are indicated by the three yellow boxes.

This analysis indicated approximately 250 acres of buried, low-relief, reef habitat divided into four separate areas (Table 5-2). Preliminary analyses comparing biological production in these impacted, low-relief reefs has shown them to have significantly lower production value than adjacent high relief habitat (Figure 5-14). From this map, three potential restoration sites were identified (Figure 5-13) representing approximately 91 acres of impacted reef habitat. Two of the buried reef areas were not identified as priorities for restoration. The Portuguese Bend region supported extremely fine sediments and was directly adjacent to ongoing erosion. If the Portuguese Bend shoreline were to be stabilized, this region may also be targeted in the future. The Sea Bench region will be avoided because of the presence of a high relief and extremely productive section of reef (Gudgel's Rock) that is located in the center of the Sea Bench area. The operations associated with artificial reef construction may threaten or otherwise injure this section of reef. Therefore, the region will not be considered for restoration.

Table 5-2. Area (acres) and perimeter (km) of five regions of buried rocky reef habitat (Pondella and Williams in preparation).

Name	Acres	Perimeter (Km)
Portuguese Bend	141	5.76
Trump National	56	3.20
Sea Bench	17	1.81
Sagebrush	12	1.18
White Point	23	1.58
Total	250	13.54

The goal of this restoration project will be to build artificial reef modules within these restoration sites that will be designed to mimic the high relief reef habitats. This habitat type has withstood the chronic impacts of sedimentation and turbidity and remain productive reefs to this day (see biological benefits below). In addition, these reefs will be designed to increase offshore transport of sediments, which will reduce sediment loads on reef habitat beyond the reef modules footprint. Implementation of this project will include a detailed environmental review and documentation, detailed construction design, and opportunities for public participation.

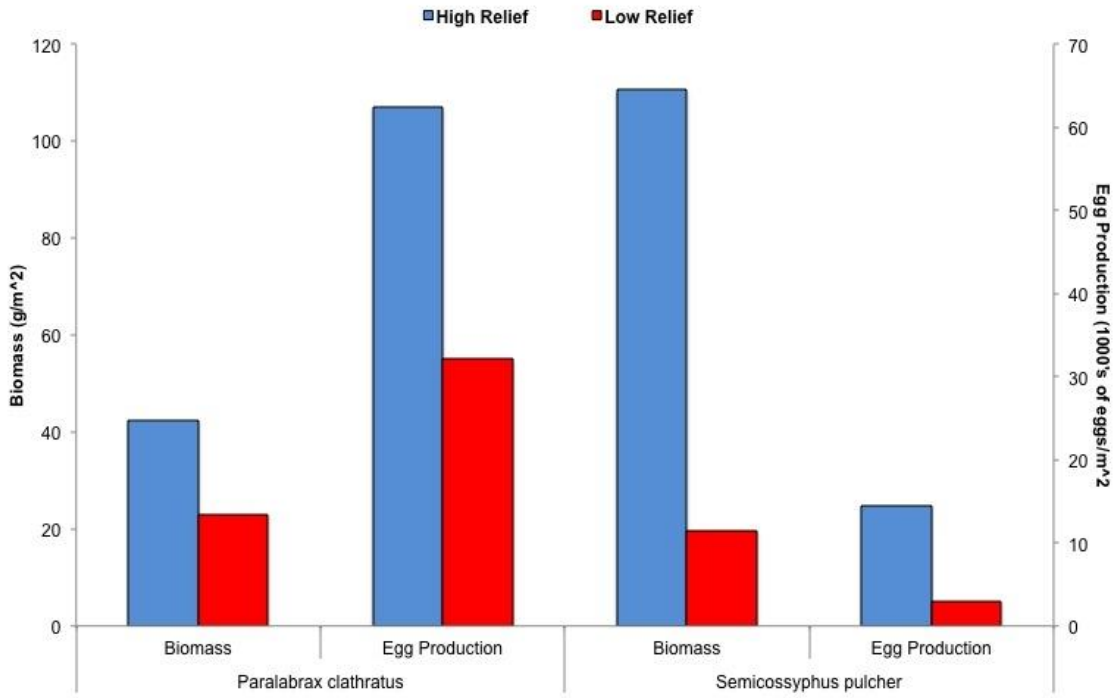

Figure 5-14. Comparison of biological production in the study area (biomass of fish and egg production) between high relief and low relief reef habitat for Kelp Bass and California Sheephead (Pondella and Williams in preparation).

ENVIRONMENTAL BENEFITS AND IMPACTS

This analysis addresses the environmental consequences of constructing artificial reefs at a conceptual level. While the restoration sites have been selected, a detailed evaluation of the environmental benefits and impacts will require additional site analysis and a detailed reef design. Additional NEPA and CEQA documentation will be required to address site specific environmental considerations once a site evaluation and design is complete.

Biological

Benefits

Reefs provide habitat for a multitude of marine fishes, invertebrates, and plants. The displacement of the sandy or muddy bottom habitat with a hard-bottom substrate would increase the diversity and may increase the number of the animal and plant biota in the area. Reefs act as nursery and spawning habitat for a variety of species native to the Southern California Bight. Reefs also act as a substrate for the recruitment and growth of giant kelp and other species of algae, which also play a critical role as nursery habitat and a food source for many fish and invertebrate species. In addition, the fish productivity of rocky reef habitat has been estimated to be 6-15 times higher than in soft-bottom habitats (Bond et al. 1999).

Because reef-associated fish typically contain lower concentrations of DDTs and PCBs than soft-bottom species, constructed reefs would benefit the biological organisms that prey on fish in the vicinity of the constructed reefs, as the organisms preying on fish would be exposed to reduced levels of these contaminants. Once constructed, an artificial reef would provide benefits for many decades with minimal operational and maintenance costs.

Impacts

In general, hard-bottom or reef habitat is one of the most important but least abundant habitats in the southern California coastal marine environment (Cross and Allen 1993). Soft-bottom substrates (i.e., sand and mud) predominate in an overwhelming percentage of the marine area along the coast from Point Dume to Dana Point (Ambrose 1994). The areas targeted for restoration are historic reef habitat that has been covered with sediments, effectively converting them to soft-bottom, sandy habitats. Restoring these reefs from soft-bottom back to reefs will not significantly reduce the total available soft-bottom habitat to those species that rely on it, and it would bring the available rocky reef habitat closer to its historic level. Soft-bottom habitats in nearshore waters of California are spawning areas for Market Squid, which is an important commercial species in California. The proposed restoration sites will be studied to determine if such limited natural habitats will be covered or compromised.

Artificial reefs are known to be aggregators of marine life and are popular fishing and diving locations because of the large numbers of fish and invertebrates attracted to the structures for habitat and food. Because of the popularity of these sites for anglers, fish mortality could increase in the vicinity of newly constructed reefs. Thus, before a reef is constructed at a given site, appropriate steps will be taken to ensure that reef design, size, placement, and long-term management will accommodate the anticipated increases in fishing and other uses of the reef site.

At a conceptual level, reef construction projects are not likely to adversely affect threatened or endangered species or essential fish habitat. However, detailed analysis will be performed each site level before a reef is constructed.

Physical

Benefits

The benefits of artificial reefs to the physical environment would be nominal. The artificial reefs proposed in this project will be designed to increase erosion of inshore sediments and to increase offshore transport of sediments. This will provide benefits in two ways, it will increase the exposure of low relief reef habitat adjacent to the constructed reefs, and it will result in offshore transport of sediments where they may cover areas contaminated with DDTs and PCBs. The extent to which these benefits will be realized will be analyzed fully once the reef design is complete. Sediment transport models can be used to fully evaluate both the potential benefits and impacts of the reef once the design is complete.

Impacts

The placement of reefs in nearshore areas has the potential to alter the transport of sediment and affect the topography of adjacent subtidal and beach areas. This impact, however, may work as a benefit as described above. Also, depending on the nature of the soft substrate in a given area, the depth to bedrock, and the slope, hard substrate dropped to the marine bottom may not perform as intended. The potential physical impacts from placing rock or rubble in a given area will undergo engineering analysis and supplemental review and evaluation.

The placement of concrete or rock materials into marine waters would cause short-term suspension of sediments at the site and result in short-term water quality impacts. The principal effect would be increased turbidity; however, depending on local conditions, the sediments at the reef site might contain elevated contaminant levels. The methods and timing for reef material placement may be adjusted in consultation with regulatory agencies to address such local conditions and reduce the short-term water quality impacts of the construction.

Human Use

Benefits

Artificial reef construction in areas will increase production of species of fish that are known to be less contaminated than those that use soft-bottom habitat. This result will provide direct benefits to anglers whose fishing opportunities have been impacted by fish consumption advisories. Artificial reefs provide human use benefits beyond fishing, as they are also popular areas for SCUBA and free diving for purposes of recreation, hunting, and underwater photography. As with the biological benefits, the human use benefits will be sustained for a period of decades or longer with minimal operational or maintenance costs.

Impacts

Depending on its location and design, an artificial reef can impact various human uses in an area. Potentially impacted uses include recreation (e.g., board, body, or wind surfing) and navigation. Constructed reefs displace soft-bottom species, so the anglers specifically targeting these species at the site would find it harder to catch these fish. The potential impacts to recreational and navigational uses will be a significant consideration as the proposed restoration sites are evaluated.

Construction activities at fishing sites may cause short-term disruption to users of a site during the period of construction. Steps will be taken to minimize the impacts of construction; these steps will be addressed at the stage when implementation plans are being developed.

LIKELIHOOD OF SUCCESS/FEASIBILITY

Artificial reefs have been constructed in many areas along the coast of California and elsewhere to enhance fisheries and fish production and to replace lost habitat. Studies of previously constructed reefs (including the 5-year pilot reef project followed by a successful 152-acre build-out near San Clemente, Orange County, CA) have resulted in a substantial body of knowledge on the likely outcomes associated with different design attributes and implementation approaches.

The San Clemente reef habitat was similar to the project described here in that the goal was to use artificial reefs to restore historic reef habitat that has been buried by sediments. The ultimate purpose was to mitigate for lost kelp production caused by the outflow of the San Onofre Nuclear Generating Station (SONGS). This project successfully restored both rocky reef habitat and now supports a healthy kelp community. Results from the initial pilot reef demonstrated that the constructed reefs provided habitat that was similar to nearby natural rocky reefs (Reed et al. 2006). Thus the methods described in this project are proven techniques with good evidence of success.

Regulatory approval and public acceptance of reef construction projects have been achieved in the past and the lessons learned from successes at the recent San Clemente reef will help guide the implementation of this project. While there is general support for reef construction, any artificial reef proposal will require careful planning and coordination with interested parties and regulatory agencies. Fishing organizations have expressed a desire for more artificial reef construction, and regulatory agencies have approved reef construction as a means for mitigating environmental impacts.

The region proposed for reef restoration may differ from the area restored by the SONGS project in the amount of turbidity, which can limit algal growth. While the goals of this restoration project do not include the production of a kelp forest habitat, algal growth is a critical building block of a healthy and diverse rocky reef habitat. The impacts of turbidity on the peninsula and its potential to limit algal growth at depth were examined using data from a light energy survey (part of the JWPCP NPDES monitoring program).

Water column profiles of light energy (measured as photosynthetically active radiation or PAR) were conducted monthly from 1982-2009 at seven nearshore sites along the Palos Verdes Peninsula (Figure 5-15). Readings are taken at 0.5m, 1 m and then at 2 m intervals below the surface until contact with the bottom or 20 m depth, whichever comes first. The light energy value measured at each depth (quanta/sec/cm^2) is divided by the surface light energy measurement (also quanta/sec/cm^2) to obtain a percentage of the surface light energy that passes through the water column to each depth. That percentage was then averaged over every sampling period from April 1982 to December 2009 to obtain a mean percentage of surface light energy captured at each depth (Figure 5-16).

Plotting the difference between the percentage at each site/depth and the average percentage of all sites at each depth allowed for comparisons among regions along the shelf (Figure 5-17). Overall, there were very small differences among sites in light penetration, and perhaps some differences in the factors that limit light penetration.

Rocky Point (Palos Verdes Point) and (to a lesser extent) Long Point stations had far below average light energy transmittance near the surface compared to other sites, but far greater transmittance further down in the water column, suggesting that the thick kelp canopy, rather than turbidity, limited light penetration at those sites. In addition, these data suggest that turbidity at Rocky Point and Long Point is generally low when compared to thinner-canopied sites to the east, such as Abalone Cove and White Point. Given the overall small differences in the percentages by site, it appears that there is sufficient light penetration at all stations, including the proposed restoration sites to sustain macroalgae.

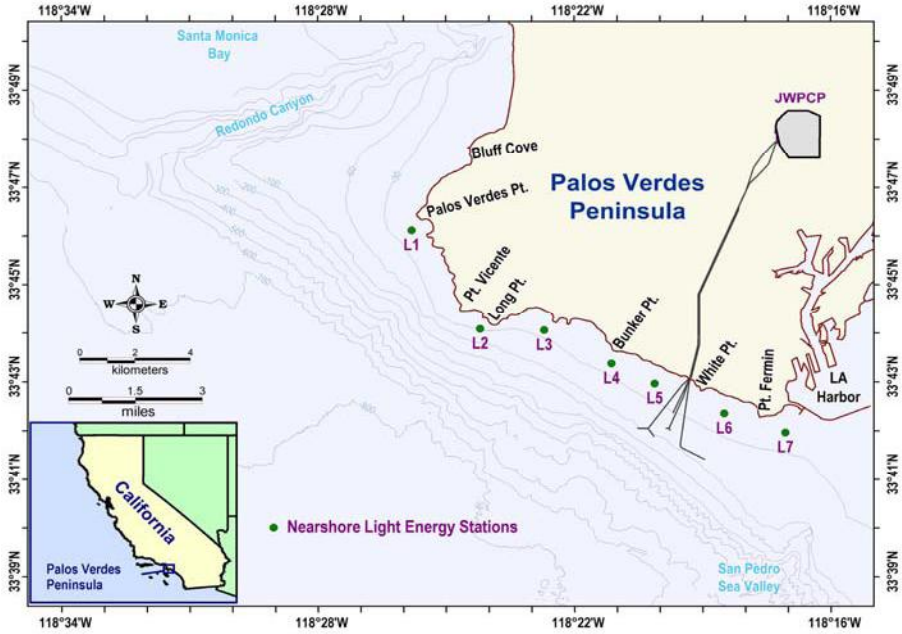

Figure 5-15. Locations of the Sanitation District's light energy stations (LACSD 2010).

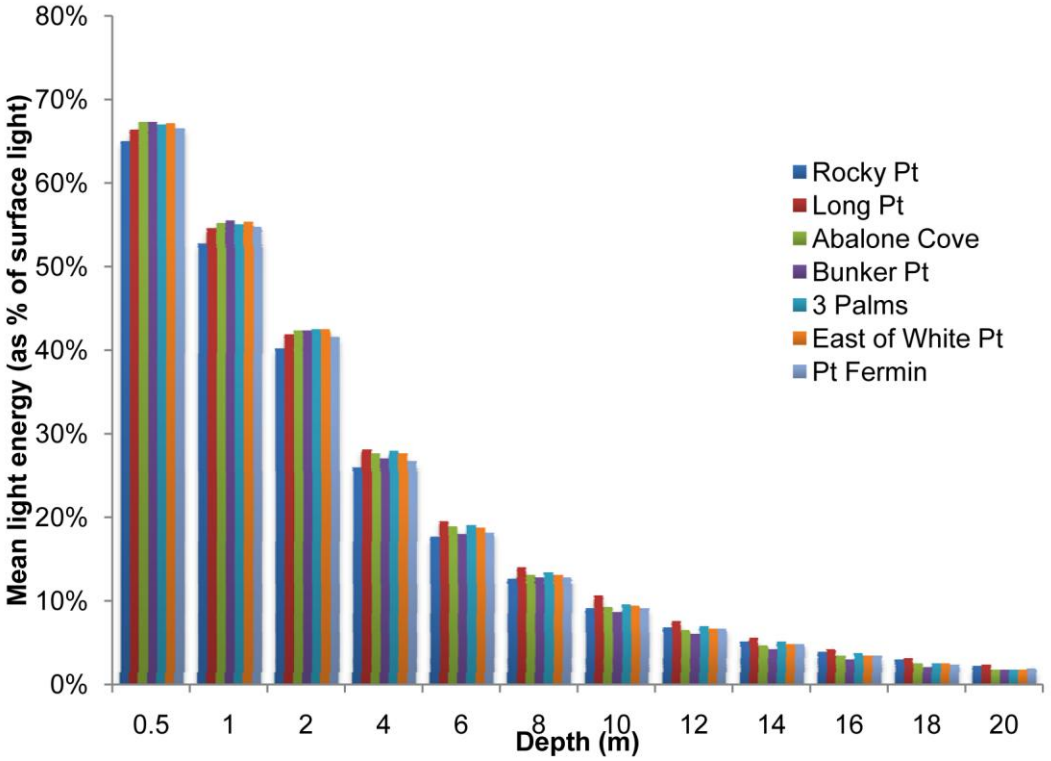

Figure 5-16. Mean light attenuation at seven sites along the Palos Verdes Peninsula (Pondella and Williams in preparation).

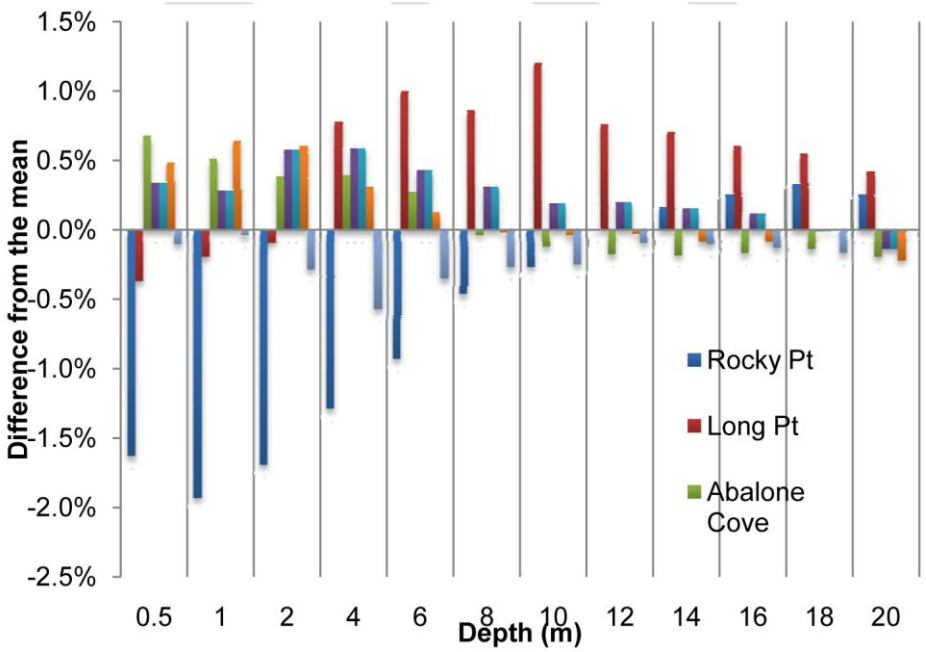

Figure 5-17. Light attenuation % difference from the mean at seven Palos Verdes Peninsula locations by depth (Pondella and Williams in preparation).

PERFORMANCE CRITERIA AND MONITORING

Several performance criteria will be used to evaluate the effectiveness of a constructed artificial reef in meeting the Trustees' restoration goals. The reef modules that will be constructed will be designed to simulate similar high relief reef habitat that naturally occur in the area (e.g., Gudgel's Rock, Figure 5-13). These natural structures will be used as a reference to which monitoring data will be compared. Monitoring will be conducted that will assess algal, invertebrate, and fish community structure and size distribution. Monitoring will be conducted using methods compatible with protocols used in ongoing monitoring of rocky reef habitats in the Southern California Bight (e.g., CRANE). The results from the SONGS reef project has shown that the first 1-2 years post construction were highly dynamic and were not sufficient to determine the longer-term development of the constructed reef community. Therefore, a minimum of four years of monitoring will be needed.

EVALUATION

The Trustees have evaluated this action against all screening criteria developed to select restoration actions and have concluded that this action is consistent with the selection factors. The Trustees determined that this type and scale of action will effectively provide long-term benefits to the fish habitat on the Palos Verdes Shelf. Rocky reef habitat is both a limiting habitat for fish production in southern California and is known to support species that tend to be lower in contaminants. This action will create high-quality fish habitat and increase fish production on the Palos Verdes Shelf.

BUDGET

Costs are based on estimates derived partly from the SONGS reef project with a 3% inflation rate applied to reef placement costs.

Project Component	**# of Years**	**Total**
Design, environmental review, permitting	2	$340,000
Mobilization	0.5	$500,000
Reef Construction (based on 80 acres)	0.5	$5,450,000
4 years of monitoring	4	$200,000
Total (minimum)		**$6.49M**

5.4.1.3. Data Gap Studies/Restoration Planning

Each year, the Trustees receive and evaluate study proposals related to different fish projects. The Trustees also determine what data gaps need to be filled in order to better inform implementation of the restoration projects and support EPA's ongoing evaluation of remedial alternatives. These studies, along with others that are identified in the future, will be considered by the Trustees for funding as the need for specific data arises. These could include but are not limited to additional studies investigating contamination levels in coastal marine fish and additional tracking studies to that support EPA's remedial planning.

5.4.2. Bald Eagles

5.4.2.1. Monitor Bald Eagles on the Channel Islands

NEXUS

Bald eagles historically nested throughout the Channel Islands prior to releases of DDTs and PCBs, but by the early 1960s had disappeared from the islands (Kiff 1980). As part of the Montrose Settlements Restoration Program, the Trustees have been funding Bald Eagle restoration work since 2001 in hopes of establishing a self-sustaining Bald Eagle population on the Channel Islands. Section 2 provides a summary of those efforts and results to date.

DESCRIPTION

Background

Historically, the Channel Islands were a stronghold for the Bald Eagle in southern California. From 1875 to 1949, active Bald Eagle nests were reported from a minimum of 35 different locations on the islands; however, this number is likely an underestimate due to the lack of systematic surveys (Kiff 2000). During this time frame, a maximum of 23 Bald Eagle nesting pairs were documented in a single year (Kiff 2000; Table 5-3). In 2011, a total of 13 nesting pairs were documented nesting on four of the eight islands (Table 5-3). The majority of the nest sites were on Catalina and Santa Cruz Islands. The Trustees anticipate that additional Channel Islands will once again support active nest sites as the Bald Eagle population matures and currently occupied islands reach their carrying capacity.

Table 5-3. Historical and 2011 Distribution of Bald Eagle Nesting Pairs on the Channel Islands.

Island	Historical Maximum # of Documented Bald Eagle Pairs in Single Year*	Number of Bald Eagle Nesting Pairs in 2011
San Miguel	3	0
Santa Rosa	3	2
Santa Cruz	5	3
Anacapa	3	1
Santa Barbara	1?	0
San Nicolas	1	0
Catalina	4	7
San Clemente	3	0
Total	23	13

*As reported in Kiff 2000

Approximately 65 Bald Eagles resided on the Channel Islands in 2011, with 25 eagles on Catalina Island and 40 eagles on the northern Channel Islands. Based on the GPS data

and sightings, Bald Eagles have dispersed and mixed with one another across the Channel Islands. Eagles released on Santa Cruz Island have been documented on all eight of the islands. Likewise, eagles fostered into nests and hatched on Catalina Island have been documented on San Clemente Island and the northern Channel Islands. Nesting pairs reflect this dispersal and mixing of Bald Eagles across the Channel Islands. Several examples include: 1) the 2006-2011 Pelican Harbor pair on Santa Cruz Island is comprised of two Catalina-fostered birds K-26 and K-11; 2) the 2010-2011 Middle Ranch pair on Catalina Island is made up of Santa Cruz-released A-37 and Catalina-released K-93, and 3) the Malva Real pair on Santa Cruz Island since 2006 has consisted of a Catalina-fostered male (K-11) and several Santa Cruz-released females (A-04, A-17, and A-35).

Methods

In Phase 2, the Trustees propose to continue funding the Bald Eagle restoration program on the Channel Islands. Since 2006, the restoration program has shifted from reintroductions on Santa Cruz Island and artificial manipulation on Catalina Island to a comprehensive monitoring program across the Channel Islands. The recent successful hatchings on both the northern Channel Islands and Catalina Island are encouraging signs that a self-sustaining population is feasible (Figure 5-18). However, additional years of monitoring are necessary to determine if the population as a whole will be self-sustaining based on the eventual size and distribution of the breeding population, level of nesting success, and juvenile survival.

Reasons to continue monitoring the Channel Islands Bald Eagle population include: 1) the Santa Cruz Island birds released in 2006 recently reached breeding age (around 2011); 2) not all eagles will successfully find a mate or garner a territory during their first years of maturity; 3) eagles that naturally hatched in the wild are still maturing (e.g., the 2006 Pelican Harbor female A-49); 4) the dietary habits of Bald Eagles (particularly juveniles) on the northern Channel Islands may shift (e.g., with the removal of deer and elk from Santa Rosa Island in 2011); 5) newly established pairs may be unable to successfully lay or hatch eggs for reasons separate from complications associated with environmental contaminants (e.g., inexperience); and 6) contaminant loads could increase as the eagles age and in the long term affect reproductive success. For these reasons, it is important to continue monitoring Bald Eagles on the Channel Islands.

Figure 5-18. Bald Eagle Triplets on Catalina Island in 2011; Bald Eagle Chick on Anacapa Island in 2011 (Photo credit: IWS).

The monitoring program will continue to focus on breeding activities, investigation of diet, survival, and contaminant analysis. The monitoring program will be flexible and tailored toward current data needs. Specific monitoring needs will be evaluated on an annual basis and certain aspects of the program or specific nest sites may be prioritized in a given year. As the Bald Eagle population continues to grow, it may not be feasible to closely monitor each nesting territory. Some nesting sites will be difficult to monitor due to logistics, inaccessibility, presence of breeding seabirds, budget limitations, etc.

In order to gain the greatest understanding of this program's long-term success given the available restoration funds, the scope of the monitoring program will be reduced after 2012. The program will shift from extensive year-round monitoring to a more directed focus of understanding the eagles' annual population status. As the available Montrose funds decrease, NPS personnel will assist with monitoring efforts when feasible in order to reduce labor and transportation costs. In addition, the use of remote video cameras as an effective monitoring tool will likely be expanded during Phase 2, allowing for decreased personnel costs. The cameras are cost effective and have facilitated IWS' efforts to monitor nest sites that are difficult to access.

ENVIRONMENTAL BENEFITS AND IMPACTS

Biological

Benefits

Monitoring provides valuable information about Bald Eagles on the Channel Islands, including population status, distribution, territory occupancy, nest success, productivity, and diet. These measures are all indicators of population health and are important to understanding whether Bald Eagles can naturally sustain a stable (or increasing) population on the Channel Islands.

As top predators, Bald Eagles are an excellent indicator species of the overall health of the ecosystem in which they live. Monitoring of contaminant levels in Bald Eagles and

their food supply will continue to provide valuable information on the overall levels of contamination in the environment and provide insights on changes in site-specific contaminant levels through time.

Impacts

The monitoring program will not result in substantial impacts to the biological environment. Bald Eagles may be disturbed during certain monitoring activities (e.g., entering the nest to band young); however, these disturbances are temporary and in the past have not resulted in adverse impacts to the eagles. Observations of the nest sites cause minimal disturbance because they are either conducted from a distance or by using a video camera placed at or near the nest. Biologists will also avoid disturbing seabird nesting colonies or other sensitive habitats during monitoring activities.

Physical

Benefits

This action will have no known benefits to the physical environment.

Impacts

This action will have no known impacts to the physical environment.

Human Use

Benefits

The presence of Bald Eagles provides both aesthetic and recreational benefits to visitors of the Channel Islands. The presence of the Bald Eagle provides human non-use or intrinsic value in that the Bald Eagle is a symbolically important species in the United States. In addition, Bald Eagles play an important role in the cultural history of the Channel Islands.

Significant efforts have been made during this program to provide the public with live video of Bald Eagle nests on both Santa Cruz and Santa Catalina Islands. The web cams have been extremely popular with the public and a related discussion forum provides an opportunity for the public to report detailed observations. The webcams are beneficial to the public in that they are a valuable educational tool, promote citizen science, and create awareness of the Bald Eagle recovery effort on the Channel Islands. The participation of the public in the program has also benefited IWS biologists and resource managers by providing a detailed daily log of observations.

Impacts

There are no known impacts to human use from this action.

LIKELIHOOD OF SUCCESS/FEASIBILITY

The monitoring program proposed for Phase 2 is a continuation of on-going successful monitoring efforts. The continuation of these monitoring efforts is important to fully understand the recovery of the Bald Eagle on the Channel Islands.

PERFORMANCE CRITERIA AND MONITORING

Monitoring efforts will be conducted according to established protocols and in accordance with past survey efforts. Adjustments to the monitoring program will be made as needed in order to collect priority information.

EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. This monitoring program will be used to detect changes in the status and distribution of Bald Eagles on the Channel Islands. Additional years of monitoring are needed to fully evaluate whether productivity and nest success are at levels necessary to sustain a naturally reproducing Bald Eagle population over the long term. Because Bald Eagles are superior indicators of environmental health and ecological integrity, the monitoring program provides valuable information about the presence of contamination within the Channel Islands ecosystem and the Southern California Bight.

BUDGET

For Phase 2, the Trustees propose to allocate an additional $4.1 million towards Bald Eagle monitoring on the Channel Islands. The Trustees propose to reduce the intensity of the monitoring effort starting in 2013 in an effort to extend the available restoration funds until 2021 (the 15-year mark after the first successful nesting in 2006). Should additional restoration funds become available, then the level of annual monitoring may be increased or the duration of monitoring may be extended beyond 2021.

This budget includes the continued funding of the Channel Islands Live EagleCam through 2021.

Project Component	**Estimated Cost/Year**	**# of Years**	**Total**
Current level of monitoring	$526,558	1 (2012)	$526,558
Reduced level of monitoring	$401,670	9 (2013-2021)	$3,615,030
Total			$4,141,588

5.4.3. Peregrine Falcons

5.4.3.1. Monitor the Recovery of Peregrine Falcons on the Channel Islands

NEXUS

The goal of this project is to monitor the recovery of the Peregrine Falcon on the Channel Islands. Data collected in 1992 in the Southern California Bight demonstrated severe (>15 percent) eggshell thinning in Peregrine Falcons (Kiff 1994). Peregrine Falcons were extirpated from the Channel Islands by the mid-1950s, largely due to DDT contamination that led to eggshell thinning and reproductive failure (Kiff 2000).

DESCRIPTION

Background

This project was originally described in the 2005 RP (see Appendix C2). One survey was completed in 2007 and the results indicate that the population of Peregrine Falcons on the Channel Islands is increasing and has exceeded the known historic population (see Section 2). The 25 active pairs documented in 2007 are nearing an earlier predicted carrying capacity of 30 pairs on the Channel Islands (Hunt 1994). Although the 2007 survey indicates that recovery of Peregrine Falcons on the southern Channel Islands has been slower than on the northern Islands, the Trustees are encouraged that Peregrine Falcons successfully bred on Santa Barbara Island in 2007. A thorough survey was also not completed on San Clemente Island in 2007 due to logistical constraints; therefore the current status of breeding Peregrine Falcons on that island is unknown.

As indicated in the 2005 RP, the Trustees would evaluate the need for active restoration of Peregrine Falcons on the Channel Islands in light of the 2007 survey results. Based on the results and the overall increase in Peregrine Falcon breeding pairs on the Channel Islands since 1985, the Trustees have determined that active restoration of Peregrine Falcons on the Channel Islands is not necessary. Therefore, the Preferred Alternative for Phase 2 is the continued monitoring of Peregrine Falcon recovery on the Channel Islands.

Methods

The proposed project is to conduct two additional comprehensive monitoring efforts on the Channel Islands during Phase 2. Active Peregrine Falcon territories will be monitored to determine breeding chronology, location of nest cliff and eyrie (nest ledge), egg laying and incubation periods, reproductive success/failure, recycling attempts, and number of young produced. In order to assess any ongoing effects of DDT contamination, biologists will collect eggshells, eggshell fragments, and addled (dead or infertile) eggs for contaminant analysis. Prey remains will also be collected from active sites for identification at the Western Foundation of Vertebrate Zoology located in Camarillo, California. Biologists will also enhance suitable Peregrine Falcon nest ledges by removing sharp stones or adding suitable substrate that reduce the chance of eggs breaking in the nest.

In 2007, logistics and weather constraints prevented a complete survey on San Clemente Island; therefore, this island will be a priority in upcoming survey efforts. The next survey is planned for 2013. A Request for Proposals will be announced in spring/summer of 2012. The next survey is being planned to coincide with an updated contaminant analysis of seabirds consumed by Peregrine Falcons on the Channel Islands. Conducting the two efforts at the same time will allow for a more accurate comparison of current contaminant data to past studies and help determine the trends and pathways of DDE contamination in the Channel Islands food chain.

ENVIRONMENTAL BENEFITS AND IMPACTS

Biological

Benefits

Monitoring provides valuable information on territory occupancy, nest success, and productivity. These measures are all indicators of population health and are important to understanding the long-term recovery of Peregrine Falcons on the Channel Islands. The monitoring data also informs natural resource managers of potential threats to Peregrine Falcon recovery.

As top predators, Peregrine Falcons are an excellent indicator species of the overall health of the ecosystem in which they live. The monitoring of eggshell thickness and contaminant levels in Peregrine Falcons will continue to provide valuable information on the overall levels of contamination in the environment and any changes in site-specific contaminant levels through time.

Impacts

The monitoring program will not result in substantial impacts to the biological environment. Peregrine Falcons pairs may be temporarily disturbed during certain monitoring activities (e.g., entering the nest to collect eggshell fragments or band young); however, the majority of the observations will be from a distance and will not disturb the birds. Biologists will also avoid disturbing seabird nesting colonies during monitoring activities.

Physical

Benefits

This action will have no known benefits to the physical environment.

Impacts

This action will have no known impacts to the physical environment.

Human Use

Benefits

The recovery of the Peregrine Falcon to the Channel Islands provides both aesthetic and recreational benefits to visitors of the islands.

Impacts

This action will have no known impacts to human uses.

LIKELIHOOD OF SUCCESS/FEASIBILITY

The monitoring effort in 2007 was successful in updating the known status of Peregrine Falcons on the Channel Islands (see Section 2). Additional monitoring will continue to add to our knowledge of Peregrine Falcon recovery on the Channel Islands.

PERFORMANCE CRITERIA AND MONITORING

Monitoring efforts will be conducted according to established protocols and in accordance with past survey efforts.

EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. This monitoring program will be used to detect changes in the status and distribution of Peregrine Falcons on the Channel Islands. Because Peregrine Falcons are superior indicators of environmental health and ecological integrity, the monitoring program provides valuable information about the presence of contamination within the Channel Islands ecosystem and the Southern California Bight.

BUDGET

For the purposes of this Restoration Plan, the Trustees have estimated the costs of two comprehensive monitoring events that will occur within Phase 2 of implementation. In Phase 1, a total of $300,000 was allocated for Peregrine Falcon monitoring. The cost of the 2007 survey was approximately $175,000; therefore, $125,000 still remains from the Phase 1 allocation. We anticipate that future surveys will cost approximately $200,000 each with increasing transportation costs. For Phase 2, a total of $475,000 will be allocated to Peregrine Falcon monitoring. This amount breaks down to $75,000 directed towards the 2013 survey (which will be added to the carryover of $125,000 from Phase 1), and $400,000 for two additional surveys during the Phase 2 implementation period.

Project Component	Survey Year	Total Allocated
Peregrine Falcon Monitoring	2013	$75,000 (added to carryover from Phase 1)
Peregrine Falcon Monitoring	~2017, 2022	$400,000
Total		**$475,000**

5.4.4. California Condors

As described in Section 2, the Trustees funded a data gap study in 2010-2011 related to California condors and the potential exposure to Montrose DDE through contaminated marine mammal carcasses. The results of this study will be reported to the Trustees in 2011 and 2012. Based on the results of the study and other relevant information, the Trustee Council may decide to fund further monitoring or restoration activities for the California Condor if appropriate.

5.4.5. Seabirds

The Trustees have evaluated a range of seabird restoration projects for Phase 2. The following section outlines the Preferred Projects, Data Gap Studies, and Non-preferred Projects. The table below outlines the Preferred Projects for Phase 2. The projects are divided into Tier 1 and Tier 2. The Tier 1 projects are priority for implementation during Phase 2. However, if restoration funds remain or if the Trustees are able to secure additional funds (through partnerships, grants, etc), then the Tier 2 projects will be considered for implementation. The Trustee Council plans to actively pursue partnerships and grants during Phase 2 in order to leverage the available restoration dollars. In some instances, the Trustee Council will be funding a portion of a particular project, rather than the entire amount shown below.

Project Name- Tier 1		**Status**	**Budget**
1.	Restore Alcids to Santa Barbara Island	Phase 1 project cont.	$2,103,333
2.	Restore Ashy Storm-Petrels on the Channel Islands	Phase 1 project cont.	$540,000
3.	Restore Seabirds to Scorpion Rock	Phase 1 project cont.	$335,000
4.	Reduce Seabird Disturbance on the Channel Islands	New	$200,000
	Total Tier 1		**$3,178,333**

Project Name- Tier 2		**Status**	**Budget**
5.	Restore Seabirds to Baja California Pacific Islands	Phase 1 project cont.	$2,771,040
6.	Restore Seabirds to Prince Island	New	$200,000
	Total Tier 2		**$2,971,040**

5.4.5.1. Restore Alcids to Santa Barbara Island

NEXUS

The goal of this action is to re-establish an active Cassin's Auklet breeding population on Santa Barbara Island through social facilitation and habitat improvement, and to improve recruitment and productivity of Xantus's Murrelets through habitat restoration. Ashy Storm-Petrels may also be targeted for restoration on Santa Barbara Island during this next phase of the project. Each of these species was injured by the contaminant releases that were the subject of the Montrose case.

DESCRIPTION

This project is a continuation and expansion of the restoration work begun in Phase 1. The proposed timeline for Phase 2 of this project is from 2012-2017. Habitat restoration work will include expansion of existing restoration sites and addition of new sites. Activities will include removing exotic vegetation and revegetating the area with native plants propagated in a permanent nursery on Santa Barbara Island (Figure 5-1). Vocalization playback systems will be used to attract Cassin's Auklets to suitable nesting areas to re-establish the auklet colony. Also, artificial cavities and nest boxes will be installed for both Cassin's Auklets and Xantus's Murrelets to facilitate recruitment, provide a stable and secure nesting area to improve productivity and assist in monitoring efforts. This habitat restoration and social attraction effort aims to: (1) increase recruitment, (2) increase reproductive output, and (3) decrease egg and chick mortality by providing safe breeding habitat. The removal of exotic vegetation and planting of native plants will be done during the non-breeding season to avoid impacts to nesting birds.

Also included in this project are monitoring components that help inform our restoration activities. In Phase 2, we plan on conducting one year of at-sea surveys around Santa Barbara Island. The at-sea surveys provide information on seabird density and oceanographic conditions such as temperature and prey availability. These data are important for better understanding the factors that may influence the success of restoration efforts. During Phase 2, the Trustee Council will evaluate the future needs of the project and provide funding for such studies as appropriate.

Environmental Benefits and Impacts

Biological

Benefits

By providing additional high-quality breeding habitat, this action seeks to restore a historic breeding colony of Cassin's Auklets and aid in the recovery of the threatened Xantus's Murrelet. The combination of habitat restoration and nest boxes will provide a favorable environment for both Cassin's Auklets and Xantus's Murrelets on Santa Barbara Island. In Northern California, nest boxes have enhanced the population growth rate of several cavity-nesting alcid species at various sites by increasing recruitment of

breeding-age birds, improving productivity, and decreasing mortality (Sydeman et al. 2000). The use of playback systems will further facilitate the recolonization of the Cassin's Auklet on the island. These techniques should increase the number of breeding pairs of Cassin's Auklets and Xantus's Murrelets on the island, thereby increasing the number of offspring produced. This action will restore critical seabird nesting habitat in the Channel Islands, as well as aid in the recovery of this important Xantus's Murrelet colony. By re-establishing the historic colony of Cassin's Auklets and increasing the number of breeding pairs of Xantus's Murrelets, this action will have long-term benefits to these species.

Figure 5-19. Restoration work at Elephant Seal Cove on Santa Barbara Island (Photo credit: A. Little, USFWS).

Impacts

This action is expected to have minimal short-term biological impacts. The removal of exotic vegetation and the planting of native plants will be done during the non-breeding season to avoid impacts to nesting birds. There will be additional human activity on Santa Barbara Island as a result of this action that could result in temporary displacement of native wildlife or the trampling of native plants. However, it is expected that any impacts will be short term and minimal. If it is determined that herbicides are necessary for plant removal, they will be applied in a manner that avoids or minimizes adverse impacts and is in compliance with NPS policies. Subsequent monitoring may temporarily disturb target species; however, the use of nest boxes will minimize such impacts to nesting alcids. Overall, the biological impacts are not expected to be substantial.

Physical

Benefits

Restoration of native plants will have long-term benefits to the physical environment of Santa Barbara Island by stabilizing the soil and decreasing erosion. However, these impacts are not expected to be substantial.

Impacts

This action may result in short-term, minimal impacts due to trampling and increased soil erosion during revegetation efforts.

Human Use

Benefits

This action will have no known benefits to cultural resources, recreation, aesthetics, transportation, or human health and safety. Native plant restoration around the NPS facilities and campground will improve aesthetics of the area for visitors.

Impacts

This action will have no known impacts to cultural resources, recreation, aesthetics, transportation, or human health and safety. Cultural resources will be avoided on the island during project implementation. It is expected that the nest boxes will be largely screened by vegetation and will not be visible to the public.

LIKELIHOOD OF SUCCESS/FEASIBILITY

Social attraction techniques, including the use of vocalization playback systems, have been successfully used for a variety of seabirds throughout the world. The use of artificial nest boxes has also proven to be successful for alcids such as the Cassin's Auklet. This project already showed signs of success when a Cassin's Auklet nested in 2010 in the Elephant Seal Point restoration site. In 2011, approximately ten Cassin's Auklets pairs were documented in newly created artificial habitat surrounding the broadcast speakers near the Landing Cove. We anticipate that additional nesting pairs will utilize the restoration sites as additional suitable habitat becomes available.

Moderate operations and maintenance will be required for this action. Minimal maintenance is necessary for cleaning and repair of nest boxes. The habitat restoration sites also require a certain level of maintenance. In order to increase survival, the outplantings require supplemental watering particularly during the first year. The revegetation areas require at least three years of weed control and supplemental outplantings, and may require periodic removal of exotic plants. However, once the native plants are established, we anticipate that the sites will be self-sustaining and will provide benefits over the long term.

PERFORMANCE CRITERIA AND MONITORING

To quantify the efficacy of the restoration efforts, a minimum of four years of monitoring is proposed. Monitoring for birds nesting in artificial cavities and natural habitat will follow established protocols. Annual monitoring will monitor reproductive success, site occupancy, and productivity.

EVALUATION

Santa Barbara Island supports the largest colony of Xantus's Murrelets in California. This island also at one time supported a sizable population of Cassin's Auklets before the colony was decimated by cats. Because these colonies have not recovered from past impacts, creation of additional nesting habitat is expected to result in a long-term measurable increase in the number of Xantus's Murrelets and Cassin's Auklets on Santa Barbara Island.

The Trustees have evaluated this action against all screening criteria developed to select restoration actions and have concluded that this action is consistent with the selection factors. The Trustees determined that this type and scale of action will effectively provide long-term benefits to the Cassin's Auklet and Xantus's Murrelet. Both of these species are priority species for seabird restoration. This action will create high-quality seabird nesting habitat and aid in the recovery of these species.

BUDGET

We anticipate continuing this project for an additional six years (2012-2017). Below are the estimated budget totals.

Project Component	**Estimated Cost/Year**	**# of Years**	**Total**
Habitat restoration, social attraction, monitoring	$325,000	6 (2012-2017)	$1,950,000
At-sea surveys, prey sampling	$153,333	1	$153,333
Total			$2,103,333

5.4.5.2. Restore Ashy Storm-Petrels on the Channel Islands

NEXUS

The goal of this action is to restore Ashy Storm-Petrel populations on the Channel Islands. This species was injured by the contaminant releases that were the subject of the Montrose case. Given the limited distribution and rarity of this species, the Ashy Storm-Petrel is a priority for seabird restoration.

DESCRIPTION

In the 2005 RP, the projects "Restore Seabirds to Santa Cruz Island and Orizaba Rock" and "Restore Ashy Storm-Petrels to Anacapa Island" were identified as Preferred Projects. The Ashy Storm-Petrel work on Anacapa Island was not completed during Phase 1 and is thus being brought forward to Phase 2. The Trustee Council is interested in restoration opportunities for this species throughout the Channel Islands. Therefore, the Phase 2 work will include previously identified projects on Anacapa and Santa Cruz Islands, but could also be expanded to include restoration projects throughout the Channel Islands as appropriate. The Trustee Council will also evaluate restoration opportunities on Anacapa Island for other priority seabird species, including the Cassin's Auklet and Xantus's Murrelet. Overall restoration actions that will be considered for the Ashy Storm-Petrel during Phase 2 include: 1) habitat improvement (e.g., stabilizing habitat areas against erosion), 2) social attraction, 3) placement of artificial nesting habitat, 4) annual monitoring at nesting sites, and 5) contaminant analysis. The goals of these activities are to: (1) increase recruitment, (2) increase reproductive output, (3) decrease egg and chick mortality by providing safe breeding habitat, and (4) establish or enhance additional Ashy Storm-Petrel breeding locations. The proposed timeline for Phase 2 of this project is from 2012-2017.

Figure 5-20. Ashy Storm-Petrel in an artificial nest on Orizaba Rock (Photo credit: L. Harvey, NPS).

This overall project will encompass the on-going restoration efforts for the Ashy Storm-Petrel on Santa Cruz Island and Orizaba Rock. The current restoration effort at these locations include annual monitoring at the Santa Cruz Island sea caves and Orizaba Rock, social attraction on Orizaba Rock, use of artificial nest sites, and contaminant analysis of fail-to-hatch eggs (Figure 5-20). The specific restoration actions to be completed each year will be dependent upon factors such as site conditions, reproductive success, and available funds. Other offshore rocks of Santa Cruz Island will be also evaluated for their restoration potential. Should restoration opportunities exist, the Trustees will consider similar restoration actions for other offshore rocks.

After removal of the Black Rat from Anacapa Island in 2003, the quality of available seabird nesting habitat has greatly increased. During 2011, seabird biologists will conduct comprehensive surveys on Anacapa Island to locate any existing or potential Ashy Storm-Petrel nesting sites, as well as scope suitable sites for restoration. Future seabird restoration actions on Anacapa Island could include habitat enhancement, native plant restoration, non-native plant removal, social attraction, use of artificial habitat, and monitoring.

Additional project planning, review, and environmental compliance will be completed as appropriate prior to implementation of the restoration activities.

ENVIRONMENTAL BENEFITS AND IMPACTS

Biological

Benefits

The Channel Islands are critical nesting habitat for the Ashy Storm-Petrel. As demonstrated on Orizaba Rock during Phase 1 restoration activities, artificial habitat can provide a favorable nesting environment and assist with monitoring activities. On Anacapa Island, the use of social attraction and artificial habitat would likely facilitate breeding in suitable habitat. The colonization and/or enhancement of existing breeding on Anacapa Island would provide long-term benefits to the Ashy Storm-Petrel in the SCB, as the established presence of a colony of birds would likely serve as an ongoing natural attractant over the long term.

This action seeks to aid in the recovery of the Ashy Storm-Petrel. Given the limited range and overall small population size of this species, the establishment of additional secure breeding sites would be a significant benefit. For seabirds that are restricted in distribution, additional breeding sites buffer the potential catastrophic effects from oil spills, non-native species, and other environmental factors.

Impacts

The restoration actions would have minimal, short-term biological impacts. Playback of tape-recorded vocalizations causes little disturbance or trauma to birds. Researcher activity in the vicinity of nesting areas would be minimized to avoid destruction of the local habitat and disturbance (Johnson et al. 1981, Baptista and Gaunt 1997). Storm-petrels are sensitive to disturbance, including that generated by researchers, especially during the incubation period (Ainley et al. 1974). Overall, the biological impacts are not expected to be substantial.

Physical

Benefits

There are no known benefits to the physical environment.

Impacts

There are no known impacts to the physical environment in the current suite of known restoration activities. Potential impacts to the physical environment from the optional activities described above (e.g., habitat enhancement), will be described in any future project planning and/or environmental compliance documents.

Human Use

Benefits

Ashy Storm-Petrel adults are nocturnal and are difficult to observe. However, biologists have installed audio and video recorders in several caves on Santa Cruz and Anacapa Islands. These recordings will be shared with the public via the MSRP website. The Trustees are exploring the feasibility of nest cams which would provide the public an opportunity to observe these rare birds.

Impacts

This action would have no known impacts to human uses. Cultural resources on the island would be avoided during the action in consultation with the NPS. A slight increase in human use might occur during the implementation of the action. However, this use would be expected to have minimal, short-term impacts.

LIKELIHOOD OF SUCCESS/FEASIBILITY

Social attraction efforts, including the use of playback systems, have been successfully used for a variety of seabirds. For Ashy Storm-Petrels (Brown et al. 2003), playback systems have been used successfully to capture birds in mist nests. Observation and monitoring of the social attraction on Orizaba Rock indicate that Ashy Storm-Petrels are attracted to the audio playback systems. The use of artificial habitat has also been successful on Orizaba Rock within the last several years (McIver et al. 2010).

Nesting Ashy Storm-Petrels on Santa Cruz Island or prospecting birds could be attracted to the new nesting sites on Anacapa Island. Because petrels typically show a high degree of tenacity to the same nest from year to year, once pairs are established, they would likely continue to breed at the same sites. The attraction of pre-breeding petrels may be a useful tool to influence the nest-site selection process by encouraging first-breeding petrels to concentrate their breeding in new areas. Lessons learned from the on-going social attraction and artificial habitat work on Orizaba Rock will be applied to future restoration sites within the Channel Islands.

PERFORMANCE CRITERIA AND MONITORING

The goals of these restoration actions are to increase recruitment of Ashy Storm-Petrels and establish/enhance secure, long-term breeding sites throughout the Channel Islands. A monitoring plan would be developed to evaluate the success of the restoration effort using standardized protocols for seabird monitoring.

EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees determined that the restoration of Ashy Storm-Petrels to the Channel Islands through the establishment of additional colonies or enhancement of existing ones would provide significant benefits to this rare seabird, which is endemic to the California Islands.

BUDGET

We anticipate continuing this project for an additional 6 years (2012-2017).

Project Component	**# of Years**	**Total**
Habitat restoration, social attraction, monitoring on Channel Islands	6 (2012-2017)	$540,000
Total		**$540,000**

5.4.5.3. Restore Seabirds to Scorpion Rock

NEXUS

The goal of this project is to restore habitat for the Cassin's Auklet, Ashy Storm-Petrel, and other nesting seabirds on Scorpion Rock located off Santa Cruz Island (Figure 5-21).

DESCRIPTION

This project is a continuation and expansion of the restoration work begun on Scorpion Rock in Phase 1. Restoration efforts undertaken during Phase 1 have resulted in the establishment of numerous native plants on the rock and the reduction in cover by non-native vegetation, principally iceplant. Despite aggressive efforts to remove iceplant on the rock, continued effort is needed to restore the site until the native plants can fully establish and outcompete the iceplant and other exotic vegetation. Habitat restoration work will include removing exotic vegetation and revegetating the rock with native plants. These plants will be propagated in a nursery from local seed at Scorpion Ranch on Santa Cruz Island. Restoration actions will also include enhancing the nest boxes used by the Cassin's Auklet and monitoring their reproductive success. The proposed timeline for Phase 2 of this project is from 2012-2017.

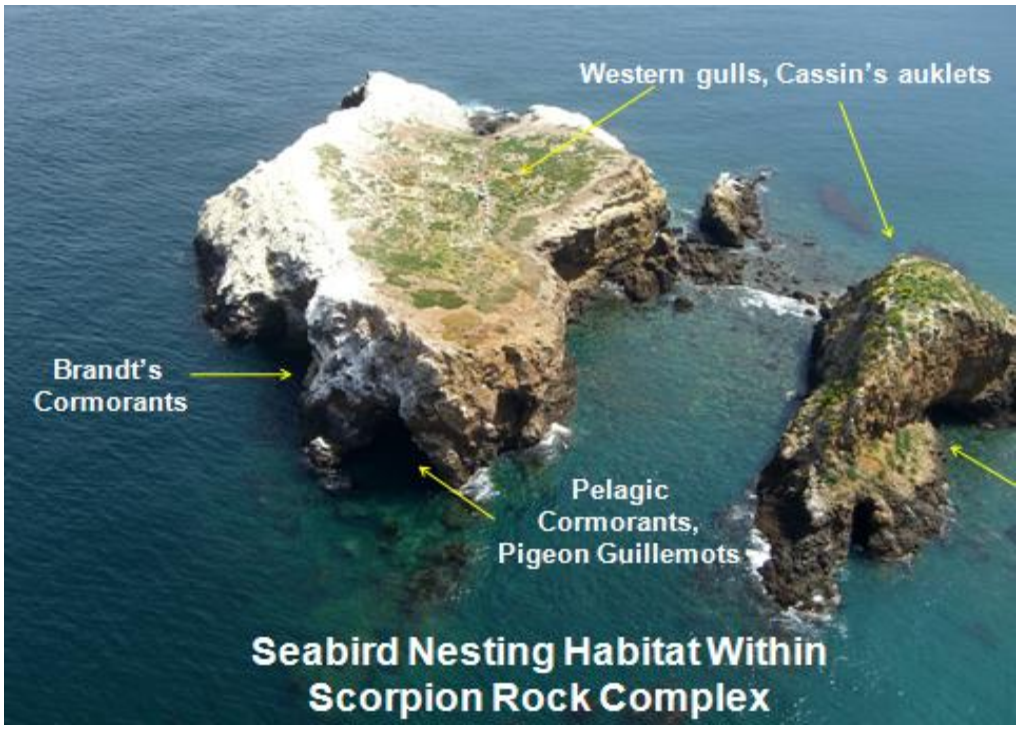

Figure 5-21. Seabird Habitat on Scorpion Rock (Photo credit: NPS).

ENVIRONMENTAL BENEFITS AND IMPACTS

Biological

Benefits

Scorpion Rocks are important nesting sites for burrow-nesting seabirds in California and support a diverse community of breeding and roosting seabirds. The elimination of invasive plants and the restoration of native plants will benefit burrow-nesting species by providing increased nesting habitat and stabilization of the rapidly eroding soil horizon on Scorpion Rock. By providing additional high-quality breeding habitat, the project seeks to increase the number of breeding seabirds, in particular Cassin's Auklets, Xantus's Murrelets, and Ashy Storm-Petrels on Scorpion Rock. The use of nest boxes facilitates monitoring and enhances suitable habitat, thereby increasing the number of successfully produced offspring and decreasing mortality.

Impacts

This action is expected to have minimal, short-term adverse effects. The removal of exotic vegetation and the planting of native plants will be done during the non-breeding season to avoid impacts to nesting birds. However, roosting seabirds may be temporarily disturbed during the revegetation and monitoring efforts. Exotic vegetation will be removed through mechanical methods, thereby eliminating the need for herbicides. Mechanical removal may result in short-term impacts to surrounding native vegetation and soil. The use of matting will help minimize potential erosion and stabilize the soil.

Subsequent monitoring may result in temporary disturbance to seabirds; however, the use of nest boxes will greatly minimize impacts to nesting alcids. Overall, the biological impacts are not expected to be substantial.

Physical

Benefits

This action will have no known benefits to water resources, oceanographic and coastal processes, air quality, or noise receptors. However, the restoration of native plants will have long-term benefits to the physical environment of Scorpion Rock by stabilizing the soil and decreasing erosion.

Impacts

This action will have no known impacts to water resources, oceanographic and coastal processes, air quality, or noise receptors. However, the removal of invasive plants may result in limited short-term impacts to soils by increasing erosion until native plants are established. The use of erosion-control measures (e.g., matting) will help mitigate any short-term negative impacts. Overall, the biological impacts are not expected to be substantial.

Human Use

Benefits

This action will have no known benefits to cultural resources, recreation, aesthetics, transportation, or human health and safety.

Impacts

This action will have no known impacts to cultural resources, recreation, aesthetics, transportation, or human health and safety. Any cultural resources on the island will be avoided during the implementation of the action. It is anticipated that nest boxes will be invisible to visitors and will not change the character of the project area.

LIKELIHOOD OF SUCCESS/FEASIBILITY

This action will be determined to be successful when seabirds begin occupying the newly created nesting habitat. Both the habitat creation and the revegetation components of the action employ proven methods and techniques that have clearly demonstrated success in the past on Scorpion Rock and other locations (Figure 5-22). As shown in Northern California and elsewhere, nest boxes have enhanced the population growth rate of several

cavity-nesting alcid species at various sites by increasing recruitment of breeding-age birds, improving productivity, and decreasing mortality (Sydeman et al. 2000).

Although it is logistically challenging to work on offshore rocks, the project was successful in Phase 1 with the planting of over 7,000 native plants and removal of several tons of non-native material. The construction of a small nursery at Scorpion Ranch during Phase 1 has facilitated the growing and transport of plants to the nearby offshore rock and could be used for future plant restoration at other restoration sites on Santa Cruz Island.

Figure 5-22. Artificial burrow on Scorpion Rock (Photo credit: D. Mazurkiewicz, NPS).

Due to the extensive seed bank of iceplant on Scorpion Rock, it is necessary to continue the exotic removal in order to allow for the establishment of native plants. However, monitoring has demonstrated that some of the native plants have begun recruiting on the island and are outcompeting the iceplant in certain areas. Although labor intensive, the continuation of this project increases the chance for long-term success once the site is not maintained on a regular basis.

PERFORMANCE CRITERIA AND MONITORING

Several parameters will be measured as part of the evaluation of the project. Annual monitoring for Cassin's Auklets will include determining hatching success, fledging success, and overall breeding success both within natural and artificial sites. Vegetation monitoring will also be conducted on an annual basis and will include analyzing various weed control treatments, survival of outplantings, recruitment, and soil chemistry on Scorpion Rock.

EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees have determined that this type and scale of

action will provide long-term benefits to Cassin's Auklets and possibly Xantus's Murrelets.

BUDGET

Project Component	Estimated Cost/Year	# of Years	Total
Current level of effort: Outplanting, monitoring, maintenance (2012)	$170,000	1 (2012)	$170,000
Reduced level of effort: monitoring, site maintenance only	$55,000	3 (2013-2015)	$165,000
Total			**$335,000**

5.4.5.4. Reduce Seabird Disturbance on the Channel Islands

NEXUS

Target species for this effort includes the California Brown Pelican, Pelagic Cormorant, Brandt's Cormorant, Double-Crested Cormorant, Pelagic Cormorant, Western Gull, Cassin's Auklet, Ashy Storm-Petrel, and Xantus's Murrelet. Each of these species was injured by the contaminant releases that were the subject of the Montrose case

DESCRIPTION:

The Channel Islands provide essential breeding and roosting habitat for seabirds in southern California. The goal of this project is to reduce human disturbance to both breeding and roosting seabirds on the Channel Islands. Seabirds that nest on cliffs, within seacaves, and on offshore rocks are highly susceptible to human disturbances. A variety of human activities have the potential to disturb breeding and roosting seabirds. These activities include recreational boating, flying planes and helicopters near colonies or roost sites, commercial or recreational fisheries operations, disturbance within colonies (e.g., landings in sea caves, walking in colony), and kayaking.

The Seabird Protection Network is comprised of State, Federal, and non-governmental organizations that work to reduce human disturbance to sensitive seabird breeding colonies. As part of the Seabird Protection Network, there are different chapters that focus their efforts in a particular geographic area. As part of Phase 2, the Trustees propose to initiate a new chapter of the Seabird Protection Network that focuses on reducing seabird disturbance on the Channel Islands. Potential partners include Channel Islands National Park, NOAA Sanctuaries, U.S. Navy, The Nature Conservancy, California Department of Fish and Game, and Catalina Island Conservancy.

This project will build upon on-going seabird disturbance reduction efforts such as the Seabird Colony Protection Program in San Mateo and Monterey County by the Gulf of the Farallones National Marine Sanctuary (GFNMS). The Torch/Platform Irene Trustee

Council is collaborating with the GFNMS to extend the program south into Santa Barbara County. The Montrose Trustees have adopted the same objectives put forth in the Torch/Platform Irene Seabird Colony Enhancement Program as follows:

1. Developing and enforcing appropriate seabird colony protective measures;
2. Educating the public and specific user groups about protective measures; and
3. Monitoring and evaluating program effectiveness to ensure integration into long-term statewide seabird management programs.

This project will consider actions on the Channel Islands such as: placing signage, positioning buoys around sensitive areas, reducing light impacts, increasing public awareness (e.g., presentations), creating and distributing educational outreach materials, and enforcement (Figure 5-24 and Figure 5-23). The education and outreach strategies will target identified audiences for each type of disturbance. Information will be provided about the sensitive nature of seabird colonies and the importance of maintaining a specified distance from breeding colonies and roost sites.

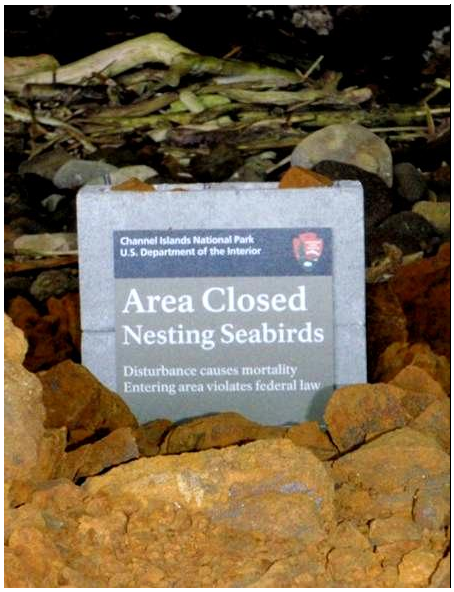

Figure 5-23. Sign in cave on Santa Cruz Island (Photo credit: L. Harvey, NPS).

Figure 5-24. Buoy near Devil's Slide Rock, CA (Photo credit: S. Tezak, NOAA).

ENVIRONMENTAL BENEFITS AND IMPACTS

Biological

Benefits

Human disturbance at breeding colonies can cause lower reproductive success through the direct loss of eggs and chicks as a result of being dislodged from the nesting site or

being trampled by birds responding to the disturbance. Also, opportunistic predation can occur when adults are flushed, leaving eggs and chicks unprotected. Disturbances also affect roosting birds by increasing energetic demands which could lead to overall lower survival and fitness. The actions implemented by this project will increase public awareness of sensitive seabird habitat and educate the public about the potential impacts of seabird/human interactions. Decreasing or eliminating these disturbances will likely have a direct beneficial impact on the reproductive output of these colonies. As outlined in the Torch/Platform Irene Final Restoration Plan, project benefits will include the following:

1. Increased public awareness of seabird habitat requirements.
2. Increased awareness of potential impacts of adverse human-seabird interactions.
3. Increased awareness of safe methods of observing seabirds while engaged in recreational activities.
4. Facilitating reduction of airplane and helicopter activity over sensitive seabird colonies.
5. Facilitating reduction of human disturbances that decrease reproductive output of nesting seabird populations.
6. Increased awareness of decision makers (such as federal, state and local agencies and management bodies) of the threat human disturbance poses to seabird breeding colonies and roost sites and methods to reduce and eliminate human disturbance.
7. Protecting seabird habitat also provides collateral benefits to marine mammals such as harbor seals and California sea lions.

Impacts

The Trustees do not anticipate any negative impacts to biological resources from this project.

Physical

Benefits

This action will have no known benefits to water resources, oceanographic and coastal processes, air quality, or noise receptors.

Impacts

This action will have no known impacts to water resources, oceanographic and coastal processes, air quality, or noise receptors.

Human Use

Benefits

There are no known benefits to human use from this project.

Impacts

The Trustees will coordinate with implementing entities to ensure that any kiosks or signs, if installed, are carefully designed and placed so as not to detract from the natural aesthetics of the area.

While the restriction of recreational activities around sensitive seabird nesting or roosting areas may limit some opportunities, this restriction is not expected to be substantial.

LIKELIHOOD OF SUCCESS/FEASIBILITY

The likelihood of success for this project is high. This project will build upon on-going successful efforts to reduce disturbance in northern California. The types of projects that are being considered have been successfully implemented elsewhere in California and many of the same approaches can be used for the Channel Islands.

The project is likely to have a positive impact on breeding seabirds by reducing disturbance to nesting sites and thereby decreasing the loss of chicks and eggs, which will lead to an increase in productivity. Improvements to communal roosts will have positive benefits to seabirds by reducing energy costs associated with commuting between prey and roosts, and with flushing and relocating due to human disturbance. Reducing energy expenditures should result in improved body condition of individual birds, which should lead to increased juvenile and adult survival, and increased reproductive success.

Developing partnerships with the target audience will be instrumental to the successful implementation of the project.

PERFORMANCE CRITERIA AND MONITORING

Prior to the implementation of human disturbance reduction actions, monitoring will be undertaken at key colony and roost sites to better define the scope of disturbance problems and to provide a basis for comparison in future years. Monitoring of the colonies will be used to evaluate whether there has been a decrease in human caused adverse effects. Indices to document a decrease in human caused effects may include a decrease in observed flushing events by aircrafts and boats and increases in colony productivity and numbers of birds utilizing roosting areas. Public feedback and reaction will be the primary means of monitoring the success of educational activities.

The following are performance goals and measures from the GFNMS Seabird Colony Protection Program that have been slightly modified for this project:

1. Increase seabird disturbance information exchange at key events/venues. Measure number of public venues attended/signs posted and number of individuals receiving information.

2. Increase awareness of organized users who impact nesting and breeding seabird colonies, including fishing association events, air shows, boat shows, and recreational venues. Measure number of organizations contacted.

3. Increase seabird protection coordination between agencies, nongovernmental organizations, and interested public. Measure number of requests for information and number of places information is posted.
4. Increase the number of agencies, non-governmental organizations, and interested public reporting incidents of seabird disturbance. Measure number of recorded incidents.

EVALUATION

The Trustees have evaluated this action against the evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. This project builds upon on-going successful efforts to reduce seabird disturbance, therefore, the project is technically feasible and likely to provide benefits to a variety of seabirds on the Channel Islands, including the Ashy Storm-Petrel, Cassin's Auklet, Xantus's Murrelet, California Brown Pelican, Western Gull, and Double-Crested Pelagic and Brandt's Cormorants.

BUDGET

The budget for this project is highly scalable. The Trustees anticipate partnering with many entities during implementation of this project and leveraging available restoration funds.

Project Component (2013-2017)	**Estimated Cost/Year**	**# Years**	**Total**
Educational and outreach materials (buoys, brochures, signs)		5	$100,000
Monitoring		5	$100,000
Total			**$200,000**

5.4.5.5. Restore Seabirds to Baja California Pacific Islands

NEXUS

The Baja California Pacific Islands support a wide range of seabirds that nest in or use the SCB. Restoration efforts on these islands will target a suite of seabird species, including the Cassin's Auklet, Brandt's Cormorant, Double-Crested Cormorant, California Brown Pelican, Ashy Storm-Petrel, and Xantus's Murrelet. . Each of these species was injured by the contaminant releases that were the subject of the Montrose case.

DESCRIPTION

In the 2005 RP/EIR, the project "Restore Seabirds to Baja California Pacific Islands" was identified as a Preferred Project and the Trustees approved of $1,042,000 to implement restoration on the Coronado and Todos Santos Islands in Phase 1. A Request for Proposals was released in May of 2011 in coordination with the Luckenbach Trustee Council that also had dedicated funds for work on the Baja California Pacific Islands. The Luckenbach Council has $2,955,116 available for restoration activities on San Martín, San Jeronimo, Natividad, Asunción, and San Roque Islands. We anticipate that some projects may be initiated in 2012 on these islands. Please refer to Appendix D5 of the 2005 EIS/EIR and the Luckenbach webpage (http://www.dfg.ca.gov/ospr/Science/Luckenbach.aspx) for more information on these projects.

The remaining islands that were included in the 2005 RP, but not funded by either the Montrose or Luckenbach Councils are Guadalupe and San Benito Islands. At the time of the 2005 EIS/EIR, both feral cats and goats were causing significant environmental degradation on Guadalupe Island. In 2005, the last remaining goats were removed from the island and the restoration focus has now shifted to the eradication of the feral cat. During Phase 2, the Trustees will consider the following restoration actions on Guadalupe Island: feral cat eradication, social attraction, use of artificial nests and burrows, habitat enhancement, light shielding, and environmental education.

The San Benito archipelago consists of three desert islands and is one of the most important breeding sites for marine birds in the world, hosting colonies of 12 species. More than two million seabirds use these islands for breeding and roosting (Wolf 2002). The San Benito archipelago has been identified by the Government of Mexico as an Important Bird Area. Recent work on West San Benito Island has documented the presence of the cactus mouse. This mouse was accidentally introduced to the island and is now a threat to the seabird colonies through egg predation. Restoration activities on San Benito Island may include Cactus Mouse eradication, removal of exotic plant species, native plant revegetation, and reduction in human disturbance, light shielding, and managing waste on the island.

ENVIRONMENTAL BENEFITS AND IMPACTS

Biological

Benefits

As described in detail in Appendix D5 of the 2005 RP, Guadalupe Island is world-renowned for its high level of biodiversity. The eradication of feral cats from Guadalupe Island would have both immediate and permanent conservation benefits for seabirds and the island ecosystem. It is anticipated that seabirds would naturally recolonize historical habitat on the main island of Guadalupe from the nearby islets within several years of cat eradication. Because of its size and the amount of suitable nesting habitat, Guadalupe Island has significant potential for seabird recovery. Seabirds such as the Cassin's Auklet, Brandt's Cormorant, Xantus's Murrelet, Western Gull, Black-Vented Shearwater and Leach's Storm-Petrel would significantly benefit from the action in terms of increased available nesting habitat and improved reproductive success as a result of reduced predation from feral cats. In addition to seabirds, this action would also have collateral benefits to the island ecosystem, including to the 10 endemic landbirds that are found on this island.

Other restoration activities on the Baja California Pacific Islands, including San Benito Island, would provide long-term benefits to priority seabirds. Eradication of the non-native Cactus Mouse is a high-priority restoration action for West San Benito Island and will prevent the spread of this species to the two other currently pest-free islands in the San Benito archipelago. Social attraction efforts would facilitate the recolonization of islands into suitable and historically occupied habitats after the removal of introduced species. Once attracted to the island, the presence of nest boxes would further encourage nesting in suitable habitat and likely increase nesting success. The use of nest boxes would also allow biologists to effectively monitor the success of the restoration efforts. Although social attraction may only be used for a short time, the recolonization of a historically occupied colony would provide long-term benefits to seabird populations since the re-established presence of a colony of birds would likely serve as an ongoing natural attractant over the long term.

A reduction in human disturbance around colonies would benefit roosting and breeding seabirds. Nesting seabirds that are sensitive to disturbance, such as California Brown Pelicans and cormorants, would in particular benefit from a reduction in human disturbance. Protection of the seabird colonies from human disturbance would likely result in recolonization of the islands and increased reproductive success. A reduction in human disturbance would also protect existing colonies.

Impacts

There is the potential for limited short-term impact from the proposed activities. Such impacts could include soil disturbance in the areas where nest boxes are used or short-term disturbance to the birds during monitoring efforts.

Physical

Benefits

The proposed actions would not result in benefits to the physical environment.

Impacts

The proposed actions would not result in impacts to the physical environment.

Human Use

Benefits

The waters around the Baja California Pacific Islands offer many recreational and economic opportunities. Healthy and complete ecosystems support fishing communities around these islands (Anderson and Keith 1980). Seabird colonies are a valuable part of island ecosystems and provide economic benefits in the form of tourism.

The proposed actions would not result in benefits to cultural resources, transportation, or health and safety.

Impacts

This action could include limiting human disturbance in the vicinity of seabird colonies. This action would likely impact people that either inhabit or illegally camp on the islands. However, this impact is not anticipated to be substantial due to the minimal number of people that inhabit the islands.

The proposed actions would not result in impacts to cultural resources, transportation, or health and safety.

LIKELIHOOD OF SUCCESS/FEASIBILITY

Feral cat eradication has been successfully carried out on at least 48 islands worldwide (Nogales et al. 2004). In northwest Mexico, cats have been successfully eradicated from 15 islands (Wood et al. 2002). The experience, knowledge, and lessons learned from these previous efforts would be applied to this action. Guadalupe Island is within the size range of other islands that had successful cat eradications; therefore, the feasibility and likelihood of success is high.

The proposed cat removal action is a critical step in the ecological restoration of Guadalupe Island. Several Mexican agencies would oversee management and enforcement on Guadalupe Island, and would be responsible for ensuring that the long-term success of this action is not compromised by the introduction of exotic species. The cat removal action would result in long-term benefits to seabird populations and the overall island ecosystem.

Although more difficult than rat eradications, mice have been successfully eradicated on islands, including Rasa Island in Mexico. Extensive pre planning has been conducted for the mouse eradication project on West San Benito Island, including pre-eradication monitoring and in-field bait attraction, palatability, and attraction experiments. As with other island eradication projects, comprehensive pre-planning is the key to successful implementation.

Social attraction efforts, including the use of playback systems and decoys, have been successfully used for a variety of seabirds, including terns, puffins, albatross, and petrels. The use of artificial nests has also proven to be successful for seabirds such as the Ashy Storm-Petrel, Leach's Storm-Petrel, Cassin's Auklet, and Pigeon Guillemot. Experts in the field of social attraction would be consulted during project planning and implementation to ensure that playback systems, decoys, and artificial nests are designed in a manner that maximizes success of the action.

Long-term success of these actions would also be dependent on whether these islands remain free from introduced species. The education of island users about the impact of introduced species is critical to the success of these restoration actions.

PERFORMANCE CRITERIA AND MONITORING

On Guadalupe Island, the benefits of cat eradication may be evaluated by recolonization and recovery of seabird colonies onto the main island of Guadalupe, increased breeding success, and reduced predation. Protocols for seabird monitoring are well established and standardized. Efforts to document baseline seabird populations would be undertaken before project implementation to evaluate the benefits from the action.

Other restoration efforts (e.g., revegetation, social attraction) will be monitored throughout the project using standardized protocols.

EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees determined that these types of restoration actions would effectively provide long-term benefits to priority seabirds, including the Cassin's Auklet, Western Gull, Xantus's Murrelet, and Brandt's Cormorant. All of these species also breed in the Channel Islands and are part of a larger metapopulation of seabirds that breed, forage, and disperse into and throughout the SCB and surrounding marine environment. This project will require additional compliance under the environmental laws of policy of the Mexican government. The Trustees will ensure that any required compliance is completed prior to project implementation.

BUDGET

Project	# of Years	Total
Feral Cat Eradication on Guadalupe Island	4	$2,207,540
Cactus Mouse Eradication on West San Benito Island	3	$563,500
Total		**$2,771,040**

5.4.5.6. Restore Seabirds to Prince Island

NEXUS

Target species for this restoration effort includes the Cassin's Auklet, Ashy Storm-Petrel, and Xantus's Murrelet. Each of these species was injured by the contaminant releases that were the subject of the Montrose case

DESCRIPTION

The goal of this project is to enhance seabird nesting habitat on Prince Island, located off of San Miguel Island within the Channel Islands National Park. Restoration activities include: removal of non-native vegetation, stabilizing the soil, establishment of prickly pear and other native vegetation, and improvement and installation of nest boxes for Cassin's Auklets (and potentially Ashy Storm-Petrels). These activities aim to: (1) increase recruitment, (2) increase reproductive output, and (3) decrease egg and chick mortality by providing safe breeding habitat. The proposed timeline for this project is from 2012-2016.

ENVIRONMENTAL BENEFITS AND IMPACTS

Biological

Benefits

Although small in size, Prince Island provides critical seabird nesting habitat for a variety of seabirds, including Brandt's Cormorants, Ashy Storm-Petrels, Cassin's Auklets, Leach's Storm-Petrel, Double-Crested Cormorant, Pelagic Cormorant, and Pigeon Guillemot. The proposed restoration activities will help stabilize seabird habitat that is currently threatened by erosion in certain areas. The installation of nest boxes will provide additional secure habitat for breeding seabirds and will reduce researcher disturbance during monitoring activities. The establishment of additional native vegetation will further reduce erosion and provide natural breeding sites. Additional habitat will also become available through the removal of non-native vegetation that often excludes burrow nesting seabirds.

Impacts

This action is expected to have minimal, short-term adverse effects. The removal of exotic vegetation and the planting of native plants will be done during the non-breeding

season to avoid impacts to nesting birds. However, roosting seabirds may be temporarily disturbed during the stabilization and revegetation efforts. Exotic vegetation will be removed by handpulling, thereby eliminating the need for herbicides. Mechanical removal may result in short-term impacts to surrounding native vegetation and soil. The use of matting will help minimize potential erosion and stabilize the soil. Subsequent monitoring may result in temporary disturbance to seabirds; however, the use of nest boxes will greatly minimize impacts to nesting alcids. Overall, the biological impacts are not expected to be substantial.

Physical

Benefits

This action will have no known benefits to water resources, oceanographic and coastal processes, air quality, or noise receptors. However, the restoration of native plants could have long-term benefits to the physical environment of Prince Island by stabilizing the soil and decreasing erosion. Overall, these impacts are not expected to be substantial.

Impacts

This action will have no known impacts to water resources, oceanographic and coastal processes, air quality, or noise receptors. However, the removal of invasive plants may result in limited short-term impacts to soils by increasing erosion until native plants are established. The use of erosion-control measures (e.g., matting) will help mitigate any short-term negative impacts.

Human Use

Benefits

This action will have no known benefits to cultural resources, recreation, aesthetics, transportation, or human health and safety.

Impacts

This action will have no known impacts to cultural resources, aesthetics, transportation, or human health and safety. Any cultural resources on the island will be avoided during the implementation of the action. Some nest boxes are visible from the surrounding water; however, they are largely concealed and will not change character of the project area.

LIKELIHOOD OF SUCCESS/FEASIBILITY

Both the habitat stabilization and revegetation components of the action employ proven methods and techniques that have clearly demonstrated success in the past. As shown in

Northern California and elsewhere, nest boxes have enhanced the population growth rate of several cavity-nesting alcid species at various sites by increasing recruitment of breeding-age birds, improving productivity, and decreasing mortality (Sydeman et al. 2000). Nest boxes have been used on Prince Island to assist with monitoring of Cassin's Auklets and has proven to be an effective monitoring tool. The boxes have also been successful at providing additional nesting habitat for Cassin's Auklets on Prince Island. Stabilization methods (i.e., matting) have proven successful on other off-shore rocks in stabilizing erosion and this project would employ similar techniques.

PERFORMANCE CRITERIA AND MONITORING

Long-term studies of Cassin's Auklets have occurred at Prince Island since the mid-1970s. Monitoring for Cassin's Auklets and other seabirds on Prince Island will continue to use standardized protocols. The success of the revegetation and stabilization efforts will be evaluated on an annual basis and monitored using established protocols.

EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees have determined that this type and scale of action will provide long-term benefits to Ashy Storm-Petrels, Cassin's Auklets, and Xantus's Murrelets. This action will also provide long-term benefits to California Brown Pelicans, Western Gulls, and Double-Crested Cormorants.

BUDGET

Project	**Estimated Cost/Year**	**# of Years**	**Total**
Restore Seabirds to Prince Island	$50,000	4 (2012-2016)	$200,000
Total Cost			**$200,000**

5.4.5.7. Data Gap Studies/Restoration Planning

Each year, the Trustees receive and evaluate study proposals related to different seabird projects. The Trustees also determine what data gaps need to be filled in order to better inform implementation of the restoration projects. The table below outlines some of the data gap studies that have recently been identified related to seabirds nesting or foraging in the SCB. These studies, along with others that are identified in the future, will be considered by the Trustees for funding as the need for specific data arises.

	Project Name	Status
1.	Determine population status and reproductive success of seabirds on Northern Channel Islands	Identified in Phase 1
2.	Update status of contaminants and eggshell thickness in breeding seabirds in the Southern California Bight	Identified in Phase 1
4.	Investigate DDE-induced eggshell thinning of Pink Footed Shearwaters	New
5.	Investigate DDE-induced eggshell thinning of Laysan Albatross eggs on Guadalupe Island	New
6.	Investigate light impacts at Santa Cruz and Santa Barbara Islands	New

5.5. NON-PREFERRED ALTERNATIVES

5.5.1. Fishing and Fish Habitat

The following projects were considered but were not selected as a Preferred Project at this time.

	Project Name	Status
1.	Palos Verdes Kelp Restoration – Outplanting Kelp	New
2.	Subtidal Reef Restoration on Palos Verdes Shelf – Sediment Removal	New

5.5.1.1. Palos Verdes Kelp Restoration – Outplanting Kelp.

This project is similar to the project described in Section 5.3.1.1, but the restoration would be accomplished by physically outplanting kelp to the reef habitat. Kelp outplanting can be accomplished in one of three ways. Reproductive sporophylls can be collected by SCUBA divers from healthy kelp plants and placed in 7-gallon mesh bags. Bags are floated 1 meter above reef recently cleared of urchins. These bags result in local recruitment. Alternatively, adult or juvenile kelp plants can be collected by SCUBA divers from healthy kelp forests and physically attached to a reef that was recently cleared of urchins. Finally, drift kelp can be collected from the surface using a boat and subsequently attached to reef that was recently cleared of urchins. These methods are a critical step to restoring kelp forest in cases where the restoration site is far from a source of new kelp recruits. If a nearby source of kelp recruits exists, natural recruitment is likely to occur once an urchin barren is cleared of urchins. While this approach has been successfully implemented to restore kelp habitats, it is labor intensive and only necessary when there is no local source of kelp recruits to the project area. The Trustees have concluded that local recruitment is sufficient for kelp recovery on the Palos Verdes Shelf once the primary limiting factor (urchin barrens) has been removed as described in preferred fish habitat project 1.

5.5.1.2. Subtidal Reef Restoration on Palos Verdes Shelf – Sediment Removal.

The Trustees considered restoring subtidal reef habitat that was buried by sediments (see section 5.3.1.2) by removing the sediments and moving them farther offshore. While this approach would have a short term benefit to the rocky reef habitat, it is unlikely to persist due to the low-relief nature off the reef habitat and the continued (although reduced) delivery of sediments to the local shelf. In addition, sediment removal would require a massive dredging effort that would not be cost effective. The Trustees have concluded that sediment removal is a less sustainable and less cost effective approach to restoring the rocky reef habitat adjacent to Bunker Point than the approach described in Section 5.3.1.2.

5.5.2. Seabirds

The following projects were considered but were not selected as a Preferred Project at this time. However, each of these projects would benefit seabirds and may be reconsidered for implementation in the future.

	Project Name	**Status**
1.	Enhance California Brown Pelican Roost Habitat	Identified in Phase 1
2.	Restore Seabirds to San Miguel Island (Black Rat eradication)	Identified in Phase 1
3.	Reduce Impacts to California Brown Pelicans and Western Gulls from Fishery Offloading Operations	New
4.	Reduce Seabird Mortality from Natural Petroleum Seeps	New

5.5.2.1. Enhance California Brown Pelican Roost Habitat.

This project was originally considered in Phase 1, but did not receive funding for implementation. The goal of this action is to restore critical non-breeding habitat for the California Brown Pelican by enhancing and protecting coastal roosts along the southern California mainland. Improvements to communal roosts would provide positive benefits to California Brown Pelicans by reducing the energy costs associated with commuting between prey and roosts as well as flushing and relocating due to human disturbance. However, the Trustees are focusing their seabird restoration efforts at this time on protecting roost sites on the Channel Islands as part of the Seabird Disturbance Reduction Project (see Preferred Project #6).

5.5.2.2. Restore Seabirds to San Miguel Island.

This project was a Preferred Project in the 2005 RP. The goal of this project is to restore seabirds on San Miguel Island by eradicating the non-native Black Rat. This project is currently on-hold due to technical and feasibility issues regarding the methods and potential impacts to the endemic San Miguel Island Fox (See Section 2). However, should methods be developed that would allow for the eradication of rats from San Miguel Island with minimal impact to non-target species (e.g., Island Fox), this project

may be reconsidered for implementation should sufficient funds for restoration be available.

5.5.2.3. Reduce Impacts to California Brown Pelicans and Western Gulls from Fishery Offloading Operations.

California Brown Pelicans and Western Gulls can be injured as they attempt to scavenge squid, fish, or offal associated with fishery off-loading operations at ports in California. Birds may be injured by heavy machinery or may become fouled with fish oil from wastewater. Birds fouled with fish oil may lose their waterproofing and subsequently become hypothermic. It is not known how many pelicans and gulls are injured or killed in conjunction with fish off-loading facilities, but reduction of potential interactions of birds with fishery operations could reduce mortality of seabirds in the SCB. However, no specific measures have been proposed to address this issue at this time. The Trustees may consider funding for specific measures to reduce impacts should ideas be brought forward in the future.

5.5.2.4. Reduce Seabird Mortality from Natural Petroleum Seeps.

Natural petroleum seeps are common in the Santa Barbara Channel and at various on-shore locations in southern California. These seeps release thousands of gallons of crude oil into the marine environment each year. Impacts of natural seeps on marine birds have not been quantified, but information on oiled birds collected each year by Oiled Wildlife Care Network member organizations indicates that at least hundreds of birds are killed each year. The majority of birds affected by seep oil in the SCB are western and Clark's grebes, although a wide variety of other birds are also affected. Reduction of this impact would benefit seabirds, although it is not clear how a reduction in oiling could be achieved. Since some inland seeps contribute oil to the marine environment through high winter stream flows, it could be possible to mitigate the effects of these seeps through some sort of mechanical prevention or oil/water separation. Benefits to seabirds could be high if a reduction in oiling could be achieved, and nexus would be moderate to high. However, since no specific measures have been proposed to address this issue, feasibility is currently low.

5.5.3. Bald Eagles

5.5.3.1. Release Additional Bald Eagles to the Channel Islands

As outlined in the 2005 RP, the Trustees delayed making additional decisions regarding future restoration actions for Bald Eagles on the Channel Islands until the results of the NCI Feasibility Study were known. One such decision that was unknown at that time was whether the release of additional Bald Eagles would be warranted. Now that the NCI Feasibility Study is complete, the Trustees have determined that additional releases of Bald Eagles are not necessary. This is based on the following: 1) there are approximately 65 resident eagles on the Channel Islands of varying ages, 2) Bald Eagle pairs have naturally hatched and fledged a total of 48 chicks since 2006 throughout the Channel Islands, 3) Bald Eagles have dispersed among the islands and are now successfully

nesting on 4 of the 8 Channel Islands, and 4) nesting success and productivity are at levels sufficient for a stable (if not increasing) population on the Channel Islands (see Section 2).

5.5.4. Peregrine Falcons

In the 2005 RP, the Trustee Council evaluated three alternatives for Peregrine Falcon restoration (Appendix C). The first alternative was the active restoration of Peregrine Falcons on the Channel Islands through hacking of additional birds. The second alternative (Preferred) included comprehensive monitoring of Peregrine Falcons on the Channel Islands. The third alternative included monitoring of Peregrine Falcons on the Baja California Pacific Islands and efforts to reduce disturbance on those islands.

Based on the results of the 2007 survey effort and the increasing number of Peregrine Falcon pairs on the Channel Islands, the Trustees have determined that active restoration of Peregrine Falcons is not necessary at this time. Therefore, this alternative will continue to be non-preferred. The Trustees have also determined that additional monitoring on the Channel Islands is warranted for several reasons, including: 1) complete coverage of the all eight of the Channel Islands is difficult in any given survey year due to weather, logistics, etc., 2) eggshell thinning data demonstrate that Peregrine Falcons continue to be exposed to DDE at levels which may impair reproduction on the Channel Islands. The Trustees have decided to continue to focus monitoring efforts on the Channel Islands (see Preferred Alternative Section) rather than allocate funds towards efforts on the Baja California Pacific Islands. The Trustees are, however, implementing seabird restoration projects on the Baja California Pacific Islands which will likely benefit Peregrine Falcons on those islands.

5.6. CUMULATIVE ENVIRONMENTAL IMPACTS

The Trustees examined a variety of alternatives to restore resources and or/services lost as a result of the hazardous releases. Project specific environmental consequences for each selected project are provided in Section 4. As required by NEPA, this section addresses the potential overall cumulative environmental impacts of implementing this Restoration Plan.

Cumulative environmental impacts are those combined effects on the quality of the human environment that result from the incremental impact of the alternative when added to other past, present and reasonably foreseeable future actions (40 CFR 1508.7,1508.25(a) and 1508.25(c)). As the projects are intended to achieve recovery of injured natural resources, the cumulative environmental consequences will be largely beneficial for birds and wildlife habitat.

Overall, MSRP actions will result in a long-term net improvement in fish and wildlife habitat, the restoration of ecological balance in areas where contamination and other human-caused disturbances have led to adverse impacts on sensitive native species, and improvement in the human use and non-use services provided by fish and wildlife in the region. Cumulative impact analysis is nonetheless required to evaluate whether specific

components of the MSRP actions, when considered in combination with other past, present, and future actions in the affected area, will have potentially substantial adverse effects.

The cumulative effects analysis in this Restoration Plan focuses on the same environmental issues as those in the direct/indirect effects analyses used in the preferred project descriptions:

- Biological resources (fish, birds, and other wildlife).
- Physical resources (earth resources, including sediments, water resources, and oceanographic and coastal processes).
- Human uses (recreational, socioeconomic, and aesthetics).

The MSRP study area is located within the SCB, extending from Point Dume to Dana Point along the southern California mainland coast. The study area includes the California Channel Islands and those Baja California Pacific Islands that lie within the SCB. Other actions considered as part of the cumulative impacts analysis for this Restoration Plan were identified by researching the activities within this study area that are affecting or will affect the same or similar resources. These other actions were identified through consultations within each of the six agencies that constitute the Trustees, consultations with the planning departments of local governments and authorities and other state and federal agencies, and searches of the database of the State of California Office of Planning and Research.

Several of the actions in this Restoration Plan are still only conceptual and will require subsequent environmental analysis. Some actions do not have specific project locations identified yet. The assessment of cumulative impacts herein focuses on those MSRP actions, locations, and resources for which sufficient detail is currently available. To the extent it is included, the cumulative effects analysis for the actions that are still conceptual is not as detailed. More specific analysis of these actions will be performed in subsequent environmental analyses. When there is uncertainty about cumulative impacts, the Council on Environmental Quality recommends that the uncertainty be addressed through subsequent project monitoring and adaptive management (Council on Environmental Quality 1997).

The study area encompasses a large geographic region in which many types of other actions affect the environment. In keeping with Council on Environmental Quality recommendations, the Trustees have narrowed the focus of the cumulative effects analysis to those actions that have relevance to the effects of the MSRP actions and to important issues of national, regional, or local interest (Council on Environmental Quality 1997).

The following discussion identifies the plans or categories of actions that may affect the same or similar resources as the MSRP actions. The MSRP actions and the affected resources that are relevant to each of these other actions are also listed. These other actions are considered in the cumulative impacts analysis that follows.

Channel Islands National Park 2001–2005 Strategic Plan: This plan addresses the management of natural resources and research and the recreational uses of these resources for the Channel Islands National Park. The plan also develops long-term policy recommendations to enhance the management of the areas in the Channel Islands under the park's jurisdiction. Cumulative additive beneficial effects are expected from the combination of NPS management activities and MSRP actions.

Several of the Bald Eagle, Peregrine Falcon, and seabird restoration actions on the Channel Islands will occur within the park's boundaries.

Channel Islands National Marine Sanctuary 1983 Management Plan: This plan addresses the management of marine resources under the sanctuary's jurisdiction. Cumulative additive beneficial effects are expected from the combination of Channel Islands National Marine Sanctuary management activities and MSRP actions.

Several of the Bald Eagle, Peregrine Falcon, and seabird restoration actions on the Channel Islands will occur within the boundaries of the Channel Islands National Marine Sanctuary.

Other Seabird Restoration Projects: In addition to the seabird restoration actions proposed by the MSRP, several other recently completed, ongoing, and proposed projects target the same seabird species and their habitats. These projects stem from natural resource damage (NRD) settlements from other cases and from the independent efforts of various environmental organizations that focus on seabird restoration. Other settled NRD cases that have resulted in seabird restoration actions in the region include the American Trader, Command, and Cape Mohican cases. Other NRD case settlements are likely to occur in the future, leading to additional seabird restoration projects. The seabird restoration projects conducted or planned for target species and/or within the study area include the Anacapa Island Restoration Project, the Brown Pelican Roost Enhancement Project in the San Diego Bay Salt Ponds, the Brown Pelican Entanglement Outreach and Education Program for Southern California, the Common Murre Restoration Project, the Western and Clark's Grebe Restoration Project, and the Seabird Colony Protection Program. These and other projects are further described in the restoration plans associated with these NRD cases. Cumulative additive beneficial effects are expected from the combination of these projects and the MSRP seabird restoration actions. The other seabird restoration projects, when considered together with the MSRP Bald Eagle and Peregrine Falcon restoration actions, will have minor additive beneficial effects on Bald Eagles.

The MSRP actions affecting the same or similar resources include the Bald Eagle, Peregrine Falcon, and seabird restoration actions.

Ports of Los Angeles and Long Beach: The Ports of Los Angeles and Long Beach are the largest ports on the west coast of the United States. Numerous construction and environmental mitigation projects are at various stages of planning, design, and implementation. Some of these projects include marine harbor and pier terminal redevelopments projects, construction of the Rainbow Harbor master plan,

reconfiguration of wharves and expansion of backlands, channel deepening projects, construction of a crude oil receiving facility at Port of Los Angeles Pier 400, expansion of Cabrillo Marine Aquarium, and construction of a fishing reef off of Point Fermin, near the San Pedro breakwater. The potential for cumulative impacts from MSRP actions and port projects cannot be adequately assessed until further details are developed on the MSRP fishing and fish habitat actions. The Trustees will consider the potential for cumulative impacts as the planning and design of these actions progress. MSRP actions affecting the same or similar resources: "construct artificial reefs and fishing access improvements."

Cooling Water Intake Entrainment and Impingement – New Requirements: Coastal electric power generation stations and other large industrial facilities draw in millions of gallons per day from nearshore waters for cooling purposes. Marine life can be either entrained or impinged on the intake structures. Entrained organisms are those that are not strong enough to swim against the current of the intake system. Impinged organisms are those that are collected on traveling screens designed to remove large debris from the intake water. Cooling water intakes kill billions of fish larvae and hundreds of thousands of juveniles and adults each year (USEPA 2004a). In addition to fish losses, larval forms of invertebrates and adult zooplankton are lost to the ecosystem. Fourteen coastal power plants in Southern California use large quantities of cooling water. In July 2004, the EPA issued new regulations under Section 316(b) of the federal Clean Water Act that set requirements for large power plants (those utilizing over 50 million gallons of water per day) to reduce the impacts of cooling water intake on marine organisms. MSRP restoration actions will have beneficial counteracting effects to the ongoing adverse effects from the operation of major cooling water intake structures in the Southern California Bight. MSRP restoration actions will have beneficial additive effects to the beneficial effects from the reductions in entrainment and impingement that are expected as a result of the implementation of the new EPA regulatory requirements for cooling water intakes.

MSRP actions that affect the same or similar resources: fishing and fish habitat actions.

Desalination Facilities: Currently, several seawater desalination facilities exist in the study area and about a dozen facilities are being considered. The existing coastal desalination facilities are relatively small, but the total output of all of the proposed coastal facilities, including some that would be among the largest in the country, could be far greater. Coastal desalination facilities may have adverse impacts on marine organisms due to the effects of the seawater intake and discharge on nearby marine life. The largest proposed desalination facilities would be located at coastal power plants that use ocean water for cooling, and these facilities would propose to use hundreds of millions of gallons of seawater per day. The existing desalination facilities in southern California are located on Santa Catalina Island, San Nicolas Island, and various offshore oil and gas platforms. These facilities have a combined maximum capacity of about 200 acre-feet per year. New facilities in various stages of planning, design, and approval for construction include facilities in Long Beach, Los Angeles, Huntington Beach, San Onofre, Carlsbad,

and San Diego. The potential combined maximum capacity of these new facilities is over 200,000 acre-feet per year.

MSRP actions that affect the same or similar resources: fishing and fish habitat restoration actions.

California Marine Life Protection Act (MLPA) Initiative: The 1999 MLPA directed the state to design and manage a network of marine protected areas to, among other things, protect marine life and habitats, marine ecosystems, and marine natural heritage, as well as improve the recreational, educational, and study opportunities provided by marine ecosystems. The California Resources Agency and the California Department of Fish and Game are partnering with the Resources Legacy Fund Foundation, NOAA, and the MPA Science Institute of the National Marine Protected Areas Center in a new initiative to achieve the MLPA goals. This public-private partnership is being guided by the advice of scientists, resource managers, experts, stakeholders, and members of the public. The MLPA Initiative, which is governed by a blue-ribbon task force, will oversee the preparation of a statewide guide for developing a Marine Protected Area master plan, create a pilot project in an area along the central coast to identify potential networks of Marine Protected Areas, develop a strategy for long-term funding, and make recommendations for improved coordination of Marine Protected Areas with key federal agencies.

The Trustees believe that, overall, the alternatives selected in this restoration plan, when considered along with past and reasonably foreseeable future projects, will have long term, local and regional beneficial impacts to natural resources.

Section 6. APPLICABLE LAWS AND REGULATIONS

6.1. OVERVIEW

The three major laws guiding the restoration of the injured resources and services for the MSRP are the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Environmental Policy Act (NEPA), and the California Environmental Quality Act (CEQA). These statutes set forth a specific process of impact analysis and public review. The Natural Resource Trustees for the Montrose case (Trustees) must also comply with other applicable laws, regulations, and policies at the federal, state, and local levels.

The potentially relevant laws, regulations, and policies are set forth below. In addition to laws and regulations, the Trustees must consider relevant environmental or economic programs or plans that are ongoing or planned in or near the study area. The Trustees must ensure that their restoration activities neither impede nor duplicate such programs or plans. By coordinating restoration with other relevant programs and plans, the Trustees can enhance the overall effort to improve the environment affected by the contaminant releases at issue in the Montrose case.

6.2. KEY STATUTES, REGULATIONS, AND POLICIES

6.2.1. Federal Statutes and Executive Orders

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 U.S.C. 9601 et seq.)

CERCLA, otherwise known as the Superfund law, provides the basic legal framework for the cleanup and restoration of the nation's hazardous substances sites. Under CERCLA, responsible parties are liable for damages, including reasonable assessment costs, for injuries to, or the loss of, natural resources. The term "natural resources" is broadly defined by CERCLA to mean "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, … any state or local government, any foreign government, or any Indian tribe…." The state provides that parties responsible for contamination of sites and the current owners or operators of contaminated sites are liable for the cost of cleanup and for damages to natural resources. Compensation is used to restore, replace, rehabilitate, or acquire the equivalent of natural resources and services. The MSRP will operate in accordance with the requirements of CERCLA.

Federal and state agencies and Indian tribes may act as Trustees on behalf of the public to assess the injuries, scale restoration to compensate for those injuries, and implement restoration. This Restoration Plan/Initial Study has been prepared jointly by the six Trustee agencies that form the Montrose Trustee Council: the National Oceanic and Atmospheric Administration (NOAA) (lead agency for the federal government), the U.S.

Fish and Wildlife Service (USFWS), the National Park Service (NPS), the California Department of Fish and Game (CDFG) (lead agency for the State of California), the California Department of Parks and Recreation (CDPR), and the California State Lands Commission (CSLC). CERCLA and its implementing regulations for natural resource damage assessment and restoration (Title 43 Code of Federal Regulations [CFR] Part 11) mandate that the designated Trustees shall develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent of the injured natural resources and lost services.

National Environmental Policy Act, 42 U.S.C. 4321, et seq.; 40 C.F.R. Parts 1500–1508

NEPA sets forth a specific process of impact analysis and public review. NEPA is the basic national charter for the protection of the environment. Its purpose is to "encourage productive and enjoyable harmony between man and the environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; and to enrich the understanding of the ecological systems and natural resources important to the Nation." The law requires the government to consider the consequences of major federal actions on human and natural aspects of the environment to minimize, where possible, adverse impacts. Equally important, NEPA established a process of environmental review and public notification for federal planning and decision making.

The Trustees have integrated CERCLA restoration planning with the NEPA process to comply, in part, with those requirements. This integrated approach allows the Trustees to meet the public involvement requirement of CERCLA and NEPA concurrently.

The Clean Water Act, 33 U.S.C. 1251, et seq.

The Clean Water Act (CWA) is the principal statute governing water quality. The goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The CWA regulates both the direct and indirect discharge of pollutants into the nation's waters. Section 301 of the CWA prohibits the discharge into navigable waters of any pollutant by any person from a point source unless it is in compliance with a National Pollution Discharge Elimination System permit.

Section 311 of the CWA regulates the discharge of oil and other hazardous substances into navigable waters and waters of the contiguous zone, as well as onto adjoining shorelines, that may be harmful to the public or to natural resources. The CWA allows the federal government to remove the substance and assess the removal costs against the responsible party. Under the CWA, removal costs include those associated with the restoration or replacement of the natural resources damaged or destroyed as a result of a discharge of oil or a hazardous substance.

Section 404 of the act authorizes the U.S. Army Corps of Engineers to issue permits, after notice and opportunity for public hearings, for the disposal of dredged and fill material into navigable waters. Generally, projects that discharge dredged or fill material into

waters including wetlands require Section 404 permits. Section 401 of the CWA provides that projects that involve discharge or fill to wetlands or navigable waters must obtain certification of compliance with state water quality standards. The Trustees anticipate that artificial reef construction, fishing access improvements, wetlands restoration actions, and potentially other actions. The implementing agency for each project will apply for these permits as appropriate after sufficient site-specific information is developed.

The Clean Air Act, 42 U.S.C. 7401, et seq.

The Clean Air Act (CAA) is the principal statute governing air quality. The primary goal of the CAA is to protect and enhance the quality of the nation's air resources so as to promote the public health and welfare and the productive capacity of its population. The CAA regulates both the direct and indirect discharge of airborne pollutants. Section 7471 of the CAA states that applicable implementation plans shall contain emission limitations and such other measures as may be necessary, as determined under regulations promulgated under this part, to prevent significant deterioration of air quality.

The Trustees anticipate that artificial reef construction, fishing access improvements, wetlands restoration actions, and potentially other actions will require consideration of general conformity requirements; for those projects undergoing environmental review following this Restoration Plan. The implementing agency for each project will address these requirements after sufficient site-specific information is developed.

Coastal Zone Management Act, 16 U.S.C. 1451, et seq.

The goal of the Coastal Zone Management Act (CZMA) is to encourage states to preserve, protect, develop, and, where possible, restore and enhance valuable natural coastal resources. Participation by states is voluntary. The State of California has enacted the federally approved California Coastal Act.

Section 1456 of the CZMA requires that any federal action inside or outside of the coastal zone that affects any land or water use or natural resources of the coastal zone shall be consistent, to the maximum extent practicable, with the enforceable policies of approved state management programs. It states that no federal license or permit may be granted without giving the state the opportunity to concur that the project is consistent with the state's coastal policies. The regulations outline the consistency procedures.

The Trustees believe that each of the selected projects can be implemented in a manner that will either have no effect on coastal resources or uses or is consistent to the maximum extent practicable with the CZMA and the California Coastal Management Program. The Montrose federal Trustees have determined that the projects for which this document constitutes final environmental review will not adversely affect coastal zone resources and/or uses, and expect the California Coastal Commission to concur. As to the projects that require further design or details in order to make such a determination, the federal agency responsible for implementing such projects will seek California Coastal Commission concurrence in its determination.

Endangered Species Act, 16 U.S.C. 1531, et seq.

The purpose of the Endangered Species Act (ESA) is to conserve endangered and threatened species and the ecosystems on which they depend. The ESA directs all federal agencies to use their authorities to further these purposes. Pursuant to Section 7 of the ESA, each federal agency shall, in consultation with the secretary, ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

Under the ESA, NOAA and the USFWS publish lists of endangered and threatened species. Before initiating an action, the federal action agency, or its non-federal permit applicant, must ask the USFWS and/or NOAA to provide a list of threatened, endangered, proposed, and candidate species and designated critical habitats that may be present in the project area. If no species or critical habitats are present, the federal action agency has no further ESA obligation under Section 7. If a listed species is present and the federal action agency determines that the project may affect a listed species, consultation is required. The first phase of consultation is informal. For major construction activities, a biological assessment is required to assist in the determination of whether the proposed action is likely to adversely affect listed species and critical habitats. For actions that are not major construction activities, the federal action agency must provide the USFWS and/or NOAA with an account of the basis for evaluating the likely effects of the action.

If the federal action agency concludes that the project will not adversely affect listed species or critical habitats, the agency submits a "not likely to adversely affect" determination to the USFWS and/or NOAA for its concurrence. If the USFWS and/or NOAA concurs with the federal action agency that the project is not likely to adversely affect any listed species, then the consultation (informal to this point) is concluded and the decision is put in writing. Although not required, the federal action agency may request written concurrence from the UFWS and/or NOAA that the proposed action will have no effect on listed species or critical habitats.

If the federal action agency determines that a project may adversely affect a listed species or a designated critical habitat, formal consultation is required. There is a designated period of time in which to consult (90 days), and beyond that, another set period of time for the USFWS and/or NOAA to prepare a biological opinion (45 days). The determination of whether or not the proposed action would be likely to jeopardize the species or adversely modify its critical habitat is contained in the biological opinion. If a jeopardy or adverse modification determination is made, the biological opinion must identify any reasonable and prudent alternatives that could allow the project to move forward.

Multiple threatened and endangered species occur in the study area for this Restoration Plan. For each project that is selected as preferred in the final Restoration Plan, the Trustees will evaluate the potential effects of the project on listed species and critical

habitat. Based on this analysis, the Trustees will perform the appropriate level of consultation with the USFWS and/or NOAA Fisheries pursuant to Section 7 of the ESA.

Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801, et seq.

The federal Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) as amended and reauthorized by the Sustainable Fisheries Act (Public Law 104-297) establishes a program to promote the protection of essential fish habitat (EFH) in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. After an EFH has been described and identified in fishery management plans by the regional fishery management councils, federal agencies are obligated to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any EFH.

None of the projects for which this Restoration Plan represents final environmental review have the potential to affect an EFH. For other projects requiring subsequent analysis and having the potential to affect EFH, the Trustees will consult with appropriate NOAA officials after sufficient site-specific information is developed.

Fish and Wildlife Coordination Act, 16 U.S.C. 661, et seq.

The federal Fish and Wildlife Coordination Act requires that federal agencies consult with the USFWS, NOAA Fisheries, and state wildlife agencies for activities that affect, control, or modify waters of any stream or bodies of water in order to minimize the adverse impacts of such actions on fish and wildlife resources and habitat. This consultation is generally incorporated into the process of complying with Section 404 of the CWA, NEPA, or other federal permit, license, or review requirements.

The Trustees will consult with the appropriate agencies as they pursue permitting for specific actions that may trigger such consultation.

Marine Mammal Protection Act, 16 U.S.C. 3371, et seq.

Under the Marine Mammal Protection Act (MMPA), the Secretary of Commerce is responsible for the conservation and management of pinnipeds (other than walruses) and cetaceans. The Secretary of the Interior is responsible for walruses, sea otters, polar bears, manatees, and dugongs. The Secretary of Commerce delegated MMPA authority to NOAA Fisheries. Title II of the act established an independent Marine Mammal Commission and its Committee of Scientific Advisors to oversee and recommend actions necessary to meet the intents and provisions of the act. The act provides that the Secretary shall allow the incidental, but not intentional, taking, by U.S. citizens engaged in activities other than commercial fishing of small numbers of depleted as well as non-depleted marine mammals if, after notice and opportunity for public comment, the secretary finds that the total of such taking will have a negligible impact on the affected

species or stock, and prescribes regulations setting forth permissible methods of taking, and requirements for monitoring and reporting such taking." However, the 1994 amendments provide that this regulation requirement may be waived provided that the proposed activity results in only harassment, and no serious injury or mortality is anticipated.

None of the projects for which this Restoration Plan represents final environmental review have the potential to affect marine mammals. For other projects requiring subsequent analysis and having the potential to affect marine mammals, the Trustees will consult with appropriate NOAA or USFWS officials after sufficient site-specific information is developed.

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703, et seq.

The Migratory Bird Treaty Act (MBTA) implements four international treaties involving protection of migratory birds, including all marine birds, and is one of the earliest statutes (amended several times) to provide for avian protection by the federal government. Among its other provisions, it broadly prohibits actions to "pursue, hunt, take, capture, kill, attempt to take, kill, possess, offer for sale, sell, offer to purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird...or any part, nest, or egg of such bird." Exceptions to these prohibitions are only allowed under regulations or permits issued by USFWS. Hunting of game birds, including waterfowl and certain shore birds, is annually regulated through a process in which the USFWS sets "framework regulations" based on the best current population data available, and states pass regulations that conform to those federal regulations. All other prohibited actions are only allowed under specific permits issued by the USFWS. Criminal violations of this act are enforced by USFWS, and it is also the primary statute under which USFWS and U.S. Department of Interior have responsibility to manage all migratory birds wherever they occur, including marine birds.

The MBTA is also the basis for USFWS oversight and permitting of collection and preservation or rehabilitation of birds oiled during spill response, which usually provides the primary data for determining extent of injury to marine birds and the need for restoration.

Projects identified in this Restoration Plan will be conducted in full compliance with the MBTA.

National Marine Sanctuaries Act, 16 U.S.C. 1431, et seq.

The National Marine Sanctuaries Act (NMSA) prohibits the destruction, loss of, or injury to any sanctuary resource and any violation of the act, any regulations, or permits issued pursuant to the NMSA. The Secretary of Commerce (Secretary) is required to conduct such enforcement activities as are necessary and reasonable to carry out the NMSA. The

Secretary may issue special use permits that authorize specific activities in a sanctuary to establish conditions of access to and use of any sanctuary resource, or to promote public use and understanding of a sanctuary resource.

The NMSA also establishes liability for response costs and natural resource damages for injury to sanctuary natural resources. Under the NMSA, the Secretary may undertake or authorize all necessary actions to prevent or minimize the destruction or loss of, or injury to, sanctuary resources, or to minimize the imminent risk of such destruction, loss, or injury. Furthermore, the Secretary shall assess damage to sanctuary resources. The act defines natural resource damages to include (1) the cost of replacing, restoring, or acquiring the equivalent of a sanctuary resource, (2) the value of the lost use of the resource pending its restoration, (3) the cost of damage assessments, and (4) reasonable monitoring costs. The Secretary is required to use recovered response costs and damages to finance response actions and damage assessments to restore, replace, or acquire the equivalent of the injured sanctuary resource, and to manage and improve national marine sanctuaries.

The Channel Islands National Marine Sanctuary is located within the study area of the Restoration Plan. None of the projects for which this Restoration Plan represents final environmental review have the potential to affect this sanctuary. For other projects requiring subsequent analysis and having the potential to adversely affect Sanctuary resources, the Trustees will consult with and as appropriate apply for a permit from the Channel Islands National Marine Sanctuary office after sufficient site-specific information is developed.

Park System Resource Protection Act, 16 U.S.C. 19jj

Public Law 101-337, the Park System Resource Protections Act (PSRPA) (16 United States Code [U.S.C.] 19jj), requires the Secretary of the Interior (Secretary) to assess and monitor injuries to NPS resources. A "park system resource" is defined by the PSRPA as "any living or nonliving resource that is located within the boundaries of a unit of the National Park System…." The act specifically allows the Secretary to recover response costs and damages from the responsible party causing the destruction, loss of, or injury to park system resources. "Response costs" are defined by the act to include the costs of actions taken by the Secretary to prevent, abate, or minimize the destruction, loss, or injury or imminent risk of such destruction, loss, or injury. Response costs also include monitoring ongoing effects of incidents causing such destruction, loss, or injury.

The Channel Islands National Park is located within the study area of the Restoration Plan, and several projects will occur on NPS lands. However, none of the projects for which this Restoration Plan represents final environmental review have the potential to negatively affect NPS resources. For other projects requiring subsequent analysis and having the potential to affect NPS resources, the Trustees will consult with and, as appropriate, apply for a permit from the Channel Islands National Park after sufficient site-specific information is developed.

Rivers and Harbors Act, 33 U.S.C. 401, et seq.

The federal Rivers and Harbors Act regulates development and use of the nation's navigable waterways. Section 10 of the act prohibits unauthorized obstruction or alteration of navigable waters and vests the U.S. Army Corps of Engineers with authority to regulate discharges of fill and other materials into such waters. Restoration actions that require Section 404 CWA permits are likely also to require permits under Section 10 of the Rivers and Harbors Act. However, a single permit usually serves for both. Therefore, the Trustees can ensure compliance with the Rivers and Harbors Act through the same mechanism.

The Trustees do not believe that any of the projects for which this Restoration Plan represents final environmental review have the potential to negatively affect navigable waters. For other projects requiring subsequent analysis and having the potential to affect navigable waterways (e.g., artificial reefs), the Trustees will consult with appropriate U.S. Army Corps of Engineers officials after sufficient site-specific information is developed.

Executive Order 11988: Construction in Flood Plains

This 1977 executive order (EO) directs federal agencies to avoid, to the extent possible, the long-and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of development in floodplains wherever there is a practicable alternative. Each agency is responsible for evaluating the potential effects of any action it may take in a floodplain. Before taking an action, the federal agency should determine whether the proposed action would occur in a floodplain. For any major federal action significantly affecting the quality of the human environment, the evaluation would be included in the agency's NEPA compliance document(s). The agency should consider alternatives to avoid adverse effects and incompatible development in floodplains. If the only practicable alternative requires siting in a floodplain, the agency should: (1) design or modify the action to minimize potential harm and (2) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain.

None of the projects for which this Restoration Plan represents final environmental review will occur in a floodplain. For other projects requiring subsequent analysis and having the potential to occur in a floodplain (e.g., wetland restoration), the Trustees will consult with appropriate officials after sufficient site-specific information is developed.

Executive Order 13112: Invasive Species

EO 13112 applies to all federal agencies whose actions may affect the status of invasive species and requires agencies to identify such actions and to the extent practicable and permitted by law (1) take actions specified in the order to address the problem consistent with their authorities and budgetary resources; and (2) not authorize, fund, or carry out actions that they believe are likely to cause or promote the introduction or spread of

invasive species in the United States or elsewhere unless, "pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

The Trustees do not believe that any of the projects for which this Restoration Plan represents final environmental review have the potential to cause or promote the introduction or spread of invasive species. For other projects requiring subsequent analysis and having the potential to affect the status of invasive species, the Trustees will consult with appropriate officials after sufficient site-specific information is developed.

Executive Order 13186: Protection of Migratory Birds

EO 13186, titled the Responsibilities of Federal Agencies to Protect Migratory Birds, requires federal agencies to avoid or minimize the effects of their actions on migratory birds, and, in some cases, to evaluate the effects of actions and plans on migratory birds during environmental analyses. The EO further directs federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within two years, a Memorandum of Understanding with the USFWS that shall promote the conservation of migratory bird populations.

None of the projects for which this Restoration Plan represents final environmental review have the potential to affect migratory birds. For other projects requiring subsequent analysis and having the potential to affect migratory species, the Trustees will consult with appropriate USFWS officials after sufficient site-specific information is developed.

Executive Order 12898: Environmental Justice

On February 11, 1994, President Clinton issued EO 12898, titled Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This EO requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The EPA and the Council on Environmental Quality have emphasized the importance of incorporating environmental justice review in the analyses conducted by federal agencies under NEPA and of developing mitigation measures that avoid disproportionate environmental effects on minority and low-income populations. The Trustees have concluded that there are no low-income or ethnic minority communities that would be adversely affected by the MSRP. Rather, MSRP actions that would restore fishing services would benefit subsistence fishers and in concert with the EPA's institutional controls program, would reduce exposures to contaminated fish that may currently be disproportionately affecting minority and low-income populations.

Environmental Justice further requires federal agencies to provide opportunities for community input in the NEPA process. The Trustees will make every effort to involve the affected community by providing notice to members of the public and access to related documents.

INFORMATION QUALITY LAW, PUBLIC LAW 106-554, SECTION 515

Information disseminated by federal agencies to the public after October 1, 2002, is subject to information quality guidelines developed by each agency pursuant to Section 515 of Public Law 106-554. These guidelines are intended to ensure and maximize the quality of the objectivity, utility, and integrity of such information. This Restoration Plan is an information product covered by the information quality guidelines established by NOAA and the Department of the Interior for this purpose. The quality of the information contained herein is consistent with these guidelines, as applicable.

6.2.2. State Statutes

CALIFORNIA ENVIRONMENTAL QUALITY ACT, PUB. RES. CODE 21000–21178.1

The California Environmental Quality Act (CEQA) was adopted in 1970 and its basic purpose is to inform California governmental agencies and the public about the potentially significant adverse environmental effects of proposed activities, identify ways that those adverse effects can be avoided or reduced below a level of significance through adoption of feasible alternatives or mitigation measures, and to disclose the reasons for agency approval of a project resulting in significant environmental effects.

The CEQA process begins with a preliminary review as to whether CEQA applies to the project in question. Generally, a project is subject to CEQA if it involves a discretionary action that is carried out, funded or authorized by an agency (i.e. the lead agency) and that has the potential to impact the environment. Once the lead agency determines that the project is subject to CEQA, the agency must then determine whether the action is exempt under either a statutory or categorical exemption.

If the lead agency determines that the project is not exempt then an Initial Study is generally prepared to determine whether the project may have a potentially significant effect on the environment. Based on the Initial Study, the lead agency determines whether to prepare a Negative Declaration (i.e., the project will not result in significant negative adverse effects to the environment) or an Environmental Impact Report. Alternately, the agency may bypass an Initial Study and proceed directly to the preparation of an EIR. The test for determining whether an environmental impact report (EIR) or negative declaration must be prepared is whether a fair argument can be made supported by substantial evidence in light of the whole record before the state lead agency that the project may have a significant effect on the environment.

As, generally speaking, the proposed projects in this Restoration Plan are subject to both NEPA and CEQA, the federal and state lead agencies, NOAA and CDFG respectively,

have decided to prepare this joint NEPA/CEQA document (specifically, an Environmental Assessment/Initial Study). Given that none of the Preferred Alternatives are expected to result in any significant adverse environmental impacts or effects, the federal and state lead agencies expect to issue, respectively, a FONSI and a Negative Declaration to cover the Preferred Alternatives addressed herein. However, as noted in Section 5. 3.1.2, the Subtidal Reef Restoration on the Palos Verdes Shelf project is only conceptual at this stage and will require subsequent NEPA and CEQA documentation once project design and a site evaluation are complete. In addition, as noted in Section 5.4.5.5, the Restore Seabirds to Baja California Pacific Islands project will require additional compliance as determined appropriate for an international project. Accordingly, a FONSI and Negative Declaration issued in response to this Restoration Plan and EA/IS will not cover the Subtidal Reef Restoration on Palos Verdes Shelf project and the Restore Seabirds to Baja Californa project.

CALIFORNIA COASTAL ACT, CALIFORNIA PUBLIC RESOURCES CODE SECTIONS 30000, ET SEQ.

The California Coastal Act was enacted by the California State Legislature in 1976 to provide long-term protection of California's 1,100-mile coastline for the benefit of current and future generations. The Coastal Act created a partnership between the state (acting through the California Coastal Commission [Commission]) and local government (15 coastal counties and 58 cities) to manage the conservation and development of coastal resources through a comprehensive planning and regulatory program. New development in the Coastal Zone may require a permit from the Commission or the appropriate local government agency. The Commission also reviews and approves Local Coastal Programs, which are the basic planning tools used by local governments to guide development in the Coastal Zone.

For all of the California coast, except San Francisco Bay, the Commission implements the federal Coastal Zone Management Act of 1972 (in the San Francisco Bay area, the implementing agency is the San Francisco Bay Conservation and Development Commission). The Commission is responsible for reviewing proposed federal and federally authorized activities to assess their consistency with the approved state coastal management program. The Commission developed the California Coastal Management Program pursuant to the requirements of the federal Coastal Zone Management Act of 1972. After NOAA approved the California Coastal Management Program in 1977, all federal activities affecting Coastal Zone resources became subject to the Commission's regulatory jurisdiction. A federal agency must conduct its activities (including federal development projects, permits and licenses, and assistance to state and local governments) in a manner consistent with the California Coastal Management Program. The process established to implement this requirement is called a consistency determination for federal activities and development projects and a consistency certification for federal permits and licenses and federal support to state and local agencies.

The Trustees do not believe that the projects implemented by the MSRP will adversely affect California's Coastal Zone resources. However, the Trustees intend to seek the Commission's concurrence that their preferred alternative is consistent with California's federally approved Coastal Management Program.

CALIFORNIA ENDANGERED SPECIES ACT, FISH AND GAME CODE 2050 ET SEQ.

Pursuant to the California Endangered Species Act (CESA) (California Fish and Game Code Sections 2050 et seq.), it is the policy of the State of California that state agencies should not approve projects as proposed that would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species if there are reasonable and prudent alternatives available. However, if reasonable alternatives are infeasible, individual projects may be approved if appropriate mitigation and enhancement measures are provided.

Pursuant to the CESA, the Fish and Game Commission has established a list of threatened and endangered species based on criteria recommended by the California Department of Fish and Game. Section 2080 of the California Fish and Game Code prohibits "take" of any species that the Commission determines to be an endangered species or a threatened species. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The CESA allows for take incidental to otherwise lawful development projects. The CESA emphasizes early consultation to avoid potential impacts to rare, endangered, or threatened species and to develop appropriate mitigation planning to offset project-caused losses of populations of listed species and their essential habitats.

Multiple threatened and endangered species occur in the study area for this Restoration Plan. For each project that is selected as preferred in the final Restoration Plan, the Trustees will evaluate the potential effects of the project on listed species and critical habitats. Based on this analysis, the Trustees will perform the appropriate level of consultation with the California Department of Fish and Game.

PUBLIC RESOURCES CODE, DIVISION 6, SECTIONS 6001, ET SEQ.

The Public Resources Code, Division 6, gives the CSLC jurisdiction and management authority over all ungranted tidelands, submerged lands, and the beds of navigable rivers, sloughs, lakes, etc. The CSLC has certain residual and review authority for tide and submerged lands legislatively granted in trust to local jurisdictions (Public Resources Code §6301 and §6306). All tide and submerged lands, granted or ungranted, as well as navigable rivers, sloughs, etc., are impressed with the common law public trust. A lease may be required from the CSLC if a restoration project is located on such lands.

6.2.3. Other Potentially Applicable Statutes and Regulations

Additional statues may be applicable to Natural Resource Damage Assessment (NRDA) restoration planning activities. The statutes listed below, or their implementing regulations, may require permits from federal or state permitting authorities.

- National Park Act of August 19, 1916 (Organic Act), 16 U.S.C. 1, et seq.
- Archaeological Resources Protection Act, 16 U.S.C. 460, et seq.
- National Historic Preservation Act of 1966 as amended (16 U.S.C. 470-470t, 110)
- Executive Order 11514 – Protection and Enhancement of Environmental Quality.
- Executive Order 11990 – Protection of Wetlands.
- Executive Order 11991 – Relating to the Protection and Enhancement of Environmental Quality.
- Porter-Cologne Water Quality Control Act (Porter-Cologne).

References

Ainley, D.G., S. Morrel, and T.J. Lewis. 1974. "Patterns in the life histories of Storm Petrels on the Farallon Islands." *Living Bird* **13**: 295-312.

Allen, L.G., D.J. Pondella, and M.H. Horn. 2006. The Ecology of Marine Fishes, California and Adjacent Waters. University of California Press. 660 pp.

Ambrose, R.F. 1994. "Resource Replacement Alternatives Involving Constructed Reefs in Southern California." Report prepared for the Montrose Settlements Restoration Program.

Anderson, D.W., and J.G. Keith. 1980. "The human influence on seabird nesting success: conservation implications." *Biological Conservation* **18**: 65-80.

Baptista, L.F., and S.L.L. Gaunt. 1997. "Bioacoustics as a Tool in Conservation Studies" Pages 212-242 in J. R. Clemmons, and R. Bucholz, editors. *Behavioral Approaches to Conservation in the Wild*. Cambridge University Press. Cambridge, United Kingdom.

Blasius, M.E., and G.D. Goodmanlowe. 2008. "Contaminants still high in top-level carnivores in the Southern California Bight: Levels of DDT and PCBs in resident and transient pinnipeds." *Marine Pollution Bulletin* **56**(12): 1973-1982.

Bond A.B., Stephens J.S., Pondella D.J., Allen M.J., Helvey M. 1999. A method for estimating marine habitat values based on fish guilds, with comparisons between sites in the Southern California Bight. *Bulletin of Marine Science* 64: 219-242.

Burkett, E.E., N.A. Rojek, A.E. Henry, M.J. Fluharty, L. Comrack, P.R. Kelly, A.C. Mahaney, and K.M. Fien. 2003. "Status review of Xantus's Murrelet (*Synthilboramphus hypoleucus*) in California." Habitat Conservation Branch Status Report 2003-01. Report to the California Fish and Game Commission. California Department of Fish and Game. 99 pp.

Brown, A., N. Collier, D. Robinette, and W. J. Sydeman. 2003. "A potential new colony of Ashy Storm-Petrels on the mainland coast of California, USA." *Waterbirds* **26**: 385-388.

Carter, H.R., G.J. McChesney, D.L. Jaques, C.S. Strong, M.W. Parker, J.E. Takekawa, D.L. Jory, and D.L. Whitworth. 1992. "Breeding populations of seabirds in California 1989-1991, Volume I." U.S. Fish and Wildlife Service, Dixon, CA. 491 pp.

Collins, P., D.A. Guthrie, T.C. Rick, and J.M. Erlandson. 2004. Food Habits of Bald Eagles that Nested Historically at San Miguel Island Based on Prey Remains Excavated from an Historic Nest Site. Unpublished report submitted to the National Park Service. Santa Barbara Museum of Natural History Technical Reports – Number 2. Santa Barbara, CA.

Council on Environmental Quality. 1997. "Considering Cumulative Effects Under the National Environmental Policy Act." Washington D.C.

Crandall, W.C. 1911. The Kelps of the Southern California Coast. U.S. Senate doc. 190, Fertilizer Resources of the U.S., Appendix N.

Cross, J.N., and L.G. Allen. 1993. "Fishes" Pages 459-540 in M. D. Dailey, D. J. Reish, and J. W. Anderson, editors. *Ecology of the Southern California Bight: A Synthesis and Interpretation*. University of California Press.

Dayton, P.K., M.J. Tegner, P.B. Edwards, and K.L. Riser. 1998. "Sliding Baselines, Ghosts, and Reduced Expectations in Kelp Forest Communities." *Ecological Applications* **8**(2): 309-322.

Dayton, P.K., M.J. Tegner, P.E. Parnell, and P.B. Edwards. 1992. "Temporal and spatial patterns of disturbance and recovery in a kelp forest community." *Ecological Monographs* **62**(3): 421-445.

Dooley, J. 2009. "Bald Eagle Space Use and Diets on the California Channel Islands as Determined by GPS and Stable Isotopes." M. Sc. Thesis. California State University, Northridge, CA.

Edwards, M.S. 2004. "Estimating Scale-Dependency in Disturbance Impacts: El Niños and Giant Kelp Forests in the Northeast Pacific." *Oecologia* **138**:436-447.

Ford, T., and B. Meux. 2010. "Giant Kelp Community Restoration in Santa Monica Bay." *Urban Coast* **2**: 43-46.

Ford T., B. Meux, and S. Fejtek. 2008. "Kelp Restoration and Monitoring Project, 2008 Annual Progress Report." Santa Monica Baykeeper, Santa Monica, CA.

Garcelon, D. 2006. "Recovery of a Lead-Poisoned Bald Eagle on Santa Rosa Island." Unpublished report. Arcata, CA.

———. 1994a. "Effects of Organochlorine Contaminants on Bald Eagle Reproduction at Santa Catalina Island." Expert Report for United States v. Montrose Chemical Corporation et al.

———. 1994b. "Food Habits of the Bald Eagle on Santa Catalina Island, November 1991-December 1992 and Food Habits of the Bald Eagle on Santa Catalina Island, January-June 1993." Expert Report for United States v. Montrose Chemical Corporation et al.

Graham, M.H. 2004. "Effects of Local Deforestation on the Diversity and Structure of Southern California Giant Kelp Forest Food Webs." *Ecosystems* **7**: 341-357.

Gress, F., R.W. Risebrough, D.W. Anderson, L.F. Kiff, and J.R. Jehl. 1973. "Reproductive failures of Double-Crested Cormorants in Southern California and Baja, California." *Wilson Bulletin* **85**: 197-208.

Grinnell, J., and F.S. Daggett. 1903. "An ornithological visit to Los Coronados Islands, Lower California." *The Auk* **20**: 27-37.

Hanson, C.C., and Bonham, J.E. 2011. "The removal of feral cats from San Nicolas Island, California, to Protect Native and Endemic Species: 2010 Annual Report." Unpublished report prepared by Island Conservation, Santa Cruz, CA. 21 pp.

Hanson, C.C., Will, D.J., Bonham, J.E., and B.S. Keitt. 2010. "The removal of feral cats from San Nicolas Island, California to Protect Native and Endemic Species: 2009 Annual Report." Unpublished report prepared by Island Conservation, Santa Cruz, CA. 19 pp.

Harrold, C., and D.C. Reed. 1985. "Food availability, sea urchin grazing and kelp forest community structure." *Ecology* 63: 547-560.

Hickey, J.J, and D.W. Anderson. 1968. "Chlorinated hydrocarbons and eggshell changes in raptorial and fish-eating birds." *Science* **162**: 271-273.

Howell, A.B. 1917. "Birds of the Islands off the Coast of Southern California." *Pacific Coast Avifauna* **12**.

———. 1912. "Notes from Todos Santos Island." *Condor* **4**: 187-191.

———. 1910. "Notes from Los Coronados Islands." *Condor* **12**: 184-187.

Hunt, G. 1994. "Peregrine Falcon Studies on the Channel Islands." Expert Report for the U.S. v. Montrose Chemical Corp. et al.

Hunt, G.L. Jr., R.L. Pitman, and H.L. Jones. 1980. "Distribution and abundance of seabirds breeding on the California Channel Islands" in pages 443-459, D. M. Power, editor. *The California Islands*: *Proceedings of a Mutidisciplinary Symposium*. Haagen Printing: Santa Barbara Museum of Natural History, Santa Barbara, CA.

Hunt, G.L. Jr., R.L. Pitman, M. Naughton, K.A. Winnet, A. Newman, P.R. Kelley, and K.T. Briggs. 1979. "Distribution, Status, Reproductive Ecology, and Foraging Habits of Breeding Seabirds" *in* Summary of Marine Mammals and Seabird Surveys of the Southern California Bight Area 1975-1978." Final Report to the U.S. Department of Interior, Bureau of Land Management. 399 pp.

Harris, M.L. and J.E. Elliott. 2011. "Effects of polychlorinated biphenyls, dibenzo-p-dioxins and dibenzofurans, and polybrominated diphenyl ethers in wild birds." In *Environmental Contaminants in Biota, Interpreting Tissue Concentrations, 2nd ed*. W. N. Beyer and J.P. Meador, eds. CRC Press, Boca Raton, FL. pp. 477-528.

Johnson, O.W., Johnson P.M., and Bruner P. 1981. "Wintering behavior and site-faithfulness of Golden Plovers on Oahu." '*Elepaio* **41**: 123-130.

Kayen, R.E., H.J. Lee and J.R. Hein. 2002. "Influence of the Portuguese Bend landslide on the character of the effluent affected sediment deposit, Palos Verdes margin, southern California." *Continental Shelf Research* 22: 911-922.

Kelner, J.J., R. Christensen, R. Clark, C. Caldow and M. Coyne. 2005. "Chapter 2, In: A Biogeographic Assessment of the Channel Islands National Marine Sanctuary (Randy Clark, John Christensen, Chris Caldow, Jim Allen, Michael Murray and Sara MacWilliams editors)." NOAA Technical Memorandum NOS NCCOS 21: 89-134.

Kiff, L.F. 2000. "Further Notes on Historical Bald Eagle and Peregrine Falcon Populations on the California Channel Islands." Boise, Idaho. 38 pp.

———. 1988. "Commentary-changes in the status of the peregrine in north America: an overview" Pages 123-139 in T. J. Cade, J. H. Enderson, C. G. Thelander, and C. M. White, editors. *Peregrine falcon populations: their management and recovery*. The Peregrine Fund, Inc. Boise, ID.

———. 1994. "Eggshell Thinning in Birds of the California Channel Islands." Expert Report for the United States vs. Montrose Chemical Corporation et al.

Los Angeles County Sanitation Districts (LACSD). 2010. "2008-2009 Joint Water Pollution Control Plant Biannual Receiving Water Monitoring Report."

Lee, H.J., C.R. Sherwood, D.E. Drake, B.D. Edwards, F. Wong, and M. Hamer. 2002. "Spatial and temporal distribution of contaminated effluent-affected sediment on the Palos Verdes Margin." *Continental Shelf Research* **22**: 859-880.

Lee, H.J., and P.L. Wiberg. 2002. "Character, fate, and biological effects of contaminated, effluent-affected sediment on the Palos Verdes Margin, Southern California: An overview." *Continental Shelf Research* **22**: 835-840.

Lowe, S., M. Browne, S. Boudjelas, and M. De Poorter. 2004. 100 of the world's worst invasive alien species. A selection from the global invasive species database. The Invasive Species Specialist Group (ISSG) a specialist group of theSpecies Survival Commission (SSC) of the World Conservation Union (IUCN), Auckland. 12 pp.

MBC Applied Environmental Sciences. 2010. "Status of the kelp beds 2009, Ventura and Los Angeles Counties." Central Region Kelp Survey Consortium.

———. 2007. "Status of the kelp beds 2006 Ventura and Los Angeles Counties." Central Region Kelp Survey Consortium Report.

McIver, W.R., A.L. Harvey, and H.R. Carter. 2010. "Monitoring and restoration of Ashy Storm-Petrels at Santa Cruz Island, California, in 2009." Unpublished report, U.S. Fish and Wildlife Service, Arcata, CA; Channel Islands National Park, Ventura, CA; and Carter Biological Consulting, Victoria, British Columbia. 32 pp.

Montrose Settlements Restoration Program (MSRP). February 2002. "Feasibility Study for Reestablishment of Bald Eagles on the Northern Channel Islands, California." Available at http://www.darp.noaa.gov/southwest/montrose/pdf/mon02-2.pdf.

Montrose Settlement Restoration Program (MSRP). 2005. "Restoration Plan and Programmatic EIR/EIS." Executive Summary from website: http://www.darrp.noaa.gov/southwest/montrose/pdf/msrp_rp_execsumm.pdf

———.2002. "Feasibility Study for Reestablishment of Bald Eagles on the Northern Channel Islands, California." Available at http://www.darp.noaa.gov/southwest/montrose/pdf/mon02-2.pdf.

Montrose Settlements Restoration Program (MSRP) and U.S. Environmental Protection Agency (USEPA). 2004. "A Survey on Recreational and Subsistence fishing in Southern California Coastal Waters." MSRP Administrative Record. Long Beach, CA.

Montrose Settlements Restoration Program (MSRP) and U.S. Environmental Protection Agency (USEPA). 2004. "2002-2004 Southern California Coastal Marine Fish Contaminants" Survey." MSRP Administrative Record. Long Beach, CA.

Nogales, M., A. Martin, B. R. Tershy, C. J. Donlan, D. Veitch, N. Puerta, B. Wood, and J. Alonso. 2004. "A review of feral cat eradication on islands." *Conservation Biology* **18**(**2**): 310-319.

North, W.J. 2000. "Survey of Palos Verdes Peninsula, 26 April 2000." Unpublished data.

———. 1964. "Experimental transplantation of the giant kelp, Macrocystis pyrifera." *Proceedings of the International Seaweed Symposium* **4**: 248-255.

Parker, M.W., S.W. Kress, R.T. Golightly, H.R. Carter, E.B. Parsons, S.E. Schubel, J.A. Boyce, G J. McChesney and S.M. Wisely. 2007. "Assessment of social attraction techniques used to restore a Common Murre colony in central California." *Waterbirds* **30**: 17-28.

Peakall, D.B., and L.F. Kiff. 1988. "DDE Contamination in Peregrines and American Kestrels and its Effect on Reproduction" in T. J. Cade, J. H. Enderson, C. G. Thelander, and C. M. White, editors. *Peregrine Falcon populations: their management and recovery*. The Peregrine Fund, Inc. Boise, ID.

Pondella, D. J., J. Williams, and J. Claisse. 2010. "Biological and Physical Characteristics of the Nearshore Environment of the Bunker Point Restoration Area and the Palos Verdes Peninsula." A report to the NOAA Restoration Center/Montrose Settlements Restoration Program. 23 pp.

RecFin. 2004. Pacific States Marine Fisheries Commission, Recreational Fisheries Information Network. Web page available at http:\\www.recfin.org.

Reed, D.J., S.C. Schroeter, D. Huang, T.W. Anderson and R.F. Ambrose. 2006. "Quantitative Assessment of Different Artificial Reef Designs in Mitigating Losses to Kelp Forest Fishes." Bulletin of Marine Sciences. **78**(1): 133-150.

Rich, P., and D. Richards. 2005. "Beachwalk monitoring on the northern Channel Islands, California, 2004." Channel Islands National Park, Ventura, CA. Technical Report CHIS-05-02.

Richards, D., and P. Rich. 2004. "Beachwalk Monitoring on the Northern Channel Islands, California, 2003 Annual Report." Channel Islands National Park, Ventura, CA. Technical Report CHIS-04-01.

———.2006. "Beach Walk Monitoring on the Northern Channel Islands, California: 2005 Annual Report." National Park Service Channel Islands National Park, Ventura, CA. Technical Report CHIS-06-01.

Risebrough, R.W., R.C. Sibley, and M.N. Kirven. 1971. "Reproductive failure of the brown pelican on Anacapa Island in 1969." *American Birds* **25**: 8-9.

Schiff, K., and R. Gossett. 1998. "Southern California Bight 1994 Pilot Project: III Sediment Chemistry." Southern California Coastal Water Research Project. Westminister, CA.

Santa Cruz Predatory Bird Research Group. 2007. "2007 Channel Islands Peregrine Falcon Study." Unpublished draft report submitted to the U.S. Fish and Wildlife Service. Santa Cruz, CA.

Sea Floor Mapping Laboratory at California State University, Monterey Bay (http://seafloor.csumb.edu/SFMLwebDATA.htm

Sharpe, P. B. 2011. "Bald Eagle Restoration on the California Channel Islands, January - December 2010, 9th Annual Report." Unpublished report prepared by the Institute for Wildlife Studies, Arcata, CA for the National Park Service, Ventura, CA. 30 pp.

———. 2010. "Bald Eagle Restoration on the California Channel Islands, January -December 2009, 8th Annual Report." Unpublished report prepared by the Institute for Wildlife Studies, Arcata, CA for the National Park Service, Ventura, CA. 25 pp.

———. 2006. "Bald Eagle Restoration on the Northern Channel Islands, California, January-December 2005, 4th Annual Report." Unpublished report prepared by the Institute for Wildlife Studies, Arcata, CA for the National Park Service, Ventura, CA. 48 pp.

Sharpe, P.B., and J. Dooley. 2001. "Restoration and management of bald eagles on Santa Catalina Island, California, 2001." Report prepared by the Institute for Wildlife Studies for the U.S. Fish and Wildlife Service, Sacramento, CA. 27 pp.

Sharpe, P.B., and D.K. Garcelon. 1999. "Analysis of the Potential Diet of Bald Eagles Reintroduced to Santa Cruz and Anacapa Islands, California." Report prepared by the Institute for Wildlife Studies for the U.S. Fish and Wildlife Service, Sacramento, CA.

Sprunt, A. IV, W.B. Robertson Jr., S. Postupalsky, R.J. Hansel, C.E. Knoder, and F.J. Ligas. 1973. "Comparative productivity of six bald eagle populations." *Transactions of North American Wildlife Natural Resources Conference* **38**: 96-106.

Steneck, R.S., M.H. Graham, B.J. Bourque, D. Corbett, J.M. Erlandson, J.A. Estes and M.J. Tegner. 2002. Kelp Forest Ecosystems: biodiversity, stability, resilience and future. *Environmental Conservation* **29**(4): 436-459.

Stephens J.S. Jr., D. Pondella II, and P. Morris. 1996. "Habitat Value Determination of the Coastal Zone off the City of Rancho Palos Verdes Based on Habitat-specific Assemblage Data." Report prepared for the U.S. Corps of Engineers: 27 pp.

Sumner, E.L. Jr., and R.M. Bond. 1939. "An Investigation of Santa Barbara, Anacapa, and San Miguel Islands, California." Report prepared for the Channel Islands National Monument, Ventura, CA.

Sydeman, W.J., J.A. Thayer, M.M. Hester, K.L. Mills, and S. Wolf. 2000. "Nest Boxes as a Tool for Seabird Population Restoration." Report prepared for the National Fish and Wildlife Foundation.

Tegner, M.J., and P.K. Dayton. 1991. "Sea urchins, El Niños, and the long-term stability of Southern California kelp forests." *Marine Ecology Progress Series* **77**:49–63.

URS Corporation. 2010. "Draft Feasibility Report. Artificial Reef Planning and Design Assistance, Belmont Pier Artificial Reef Project, Long Beach California." MSRP Administrative Record. Long Beach, CA.

U.S. Environmental Protection Agency. 2004a. "Cooling Water Intake Structures – Section 316(b)." U.S. EPA Fact Sheet 821-F-04003.

U.S. Fish and Wildlife Service (USFWS). 2008. "Environmental Assessment for the Restoration of San Nicolas Island's Seabirds and Protection of other Native Fauna by Eradicating Feral Cats." Report on behalf of the Montrose Natural Resources Trustee Council and U.S. Navy. 81 pp.

———.2009. "Final Environmental Assessment for the Restoration of San Nicolas Island's Seabirds and Protection of other Native Fauna by Removing Feral Cats." Report on behalf of the Montrose Natural Resources Trustee Council and U.S. Navy. 79 pp.

U.S. Navy. 2005. "Integrated Natural Resources Management Plan (INRMP) 2006-2010 for San Nicolas Island." 129 pp.

Whitworth, D.L., A.L. Harvey, and H.R. Carter. 2011. "Cassin's Auklets, Xantus's Murrelets and Other Crevice-Nesting Seabirds at Santa Barbara Island, California: 2009-10 Surveys." Draft unpublished report, California Institute of Environmental Studies, Davis, California; Channel Islands National Park, Ventura, California; and Carter Biological Consulting, Victoria, British Columbia. 79 pp.

Whittaker, R. J. 1998. "Island Biogeography: Ecology, Evolution, and Conservation." Oxford University Press. Oxford, United Kingdom. 285 pp.

Wiemeyer, S.N., C.M. Bunck, and C.J. Stafford. 1993. "Environmental contaminants in bald eagle eggs - 1980-84 - and further interpretations of relationships to productivity and shell thickness." *Archives of Environmental Contamination and Toxicology* **24**: 213-227.

Wolf, S. G. 2002. "The Relative Status and Conservation of Island Breeding Seabirds in California and Northwest Mexico." M. Sc. Thesis. University of California, Santa Cruz, CA.

Wood, B., B.R. Tershy, M.A. Hermosillo, C.J. Donlan, J.A. Sanchez, B.S. Keitt, D.A. Croll, G.R. Howald, G.R. Biavaschi, and N. Biavaschi. 2002. "Removing cats from the islands in Northwest Mexico" Pages 374-380 *in* C. R. Veitch, and M. N. Clout, editors. *Turning the Tide: The Eradication of Invasive Species.* World Conservation Union. Gland, Switzerland.