Stuyvesant/Humboldt Coast Oil Spill

Draft
Damage Assessment and Restoration Plan

for public review and comment

May 2004

Prepared by:
California Department of Fish and Game
California State Lands Commission
United States Fish and Wildlife Service

Executive Summary

On September 6, 1999, the dredge *M/V Stuyvesant* (the *"Stuyvesant"*) spilled at least 2100 gallons of Intermediate Fuel Oil 180 (IFO-180) into the Pacific Ocean near the mouth of Humboldt Bay, near Eureka, California (the "Spill"). The federal Oil Pollution Act of 1990 (OPA) (33 U.S.C. §§ 2701, et seq.) and California's Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (the "California Act") (Gov. Code §§ 8670.1, et seq.), establish liability for natural resource damages, requiring responsible parties to make the environment and the public whole for the injury, destruction and loss of natural resources and services resulting from oil spills into navigable and/or marine waters. The following agencies are designated natural resource trustees (the "Trustees") under OPA and/or State law, for natural resources injured by the Stuyvesant oil spill: the California Department of Fish and Game (CDFG); the California State Lands Commission (CSLC); and the United States Fish and Wildlife Service (USFWS). As a designated Trustee, each agency is authorized to act on behalf of the public under state and/or federal law to assess and recover natural resource damages and to plan and implement actions to restore, rehabilitate, replace, or acquire the equivalent of the affected natural resources injured as a result of a discharge of oil.

Damage Assessment and Restoration Plan (DARP)

The Trustees have prepared this draft DARP, describing the injuries resulting from the Spill and proposing restoration alternatives. This plan was developed, in part, through cooperative studies with Bean Stuyvesant LLC and Bean Dredging, LLC (collectively, "Bean" or the "Responsible Parties"). This document also describes potential adverse environmental impacts as well as cumulative impacts that may result from the restoration alternatives. It serves, in part, as the Trustee agencies' compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Additional environmental compliance will be required prior to actual implementation of the restoration projects. At this time, the Trustees are seeking written comments from the public on the restoration alternatives described herein.

What was injured?

Studies conducted by the Trustees and other experts identified the following injuries to natural resources and recreational services from the spill:

- Marbled Murrelets—135 estimated dead
- Common Murres—1,600 estimated dead
- Other birds—670 estimated dead
- Fish and shrimp— 3,282 kg of shrimp and over 6,000 epipelagic fish estimated dead
- Sandy beach habitat—3,054 acres of shoreline lightly, moderately, or heavily oiled
- Rocky intertidal habitat—162 acres of shoreline lightly, moderately, or heavily oiled
- Recreational services—estimated 9,415 lost user-days, 197 diminished user-days

What restoration projects will compensate for these injuries?

The Trustees grouped the injuries into categories and identified restoration projects that would address each injury category. The figure below provides a conceptual guide to the injury categories and the restoration categories that would address each injury.

Injury Categories	Restoration Categories
1. Grebes and Loons	1. Grebe/Loon Nesting Habitat Projects
2. Pelicans, Cormorants, and Gulls	2. Cormorant/Pelican Nesting/Roosting Projects
3. Rocky Seabirds*	3. Rocky Seabird Projects
4. Marbled Murrelets	4. Marbled Murrelet Projects
5. Wetland Birds**	5. Wetlands Projects
6. Water Column	
7. Rocky Intertidal Habitat	
8. Sandy Beach Habitat	6. Dune Restoration/Snowy Plover Projects
9. Human Recreational Use	7. Human Recreational Use Projects

* Alcids (except Marbled Murrelet) and Procellarids
** Medium and Small Gulls, Terns, Scoters, Coot, Egret, Geese, Phalaropes

After evaluating a number of restoration project proposals, the Trustees identified the following tentative preferred restoration projects.

Protection of Western Grebe nesting habitat
Contribute toward the acquisition of land around Lake Earl in Del Norte County. This large coastal lagoon is home to the largest Western Grebe colony on the Pacific Coast, with the potential to host over 100 nesting pairs. Much of the fringe of the lake is privately owned. When lake levels rise in late winter or early spring, local landowners require the breeching of the sand bar, which drains the lake to a level of 4 feet. Water levels then rise as the lake slowly refills, inundating grebe nests. The project would contribute to the acquisition of land around the lake's edge to allow the lake to rise to a level of 10 feet, thereby creating more grebe nesting habitat and protecting grebe nests from sudden water level fluctuations.

Enhancement of Double-crested Cormorant nesting site and Brown Pelican roosting site
Refurbish the Old Arcata Wharf in north Humboldt Bay. The remnants of this abandoned wharf host nesting cormorants and roosting Brown Pelicans. However, the wharf is deteriorating rapidly. This project would involve installing new pilings and a new platform on the existing footprint of the wharf, in order to protect and expand bird use in the future.

Restoration of Common Murre nesting colony
Contribute toward the restoration of an extirpated murre colony on Redding Rock, off Humboldt County. This colony once contained over 1,000 Common Murre pairs, but has declined to zero as a result of human disturbance and possibly oil spills, including the *Stuyvesant* spill. This project would combine public education to reduce disturbance with social attraction techniques that have proved successful in re-attracting murres to former nesting sites.

Protection of Marbled Murrelet nesting habitat
Protect good occupied nesting habitat from logging and other development pressures and manage it for Marbled Murrelets. Good nesting habitat is defined as residual or old growth redwood forest with characteristics conducive to Murrelet nesting. "Occupied" implies that Murrelets currently nest there. This project will seek to protect such stands that are currently at risk of logging and manage them for Marbled Murrelets. One of the tentative preferred restoration projects under consideration by the Trustees is the acquisition of some or all of the remaining

Grizzly Creek Marbled Murrelet Conservation Area (Humboldt County, California). Once acquired this habitat would be placed under the management of a State and/or Federal Agency to be managed for Marbled Murrelets.

Protection of Marbled Murrelet nesting success through corvid management
Improve Murrelet nest success by contributing to on-going corvid (i.e.; ravens, jays, crows) management projects in Redwood National Park and vicinity. Corvid populations are artificially high in areas where human food waste is readily accessible. This, in turn, leads to increased predation of Murrelet nests by corvids. Management efforts may include education of park campers and visitors regarding control of food waste, improved garbage facilities, and outreach to nearby communities where food waste may support artificially high corvid numbers.

Restoration of salt marsh wetlands
Contribute toward the restoration of approximately 140 acres of tidal wetlands on the Hookton Slough Unit of Humboldt Bay National Wildlife Refuge. Restoration of this marsh would consist of removing all or major portions of the armored levee along Hookton Slough to allow full tidal action to approximately 140 acres of the Hookton Slough Unit. A new levee, or levee segments, would be constructed along the South side of the Hookton Slough Unit to protect Hookton Road and the residences and associated facilities along Table Bluff. Restoration of the Hookton Slough Unit to tidal action is one of the largest wetland restoration projects possible on publicly owned lands around Humboldt Bay.

Restoration of coastal dune habitat
Implement non-native plant control efforts in selected dune systems in Humboldt County to encourage recovery of native dune plant species, and develop human disturbance reduction controls to protect nesting Snowy Plovers.

Enhancement of recreational beach amenities
Implement human access improvements, develop educational aids and conduct a tide pool baseline study at Patrick's Point State Park, and contribute to a Humboldt Bay Trails project to improve public access and educational opportunities at Humboldt Bay natural area.

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1.0 Introduction and Purpose

This draft Damage Assessment and Restoration Plan (DARP) was prepared by State and Federal natural resource trustees (the "Trustees") responsible for restoring natural resources[1] and resource services[2] injured by the September 6, 1999 oil spill from the *Stuyvesant* off the coast of Humboldt County, California (the "Spill"). Consistent with OPA and the National Environmental Policy Act (NEPA), the purpose of restoration planning is to identify and evaluate restoration alternatives and to provide the public with an opportunity for review and comment on the proposed restoration alternatives. Restoration planning provides the link between injury and restoration. The purpose of restoration, as outlined in this draft DARP, is to make the environment and the public whole for injuries resulting from the Spill by implementing restoration actions that return injured natural resources and services to baseline (or pre-spill) conditions and compensate for interim losses.

The USFWS, the CDFG, and the California State Lands Commission, are the Trustees for the natural resources injured by the spill (Trustees). As a designated Trustee, each agency is authorized to act on behalf of the public under state and/or federal law to assess and recover natural resource damages and to plan and implement actions to restore, rehabilitate, replace, or acquire the equivalent of the affected natural resources injured as a result of a discharge of oil.

At the time of the Spill, the *Stuyvesant* was owned by Bean Stuyvesant, LLC and operated by Bean Dredging, LLC ("Bean"). Both are Responsible Parties (RPs) under OPA and the California Act. Under OPA and the California Act, the RP is liable for the costs of conducting a natural resource damage assessment, as well as the costs of implementing restoration projects to restore the injured resources.

The Trustees have prepared this draft DARP to inform the public about the natural resource damage assessment and restoration planning efforts that have been conducted following the Spill. The Trustees seek comments on the restoration alternatives presented here. The Trustees will consider written comments received during the public comment period before finalizing the document and presenting a demand to the RPs to fund the restoration projects identified in the final DARP. Upon receipt of damages from the RP's or the Oil Spill Liability Trust Fund, the Trustees may reopen the Administrative Record and conduct further restoration planning. The Trustees will evaluate whether the funds received are sufficient to fully implement the preferred projects and/or whether any of the preferred projects have become infeasible. At that time, the USFWS, as the lead federal agency, will prepare an Environmental Assessment or Environmental Impact Statement, as appropriate, to fulfill the requirements of NEPA. The Trustees may then reconsider the projects for funding and implementation. Any modifications to the final DARP will be documented in the Administrative Record.

[1] Natural resources are defined under the Oil Pollution Act (OPA) as "land, fish, wildlife, biota, air, water, groundwater, 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 or Indian tribe, or any foreign government.

[2] Services (or natural resources services) means the functions performed by a natural resource for the benefit of another natural resource and/or the public.

1.1 Overview of the Incident

On September 6, 1999, the *Stuyvesant* spilled at least 2100 gallons of Intermediate Fuel Oil 180 (IFO-180) into the Pacific Ocean near the mouth of Humboldt Bay, near Eureka, California (Figure 1-1). The incident began at approximately 5:00 pm at least one nautical mile offshore from the channel into Humboldt Bay. A dredge arm on the *Stuyvesant* punctured one of its fuel tanks. At that time, however, the puncture was below the water line and pressure from the ocean water may have limited the release of oil. The dredge proceeded to a point approximately four miles off the North Spit where it dumped its dredge spoils. At this time, 6:54 pm, the vessel became much lighter, the puncture in the fuel tank rose above the water line, and the oil leak may have begun in earnest. The vessel proceeded to return to Humboldt Bay and was inside the channel between the North and South Spits at approximately 7:30 pm. An out-going tide prevented oil from entering Humboldt Bay.

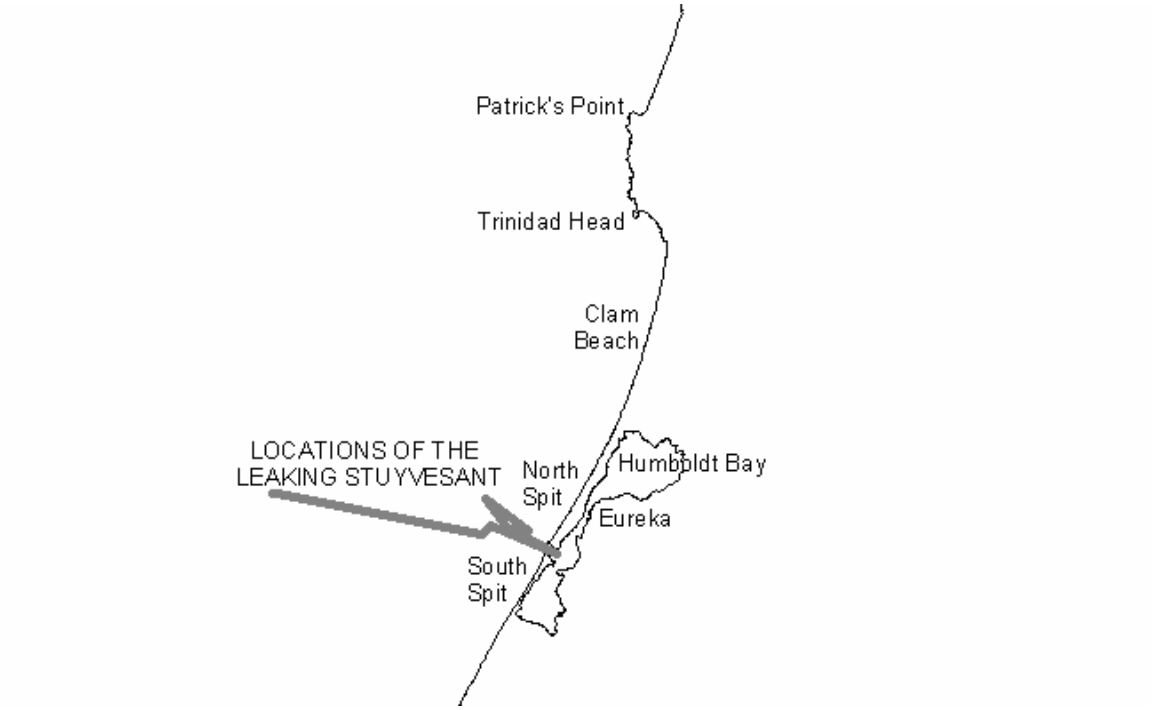
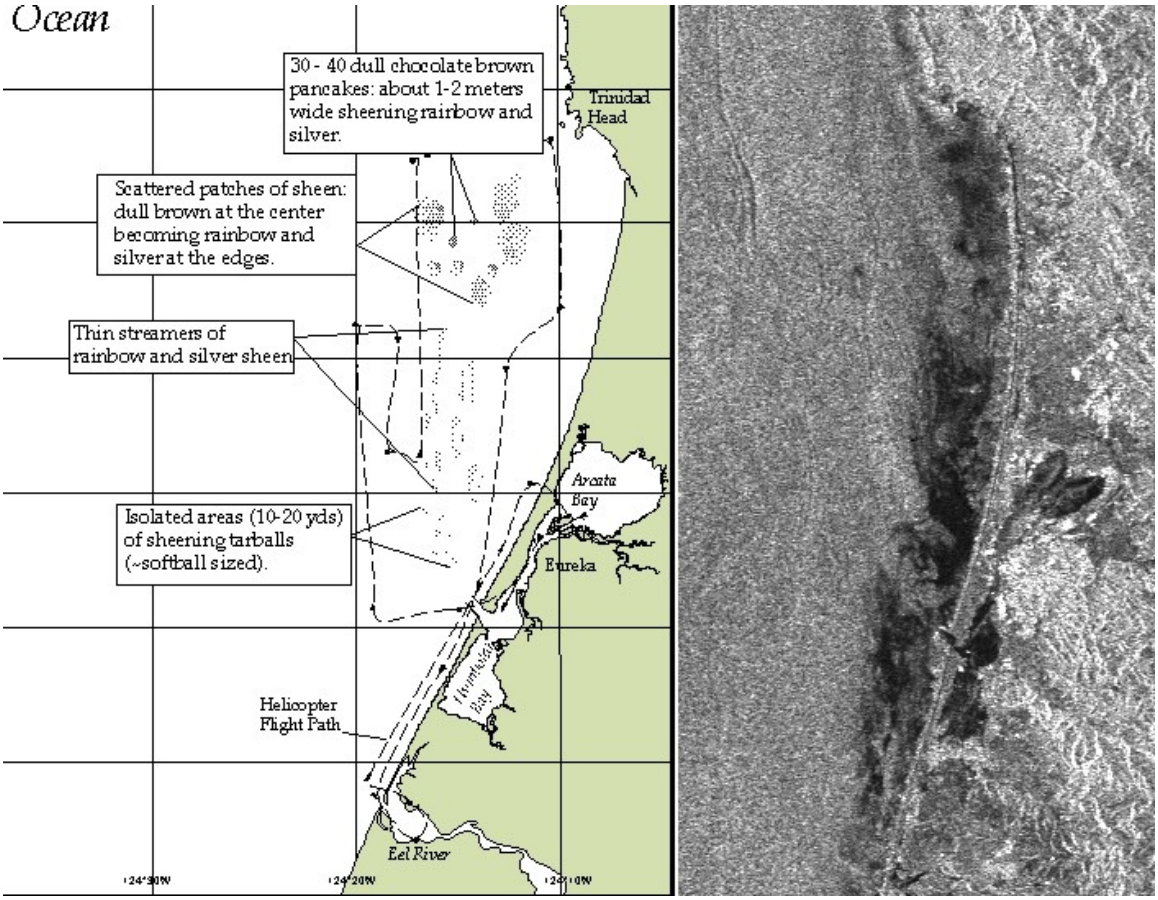


Figure 1-1: Location of the oil spill

At this point, the vessel turned around and headed back out to sea. By 8:22 pm, the *Stuyvesant* was approximately three miles offshore, directly out from the channel entrance. At this time, oil was moved to other compartments in the vessel in an effort to stem the leak. At 11:30 pm, the vessel moved further offshore. By 4:10 am on September 7, the *Stuyvesant* was approximately 15 miles offshore and the leak was stopped. It appeared that most of the escaped oil was released within four miles of the coastline.

Strong north winds (17 knots at the Eel River Buoy) initially spread oil to the south. However, these were replaced with south winds (15 knots) by the afternoon of September 7. Strong south winds prevailed for most of the ensuing days, causing the oil to spread primarily to the north. Overflights by National Oceanic and Atmospheric Administration (NOAA) identified oil slicks

and tarballs in the ocean as far as 15 miles offshore and as far north as Patrick's Point. Figure 1-2 presents a composite, showing the annotated map from the NOAA overflight that occurred on September 8 between 12:00 noon and 1:30 pm and a Synthetic Aperture Radar (SAR) image taken from the RADARSAT satellite on September 8 at 6:31 am. Analysis of the satellite image confirmed that much of the dark area along the coast was the result of oil on the water.[3] On September 8, shoreline assessment crews observed oil on the shore of the South Spit. On September 9, oil was observed washing ashore between the North Spit and Trinidad Head. Clam Beach was closed to public access from September 9 through 12. Indian Beach, north of Clam Beach, remained closed through September 16.



Sept. 8, noon to 1:30 pm Sept. 8, 6:31 am

Figure 1-2: Overflight map and satellite image of oil spill.

The United States Coast Guard (USCG), the CDFG's Office of Spill Prevention and Response along with other State, Federal and local agencies, established a unified command in responding to the spill. As part of the response activities, wildlife response teams collected 1,251 injured or

[3] Except in very light and very strong winds, oil can be detected on the water in SAR images because oil flattens the small ripples of water on the ocean's surface. As a result, the oil surface returns a different signal, which appears darker in the image. Note that this is not a visual image, but a reflection of radar waves upon the surface of the earth and water. This method for oil detection may be used at night and in cloudy conditions.

dead birds, most of them oiled, along the shoreline or at sea between September 7 and 25. Shoreline Cleanup and Assessment Teams (SCAT) conducted surveys daily through September 15.

1.2 Natural Resource Damage Assessment

The Trustees commenced the Pre-assessment Phase of the natural resource damage assessment (NRDA) in accordance with the OPA NRDA regulations (the "OPA regulations") (15 C.F.R. § 990.40), to determine if they had jurisdiction to pursue restoration under OPA and, if so, whether it was appropriate to do so.

Based on their analyses of initial data collected during the response and the Pre-assessment Phase, the Trustees found that they had jurisdiction to pursue restoration under the Oil Pollution Act. The Trustees further determined that response actions had not adequately addressed the injuries resulting from the incident, and that feasible primary and/or compensatory restoration actions existed to address the potential injuries. These determinations were memorialized in a Notice of Intent to Conduct Restoration Planning (Federal Register Vol. 68, No. 226, pages 65944-65946, November 24, 2003).

Consequently, the Trustees initiated the Restoration Planning Phase of the NRDA, in accordance with 15 C.F.R. section 990.50, which includes evaluating and quantifying potential injuries (injury assessment) and using that information to determine the need for and scale (or size) of restoration actions (restoration selection). Bean entered into a cooperative NRDA agreement with the Trustees and was an active and cooperative participant in many of these efforts.

1.3 Summary of Natural Resource Injuries

The Trustees have dedicated considerable time and effort to assessing the nature and extent of natural resource injuries and lost services resulting from this spill. The Trustees have used available information, focused studies, and expert scientific judgments to arrive at the best estimate of the injuries caused by the spill. Principal investigators included State and federal scientists, consultants with damage assessment experience, and local experts. There is, however, some uncertainty inherent in the assessment of impacts from oil spills. While collecting more information may increase the precision of the estimate of the impacts, the Trustees believe that the type and scale of restoration actions would not substantially change as a result of more research. The Trustees have sought to balance the desire for more information with the reality that further research would delay the implementation of the restoration projects, at the expense of the local environment, the citizens of California, and others who use and enjoy the area's natural resources.

Based on the assessment activities, the Trustees believe that the spill caused injuries to natural resources at sea and along the Humboldt County coast, including birds, fish and habitat. The spill also impacted recreational use.

It is the intent of the Trustees to address all injuries. However, rather than develop separate restoration projects for each species and habitat type impacted, the Trustees have grouped the injuries into categories, sometimes lumping impacts to similar species or habitats. In this way,

one larger restoration project, benefiting a suite of species or one primary species or habitat type, serves as the compensation for all injuries within that category. Table 1.1 summarizes the Trustees' injury quantification results.

1.4 Summary of Tentative Preferred Restoration Projects

The Trustees' mandate under the OPA (see, 33 U.S.C. 2706(b)) is to attempt to make the environment and the public whole for injuries to natural resources and natural resource services resulting from the discharge of oil. This purpose must be achieved through the restoration, rehabilitation, replacement or acquisition of equivalent natural resources and/or services. Thus, for a project to be considered, there must be a connection between natural resource injuries and proposed restoration actions.

Restoration actions under OPA are termed primary or compensatory. Primary restoration is any action taken to accelerate the return of injured natural resources and services to their baseline condition. Trustees may elect to rely on natural recovery rather than primary restoration actions where feasible or cost-effective primary restoration actions are not available, or where the injured resources will recover relatively quickly without human intervention.

Compensatory restoration is any action taken to compensate for interim losses of natural resources and services pending recovery. The scale of the required compensatory restoration will depend on the extent and severity of the initial resource injury and how quickly each resource and associated service returns to baseline. Primary restoration actions that speed resource recovery will reduce the amount of compensatory restoration.

For all of the biological injury categories, the Trustees assumed that natural processes would eventually lead to full recovery of the injured resources. Thus, the Trustees focused on restoration projects that would provide compensatory restoration for interim losses. To the extent that restoration projects are implemented prior to the completion of natural recovery, there is an element of primary restoration. This factor is taken into account in the scaling of the restoration project sizes.

The Trustees and their scientific advisors considered approximately 50 restoration concepts and alternatives with the potential to provide compensatory restoration. These were evaluated based on selection criteria developed by the Trustees consistent with the guidelines provided in the OPA regulations (15 C.F.R. § 990.54(a)). Section 4.2.4 of this draft Plan presents OPA-based selection criteria developed by the Trustees for this spill. Based on the Trustees' evaluation, a total of eight projects are being proposed as tentative preferred restoration projects. These are presented in Table 1-1. Note that these tentative preferred restoration projects were identified in part because they were amenable to the scaling process (i.e.; the projects were strong candidates for conducting quantitative comparisons between the benefits of restoration and the losses from the Stuyvesant Spill). The Trustees may further evaluate and prioritize restoration projects for implementation, based on the future availability of restoration funds.

Table 1-1: Summary of Injuries and Tentative Preferred Restoration Projects

Injury Category	Injury Estimate	Restoration Project
Loons and Grebes	77 estimated dead	10% contribution to Lake Earl project to benefit Western Grebe nesting colony
Pelicans, Cormorants, and Large Gulls	139 estimated dead	Protection or creation of 11 Double-crested Cormorant nests and Brown Pelican roost site at Old Arcata Wharf
Alcids (except Marbled Murrelet) and Procellarids	1,937 estimated dead (1,600 Common Murres)	27% contribution to Redding Rock project to benefit Common Murre nesting colony
Marbled Murrelets	135 estimated dead	Protection or creation of 12 to 14 highly productive nests; Corvid management program
Wetland Birds	117 estimated dead	Restoration of 4.8 acres of wetland habitat (Hookton Slough restoration)
Water Column Impacts	4.6 million shrimp and 6,000 fish estimated dead	Restoration of 1.2 acres of wetland habitat (Hookton Slough restoration)
Rocky Intertidal Impacts	162 acres impacted	Restoration of 0.8 acres of wetland habitat (Hookton Slough restoration)
Sandy Beach Impacts	3,054 acres impacted	Restoration of 6.6 acres of dune habitat
Human Recreational Use Losses	9,415 lost user-days 197 diminished user-days	$270,787 contribution toward recreational beach use improvements

Note that there are two projects to address the Marbled Murrelet injury and one combined wetland project to address injuries to wetland birds, water column biota, and rocky intertidal habitat.

2.0 Affected Environment

This chapter presents a brief description of the physical and biological environment affected by the *Stuyvesant* oil spill, and potentially affected by tentative preferred projects, as required by NEPA (40 U.S.C. Section 4321, et. seq.). The physical environment includes approximately 364 square miles of ocean, 60 miles of shoreline from Eel River Wildlife Area to Sharpes Point, Humboldt Lagoon State Park, and the mouths of Little River, Mad River, various smaller creeks, and Humboldt Bay. The biological environment includes a wide variety of birds, fish, mammals, shellfish, and other organisms. Several State and federally-recognized threatened or endangered species are also found within the spill zone. One species, the Marbled Murrelet, occurs primarily within the oiled area at sea.

2.1 Physical Environment

Humboldt Bay is centered geographically on the west coast of Humboldt County. The coast in the vicinity of the bay consists of low-lying river deltas that end in wide sandy beaches, while farther to the north and south are steep cliffs, ridges, and bluffs.

The outer coast of the Humboldt Bay complex contains approximately 1,600 acres of dune forest, vegetated dunes, and open sand. It is home to the Western Snowy Plover (*Charadrius*

alexandrinus nivosus). The North and South Spit areas are recognized as the most complete and least disturbed dune ecosystem on the west cost of the United States.

The Humboldt Bay water complex includes the northern Arcata Bay and the southern Humboldt Bay. It is the fifth largest estuary on the west coast and second largest in California. Because of the relatively limited amount of freshwater input to the bay, it has been described as a large, tidally-driven, coastal lagoon. At one time, the bay and adjacent wetlands covered more than 27,000 acres. However, the conversion of tidal areas to pastureland and other uses has reduced this area to 17,000 acres. Salt marsh habitat around the bay has been reduced even more dramatically, from 7,000 acres to approximately 700 acres.

2.2 Biological Environment

Humboldt Bay includes an extensive system of tidal mudflats and eelgrass beds that provide diverse fish and macro invertebrate communities, as well as highly productive year-round foraging habitats for wading birds and shorebirds. Intertidal wetlands are a critical part of the Humboldt Bay ecosystem to shorebirds, providing much of the primary productivity, nutrients, and invertebrate biomass that support the large numbers of birds that use the bay as a wintering area and migratory staging area. Humboldt Bay is very important as a link in the coastal flyway for waterfowl, shorebirds, and other water associated birds, supporting a total of 250 different species (Monroe et al. 1973). It has recently been declared a Western Hemisphere Shorebird Reserve Network site. Eelgrass thrives in the bay, due to the brackish to saline conditions that occur. Eelgrass meadows provide food, cover, spawning areas, or attachment surfaces for a variety of marine invertebrates, fish, shorebirds, waterfowl, and marine mammals. Eelgrass also stabilizes substrate, controls turbidity, and, to a lesser degree, controls shoreline erosion. (Helvie and Lowe 1985)

Rocky shores mark the coastline as one moves farther to the north and the south of the Bay. These areas support intertidal communities (including, crabs, mussels, and other macro invertebrates), as well as marine mammals. Offshore rocks provide habitat for large colonies of Common Murres and other seabirds**.**

Inland from the Bay are ancient redwood forests that include some of the largest and oldest trees in the world. Large old growth trees also provide nesting habitat for the Marbled Murrelet, a seabird that spends most of its life on the ocean.

2.2.1 Species of Concern

There are several species in the spill area that are of special concern due to their population status. These include the Brown Pelican, Snowy Plover, Marbled Murrelet, and Coho Salmon. The bird species, all of which suffered direct impacts from the spill, are discussed in Chapter 4. Coho Salmon, which would have been at sea at the time of the spill, are not suspected of suffering any impacts from the spill.

Two endangered species of plants (Menzies' Wallflower and Beach Layia) occur in dune areas in the Humboldt Bay Area. These plant species were of concern during beach cleanup efforts.

Careful management of vehicles and personnel involved in the spill response prevented impacts to these sensitive dune plants.

3.0 Selection of Injuries to Include in the Assessment

3.1 Authorities and Legal Requirements

The USFWS, the CDFG, and the California State Lands Commission, are the Trustees for the natural resources injured by the spill (Trustees). The USFWS is a designated Trustee for natural resources pursuant to subpart G of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 C.F.R. § 300.600 et seq.) and Executive Order 12580 (3 C.F.R., 1987 Comp. p. 193, 52 Fed. Reg. 2923 (January 23, 1987) as amended by Executive Order 12777 (56 Fed. Reg. 54757 (October 19, 1991)). The CDFG is a designated Trustee pursuant to OPA and has State natural resource trustee authority pursuant to Fish and Game Code section 1802 and the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (Gov. Code §§ 8670.1, et seq.). The CSLC has State natural resource trustee authority pursuant to Public Resources Code sections 6201, et seq. As a designated Trustee, each agency is authorized to act on behalf of the public under state and/or federal law to assess and recover natural resource damages and to plan and implement actions to restore, rehabilitate, replace, or acquire the equivalent of the affected natural resources injured as a result of a discharge of oil.

3.1.1 Overview of the Oil Pollution Act

The Oil Pollution Act (33 U.S.C. § 2706(b)) establishes a liability regime for oil spills which injure or are likely to injure natural resources and/or the services that those resources provide to the ecosystem or humans. Federal and state agencies and Indian tribes act as Trustees on behalf of the public to assess the injuries, plan restoration to compensate for those injuries and implement restoration. This draft DARP has been prepared jointly by CDFG, USFWS, and CSLC. OPA defines "natural resources" to include land, fish, wildlife, water sources 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 or Indian tribe, or any foreign government. Assessments are intended to provide the basis for restoring, replacing, rehabilitating, and acquiring the equivalent of injured natural resources and services. OPA provides that the Trustees may assess damages for natural resources injured under their trusteeship. OPA further authorizes the Trustees to develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent of the natural resources under their trusteeship. The process emphasizes both public involvement and participation by the Responsible Party(ies).

3.1.1.1 Coordination among the Trustees

The OPA NRDA regulations provide that where an oil spill affects the interests of multiple trustees, they should act jointly to ensure that full restoration is achieved without double recovery. (15 C.F.R. § 990.14(a)) The Trustees in this matter have worked together from the day of the spill in a shared effort to fully restore the resources that were injured. The National Oceanic and Atmospheric Administration (NOAA) initially participated in the NRDA process. Thereafter, NOAA decided to withdraw from the process and defer to the remaining Trustees' determinations regarding natural resource injuries and restoration.

3.1.1.2 Coordination with the Responsible Parties

The OPA NRDA regulations encourage the Trustees to invite responsible parties to participate in the NRDA and enter into agreements with them to promote cost-effectiveness and cooperation. (15 C.F.R, § 990.14(c)) The Trustees extended such an invitation and entered into a Cooperative Natural Resource Damage Assessment Agreement (hereinafter "Agreement") with Bean for this Oil Spill. The Agreement established a process by which representatives of Bean and the Trustees would coordinate their studies and other technical activities in the injury determination and quantification stages of the assessment. The Agreement was subsequently amended to extend its terms to restoration scaling and planning activities.

Under the Agreement, biologists, toxicologists, resource economists, and other specialists representing Bean and the Trustees cooperated as a technical working group in gathering and analyzing data and other information regarding injuries to various species and habitats, and in discussing potential actions that would restore, or compensate for, injured species and habitats. Consultants were employed to assist with certain issues requiring specialized expertise not possessed by representatives of Bean or the Trustees.

The Administrative Record contains the results of this cooperative effort, including reports on specific topics. The determinations and other decisions made by the Trustees, and documented in this draft DARP and elsewhere, reflect consideration of the efforts and input of the technical representatives of the parties.

3.1.1.3 Coordination with the Public

Public review of this draft DARP is an integral component of the restoration planning process. The Trustees have scheduled a 45-day public review period for the draft plan. This comment period opens on May 26, 2004 and closes on July 9, 2004. Comments must be received by that date to be considered part of the official record. Comments should be sent to the attention of Charlene Hall by fax (916-414-6713), in writing (U.S. Fish and Wildlife Service, 2800 Cottage Way, suite 2605, Sacramento, CA 95825), or via e-mail (Charlene_Hall@fws.gov).

The Trustees will hold a public meeting in Eureka, California on June 16, 2004 from 7 pm to 9 pm. At this meeting, the Trustees will present a brief overview of the draft DARP and accept public comment.

Further information on this public meeting and other activities of the Trustees will be distributed to those on the Trustees' mailing list, and will be announced at http://www.dfg.ca.gov/ospr/organizational/scientific/nrda/NRDAstuy.htm and through press releases. To be placed on the mailing list please contact Charlene Hall via the contact information listed above.

3.1.1.4 Administrative Record

The Trustees have opened an Administrative Record (Record) in compliance with 15 Code of Federal Regulations, section 990.45. The Record includes documents relied upon or considered thus far by the Trustees during the assessment and restoration planning performed in connection with the Spill. The Record is on file at the U.S. Fish and Wildlife Service, 2800 Cottage Way,

Suite 2605, Sacramento, CA 95825, and the California Department of Fish and Game, 619 Second Street, Eureka, CA 95501. Arrangements may be made to review the Record by contacting Charlene Hall at 916-414-6739 (for Sacramento) or Kris Wiese at Kwiese@ospr.dfg.ca.gov or 707-441-5762 (for Eureka). The Record may also be viewed at http://www.dfg.ca.gov/ospr/organizational/scientific/nrda/NRDAstuy.htm.

3.1.2 Compliance with Applicable Laws and Regulations

3.1.2.1 Federal Statutes

Oil Pollution Act of 1990 (33 U.S.C. §§ 2701, et seq.; 15 C.F.R. Part 990)

The Oil Pollution Act, 33 U.S.C. 2706(b), establishes a liability regime for oil spills which injure or are likely to injure natural resources and/or the services that those resources provide to the ecosystem or humans. Federal and state agencies and Indian tribes act as Trustees on behalf of the public to assess the injuries, scale restoration to compensate for those injuries and implement restoration. This draft DARP has been prepared jointly by CDFG, USFWS, and CSLC. Each of these agencies is a designated natural resource Trustee under OPA and/or State law, for natural resources injured by the Stuyvesant Spill. OPA defines "natural resources" to include land, fish, wildlife, water sources 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 or Indian tribe, or any foreign government. Assessments are intended to provide the basis for restoring, replacing, rehabilitating, and acquiring the equivalent of injured natural resources and services. OPA provides that the Trustees may assess damage for natural resources under their trusteeship. OPA further authorizes the designated Trustees to develop and implement a plan for the restoration, rehabilitation, replacement, or acquisition of the equivalent of the natural resources under their trusteeship. The process emphasizes both public involvement and participation by the Responsible Party(ies).

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

The National Environmental Policy Act sets forth a process of environmental 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.” (42 U.S.C. § 4321) The law requires the government to consider the consequences of major federal actions on human and natural aspects of the environment in order to minimize, where possible, adverse impacts. Equally important, NEPA established a process of environmental review and public notification for federal planning and decision making.

Generally, when it is uncertain whether an action will have a significant effect, federal agencies will begin the NEPA planning process by preparing an environmental assessment (EA). The EA

may undergo a public review and comment period. Federal agencies may then review the comments and make a determination. Depending on whether the impact is considered significant, an environmental impact statement (EIS) or a finding of no significant impact (FONSI) will be issued.

The Trustees are integrating the OPA restoration planning process with the NEPA process to comply, in part, with those requirements. This integrated process allows the Trustees to meet the public involvement requirement of OPA and NEPA concurrently. The draft DARP is the equivalent of a public scoping document under NEPA.

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

The Clean Water Act (CWA or the "Act") is the principle statute governing water quality. The Act's goal 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 Act 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 (NPDES) 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 The Act allows the federal government to remove the substance and assess the removal costs against the responsible party.

Section 404 of the Act authorizes the U.S. Army Corps of Engineers (the "Corps") to issue permits, after notice and opportunity for public hearings, for the disposal of dredged material into navigable waters. Generally, projects which move material in or out of waters or wetlands require section 404 permits. Section 401 of the Act provides that projects that involve discharge or fill to wetlands or navigable waters must obtain certification of compliance with state water quality standards.

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 (acting through the California Coastal Commission) 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 do not believe that the tentative preferred restoration alternatives in the draft DARP will adversely affect the state's coastal zone. However, to comply with the CZMA, the Trustees intend to seek the concurrence of the California Coastal Commission that their tentative

preferred restoration projects are consistent to the maximum extent practicable with the enforceable policies of California's Coastal Management Program.

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 upon which they depend. The ESA directs all federal agencies to utilize their authorities to further these purposes. All federal agencies are required to ensure that any action that they authorize, fund or carry out is not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of habitat designated as critical for such species, unless the agency is granted an exemption for the action. Under the ESA, the National Marine Fisheries Service (NMFS) and the USFWS publish lists of endangered and threatened species. If a federal agency proponent (action agency) of a project determines that a listed species may be in the action area of the project, the agency must consult with the Fish and Wildlife Service and/or NMFS to ensure that implementing the project will not jeopardize the listed species. If the action agency concludes that the project will not affect a listed species or its critical habitat, it submits a "no effect determination" to the USFWS and / or NMFS for its concurrence. If the project constitutes a major construction activity, then the action agency must prepare a biological assessment with a more in-depth evaluation of the potential effects of the project on the listed species, which may still lead to a no effect determination. If the project is likely to adversely affect either a listed species or its critical habitat, then more formal consultation procedures are required. See Appendix A for a list of federally listed/proposed species in Humboldt County, CA.

The federally endangered California Brown Pelican and the federally threatened Marbled Murrelet and Western Snowy Plover may utilize and/or nest on beaches, other coastal features, and in forests which may be included in selected areas for implementing restoration projects. Marbled Murrelets nest near and around the proposed corvid control projects sites and nest within the acquisition project sites. Corvid and Murrelet surveys will occur in a manner that will not disturb Murrelets, and are intended to increase nest success of Murrelets. Several species of birds, including the California Brown Pelican and the Western Snowy Plover may utilize beaches near the proposed recreational use projects, habitat restoration projects, and seabird restoration projects. These projects will be implemented outside of the nesting and rearing season and will not be located within zones of the beaches used for nesting.

The Trustees will evaluate whether any of the restoration projects constitute a major construction activity or will adversely affect listed species. The Trustees will submit this determination to the USFWS and/or NMFS and will seek written concurrence prior to implementing the projects. If the Trustees determine that a restoration project will adversely affect a threatened or endangered species, they will either redesign the project, substitute another project, or consult with the USFWS and/or NMFS to obtain necessary permits or approvals under Section 7 of the Endangered Species Act.

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 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.

The Trustees believe that the tentatively preferred projects in the draft DARP will have no adverse effect on EFH and will promote the protection of fish resources and EFH.

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

The federal Fish and Wildlife Coordination Act (FWCA) requires that federal agencies consult with the USFWS, NMFS, 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 Clean Water Act, NEPA or other federal permit, license or review requirements.

The Trustees will consult with the appropriate agencies on any projects that involve activities that affect, control or modify water bodies.

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 and marine otters, polar bears, manatees, and dugongs. The Secretary of Commerce delegated MMPA authority to NMFS. 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 requirement may be waived provided that the proposed activity results in only harassment, and no serious injury or mortality is anticipated.

The Trustees do not expect the restoration projects listed as tentatively preferred alternatives in the draft DARP to “take,” “harass,” or “injure” any species protected under the MMPA.

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, capture, or kill, possess, offer for sale, sell, …offer to purchase, purchase, deliver for shipment, ship, …cause to be shipped, … deliver for transportation, transport, cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, 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 promulgates "framework regulations" based on the best current population data available, and states promulgate regulations that conform to the 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 Interior have responsibility to manage all migratory birds wherever they occur, including marine birds.

The MBTA also is 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.

The tentative preferred projects in the draft DARP 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, or regulations and/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 which authorize specific activities in a sanctuary, in order 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 damages to sanctuary resources. The NMSA defines natural resource damages to include the cost of replacing, restoring, or acquiring the equivalent of a sanctuary resource; the value of the lost use of the resource pending its restoration; the cost of damage assessments; and 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.

Park System Resource Protection Act(16 U.S.C. § 19(jj))

Public Law 101-337, the Park System Resource Protections Act (PSRA; 16 U.S.C. 19jj), authorizes the Secretary of the Interior (Secretary) to assess and monitor injuries to the National Park Service (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 NPS.…" except for resources owned by a non Federal entity. 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. The Act further provides that "response costs" include monitoring ongoing effects of incidents causing such destruction, loss, or injury. "Damages" include the cost of "replacing, restoring, or acquiring the equivalent of a park system resource" and the "value at any significant loss of use" of such resources.

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 Army Corps of Engineers with authority to regulate discharges of fill and other materials into such waters. Restoration actions that require Section 404 Clean Water Act 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 mechanisms.

Executive Order (EO) 11988 – Construction in Flood Plains

This 1977 Executive Order directs federal agencies to avoid, to the extent possible, the long-and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct or indirect support of development in flood plains wherever there is a practicable alternative. Each agency is responsible for evaluating the potential effects of any action it may take in a flood plain. Before taking an action, the federal agency should determine whether the proposed action would occur in a flood plain. 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 flood plains. If the only practicable alternative requires citing in a flood plain, 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 flood plain.

Executive Order 13112 - Invasive Species

Executive Order 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."

Executive Order (EO) 12898 - Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This Executive Order 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. EPA and the Council on Environmental Quality (CEQ) 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 is no low income or ethnic minority community that would be adversely affected by the tentative preferred projects in the draft DARP.

Environmental Justice further requires federal agencies to provide opportunities for community input in the NEPA process. The Trustees will involve the affected community by providing notice to the public, seeking public comments, holding public meetings and providing public access to the Administrative Record.

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 that are intended to ensure and maximize the quality of the objectivity, utility and integrity of such information. This draft DARP is an information product covered by information quality guidelines established by USFWS and DOI for this purpose. The quality of the information contained herein is consistent with these guidelines, as applicable.

3.1.2.2 State Statutes

California Environmental Quality Act (Pub. Res. Code §§ 21000-21178.1)

The California Environmental Quality Act (CEQA) was adopted in 1970 and applies to most public agency decisions to carry out, authorize or approve projects that may have adverse environmental impacts. CEQA requires that agencies inform themselves about the environmental effects of their proposed actions, consider all relevant information, provide the public an opportunity to comment on the environmental issues, and avoid or reduce potential environmental harm whenever feasible.

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 discretionary action by an agency that may cause a significant effect on the environment. Once the agency determines that the "project" is subject to CEQA, the lead 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 must be prepared to determine whether the project may have a potentially significant effect on the environment. Alternatively, the lead agency may consider an environmental assessment prepared pursuant to NEPA to determine whether the project may have a potentially significant effect on the environment. Based on the initial study/environmental assessment, the lead agency determines the type of CEQA documentation that will be prepared. The test for determining whether an environmental impact report (EIR) or negative declaration must be prepared is whether a fair argument can be made based on substantial evidence that the project may have a significant effect on the environment.

The State Trustee (CDFG) considers many of the projects to be categorically exempt pursuant to: (1) "Minor alterations to land, water, or vegetation"; (2) "Actions by regulatory agencies for protection of natural resources", and (3) "Actions by regulatory agencies for the protection of the environment." However, the Trustees intend to undertake further environmental review under NEPA/CEQA. CEQA encourages the use or adoption of a federal EIS or FONSI prepared pursuant to NEPA when such documents are available, or the preparation of joint state/federal documents, in lieu of preparing a separate EIR or negative declaration under CEQA.

The Trustees are integrating the OPA restoration planning process with the NEPA and CEQA processes to comply, in part, with CEQA. This integrated process allows the Trustees to satisfy the public involvement requirements of OPA, NEPA , and CEQA concurrently.

California Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (Gov. Code §§ 8670.1, et seq.)

The Lempert-Keene-Seastrand Oil Spill Prevention and Response Act, commencing with Government Code section 8670.1, became effective on September 24, 1990. This legislation is the key state compensatory mechanism for subsequent spills. It establishes a comprehensive liability scheme for damages resulting from marine oil spills. Recoverable damages include injury to natural resources, the cost of rehabilitating wildlife, habitat, and other resources, and loss of use and enjoyment of natural resources, public beaches, and other public resources. Responsible parties are required to fully mitigate adverse impacts to wildlife, fisheries, and wildlife and fisheries habitat by successfully carrying out environmental restoration projects or funding the activities of CDFG to carry out environmental restoration projects.

California Coastal Act (Pub. Res. Code §§ 30000, et seq.)

The California Coastal Act was enacted by the State Legislature in 1976 to provide long-term protection of California's 1100-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) 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.

The California Coastal Commission's authority (called federal consistency review) comes from the Federal CZMA. After California's Coastal Management Program was approved by the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce pursuant to the CZMA in 1977, all federal activities affecting coastal zone resources became subject to the California Coastal Commission's regulatory jurisdiction.

The Trustees do not believe that the tentative preferred projects in the draft DARP will adversely affect California's coastal zone resources. However, the Trustees intend to seek the California Coastal Commission's concurrence that restoration projects selected for implementation are consistent with California's Coastal Management Program.

California Endangered Species Act (Fish and G. Code §§ 2050 et seq.)

It is the policy of the State of California that state agencies should not approve projects as proposed which 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. If reasonable alternatives are infeasible, individual projects may be approved if appropriate mitigation and enhancement measures are provided. Under this act, the Fish and Game Commission established a list of threatened and endangered species based on *criteria* recommended by the CDFG.

California Harbor and Navigation Code, section 294

Harbors and Navigation Code Section 294 creates absolute liability for damages from the discharge or leaking of gas, oil, or drilling waste onto marine waters. Damages include cost of wildlife rehabilitation and injury to natural resources or wildlife, and "loss of use and enjoyment of public beaches and other public resources or facilities."

Public Resources Code, Division 6, sections 6001, et seq.

The Public Resources Code, Division 6, gives the CSLC trustee ownership over State sovereign tide and submerged lands. Permits or leases may be required from the CSLC if a restoration project is located on such lands.

3.1.2.3 Other Potentially Applicable Statutes and Regulations

Additional statutes may be applicable to 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)
- Clean Air Act, 42 U.S.C. 7401, *et seq*.
- 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

4.0 4.0 Injury Quantification and Restoration Planning

This chapter describes the Trustees' efforts to quantify the nature, extent, and severity of injuries to natural resources and the lost or diminished recreational uses resulting from the oil spill (please refer to section 3.1.1.2, above, which describes the cooperative assessment approach utilized by the Trustees). It begins with an overview of the data collected immediately after the spill as part of the "pre-assessment" phase, followed by a description of the damage assessment strategy and methods used to determine and quantify the injuries. The remainder of the chapter presents summaries of the injury quantification results, restoration options, including a no-action alternative, and restoration scaling for all injury categories.

4.1 Overview of Pre-assessment Activities and Findings

When oiled birds began arriving on the beaches, the Trustees responded, recognizing that natural resource injuries were likely occurring. Pre-assessment activities, as described in the OPA regulations, focused on collecting ephemeral data essential to determine whether: (1) injuries had resulted, or were likely to result, from the incident; (2) response actions were adequately addressing, or were expected to address, the injuries resulting from the incident; and (3) feasible restoration actions existed to address the potential injuries. The following summarizes key Pre-assessment activities and findings:

Oiled Wildlife Search and Collection: These activities were conducted for response purposes to capture live oiled wildlife, if possible (for potential rehabilitation), and to remove dead oiled wildlife from the impacted areas. The data gathered related to these activities is useful for natural resource damage Pre-assessment. In this case, search and collection spanned 20 days (from September 8 to 28 1999) and covered 100 miles of coastline (from the South Spit of the Humboldt Bay to the Smith River). These surveys recovered a total of 1,251 birds (642 live and 609 dead), including 24 Marbled Murrelets. The breakdown by species is provided under the injury categories below. The surveys also documented impacts to the water column, as over 2 million shrimp (*Thyanoessa spinifera*) were discovered washed up dead along the North Spit (i.e., Fairhaven Beach and Dugan's Cove) and along the northern portion of the South Spit.

Shoreline Cleanup and Assessment Team (SCAT) Surveys: These surveys were conducted for response purposes, to inform and guide the Incident Command Center in their efforts to cleanup the oil. The data gathered by these surveys is useful for natural resource damage Pre-assessment. In this case, the surveys spanned 20 days (from September 8 to 28, 1999) and covered 100 miles of coastline (from the South Spit of Humboldt Bay to the Smith

River). These surveys indicated that 60 miles of coastline, including both sandy beach and rocky intertidal habitat, were exposed to oil.

Aerial Surveys: These surveys were conducted, to provide counts and species identification of marine birds and mammals in the vicinity of the spill or spill trajectory. The data gathered by these surveys was useful for natural resource damage Pre-assessment. Surveys were conducted on September 8 and 9, 1999. Near shore survey lines were flown parallel to the coast about 50 meters to 100 meters from the edge of the surf zone, and offshore survey lines were flown up to 19 km seaward. On September 8 and 9, the total survey distance flown was 882.13 km. These surveys extended as far north as the mouth of the Klamath River and as far south as the mouth of Humboldt Bay. A third survey was flown on October 1, 1999, in order to provide wildlife data for the coastline north of the Klamath River. This 380.4 km survey covered the area between the mouth of Humboldt Bay and Crescent City, California.

Boat Surveys: These surveys were conducted for response purposes, to provide information on location of oil on water and oiled wildlife, and to census marine birds and mammals that were at risk of exposure to oil. Surveys were conducted in Humboldt Bay (north and south bays, and the shipping channel) and adjacent offshore waters from September 7 to 24, 1999. Offshore survey transects ran parallel to the shore at distances of 400 m, 800 m, 1.4 km, 2 km, 3 km, 5 km, and 10 km offshore.

Human Recreational Use Research: During the spill, the Trustees documented beach closures and maintained communication with local authorities and the Incident Command Center regarding other possible impacts to human recreational activities.

Based on information collected during the Pre-assessment efforts summarized above, the Trustees identified the following categories of injury: (1) birds (which were further divided into sub-groups according to species and restoration options), (2) water column species, (3) shoreline habitat, and (4) recreational use. The Trustees determined that a number of potential restoration actions exist to compensate for the losses and proceeded with injury assessments.

4.2 Injury and Damage Assessment Strategy

The goal of injury assessment is to determine the nature, extent and severity of injuries to natural resources, thus providing the technical basis for evaluating and scaling restoration actions. The OPA regulations define injury as “an observable or measurable adverse change in a natural resource or impairment of a natural resource service.” Diminution in the quantity and/or quality of recreational use of natural resources also constitutes an injury as defined by the OPA regulations.

For each of the injury categories, the Trustees selected appropriate assessment procedures based on the: (1) range of procedures available under section 990.27(b) of the OPA regulations; (2) time and cost necessary to implement the procedures; (3) potential nature, degree, and spatial and temporal extent of the injury; (4) potential restoration actions for the injury; (5) relevance and adequacy of information generated by the procedures to meet information requirements of

planning appropriate restoration actions; and (6) input from consultants with damage assessment experience, scientific experts, and/or technical consultants representing Bean.

Each injury assessment focused on determining both the magnitude of the injury (i.e., number of animals killed or area of habitat lost) and the time to full recovery. This produces an estimate of direct plus interim (from the time of injury until full recovery) loss of resources resulting from the oil. Injury estimates in future years were discounted at three percent per year (NOAA 1999).

4.2.1 Damage Assessment Methods for Birds

4.2.1.1 Estimation of Numbers of Birds Impacted

The first step in injury quantification was to estimate the number of birds impacted, by species. Not all impacted birds are found and collected during spill response for a variety of reasons:

- *Unsearched areas*. Because precipitous parts of the coastline are inaccessible, they often remain unsearched by spill responders. In this case, much of the Trinidad Head area was unsearched or sparsely searched.
- *Scavenging*. Scavengers (including mammals such as raccoons and birds such as gulls and crows) may pick apart or entirely remove dead birds from the beaches.
- *Search efficiency*. Spill responders searching for beach cast birds may not find them all.
- *Re-wash*. Bird carcasses that are deposited on a beach may be subsequently removed from the beaches by high tides or large waves and re-deposited elsewhere. One recent study found that birds on sandy beaches were more subject to re-wash than birds on rocky coastlines (Glenn Ford, R.G Ford Consulting Company, Inc., personal communication). Over time, birds would end up disproportionately on rocky shorelines, where they are less likely to be removed by re-wash processes. This study also found that dead birds were just as likely to strand on "reflective" coastlines, with cliffs and rocks, as they were to strand on sandy "depositional" beaches.
- *Beach transit*. It is often assumed that live oiled birds come to the beaches and simply stop there. Recent experience, however, has noted that many birds, including Common Murres, may continue walking inland, perhaps in search of cover. In one case, 16 of 16 live beached murres walked several hundred meters inland into a dune complex, where they could not be found (Steve Hampton, CDFG, personal communication). This was based on observations of Common Murre tracks heading into adjacent dunes.
- *Removal or burial by the public*. On beaches with even light human use, dead birds are subject to being tossed in trash cans or buried in the sand. This may prevent their discovery by spill response crews.
- *At-sea loss*. Because many oiled hypothermic birds lose bodyweight quickly and die of starvation within two days (Oka and Okuyama 2000), some birds never make it to the beach. Dead or dying birds are often subject to winds and currents, which may carry them offshore. Additionally, dead and dying birds are subject to scavenging and predation while at sea.
- *Departure from the area*. Larger birds, such as pelicans, are sometimes able to survive minor oiling for many days. During this time, they may travel well outside the spill zone and beyond the scope of response personnel.

The Beached Bird Model (see Ford et al. 1987) seeks to take some of these factors into consideration, by estimating the number of birds killed from the numbers of birds found on the beach (a method called "back casting"). Using estimated rates of carcass disappearance, the number of birds removed or not found on the beaches is then estimated. Using a simplified example, if the odds of a bird being removed by a scavenger in the course of a day are 50% and the odds of it being overlooked by a searcher are 50%, then the odds of it being recovered are 25%. This would imply that, for every one bird found, three more are missed. This would result in a "beached bird multiplier" of four. That is, one bird recovered implies that four birds were impacted.

The Beached Bird Model used in this case was based on Ford et al.(1987; 1996), but was further developed by the Trustee-RP technical working group. Modifications to the model also relied on previous studies to guide the choice of scavenging and search efficiency parameters. The model incorporated different scavenging rates for large and small birds; it was assumed that small birds were more likely to be removed from the beaches than large birds.[4] In addition, all birds were more likely to be scavenged when fresh, and less likely as they decomposed. Likewise, the model incorporated different search efficiency rates, depending upon the size of the bird, the coloration of its plumage, the method of the search, and the type of beach that was searched. The Trustee-RP technical working group assumed that small, dark, birds on rocky beaches had lower "find ability" than larger, white-bellied birds on open sandy beaches. They also assumed that searches conducted using ATVs or vehicles had lower search efficiency than foot searches.

Because of the location of the spill and level of search effort, re-wash, beach transit, removal or burial by the public, at-sea loss, and departure from the area were considered to be small factors in this case and were not evaluated or included in the model. To the extent that these factors contributed to carcass disappearance, the model may provide an underestimate of actual bird mortality.

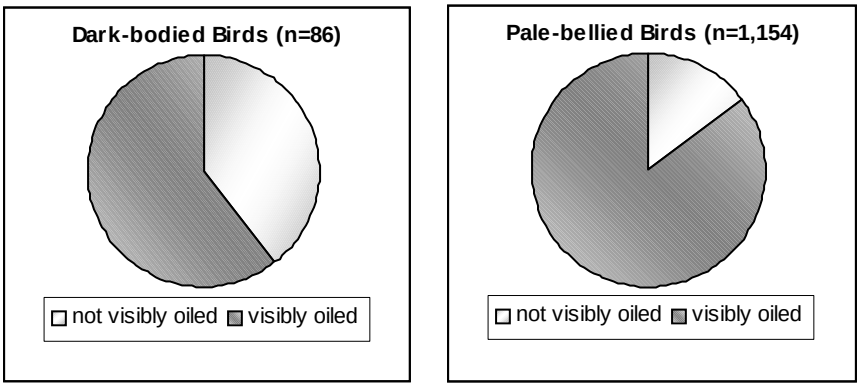
During any spill response, some level of natural background mortality can be expected to contribute to the number of birds collected. Before the Beached Bird Model can be employed, it is appropriate to separate such birds from the spill-related birds that were collected. It is not sufficient to assume that birds without visible oiling are not spill related. Spill related birds might show no visible oiling for the following reasons:

- *Thin sheen or small amounts of oil*. For ocean-going birds that must rely on the sea for their food, a spot of oil the size of a nickel may be sufficient to cause death. Like a hole in a wetsuit, the oil destroys the feathers' ability to insulate the bird, thus allowing cold ocean water to spread against the bird's skin. Birds typically die of hypothermia and starvation (Moskoff 2000). Often, such small traces of oil may be difficult to see on a bird. They may appear wetted, like a wet dog, but show no oil.
- *Scavenging*. Oil usually coats the under parts of a bird, such as the belly and breast, as the bird swims in the ocean. These are the same parts of the bird that are removed by scavengers. Experience in California and a recent study in Canada have found that scavengers do not hesitate to feed upon oiled birds (Wiese 2002). When this occurs,

[4] The definition of a small bird was one that could be carried off by a gull or raven. Large birds could only be removed from the beach by a mammalian scavenger. The cut-off for small birds was Rhinoceros Auklet. Birds larger than this were considered large birds.

those feathers are often removed. Scavenging often occurs in the first few hours or days after a bird is beached. It is not unusual for a fresh bird to be reduced to a skeleton overnight (Ford and Ward 1999).

- *Dark plumage*. Because oil is usually black, it is most difficult to see on dark-plumaged birds. While most seabirds have white under parts, some are entirely dark in plumage color. In this spill, dark-plumaged birds (Sooty Shearwater, all cormorant species, all scoter species, Tufted Puffin, and Pigeon Guillemot) were almost three times as likely to be labeled "not visibly oiled" as were pale-bellied species (40% verses 15%).



There are two approaches to accounting for natural mortality among the birds collected:

1. Examine each entry in the intake log and remove each individual bird that seems unlikely to be spill related (e.g. old, desiccated carcass on the first day of the spill; gunshot wound, etc.)
2. Estimate the average background carcass deposition rate and subtract a flat rate from the total number of birds collected during the response. In some cases, beached bird surveys in the area may provide historical data for individual beaches and time of year, by species.

In this case, the Trustee-RP technical working group (see section 3.1.1.2 for a description of this group) agreed to use the first approach. After careful evaluation of the bird intake logs, they agreed that 1,251 birds were spill-related. Nineteen birds were determined to be unrelated to the spill, as their carcass condition indicated that they pre-dated the spill.

Using this data set of 1,251 birds, the Beached Bird Model was employed to estimate the actual mortality that occurred during the spill. Additionally, the Trustees had to evaluate the fate of rehabilitated and released birds. During the response, 284 birds were rehabilitated and released, 253 of which were Common Murres. Although there is uncertainty associated with the fate of such birds, several studies have suggested that post-rehabilitation survival is extremely low (e.g., less than 10%), especially for alcids such as Common Murres (Sharp 1996). During the Stuyvesant response, the Oiled Wildlife Care Network conducted a telemetry study of Common Murres associated with this oil spill. Detailed results have not yet been published, but summaries have been presented at meetings (Newman and Mazet 2001). These summaries suggest a survival rate possibly greater than the earlier studies. Given this, the Trustees assumed that 75% of the rehabilitated birds died (n = 213), while 25% survived to join (or re-join) the

breeding population. The results of the Beached Bird Model are presented in the Injury Quantification section for each species grouping below.

4.2.1.2 Bird Restoration Categories

For restoration planning purposes, the Trustees concluded that it was not desirable to implement restoration projects for each of the 35 bird species impacted. For many of these species, no restoration project has ever been implemented, creating challenges with respect to feasibility. For others, the impact was relatively small, implying that a small restoration project would suffice for compensation. The implementation of many small projects, however, would be economically inefficient, as each project incurs some level of fixed costs. Thus, in order to focus restoration efforts on larger, efficient, and feasible projects, the Trustee RP technical working group created restoration categories for birds according to the following criteria:

1. The species in each group should be similar in their habitat preferences and life histories.
2. The species in each group are likely to benefit from a single restoration action.
3. Each grouping must contain one or more species for which there are feasible restoration options.
4. Species with declining populations with special restoration needs should be specifically addressed to the extent feasible.

The following groupings were constructed by the technical working group:

Marbled Murrelet
This species is unique in that it is the most sensitive species, with respect to population size, to suffer direct mortality from the spill and thus requires special attention in terms of both primary and compensatory restoration. Furthermore, among the species impacted by the spill, this species has relatively narrow habitat requirements.

Grebes and Loons
These species are fairly similar in their breeding and wintering habitat preferences, as well as their foraging techniques and prey preferences.

Large Gulls, Cormorants, Pelicans
These species can all be found on coastal rocks and other platforms, where they nest or roost. They all forage in the near-shore ocean. A project providing nesting or roosting opportunities for any one of these species will likely benefit the others. Large Gulls includes Western and Glaucous-winged Gulls.

Alcids (except Marbled Murrelet), Procellarids
This category includes the Common Murre, the species most heavily impacted, with respect to numbers killed, by the spill. All of these species forage at sea and nest on offshore rocks.

Medium and Small Gulls, Terns, Scoters, Coot, Egret, Geese, Phalaropes
This is a category for several species that suffered relatively less mortality than others, with the exception of the scoters. Most of these species forage in wetlands or on fish or invertebrates that come from wetlands. The gulls include California, Ring-billed, and Sabine's Gull.

Snowy Plover

While no birds of this species were collected dead, ten were observed oiled. Snowy Plovers are a sensitive species with unique habitat preferences, and the coastal population of the Western Snowy Plover is listed as threatened under the federal Endangered Species Act.

All impacted birds were accounted for in the calculation of compensatory damages. Thus, just because a species was grouped with others and may not benefit from a specific restoration project, it was not ignored in the damage estimations. Spill-related mortality was estimated for each species and all injuries within each grouping were counted when scaling restoration.

4.2.1.3 Damage Quantification for Birds

Damage quantification relied on a service-to-service restoration-based approach; that is, the Trustees sought to determine appropriate restoration projects to both restore the injured resources and compensate for the interim losses between the time of the spill and full recovery to pre-spill conditions (see NOAA 1997). Restoration scaling is the process of determining the appropriate size of a restoration project. These projects, because of their compensatory nature, are intended to provide resources "of the same type and quality, and of comparable value" as the resources which were injured (NOAA 1995). For this task, the Trustees relied upon the Resource Equivalency Analysis (REA) method for injury and restoration scaling.

The REA method is divided into two main tasks: the debit calculation and the credit calculation. The debit calculation involves determining the amount of "natural resource services" that the affected resources would have provided had they not been injured. The unit of measure may be acre-years, stream feet-years, or some other metric (such as bird-years). The credit calculation seeks to estimate the quantity of those resource services that would be created by a proposed compensatory restoration project. Thus, the size of the restoration project is said to be "scaled" to equal the size of the injury. Consistent with federal recommendations for NRDA (NOAA 1997; see also NOAA 1999) and generally accepted practice in the field, future years are discounted at a rate of 3% per year. This discounting is done based on the assumptions that present services are more valuable than future services, and that some uncertainty exists when estimating future restoration benefits. This assumption is typically used by the Trustees when scaling restoration projects.

When the injury is primarily to individual animals rather than to a complete habitat, the REA may focus on lost animal-years. For example, suppose an oil spill causes negligible injury to a body of water, but results in the death of 100 ducks. Using information about the life history of the ducks (e.g., annual survival rate, average life expectancy, average fledging rate, etc.), it is possible to mathematically model/estimate the lost "duck-years" due to the spill. On the credit side, restoration projects can be designed to create duck nesting habitat and scaled, such that the size of the project is sufficient to create as many "duck-years" as were lost in the incident. This

is the approach used for the bird species groups listed above. The scaled project sizes and some of the details used in the scaling calculations are provided below. See Appendix B for further details on the REA method.

There are a variety of ways to calculate lost bird-years, all of which imply informed biological assumptions regarding the recovery of the species from the spill. For all species, the Trustees assumed that a representative section from each age class was killed by the spill. For all species except the Marbled Murrelet, the Trustees employed a single-generation stepwise replacement approach, which will be described here. The Marbled Murrelet calculation will be described under the Injury Quantification section for that species below.

The single-generation stepwise replacement approach to calculation of lost bird-years assumes that each year after the spill the juvenile age class will be entirely replaced. That is, despite the fact that some breeding adults have been removed from the population, the population produces the same number of juveniles post-spill as it did pre-spill.[5] Thus, the youngest age class impacted by the spill will fully recover to its pre-spill level after the next breeding season. The second-year age class will fully recover two years after the spill, as the recovered first-year birds grow older. Likewise, the third-year age class will fully recover after three years, and so on. Mathematically, this is equal to calculating the number of years lost by the killed birds, based on the life expectancy of each age class. Details regarding the demographic parameters used to calculate lost bird years are presented in Appendix C.

The bird-years gained by each restoration project were evaluated differently, depending upon the benefits associated with each specific project. These will be explained below.

4.2.2 Damage Assessment Methods for Habitat

The impacted habitats included the water column and shoreline habitats.

For evaluating impacts to the water column, the Trustee-RP technical working group estimated the number of dead animals within the water column, using observations of dead shrimp and modeling of oil toxicity in the ocean. This injury quantification information was then used in a trophic-level REA to scale an out-of-kind restoration project (wetlands) that would compensate for injuries to the water column. This is explained in detail in Section 4.3.6 and Appendix I.

For evaluating impacts to shoreline habitats, the Trustee-RP technical working group estimated the number of acres oiled, the degree of oiling, and the associated degree and duration of injury associated with the oiling. Specific habitat types included sandy beaches and rocky intertidal areas. This injury quantification information was then used in a Habitat Equivalency Analysis (HEA) to scale restoration of dunes and wetlands (see Appendix J).

[5] Biologically, this could occur if the population was at carrying capacity with respect to breeding opportunities (perhaps limited by available nesting habitat or food base during the nesting season). The loss of some adults would open up room for other adults to take over the vacant nesting opportunities and thus maintain the population's annual production of juveniles.

4.2.3 Damage Assessment Methods for Recreational Use

For recreational use impacts, the Trustees and Bean commissioned a joint study by consultants that sought to place a direct dollar value on the loss to the public. The consultant used the following approach:

1. Determined the types of recreational activities impacted.
2. Quantified the number of trips lost due to closures of beaches and boat ramps.
3. Quantified the number of trips diminished in value due to the spill.
4. Determined appropriate values per trip for various activities, based on previous economic studies of the value of outdoor recreation.
5. Multiplied the value per trip or diminished trip by the number of affected trips to arrive at a final lost value figure.

The full report on the recreational use injury assessment and results can be found in the Administrative Record (see section 3.1.1.4. for information on accessing Administrative Record documents).

4.2.4 Restoration Project Selection Criteria

The Trustees considered numerous restoration alternatives to compensate the public for spill-related injuries. Each restoration alternative was evaluated using the initial screening criteria:

Phase I - INITIAL SCREENING CRITERIA: The following initial screening criteria were used to select the tentative preferred and non-preferred restoration projects presented in this draft DARP.

A. **Consistency with Trustees' Restoration Goals.** Projects must meet the Trustees' intent to restore, rehabilitate, replace, enhance, or acquire the equivalent of the injured resources and resource services.

B. **Technical Feasibility.** The project must be technically and procedurally sound. Consider the level of risk or uncertainty and the degree of success of projects utilizing similar or identical techniques in the past.

C. **Cost-Effectiveness.** Consider the relationship of expected project costs to expected resource and service benefits. Seek the least costly approach to deliver an equivalent or greater amount and type of benefits.

D. **Relationship to Injured Resources and/or Services (nexus).** Projects that restore rehabilitate, replace, enhance, or acquire the equivalent of the same or similar resources or services injured by the spill are preferred to projects that benefit other comparable resources or services. Consider the types of resources or services injured by the spill, the location, and the connection or "nexus" of project benefits to those injured resources.

E. **Time to Provide Benefits.** Consider the time it takes for benefits to be provided to the target ecosystem, species, or public to minimize interim resource loss (sooner = better).

F. **Duration of Benefits.** Consider the expected duration of benefits from the project. Long-term benefits are the objective.

Phase II - ADDITIONAL SCREENING CRITERIA: The following additional criteria are not considered to be of lesser importance than the initial screening criteria. These criteria are generally more appropriately applied after more detailed project plans and scopes of work are developed. To the extent that sufficient information was available, these criteria were used during the tentative preferred restoration project identification process. These additional screening criteria will be used to further evaluate and prioritize tentative preferred projects for funding and implementation.

G. **Avoidance of Adverse Impacts.** The project should avoid or minimize adverse impacts to the environment and the associated natural resources. Adverse impacts may be caused by collateral injuries when implementing, or as a result of implementing, the project. Consider avoiding future short-term and long-term injuries as well as mitigating past injuries.

H. **Likelihood of Success.** Consider the potential for success and the level of expected return of resources and resource services. Consider also the ability to evaluate the success of the project, the ability to correct problems that arise during the course of the project, and the capability of individuals or organizations expected to implement the project.

I. **Multiple Resource and Service Benefits.** Consider the extent to which the project benefits more than one injured natural resource or resource service. Measure in terms of the quantity and associated quality of the types of natural resources or service benefits expected to result from the project.

J. **Compliance with Applicable Federal, State, and Local Laws and Policies.** The project must comply with applicable laws and policies.

K. **Public Health and Safety.** The project must not pose a threat to public health and safety.

L. **Maintenance and Oversight of Project.** Consider the opportunities to protect the implemented project and resulting benefits over time through conservation easements, land acquisition, or other types of resource dedication. Long-term protection is preferable.

M. **Opportunities for Collaboration.** Consider the possibility of matching funds, in-kind services, volunteer assistance, and coordination with other ongoing or proposed projects. External funding and support services that reduce costs or extend benefits are preferable.

Funds, however, shall not be used to offset the costs of ongoing mitigation projects required pursuant to state or federal law.

N. **Total Cost and Accuracy of Estimate.** The total cost estimate should include costs to design, implement, monitor, and manage the project. Its validity is determined by the completeness, accuracy, and reliability of methods used to estimate costs, as well as the credibility of the person or entity submitting the estimate.

O. **Comprehensive Range of Projects.** Consider the extent to which the project contributes to the more comprehensive restoration package. Evaluate the project for the degree to which it benefits any otherwise uncompensated spill injuries.

Phase III - SUPPLEMENTAL CRITERIA: The following criteria will be considered when appropriate (e.g., as a tie-breaker in the case of more than one project being equally preferred after Phase I and II evaluations).

P. **Ability to Document Benefits to the Public.** Consider the ability to document receipt or delivery of benefits to the public as a result of the project.

Q. **Educational/Research Value.** Consider the project's potential for public education and outreach and/or clarification of restoration planning issues.

R. **Non-Duplication.** Projects should not duplicate other efforts already ongoing at the same location.

4.3 Injury and Restoration by Category

The following sections provide the details regarding injury quantification, the range of potential restoration options, and, for each injury category, a description of the tentative preferred restoration project and the scaling of the size of that project.

NEPA requires the Trustees to consider a "no action" alternative, and the OPA regulations require consideration of a somewhat equivalent natural recovery option. Under this alternative, the Trustees would take no direct action to restore injured natural resources or compensate for lost services pending natural recovery. Instead, the Trustees would rely on natural processes for recovery of the injured natural resources.

The principal advantages of the natural recovery approach are the ease of implementation and the absence of monetary costs. Natural processes rather than humans determine the trajectory of recovery. However, while natural recovery would occur over time for most of the injured resources, the interim losses suffered would not be compensated under the no action alternative. OPA clearly establishes Trustee responsibility to seek compensation for interim losses pending recovery of natural resources. Losses were, and continue to be, suffered during the period of recovery from this Spill, and technically feasible, cost-effective alternatives exist to compensate for these losses.

4.3.1 Loon and Grebe Injury and Restoration

This grouping of species lumps two orders of birds: loons (*Gaviiformes*) and grebes (*Podicipediformes).* These two orders are quite similar. Both are duck-like birds that spend most of their lives floating on the water and diving for fish. All of these species nest on inland lakes along marsh edges and winter in near-shore ocean waters and/or inland lakes. Their nests are constructed of small islands of vegetation that sit low in the water.

Two species, Common Loon and Western Grebe, account for 81% of the estimated impacted birds from this species group. Both of these species occur regularly along the California coast in winter. No loons currently nest in California, although Common Loons historically nested in small numbers in northeastern California (Grinnell and Miller 1944). Loon nesting in western North America is largely restricted to undisturbed portions of Alaska and Canada (McIntyre and Barr 1997). The Common Loon is listed as a California State Species of Special Concern. Western Grebes nest in scattered locations in the northern half of the state. The largest colonies (greater than 300 nests) are at:

- Eagle Lake in Lassen County,
- Tule Lake National Wildlife Refuge (North Sump) in Siskiyou County,
- Clear Lake in Lake County, and
- Lake Almanor in Plumas County (personal communication, G. Ivey).

In the vicinity of the spill site, up to 100 pairs of Western Grebes nest at Lake Earl in Del Norte County (personal communication, T. Williamson). This is the largest Western Grebe colony on the west coast. The total number of Western Grebes nesting in the state is approximately 4,000 pairs (personal communication, G. Ivey). Grebe nesting colonies in California are subject to several factors that may reduce or eliminate nest productivity in any given year: wave wash from boat wakes, disturbance and direct destruction of nests from boats or personal watercraft (e.g. jet-skis), and sudden changes in water levels (personal communication, D. Anderson, G. Ivey, T. Williamson).

4.3.1.1 Injury Quantification

There were 48 birds collected in this species group. The total estimated dead was 77, implying a total dead-bird multiplier of slightly less than two. This relatively low multiplier was due to the proximity of the oil and these species to the shoreline, the thorough search effort, and the fact that most of the species in this group are large-bodied birds.

	Collected Alive		Collected	Total	Total
Species	**Released**	**Died**	**Dead**	**Collected**	**Estimated Dead**
Red-throated Loon	0	5	0	5	7
Common Loon	7	17	0	24	38
Pied-billed Grebe	0	0	1	1	1
Eared Grebe	0	0	1	1	6
Western Grebe	3	1	12	16	24
grebe, sp.	0	0	1	1	1
TOTAL	**10**	**23**	**15**	**48**	**77**

Because population data was not available for every species, lost bird-years were calculated relying on the demographic characteristics of Common Loon (for the loons) and an average of grebe species (for the grebes), as described in Sperduto et al. (1999). See Appendix C for details. The Trustee-RP technical working group applied the single-generation stepwise replacement approach to calculating lost bird-years as described in the Methods section above, and agreed upon the following lost bird-years:

Species	Total Estimated Dead	Bird-Year Multiplier	Total Lost Bird-Years
Red-throated Loon	7	6.30	44
Common Loon	38	6.30	239
Pied-billed Grebe	1	6.30	3
Eared Grebe	6	2.64	16
Western Grebe	24	2.64	63
grebe, sp.	1	2.64	3
TOTAL	**77**		**368**

These lost bird-years represent the interim losses between the time of the spill and return of these populations to pre-spill conditions. Thus, any restoration project benefiting this species group should seek to replace 368 lost bird-years.

4.3.1.2 Restoration Alternatives

Restoration options for loons and grebes on their wintering grounds are limited. Furthermore, because their populations are most likely limited by pressures on their nesting grounds, it makes most sense to focus restoration at these locations. Because Common Loons and Western Grebes were the predominant species impacted, the Trustees examined potential restoration options for these species. Restoration for Common Loons would require actions far removed from the spill area, most likely in Canada or Alaska. Specific restoration projects in these areas have not been identified.

Two projects were considered for benefiting grebes in California, which are listed in the table below.

PROJECT CONCEPT	BENEFITS
Acquisition of land around Lake Earl to allow for higher lake levels and increase Western Grebe nesting	Western Grebe
Contribution to grebe project described in American Trader Restoration Plan (protection from human disturbance at inland lakes)	Western/Clark's Grebes

After evaluating these projects using the initial and additional screening criteria, the Trustees identified the Lake Earl project as a tentative preferred project; this site hosts one of the larger Western Grebe colonies in the state and the largest along the coast.

Enhancement of Lake Earl Western Grebe Nesting Habitat: This project would take place within the Lake Earl Wildlife Area (Del Norte County), partially managed by the CDFG. Lake Earl, together with Lake Talawa with which it is linked, is a large shallow marshy lake

bordered by coastal dunes and marshy pastures. As noted above, this lake is home to the largest Western Grebe colony on the Pacific Coast, with the potential to host over 100 pairs.

Much of the fringe of the lake is privately owned. When lake levels rise in late winter or early spring, local landowners require the breeching of the sand bar, which drains the lake to a level of 4 feet. Water levels then raise as the lake slowly refills, inundating grebe nests.

The project involves contributing to the acquisition of land around the lake's edge to allow the lake to rise to a level of 10 feet. This would create more nesting habitat and also protect grebe nests from sudden water level fluctuations. This acquisition has been a long-term management goal of Trustee agencies responsible for this species. All of the parcels within the 10-foot contour have been identified and many have already been acquired. However, no more funds are currently identified, although 265 acres remain to be purchased.

4.3.1.3 Scaling for Primary and Compensatory Restoration

As section 4.3.1.1 described, the total injury to this restoration category was 368 lost bird-years. For restoration scaling, the Trustees assumed that land acquisition around Lake Earl and the resulting improved management of water levels would result in an increase of 30 grebe nests annually. Assuming that project benefits begin in the year 2004 and continue for 100 years, the Trustee-RP technical working group calculated that such a project would generate 3,816 additional bird-years over the course of 100 years. Because only 368 bird-years were lost due to the spill, a contribution of approximately 10% to the project would be appropriate to compensate for the injury to these birds. Thus, the Trustees are seeking a 10% contribution toward the completion of the Lake Earl project. Additional funding may be available from other oil spill damages as well as other sources.

Appendix D provides additional details regarding the bird REA for this species group.

4.3.1.4 Environmental Consequences (Beneficial and Adverse)

Beneficial Effects

This project will lead to the increased natural functioning of Lake Earl, benefiting nesting habitat for Western Grebes. Once Lake Earl is allowed to rise to the 10-foot contour, nesting habitat at the lake's edges will increase. Furthermore, grebe nests will be less subject to fluctuations in water levels from sudden draw downs in water, and thus will have greater productivity.

Adverse Effects

There are no potential adverse effects associated with acquiring land and allowing Lake Earl to function in a more natural manner. All land will be purchased from willing sellers.

4.3.1.5 Probability of Success

Once all the land within the ten-foot contour is acquired, lake levels will be allowed to rise to this level. There are no apparent external factors that will prevent the grebes from utilizing the

lake at this time. Note that this specific project is merely a contribution to the total acquisition requirement. Thus, the project has a high likelihood of success provided total acquisition is achieved.

4.3.1.6 Performance Criteria and Monitoring

The project also contemplates several years of monitoring, both before the acquisition is completed and afterwards, in order to measure the number of increased grebe nests. The monitoring will seek to quantify both the number of grebe nests and nest productivity.

4.3.1.7 Evaluation

The Trustees have evaluated this project against the initial and additional screening criteria developed to select restoration projects and concluded that this project is consistent with these selection factors. The trustees determined that this type and scale of project would effectively provide appropriate compensation for injuries to loons and grebes that occurred as a result of the spill and have identified this project as a tentative preferred project.

4.3.2 Pelican, Cormorant, and Gull Injury and Restoration

This species grouping includes all pelicans, cormorants, and large gulls collected during the spill response. These species share several characteristics: they all forage in near-shore waters and in bays, they all spend considerable time out of the water roosting on rocks or other platforms, and they are frequently found roosting and foraging together.

The California Brown Pelican is listed as a state and federal endangered species. Nesting occurs in Mexico and on islands off southern California; the pelican occurs in Humboldt County during the non-breeding season as a seasonal migrant, primarily during fall and winter. Brown pelicans typically forage in relatively shallow coastal waters, feeding almost entirely on surface-schooling fish caught by plunge diving in coastal waters. Brown pelicans are rarely found away from salt water and do not normally venture more than 32 kilometers (20 miles) out to sea. During the non-breeding season, brown pelicans roost communally; roosting sites and loafing areas are essential habitat for local individuals and Mexican migrants. Brown pelicans are tropically-derived seabirds that have wettable plumage so they must have terrestrial roost sites to dry wet plumage after feeding or swimming (Jaques and Anderson 1987). Roost sites are also important for resting and preening. The essential characteristics of roosts include: nearness to adequate food supplies; presence of physical barriers to predation and disturbance; sufficient surface space for individuals to interact normally; and adequate protection from adverse environmental factors such as wind and surf (Jaques and Anderson 1987). Major roosts are found on jetties and other manmade structures, offshore islands and rocks, and the beach at the mouths of estuaries (Jaques and Anderson 1987). In many sections of the coast, such roosting sites are in short supply (Jaques 1994; Jaques and Strong 2002).

All three cormorant species (Double-crested, Brandt's, and Pelagic) occur in California year-round. The latter two species are found strictly along the coast, while Double-crested occurs inland as well. The Double-crested Cormorant has also been listed as a California Species of Special Concern as a result of impacts from DDT in past decades. Like the pelican, these species

require disturbance-free roost sites to enable them to rest and dry their plumage after foraging for fish in the water. Likewise, their nesting is limited to disturbance-free areas, typically small offshore rocks and anthropogenic structures (e.g., abandoned piers).

Both Western Gull and Glaucous-winged Gull occur primarily along the coast. The Western Gull breeds in California and is present year-round, while the Glaucous-winged Gull breeds north of California and is present primarily in the winter months. Both species nest on offshore rocks and other platforms, frequently in close proximity to cormorants.

4.3.2.1 Injury Quantification

There were 73 birds collected in this species group. The total estimated dead was 139, implying a total dead-bird multiplier of slightly less than two. This relatively low multiplier was due to the proximity of the oil and these species to the shoreline, the thorough search effort, and the fact that all of the species in this group are large-bodied birds.

	Collected Alive		Collected	Total	Total
Species	**Released**	**Died**	**Dead**	**Collected**	**Estimated Dead**
Brown Pelican	0	1	1	2	3
Brandt's Cormorant	1	2	9	12	23
Double-cr. Cormorant	0	0	12	12	25
Pelagic Cormorant	0	0	4	4	8
cormorant, sp.	0	0	3	3	4
Western Gull	0	9	18	27	52
Glaucous-winged Gull	0	1	2	3	6
gull, sp. (large)	0	0	9	9	18
TOTAL	**1**	**13**	**59**	**73**	**139**

Because population data was not available for every species, lost bird-years were calculated relying on the demographic characteristics of Brown Pelican, Double-crested Cormorant (for all cormorants), and Western Gull (for all gulls). See Appendix C for details. Applying the single-generation stepwise replacement approach to calculating lost bird-years as described in the Methods section above, the Trustee-RP technical working group agreed upon the following lost bird-years:

Species	**Total Estimated Dead**	**Bird-Year Multiplier**	**Total Lost Bird-Years**
Brown Pelican	3	6.20	19
Brandt's Cormorant	23	4.44	102
Double-cr. Cormorant	25	4.44	111
Pelagic Cormorant	8	4.44	36
cormorant, sp.	4	4.44	18
Western Gull	52	4.50	234
Glaucous-winged Gull	6	4.50	27
gull, sp. (large)	18	4.50	81
TOTAL	**139**		**627**

These lost bird-years represent the interim losses between the time of the spill and return of these populations to pre-spill conditions. Thus, any restoration project benefiting this species group should seek to replace 627 lost bird-years.

4.3.2.2 Restoration Alternatives

The restoration concepts for this group of species share one goal: to provide roosting benefits for Brown Pelicans in the vicinity of the spill. Some of the projects provide nesting benefits for cormorants, nesting or roosting benefits for gulls, as well as a variety of other species and services outside the restoration category. These potential projects are listed in the table below.

PROJECT CONCEPTS	BENEFITS
South Spit of Smith River acquisition and management (57 acres of dune/sand)	Brown Pelicans, gulls, shorebirds, Snowy Plovers
Island Roost at Lake Talawa – building up the island above high water	Brown Pelicans, cormorants, gulls, Snowy Plovers, shorebirds, Aleutian Geese
Artificial Pelican Roosts – float at Samoa Bridge and tree in Crescent City Harbor	Brown Pelicans, cormorants, gulls,
Old Arcata Wharf Restoration – refurbishing and enlarging of abandoned wharf	**Double-crested Cormorant, Brown Pelicans**
South Spit of Humboldt Bay acquisition (627 acres of dune and salt marsh) – protection from disturbances	Snowy Plover, shorebirds, pelicans, human recreational. use
Pelican roost at North Jetty on North Spit – cut off to create an island	Brown Pelicans
Pelican signs on South Spit – to reduce human disturbances	Brown Pelicans

After evaluating these projects using the initial and additional screening criteria, the Trustees identified refurbishment of the Old Arcata Wharf as a tentative preferred restoration project.

Old Arcata Wharf Restoration Project: The remnants of the Old Arcata Wharf in north Humboldt Bay continue to deteriorate over time. Nevertheless, this abandoned wharf continues to be used by Double-crested Cormorants for nesting and gulls and pelicans for roosting.

Aerial Photographs of Old Arcata Wharf

Section 1 in 1995.

Section 2 in 1995.

Sections 1 and 2 in 2000.

The dark spots in these aerial photos are nesting cormorants and roosting pelicans. Note the decay of the wharf over time between 1995 and 2000. The large square in Section 1 (1995 photo) is completely missing in 2000. It is assumed that, without refurbishment, the wharf would continue to fall apart and would cease to exist as a roosting and nesting location for birds.

This project would involve installing new pilings and installing a new platform on the existing footprint of the wharf, in order to protect and expand bird use in the future.

4.3.2.3 Scaling for Primary and Compensatory Restoration

As section 4.3.2.1 described, the total injury to this restoration category was 627 lost bird-years. For restoration scaling, the Trustee-RP technical working group focused on cormorant nesting, estimating the increased number of bird-years that would derive from additional nests at the refurbished wharf. Assuming that project benefits begin in the year 2004 and continue for 50 years, the working group calculated that such a project would generate 63 additional bird-years per nest. Because 627 bird-years were lost due to the spill, a total of 11 new nests would compensate for the injury to these birds. The refurbishment of the Old Arcata Wharf would need to be sufficient in size to provide for this number of new nests. Because surveys have shown one nest for every 11 square feet on the existing platform, approximately 120 square feet would be required to provide for 11 new nests. Additional funding from other sources may augment the size of this project.

Appendix E provides additional details regarding the bird REA for this species group.

4.3.2.4 Environmental Consequences (Beneficial and Adverse)

Beneficial Effects

This project will provide increased nesting habitat for cormorants and roosting habitat for Brown Pelicans. Furthermore, by virtue of the project location, this habitat will be relatively free of human disturbance. As described above, disturbance-free roosting and nesting sites for these species are important and currently in short supply.

Adverse Effects

Because this project seeks to refurbish and reconstruct part of a pre-existing structure, minimal adverse impacts are anticipated. Roosting birds may be temporarily disrupted during the project construction period. Invertebrates residing in the mudflats around the wharf should suffer minimal disturbance, as the new pilings necessary for this project will merely replace old pilings at the same locations.

4.3.2.5 Probability of Success

Given past and current use of the wharf by these species, the Trustees expect the birds to utilize the additional refurbished wharf platform immediately. Thus, the project has a high likelihood of success. However, permitting issues regarding construction within the bay will need to be addressed prior to implementation. However, given that the project does not seek to increase the footprint of the old wharf, the Trustees expect that the project will have a better chance of moving forward.

4.3.2.6 Performance Criteria and Monitoring

The project also contemplates several years of monitoring in order to measure the number of increased cormorant nests and use by roosting pelicans and other bird species. The monitoring will seek to quantify both the number of cormorant nests and nest productivity, as well as the number of roosting pelicans.

4.3.2.7 Evaluation

The Trustees have evaluated this project against initial and additional screening criteria developed to select restoration projects (see Section 4.3.2.2) and concluded that this project is consistent with these selection factors. The trustees determined that this type and scale of project would effectively provide appropriate compensation for injuries to pelicans, cormorants, and gulls that occurred as a result of the spill and have identified this project as a tentative preferred project.

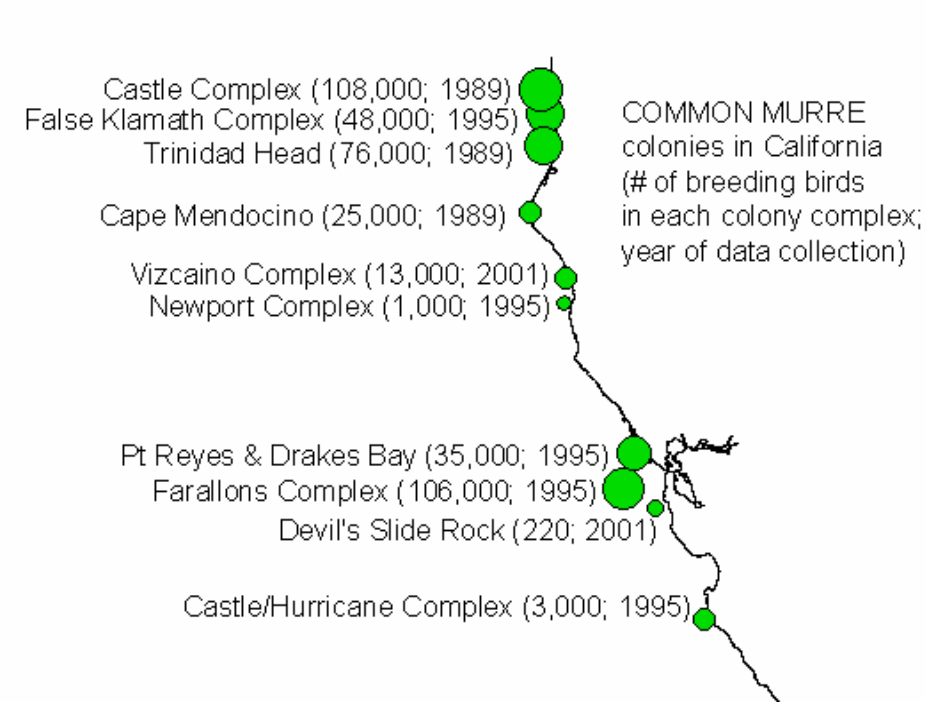
4.3.3 Common Murre, Other Alcids (except Marbled Murrelet) and Procellarid Injury and Restoration

This grouping of species includes alcids (except Marbled Murrelets) and Procellarids. Alcids are small to medium-sized seabirds, resembling ducks or small penguins (although they are capable of flight). Alcids spend much of their lives at sea, where they swim on the surface and dive for fish. They typically nest, often in large colonies, on cliff edges or in burrows on islands or remote headlands along the coast. Puffins are the most well-known members of the alcid family. Procellarids, also called tubenoses, are highly pelagic seabirds resembling gulls, though they are typically longer-winged and have a more graceful, arcing flight. Procellarids spend most of their lives at sea, where they travel great distances soaring low over the waves, stopping to land on the water wherever food is available. They typically nest on remote islands or cliffs. Albatrosses are the largest and most well-known Procellarids.

In addition to their highly pelagic habits and preference for remote nesting locations, alcids and Procellarids have other similarities: they are among the longest-lived and slowest reproducing of all birds, laying only one egg a year (if they nest at all) and often living in excess of 20 or 30 years.

In this case, one species (the Common Murre) accounts for 83% of all estimated mortalities to this bird group. The Common Murre, despite its name, has a population that is well below historical levels. It is estimated that over a million birds once nested on the Farallon Islands alone (Carter et al. 2001). Beginning in the late 1800s, hunting, egging, human disturbance, and oil pollution took a tremendous toll on the birds. By 1959, less than 10,000 birds remained on the Farallon Islands. Since then, however, numbers have increased, although with some setbacks due to oil spills and gill-netting. Today, with gill-netting, hunting, and egging eliminated, the murre population throughout the state is steady or slightly increasing on a slow recovery towards historical levels.

To a large degree, the nesting colonies in California can be divided into two regions: northern California (encompassing Del Norte, Humboldt and Mendocino Counties) and central California (encompassing the Gulf of the Farallones region to Big Sur). From 1979-95, Common Murres were recorded breeding at 13 locations in northern California: Del Norte County (Castle Rock, Sisters Rocks, and False Klamath Rock); Humboldt County (Redding Rock, White Rock, Green Rock, Flatiron Rock, Blank Rock, Pilot Rock, False Cape Rocks, and Steamboat Rock); and Mendocino County (Rockport Rocks and Cape Vizcaino) (Carter et al. 2001). Since 1995, murres also have bred at Newport Rocks, Kibesillah Rock, and Goat Island Area in Mendocino County.



Focusing on the northern California colonies, Carter et al. (2001) note that "murres currently use much of the available and suitable breeding habitat on all large islands in Del Norte and Humboldt counties, although breeding densities could increase further." They then note that suitable locations that lack murre colonies are subject to human disturbance.

4.3.3.1 Injury Quantification

Just over one thousand birds in this species group were collected. The total estimated dead was just under two thousand, implying a total dead-bird multiplier of slightly less than two. This relatively low multiplier was due to the proximity of the oil to the shoreline, the thorough search effort, and the fact that most of the species in this group are large-bodied birds.

Species	Collected Alive		Collected Dead	Total Collected	Total Estimated Dead
	Released	Died			
Laysan Albatross	0	0	1	1	2
Northern Fulmar	0	0	5	5	10
Pink-footed Shearwater	0	0	2	2	3
Buller's Shearwater	0	0	3	3	10
Sooty Shearwater	0	0	14	14	27
Common Murre	253	295	390	938	1,600
Pigeon Guillemot	3	8	12	23	74
Cassin's Auklet	0	0	17	17	60
Rhinoceros Auklet	6	7	33	46	150
Tufted Puffin	0	0	1	1	1
TOTAL	**262**	**310**	**478**	**1,050**	**1,937**

Because population data were not available for every species, lost bird-years were calculated relying on the demographic characteristics of Northern Fulmar (for fulmar and albatross), Sooty Shearwater (for the shearwaters), and Common Murre (for the alcids). See Appendix C for

details. Applying the single-generation stepwise replacement approach to calculating lost bird-years as described in the Methods section above, the Trustee-RP technical working group agreed upon the following lost bird-years:

Species	Total Estimated Dead	Bird-Year Multiplier	Total Lost Bird-Years
Laysan Albatross	2	16.50	33
Northern Fulmar	10	16.50	165
Pink-footed Shearwater	3	12.70	38
Buller's Shearwater	10	12.70	127
Sooty Shearwater	27	12.70	343
Common Murre	1,600	7.18	11,488
Pigeon Guillemot	74	7.18	531
Cassin's Auklet	60	7.18	431
Rhinoceros Auklet	150	7.18	1,077
Tufted Puffin	1	7.18	7
TOTAL	**1,937**		**14,240**

These lost bird-years represent the interim losses between the time of the spill and return of these populations to pre-spill conditions. Thus, any restoration project benefiting this species group should seek to replace 14,240 lost bird-years.

4.3.3.2 Restoration Alternatives

Restoration options for Procellarids (in this case, primarily shearwaters) in California are quite limited. As described above, these species do not nest in the state, but only pass through its waters as part of their annual migration. Restoration efforts are best targeted at population bottlenecks where a species faces threats. In most cases, that is on the breeding grounds. While shearwaters have suffered past declines from drift-net fishing, their greatest threat today is on the breeding grounds, where they face predation by introduced non-native mammals (Veit, et al. 1996; Lyver, et al. 1999; Oedekoven, et al. 2001; Atkinson 1978; Jones 2000). The breeding grounds for the Procellarid species impacted in this case are in New Zealand, Chile, and remote islands in the Pacific Ocean. While there are feasible restoration options in some of these areas, these projects are typically fixed in size, benefiting more birds than would be required to compensate for the relatively small injury to Procellarids in this case. Instead the Trustee-RP technical working group focused on Common Murres, the species most impacted by the spill (with respect to number of individuals oiled).

Restoration options exist for some of the other alcids besides Common Murres, although the projects brought to the Trustees' attention are rather small and experimental. The table below lists all projects considered to benefit this species group.

PROJECT CONCEPTS	BENEFITS
Trinidad Seabird Colonies – re-colonization of Tufted Puffin at Green and Puffin Rocks	Tufted Puffin
Trinidad Seabird Colonies – re-colonization of Common Murre at Sea Lion Rock	Common Murre
Trinidad Seabird Colonies – enhance nesting habitats for Leach's Storm-Petrel at Little River and Prisoner Rocks	Leach's Storm-Petrel
Whaler Island Restoration (Crescent City Harbor) – re-establish it as a seabird colony	Leach's Storm-Petrel, Fork-tailed Storm-Petrel, Common Murre, Pigeon Guillemot, Cassin's Auklet, Western Gull
Human Disturbance Reduction Program – for Humboldt and Del Norte County seabird colonies	Common Murre, alcids (except Marbled Murrelet), storm-petrels
Cape Vizcaino Area seabird colonies – acquisition and management	Common Murre, alcids (except Marbled Murrelet), cormorants, gulls, Black Oystercatcher
Redding Rock murre re-colonization and protection	**Common Murre**

Because Common Murres represent the vast majority of birds in this category, and were determined by the technical working group to be a surrogate for all other species in this category, several murre restoration options were considered. One proposal would seek to protect a murre colony at Cape Viscaino in Mendocino County; another would focus on a management program to minimize human disturbance of murre and other seabird nesting rocks. After evaluating these projects using the initial and additional screening criteria, the Trustees identified contribution to the restoration of a murre colony at Redding Rock as the tentative preferred project. This project will restore murres at a location most proximate to the spill site and redress impacts caused from past and on-going human disturbance.

Redding Rock Murre Re-colonization Project: While murre numbers at most colonies in northern California have been stable or increasing, Redding Rock is a notable exception. Numbers of breeding murres oscillated between 1979 and 1989 (ranging from 800-2,100 birds; Carter et al. 2001) but have declined since 1995. By 2002, no breeding murres were noted during aerial surveys, although some may have attended prior to surveys. A detailed description of the demise of this colony requires counting several years of archived aerial photographs (1987 to 2002). Colony extirpation seems imminent due to the following causes: human disturbance by USCG crews which service the automated light; probable aircraft and boat disturbances; California sea lions hauling out high on the rock; and probable mortality from the 1997 *Kure* and 1999 *Stuyvesant* oil spills. Natural re-colonization or recovery likely will not occur in the near future without restoration efforts.

Restoration actions would include: a) cooperation between USCG, Federal Aviation Administration (FAA), CDFG, and other state and federal agencies to prevent human disturbance of murres (including prohibiting landing and low overflights, plus installing buoys to mark boat closures within ~200 m of the rock); b) installation of small barriers to keep sea lions off the top areas of the rock (barriers have been used elsewhere for sea lions and topography at Redding Rock would assist their effectiveness); and c) use of social attraction techniques (e.g., decoys, recorded vocalizations, and mirrors) to attract murres to Redding Rock (especially recent breeders that are more likely to rapidly re-colonize). Monitoring would be achieved by aerial

photography because the rock is located three miles from shore. By employing several restoration techniques in the next few years, permanent colony extirpation may be avoided and the colony should return to higher levels than seen since 1979, given the amount of suitable nesting habitat available.

4.3.3.3 Scaling for Primary and Compensatory Restoration

As section 4.3.3.1 described, the total injury to this restoration category was 14,240 lost bird-years. For restoration scaling, the Trustee-RP technical working group relied on data from the Devil's Slide Rock Common Murre Re-colonization Project off the Central California coast. This project has many similarities to the proposed Redding Rock project: 1) both projects seek to re-colonize murres to offshore rocks; 2) the potential colony size on each rock is quite similar; and 3) the techniques to be employed are identical.

Using data from the first seven years (1996-2002) of the Devil's Slide Rock project (Knechtel, et al. 2003), and assuming continued growth in colony size until maximum colony size is reached, such a project would generate 53,744 additional bird-years over the course of 100 years. Because 14,240 bird-years were lost due to the spill, the Trustee-RP technical working group concluded that a project approximately 27% of the size of the Devil's Slide Rock project would be appropriate to compensate for the injury to these birds. Thus, the Trustees are recommending a 27% contribution toward the Redding Rock project. Additional funding may be available from other oil spill damages (e.g. *Kure*) as well as other sources.

Appendix E provides additional details regarding the bird REA for this species group.

4.3.3.4 Environmental Consequences (Beneficial and Adverse)

Beneficial Effects

This project is designed to reestablish a Common Murre colony . In the long run, this will lead to an overall increase in the number of murres in Humboldt County, as well as an increase in the number of colonies. Education of government agencies and the public will also be achieved as part of this project, which may lead to greater awareness regarding human disturbances at other seabird colonies.

Adverse Effects

The adverse impacts associated with this project are minimal. There will be small impacts to USCG operations and to sea lions. The USCG may service the light at other times of the year besides the breeding season. Elsewhere in the state, the USCG has expressed a willingness to consider natural resource protection during their operations. Sea lions will continue to have access to much of the lower reaches of the rock, where the majority of sea lions haul out.

4.3.3.5 Probability of Success

Social attraction techniques (e.g., the use of decoys) to reestablish a murre colony have been successfully used in central California. This project will replicate those techniques. Because

murres have used Redding Rock in the recent past and because there are many murres in the area, the Trustees believe this project will be successful. The educational components of this project will likewise draw on materials and methods developed for a successful project in Oregon.

4.3.3.6 Performance Criteria and Monitoring

The project also contemplates several years of monitoring in order to measure increases in murre attendance at the rock. Because of the remote location of the rock, the monitoring will rely on aerial photographs and will not be able to measure nest productivity.

4.3.3.7 Evaluation

The Trustees have evaluated this project against initial and additional criteria developed to select restoration projects and concluded that this project is consistent with these selection factors. The trustees determined that this type and scale of project would effectively provide appropriate compensation for injuries to murres, other alcids (except Marbled Murrelet), and Procellarids that occurred as a result of the spill and have identified this project as a tentative preferred project.

4.3.4 Marbled Murrelet Injury and Restoration

The Marbled Murrelet is a small seabird in the alcid family found along the Pacific Coast from Alaska to California. At sea, it feeds by diving for small fish in near-shore waters, typically within 5 km of the coastline. Unlike most alcids, the Marbled Murrelet nests up to 50 km (most within 30 km) inland in late-successional and old-growth coniferous forests. In California, it nests almost exclusively in redwoods (*Sequoia sempervirens*) older than 200 years (Nelson 1997). Like most alcids, the Marbled Murrelet is a long-lived slow-reproducing species, laying only one egg per year. Given these demographic characteristics, the vast majority of the population consists of breeding adults, whose survival is critical to sustaining the species (Beissinger 1995).

The Marbled Murrelet was federally listed as a threatened species in Washington, Oregon and California on September 28, 1992 (U.S. Fish and Wildlife Service 1992). The draft recovery plan was released on August 1, 1995 and the final recovery plan was released in 1997 (U.S. Fish and Wildlife Service 1997). The species is State listed as endangered in California and as threatened in Oregon and Washington (U.S. Fish and Wildlife Service 1997). Timber harvest in nesting habitat was the primary reason for listing the species (U.S. Fish and Wildlife Service 1992).

The recovery plan recommends implementing the following short-term actions to stabilize and increase the population: (1) maintain all occupied nesting habitat on Federal lands administered under the Northwest Forest Plan (USDA Forest Service and U.S. Bureau of Land Management 1994); (2) on non-Federal lands, maintain as much occupied habitat as possible and use the Habitat Conservation Planning process to avoid or reduce the loss of this habitat; (3) maintain

potential and suitable habitat in large contiguous blocks; (4) maintain and enhance buffer habitat surrounding occupied habitat; (5) decrease adult and juvenile mortality; and (6) minimize nest disturbances to increase reproductive success. The recovery plan also recommends implementing the following long-term actions to stop population decline and increase population growth: (1) increase the amount and quality of suitable nesting habitat; (2) decrease fragmentation by increasing the size of suitable stands; (3) protect "recruitment" nesting habitat to buffer and enlarge existing stands, reduce fragmentation, and provide replacement habitat for current suitable nesting habitat lost to disturbance events; (4) increase speed of development of new habitat; and (5) improve and develop north/south and east/west distribution of nesting habitat. The recovery plan identifies six Marbled Murrelet Conservation Zones throughout the listed range. The Stuyvesant Spill occurred outside the entrance to Humboldt Bay within Marbled Murrelet Conservation Zone 4 (Zone 4). Zone 4 extends from North Bend, Coos County, Oregon, south to the southern end of Humboldt County, California.

The 2002 population point estimate for Zone 4 is 4,900 Murrelets, with a 95 percent confidence interval of 3,500 to 6,400 Murrelets (Huff *et al.* 2003). Fecundity can be estimated from juvenile-to-adult ratio data gathered during monitoring at-sea or from individual reproductive histories gathered from radio telemetry work. Current estimates using both techniques suggest that the population in Zone 4 is declining (Beissinger and Peery 2003; Beissinger 1995). The total California population is estimated at 6,450 individuals (Ralph and Miller 1995). The majority of California Murrelets breed in the coastal redwoods of Del Norte and Humboldt Counties. A relatively isolated population of approximately 500 birds breeds in the Santa Cruz Mountains in San Mateo and Santa Cruz Counties of central California (Peery *et al.*, in review). A small number of birds may also nest at scattered locations in Mendocino County (Thomas Hamer, personal communication). In winter, some Marbled Murrelets appear to move away from their breeding areas and can be regularly found along the coast as far south as Pt. Sal (Peery *et al.* 2002).

In addition to loss of nesting habitat due to logging, potential causes of Murrelet decline include nest predation by corvids (ravens, jays) and other predators, oil spills, marine pollution, and possibly prey availability as a function of oceanographic events (U.S. Fish and Wildlife Service 1997; Nelson 1997). Predation of eggs and chicks is a major cause of nest failure (Nelson and Hamer 1995). Nelson and Hamer (1995) further predict that even small increases in predation can have deleterious effects to population viability due to the Murrelet's low reproductive rate.

In northern California, availability of nesting habitat is widely thought to be a limiting factor on the Marbled Murrelet population and the primary reason for its decline (see Ralph *et al*. 1995 and Miller *et al.* 1997). When logging occurs in nesting habitat, displaced Marbled Murrelets do not "pack" into the remaining good habitat at higher densities (Burger 2001; see also Miller *et al*. 2002). In fact, Marbled Murrelet nesting densities or other standardized observations of nesting birds are remarkably constant within forest types, even after logging of nearby nesting habitat occurs (Burger et al. 2002; Burger and Tillmanns 2002; Conroy *et al*. 2002). When nesting habitat is lost, the population declines. In the long run, all nests are lost and the population loses an equal number of breeding pairs (Burger 2001). In the short run, some of the displaced birds probably attempt to nest elsewhere, although in less preferred locations. Meyer and Miller (in press) report that displaced birds continue to use small forest fragments for several years before abandoning the area. Because these locations are marginal, breeding success is likely lower and the displaced subpopulation fails to sustain itself and is eventually lost after several years (see Miller *et al.* 2002).

4.3.4.1 Acute Mortality

Twenty-four Marbled Murrelets were collected as a result of the spill. The Trustee-RP technical working group estimated total mortality at 135 individuals, implying a 5.6 dead bird multiplier. This is higher than the multiplier calculated for most other birds killed in the spill. As noted above, Marbled Murrelets are small-bodied birds. This makes their carcasses difficult to find for human searchers and easily removed by scavengers. This multiplier is low, however, relative to small-bodied birds in other spills due to the thorough beach search effort conducted in the Stuyvesant spill.

	Collected Alive		Collected Dead	Total Collected	Total Estimated Dead
Species	**Released**	**Died**			
Marbled Murrelet	0	4	20	24	135

4.3.4.2 Restoration Alternatives

The table below provides a list of restoration concepts considered by the Trustees.

PROJECT CONCEPTS	**BENEFITS**
Acquisition of old growth/residual habitat at risk of logging	**Marbled Murrelet**
Corvid management programs	**Marbled Murrelet**
Silvi culture of second growth forest to create nesting habitat	Marbled Murrelet
Captive breeding	Marbled Murrelet
Artificial nest platforms	Marbled Murrelet

Captive breeding, silviculture and the use of artificial nests are relatively untested concepts and were therefore not considered by the Trustees to be feasible projects having an adequate likelihood of success. In general, restoration options for Marbled Murrelets are limited by the lack of information on the survival and reproductive requirements of the species, as well as its unusual life history.

After evaluating these projects using the initial and additional screening criteria, the Trustees identified the remaining two projects as the tentative preferred restoration projects for Murrelet restoration. The first, acquisition and management of old growth habitat , is to protect from imminent logging, and to enhance, Murrelet nesting habitat. The second, corvid management, is to maintain or increase Murrelet nest productivity in the region.

Grizzly Creek MMCA acquisition and management: This project would contribute to the acquisition and management for the benefit of Marbled Murrelets of the Grizzly Creek Marbled Murrelet Conservation Area (MMCA). Marbled Murrelets nest in these stands, though the exact number of nests is unknown and difficult to determine. This MMCA was set aside in the 1999 Pacific Lumber Company Habitat Conservation Plan for a period of five years to provide an opportunity for acquisition and permanent protection of the MMCA by the United States and/or the State of California. The option to purchase these acres expired in February 2004. Thereafter, if not acquired, the MMCA might have been subject to timber harvesting. Acquisition of the Grizzly Creek MMCA began in 1999 pursuant to State Assembly Bill 1986. Thereafter, the California Wildlife Conservation Board (WCB) acquired approximately 716± acres. The State had insufficient funds to acquire the entire MMCA. Approximately 600 acres remained to be protected. Of these 600 acres, 328 contain residual redwood forest with scattered old growth trees, and 24 acres contain un-entered old growth. In the fall of 2003, prior to the option expiring, the CDFG and the USFWS encouraged the WCB to use a portion of its Proposition 40 funds to acquire the remaining MMCA acres. The WCB purchased the remaining acres with the understanding that funds earmarked for Marbled Murrelet habitat acquisition acquired through a civil judgment or settlement of the Stuyvesant case may be available to replace and/or supplement at least a portion of the funds placed in escrow by the WCB to purchase the remaining MMCA parcels.[6]

Corvid management at Redwood National and State Parks and vicinity: This project would contribute to on-going management efforts to limit anthropogenic food sources that result in unnaturally large corvid (*i.e.*, Steller's Jay, Common Raven, American Crow) populations. Nelson (1997), in discussing Murrelet fecundity in general, notes:

[6] The CDFG advised the WCB that any use of recovered funds would be conditioned upon the Trustees' compliance with the Oil Pollution Act's requirement for "adequate public notice, opportunity for a hearing, and consideration of all public comments," prior to finalizing and implementing a restoration plan for the spill. The CDFG also advised the WCB that: 1) any settlement of the Trustees' claims for natural resource damages will be set forth in a judicial consent decree which is also subject to public comment before the court will enter it as a judgment; and 2) the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) apply to the approval of the restoration plan of which projects to address Marbled Murrelet injuries would be a component.

> Predators contribute substantially to nest failure in North America (43% of 32 nests, Nelson and Hammer 1995; 71% of 14 nests, I. Manley pers. comm.). Eggs may be preyed on when nests are neglected for short periods of time or abandoned, or if adult is chased off nest. Adults are vulnerable during incubation and during flights to nests. Chicks may be preyed on anytime during the 27-40 days they are along [*sic*] in the nest.
>
> Avian predators (1) of eggs: include Common Ravens (Corvus corax) and Steller's Jays (Cyanocitta stelleri), (2) of chicks: include Common Ravens, Steller's Jays, and Sharp-shinned Hawks (Accipiter striatus), (3) of adults on nest: include Common Ravens and Sharp-shinned Hawks, and (4) of adults flying in forests: include Peregrine Falcon (Falco peregrinus); Singer et al. 1991, Marks and Naslund 1994, Nelson and Hamer 1995, D. Suddjian pers. comm.).

Thus corvids (i.e., ravens and jays) are some of the primary nest predators of Murrelets (see also Brand and George 2000).

Raven predation of endangered species is not a new problem. It has been widely documented in the Mojave Desert with respect to the Desert Tortoise. In that context, a comprehensive program to address anthropogenic food sources that support ravens is being recommended to supplement lethal control efforts (Boarman 2002). The problem of corvid management has also been addressed in a recent statewide Corvid Management Plan, which reviews many potential management options (Liebezeit and George 2002).

4.3.4.3 Scaling for Primary and Compensatory Restoration

As with the other bird species groups, the Trustees used a REA approach for scaling the appropriate size of a restoration project. Because Marbled Murrelets are a declining species, this REA differed from the others in how lost and gained bird-years were calculated. The Trustees' framework for scaling restoration included: (1) a population model to quantify lost bird-years due to the spill, and (2) a nest model to examine the benefits, in terms of gained bird-years, from protecting nests via land acquisition (see Appendix G for a more detailed description). The injury model was based upon a similar life-cycle as used by Beissinger (1995) and Beissinger and Nur (1997). It incorporated a density dependent mechanism, whereby birds preferentially (but not exclusively) nested in higher quality versus lower quality old-growth habitat. Bird-year loss was measured by projecting the number of females in the local Murrelet population over the recovery period under injured and uninjured scenarios.

A nest-based model was used to assess the number of highly productive nests that would need to be protected in order to compensate for the injury. A productive nest was defined as one where Murrelets were nesting at a "stationary fecundity" (i.e., nest productivity was sufficiently high to offset losses due to natural mortality/survivorship). The benefit of the land acquisition project was assumed to be the difference between the numbers of birds in the population over time as a result of active nests at a highly productive "acquisition site" versus those same birds initially nesting at a much less productive "alternative" site. This simulated Murrelets having to find new nesting areas after their current habitat is removed (due to logging).

Because of uncertainty in Marbled Murrelet demographics (e.g., survivorship, fecundity), the trustees examined a wide range of plausible scenarios when scaling restoration. Results suggest

that *more than* 13 highly productive nests would need to be protected from imminent logging in order to compensate for the mortality resulting from the spill. The Trustee-RP technical working group agreed that the protection of 12-14 productive nests (where Murrelets were nesting at a "stationary fecundity") would compensate for the spill related acute mortality.

Using optimistic, but reasonable, assumptions regarding the benefits from protecting nests within the MMCA, the Trustees believe that acquisition, enhancement, and management for the benefit of Marbled Murrelets of the remaining portions of the Grizzly Creek MMCA that offer Murrelet nesting habitat and a suitable buffer will compensate for the Marbled Murrelet injury. Because there are considerable uncertainties regarding the actual benefits from protecting nests within the MMCA, e.g., whether or not 12-14 nests with stationary fecundity exist in these parcels, the Trustees also believe that a contribution to on-going corvid management efforts in the Redwood National and State Parks and vicinity, and expanding these efforts to include the MMCA, is important for full compensation for injuries to Murrelets.

4.3.4.2 Environmental Consequences (Beneficial and Adverse)

Beneficial Effects

The land acquisition, enhancement, and management project will protect nesting Marbled Murrelet habitat and guarantee that it remains in existence primarily for the benefit of Marbled Murrelets in the future. It is known that Murrelets nest within the MMCA and that they would not be able to do so if the area were logged.

The corvid management project is intended to improve Marbled Murrelet nest success through a decrease in predation caused by ravens, crows, and jays. Sustaining the Marbled Murrelet population through the next few decades will enable future Murrelets to access increasing amounts of protected old growth forest and second growth forest as it matures into suitable nesting habitat.

Because campgrounds are located near the largest old growth trees, many known nesting stands with the highest Marbled Murrelet activity are near campgrounds. To the extent that the campgrounds serve as source populations for jays and ravens, the project may considerably lower corvid numbers in areas adjacent to the campgrounds as well. Consequently, those Marbled Murrelets beyond the immediate vicinity of the campgrounds may also benefit from the project.

The educational components of the corvid management project will teach the public about imbalances in the ecosystem that may be caused as different species respond positively and negatively to human actions. Specifically, the public will learn how seemingly innocuous interactions with wildlife (e.g., feeding jays at a picnic table) or poor housekeeping at a campsite (e.g., leaving a bag of chips on a table) sustains corvid populations at unnaturally high levels, which in turn can have long-term negative consequences for the Marbled Murrelet. The educational message may carry beyond the campgrounds to local residences and other human gathering places, resulting in increased awareness at those locations as well.

Adverse Effects

With respect to the MMCA acquisition, there are no obvious adverse impacts to wildlife or habitat provided that the habitat is managed according to approved Marbled Murrelet habitat management guidelines.

With regard to the corvid management program, this project will have direct impacts upon both campers at campground and picnic areas and upon corvids and possibly other animals that scavenge food waste at these sites.

Campers will be made more aware of rules and restrictions upon their food management and may be under the threat of enforcement action should they fail to comply. While this will likely make camping less convenient, such measures are commonplace in campgrounds where bears pose a threat to campers (e.g., Yosemite National Park, Redwood National Park, Olympic National Park, and many others) and are already in place at Redwood National and State Parks. Because of potential bear problems here, most campers are accustomed to dealing with the inconveniences associated with food management restrictions.

While corvids and other animals such as raccoons will not be trapped and removed, they will likely experience a reduction in their available food supply. For corvids, this may lead to decreased fledgling survival and lower reproductive success. These adverse impacts are an inevitable part of the path from artificially elevated population levels to lower more natural population levels. Corvids, raccoons, and other animals living outside of the campgrounds are not likely to be impacted.

4.3.4.3 Probability of Success

The probability of success of the acquisition/management project is high. Such land acquisitions have been done in the past (e.g., by the Apex Houston Oil Spill Trustee Council) and such lands remain protected and still contain nesting Marbled Murrelets. There is no reason to expect Marbled Murrelets will abandon suitable nesting habitat.

The success of the corvid management project relies on several linkages: the link between project tasks and an actual reduction in food waste; the link between a reduction in food waste and an actual reduction in corvid numbers; and the link between a reduction in corvid numbers and an actual reduction in nest predation.

The first two linkages have been demonstrated at other campgrounds dealing with bear problems. For example, daily camper education, constant enforcement, and improved food waste receptacles at Yosemite National Park severely limit the amount of food available to wildlife. In the Santa Cruz Mountains, corvid density has been correlated with the level of campground occupancy (D. Suddjian, *pers. com.*).

The elevated corvid levels at campgrounds and picnic areas suggest that corvids do depend on human food waste, and thus corvid numbers may be reduced by a reduction in food waste. The final link between corvid numbers and actual nest predation is difficult to measure directly, as Marbled Murrelet nests are difficult to find and study. However, experiments with artificial eggs

have found that predation pressure declines with decreasing corvid density (Raphael *et al.* 2002). Thus, the project has a reasonable probability of success.

4.3.4.4 Performance Criteria and Monitoring

These projects will include several years of monitoring. At the MMCA, surveys for Murrelets and Murrelet nesting behavior will be conducted. At the locations for the corvid management programs, surveys of corvids, relative to control locations, will be conducted.

4.3.4.5 Evaluation

The Trustees have evaluated these projects against initial and additional screening criteria developed to select restoration projects and concluded that these projects are consistent with the selection factors. The Trustees determined that this type and scale of project would effectively provide appropriate compensation for Marbled Murrelets injured as a result of the Spill and have identified these projects as tentative preferred projects.

4.3.5 Wetland Birds Injury and Restoration

This species group includes a wide variety of birds associated with wetlands or that feed upon fish or marine invertebrates. This broad category was created because relatively low numbers of each species were impacted by the spill, such that restoration for more refined categories would result in very small projects. By combining these species into a single category, the Trustees have identified a restoration project that is both more viable and cost effective.

The majority of these species do not breed in the vicinity of the spill, but are winter visitors to the area. Their nesting grounds are often far to the north or far inland (e.g. boreal lakes for scoters, tundra pools for phalaropes, inland lakes for California and Ring-billed Gulls).

4.3.5.1 Injury Quantification

There were 54 birds collected in this species group. The total estimated dead was 117, implying a total dead-bird multiplier of slightly more than two. The multiplier varies from species to species depending on the size of the bird and the dates and locations, relative to search effort, where they were collected.

	Collected Alive		Collected	Total	Total
Species	**Released**	**Died**	**Dead**	**Collected**	**Estimated Dead**
Great Egret	0	1	0	1	2
White-fronted Goose	0	0	1	1	2
Canada Goose	0	0	2	2	4
White-winged Scoter	3	3	4	10	16
Surf Scoter	7	2	8	17	27
American Coot	1	0	0	1	2
Red-necked Phalarope	0	0	1	1	3
Red Phalarope	0	0	2	2	5
Ring-billed Gull	0	1	1	2	9
California Gull	0	0	3	3	7
Sabine's Gull	0	0	2	2	10
gull, sp. (small)	0	0	1	1	5

Caspian Tern	0	1	1	2	3
Common Tern	0	0	1	1	1
unknown	0	0	11	11	21
TOTAL	**11**	**8**	**38**	**57**	**117**

Because population data was not available for every species, lost bird-years were calculated relying on the demographic characteristics of Western Gull (for the gulls) and an average of scoter species for all other birds, as described in Sperduto et al. (1999). See Appendix C for details. Due to the low numbers of birds collected in this species group (except for scoters and gulls), further refinement of this approach would yield little change in the final restoration scaling results. Applying the single-generation stepwise replacement approach to calculating lost bird-years as described in the Methods section above, the Trustee-RP technical working group agreed upon the following lost bird-years:

Species	Total Estimated Dead	Bird-Year Multiplier	Total Lost Bird-Years
Great Egret	2	2.60	5
Gr. White-fronted Goose	2	2.60	5
Canada Goose	4	2.60	10
White-winged Scoter	16	2.60	42
Surf Scoter	27	2.60	70
American Coot	2	2.60	5
Red-necked Phalarope	3	2.60	8
Red Phalarope	5	2.60	13
Ring-billed Gull	9	4.44	40
California Gull	7	4.44	31
Sabine's Gull	10	4.44	44
gull, sp. (small)	5	4.44	22
Caspian Tern	3	2.60	8
Common Tern	1	2.60	3
unknown	21	2.60	55
TOTAL	**117**		**361**

These lost bird-years represent the interim losses between the time of the spill and return of these populations to pre-spill conditions. Thus, any restoration project benefiting this species group should seek to replace 361 lost bird-years.

4.3.5.2 Restoration Alternatives

Because these species are associated with wetlands (either directly or indirectly), the Trustees considered a wide variety of project concepts to restore wetlands in the Humboldt Bay area. Many of these projects aim to restore converted pasture lands back to tidally-influenced salt marsh habitat. Additionally, several projects focused directly on certain species of birds. The table below lists all the projects considered.

PROJECT CONCEPT	BENEFITS
Tract 20 acquisition (302 acres of tidelands) for Humboldt NWR – protection from oyster culture	Eelgrass, mudflats, shorebirds
Hunt Ranch acquisition (74 acres of diked ag land) and conversion back to wetlands	Salt marsh, mudflats, shorebirds, wetlands
Eel River Wildlife Area acquisition (up to 3,000 acres of nearby ag land) and conversion to wetlands	Wetlands (brackish, estuary, and freshwater)
Mad River Slough Wildlife Area acquisition (up to 1,000 acres of nearby ag land) and conversion to wetlands	Wetlands (brackish, estuary, and freshwater)
Old Arcata drive-in theatre acquisition (25 acres) and conversion to wetlands	Wetlands (freshwater)
White Slough Field at Humboldt Bay NWR – restore tidal action w/ setback levee	Eelgrass, salt marsh, shorebirds
North Spit eelgrass bed restoration – remove fill on 10 acres	Eelgrass
North Bay eelgrass bed restoration – remove oyster shell debris on 100 acres	Eelgrass
Hookton Slough restoration – move levee to restore tidal action to 140 acres	**Salt marsh, mudflat, shorebirds, wetlands, possibly eelgrass**
Bayview/Schmidbauer acquisition (290 acres of diked ag land) – restore to wetlands	Salt marsh, mudflat, shorebirds, wetlands, possibly eelgrass
Industrial shoreline enhancement – re-establish "natural" shoreline	Shorebirds
Shorebird viewing blinds and signs – s. of Samoa Bridge	Shorebirds, human rec. use
Tide gate improvements – to restore some tidal action to various streams	Fish (Tidewater Goby, Coho Salmon); waterfowl
Table Mountain heron/egret rookery acquisition (4 acres w/ 60 pairs) for Humboldt Bay NWR	Herons, egrets
Promotion of shellfish areas – to establish more shell fish areas	Scoters, waterfowl
On-water seaduck roosting zones – protection from disturbance	Scoters, waterfowl

After evaluating these projects using the initial and additional screening criteria, the Trustees identified a contribution toward wetlands restoration at Hookton Slough as a tentative preferred project.

Hookton Slough Wetland Restoration Project: The Hookton Slough Unit consists of approximately 220 acres at the South end of Humboldt Bay within the Humboldt Bay National Wildlife Refuge. It is bordered by a large, armored levee along Hookton Slough on the north side and the hillside of Table Bluff on the south. As with the majority of the refuge, it consists of Humboldt Bay tidelands that were diked and drained approximately 75 years ago.

This project would remove all or major portions of the armored levee along Hookton Slough to allow full tidal action to approximately 140 acres of the Hookton Slough Unit. A new levee, or levee segments, would be constructed along the South side of the Hookton Slough Unit to protect Hookton Road and the residences and associated facilities along Table Bluff. Restoration of the Hookton Slough Unit to tidal action is one of the largest wetland restoration projects possible on publicly owned lands around Humboldt Bay.

4.3.5.2 Scaling for Primary and Compensatory Restoration

As section 4.3.5.1 described, the total injury to this restoration category was 361 lost bird-years. Because these species use Humboldt Bay wetlands and associated habitats primarily as a winter foraging area and not as a breeding area, restoration scaling could not be based on increased nesting, fecundity, or some related measure of reproductive success. Instead, the scaling was based upon potential bird use, as measured in bird user-days.

Assuming that project benefits begin in the year 2004, ramp up gradually, and continue for 100 years, the Trustee-RP technical working group calculated that such a project would generate 27,677 additional bird user-days per acre. The Trustee-RP technical work group agreed that because 131,853 bird-days were lost due to the spill, a total of 4.8 acres would be appropriate to compensate for the injury to these birds. Additional acres of wetland restoration will be required to compensate for injuries to the water column (see Section 4.3.6) and rocky intertidal habitat (see Section 4.3.7).

Appendix H provides additional details regarding the REA for this species group.

4.3.5.3 Environmental Consequences (Beneficial and Adverse)

Beneficial Effects

This project will restore 140 acres of salt marsh habitat, creating a mosaic of vegetated habitats, mudflats, and other intertidal wetlands. This habitat improvement will benefit a wide variety of bird species, including egrets, waterfowl, shorebirds, gulls, and terns. Other invertebrate and fish species associated with salt marsh habitats will also benefit.

Adverse Effects

Given that this project re-creates tidally influenced wetland habitat from terrestrial habitat, species associated with the terrestrial habitat may be affected through loss of habitat. Removal of the old levee will also result in impacts to plan and invertebrate communities in wetland areas (ditches and bay) adjacent to the levee.

4.3.5.4 Probability of Success

This project relies on minimal human intervention, primarily in the form of changing the location of levees. Most of the restoration will occur through natural processes as intertidal flows return to the area. Similar projects have been successful elsewhere in California, including the Tubbs Island levee setback project on San Pablo Bay National Wildlife Refuge. Permitting issues regarding construction of the new levee and removal of the old levee will be addressed prior to implementation.

4.3.5.5 Performance Criteria and Monitoring

This project will include annual monitoring regarding vegetation type and bird use to document the re-creation of salt marsh habitat. Presence of plant and bird species associated with salt marsh will indicate successful restoration.

4.3.5.6 Evaluation

The Trustees have evaluated this project against initial and additional screening criteria developed to select restoration projects and concluded that this project is consistent with these selection factors. The Trustee-RP technical working group determined that this type of project would effectively provide appropriate compensation for wetlands birds (as defined above) injured as a result of the Spill and have identified this project as a tentative preferred alternative.

Additionally, as will be described below, the Trustee-RP technical working group determined that this type of project would also provide compensation for water column biota and rocky intertidal habitat injured as a result of the Spill. The total scale of the project reflects compensation for all three categories of injury: wetland birds, water column biota, and rocky intertidal habitat.

4.3.6 Water Column Injury and Restoration

Impacts to water column biota often go undetected during oil spills. In this case, however, a die-off of shrimp (*Thyanoessa spinifera*) was documented in the vicinity of the North and South Spits of Humboldt Bay on September 12, 1999, the 6th day after the spill. This led to a more thorough investigation of potential water column impacts via the use of models that estimate the physical fate of oil in the water.

4.3.6.1 Injury Quantification

Modeling of the physical fate of the oil in the water column, conducted by the Trustee-RP technical working group, revealed that water concentrations of relatively toxic oil constituents (polyaromatic hydrocarbons [PAHs]) were highest in the upper reaches of the water column (near the ocean surface). Based on modeled concentrations, PAH toxicity assessment for aquatic organisms was limited to the upper 2 meters of the water column. The model estimated that 4.6 million (3,282 kg) shrimp, 6000 (121 kg) anchovies and 5 (5 kg) unknown epipelagic fish likely were also killed by the spill.

4.3.6.2 Restoration Alternatives

The Trustees are not aware of restoration alternatives specifically designed for shrimp or anchovies. Thus, the Trustees opted to compensate via out-of-kind restoration, focusing on salt marsh wetlands in Humboldt Bay. The same restoration options considered under the wetland bird injury category (see Section 4.3.5) were considered here. This project for water column injuries would simply be combined with the tentative preferred restoration project identified to address wetland birds as well. See that section for a detailed list of restoration alternatives and a description of the tentative preferred restoration project (i.e. Hookton Slough).

4.3.6.3 Scaling for Primary and Compensatory Restoration

As section 4.3.6.1 described, the total injury to this restoration category was 3,282 kg of shrimp, 121 kg of anchovies and 5 kg of unknown epipelagic fish. In order to scale this injury to an out-

of-kind restoration project, the Trustees calculated the injury in terms of lost kg-years of biomass, based upon the size of the animals and their life expectancy. The Trustee-RP technical working group jointly estimated that 2,843 kg-years of biomass were lost due to the spill. Furthermore, upon examination of ecological efficiency parameters, the Trustee-RP technical working group jointly agreed that 357,486 kg of primary production biomass would be necessary to sustain or replace the lost resources.

The biomass production associated with a salt marsh restoration project was then examined. The Trustee-RP technical working group agreed to rely on Rogers (1981), whereby the average Humboldt marsh plant productivity is estimated at 5.22 g(ww)/m^2/year. The Trustees then assumed that a salt marsh restoration project would provide benefits gradually, eventually realizing a goal of 60% of potential (as defined by Rogers 1981) over a period of 12 years and then providing those benefits such that the total life of the project is 100 years. The Trustees calculated that such a project would generate 72.4 kg/m^2. Because 357,486 kg of biomass are required to offset the injury, a total of 4,938 m^2, or 1.2 acres of salt marsh restoration would be appropriate to compensate for the injury to these water column biota. These acres may be added to the acres calculated for salt marsh restoration to compensate for wetland bird and rocky intertidal injuries.

Appendix I provides additional details regarding the REA for this species group. See Section 4.3.5.4 for environmental consequences of the preferred restoration project for this injury (Hookton Slough project).

4.3.7 Rocky Habitat Injury and Restoration

The Rocky Habitat can be categorized into three types, based on substrates and types of services provided: beach/rocky intertidal habitats; cliffs/offshore rocks/artificial habitat (e.g., riprap and jetties); and tide pools. In general, rocky habitats provide shelter and/or foraging for invertebrates, birds, and plants, particularly in the cracks and crevices in the rocks. Harbor snails, kelp, and other invertebrates make up a substantial aspect of the biota in the intertidal rocky habitat outside crevices and pools. The upper intertidal area and areas above the splash zone also provide habitat for plants and invertebrates, as well as important nesting and roosting areas. The tide pools and cracks in the rocks provide shelter to plants and invertebrates, and therefore foraging areas for birds and mammals.

In general, due to the high tidal energy and substrate type of rocky habitats, oil persistence is relatively low compared to sandy beaches, and lower on vertical (cliff) versus platform surfaces. However, rocky habitat contains microhabitats with elevated susceptibility to oiling, such as crevices and tide pools. These areas can trap and hold weathered oil, exposing the rich floral and faunal communities to large accumulations of oil for limited periods.

4.3.7.1 Injury Quantification

An estimated 162 acres of rocky intertidal habitat was exposed to oil. Appendix J provides a full report on the injury assessment and quantification of sandy beach and rocky intertidal habitat injuries. This report was prepared by the Trustee-RP technical working group. The report concludes that 10.4 acre-years (discounted) of rocky intertidal habitat services were lost due to the spill.

4.3.7.2 Restoration Alternatives

Restoration options for rocky intertidal habitat are quite limited. Thus, the Trustees opted to compensate via out-of-kind restoration, focusing on salt marsh wetlands in Humboldt Bay. The same restoration options considered under the previous two injury categories were considered here. This project for rocky intertidal injuries would simply be combined with the tentative preferred restoration projects identified to address those categories . See Section 4.3.5 for a detailed list of restoration alternatives and a description of the tentative preferred restoration project (i.e. Hookton Slough).

4.3.7.2 Scaling for Primary and Compensatory Restoration

Restoration scaling was based upon the quantified injury to rocky intertidal habitat. As section 4.3.7.1 described, the total injury to this restoration category was 10.4 acre-years (discounted) of resource services. For restoration scaling, the Trustees focused on wetland restoration, estimating the increased number of acre-years of resource services that would derive from restored acres of wetland habitat. While out-of-kind, the Trustees directly scaled wetland restoration to rocky intertidal impacts. Efforts to refine this out-of-kind scaling would likely lead to assessment costs that exceed the value of the injury.

Assuming that project benefits begin in the year 2004, ramp up as described in the previous section, and continue for 100 years, the Trustee-RP technical working group calculated that such a project would generate 13.9 additional acre-years of services per acre. Because 10.4 acre-years were lost due to the spill, a total of **0.8 acres** of salt marsh restoration would be appropriate to compensate for the injury to the rocky intertidal habitat. This part of an acre may be added to the acres calculated for salt marsh restoration to compensate for wetland bird and water column injuries.

Appendix J provides additional details regarding the HEA for this injury category. See Section 4.3.5.4 for environmental consequences of the preferred restoration project for this injury (Hookton Slough project).

4.3.8 Sandy Beach Habitat and Snowy Plover Injury and Restoration

The sandy beach habitat is host to a wide variety of invertebrates and certain shorebirds (including the Snowy Plover) which feed upon them. These biota may be found in the intertidal zone, the dry sand of the upper beach, or in the wrack (e.g., “seaweed” on the beach).

Prior to the spill, students of Dr. Milton Boyd of Humboldt State University conducted surveys of the invertebrates at Clam Beach. These surveys showed the most abundant phylum sampled was Arthropoda (which included the orders Amphipoda [57.1% of total invertebrates], Mysidacea [20.5%], and Isopoda [13.5%]. The phylum Polychaeta made up 7.2% of their sample.

Because of its richness, expansive area, and shallow nature, Clam Beach is an important feeding area for shorebirds in the Humboldt Bay area. Isopoda, Amphipoda, and Mysidacea are eaten by many shorebirds, including the Snowy Plover. Polychaeta are also a food item for shorebirds as well as for surf perch.

The likelihood of exposure of Isopoda, Amphipoda, and Mysidacea to oil is high. These animals actively feed on the beach face with the incoming or receding tide and would easily be exposed to the oil itself, or a waterborne fraction, through external contact, respiration, and ingestion. Animals would continue to be exposed as stranded oil was lifted from the beach and transported to new locations. Some animals were likely lost to smothering wherever oil stranded on the beach. Polychaeta were probably exposed to some waterborne fraction, but are generally resistant to small amounts of oil. Additionally, the necessary removal of oiled wrack during the clean-up process decreased the abundance of detritus and decaying organic matter available for shelter and food. This would cause immediate impacts as well as delay recovery.

Adult surf perch feeding in the near shore area would not likely be affected. Effects could have occurred to eggs or larva had the spill occurred during spring months.

The Snowy Plover is a shorebird found along the west coast of North American and at inland alkaline lakes. The Pacific coast population of the Western Snowy Plover was Federally listed as threatened on March 5, 1993 (U.S. Department of the Interior 1993) and critical habitat was designated on December 7, 1999 (U.S. Department of the Interior 1999). The primary threats that warranted listing of the Pacific coast population include loss of nesting sites due to European beachgrass (*Ammophila arenaria*) encroachment and urban development; disturbance from human recreational activities; and predation exacerbated by human disturbance (U.S. Department of the Interior 1993). Recovery objectives in the draft Western Snowy Plover recovery plan (U.S. Fish and Wildlife Service 2001) include: (1) achieving well-distributed increases in numbers and productivity of breeding adult birds, and (2) providing for long-term protection of breeding and wintering plovers and their habitat.

Because Snowy Plovers rarely enter the water and spend most of their time foraging in the wrack or dry sand areas of the beach, they are at less risk from oil spills than some other shorebirds. Nevertheless, Snowy Plovers routinely become oiled as they forage on the beach and in oily wrack and may suffer from oil ingestion and decreased mobility as a result of oiling.

The area affected by the Stuyvesant spill is located in Snowy Plover federal Recovery Unit 2, which includes Del Norte, Humboldt, and Mendocino Counties, California. The overall management goal for Recovery Unit 2 is 200 breeding adults, including 162 breeding adults in Humboldt County. The Little River/Clam Beach segment, the South Spit/Eel River Wildlife Area segment, and the Eel River gravel bars are the 3 primary breeding areas within Humboldt County, which accounted for all of the nesting in Recovery Unit 2 from 1999 through 2003, with the exception of 2 nest attempts in Mendocino County during that 5-year period.

The northern California population is quite small (less than 50 pairs), with many of them breeding at Clam Beach (Colwell et al. 2003). R. LeValley reported approximately 49 breeding plovers within Humboldt County in 1999 (LeValley et al. 1999). Sixteen plovers nested from the mouth of the Eel River to the entrance of Humboldt Bay. Fourteen plovers nested on Clam Beach; the beach segment between the Mad River and Little River. The breeding population

estimate for Humboldt County in 2003 is 54 plovers, based on color band data. As a comparison, the 2003 breeding season survey detected only 39 plovers in Mendocino, Humboldt, and Del Norte Counties, suggesting that single-survey efforts underestimate local population size (Colwell et al. 2003, Bart and Earnst 2002). Colwell et al. (2003) reports 4 breeders between the Eel River mouth and the entrance to Humboldt Bay, and 18 breeding plovers from the Mad River to Little River.

4.3.8.1 Injury Quantification

An estimated 3,054 acres (40 linear miles) of sandy beach habitat was exposed to oil. Appendix I provides a full report on the injury assessment and quantification of sandy beach and rocky intertidal habitat injuries. This report was prepared by the Trustee-RP technical working group. The report concludes that 58.6 acre-years (discounted) of sandy beach habitat services were lost due to the spill.

Thirty Snowy Plovers were observed at Clam Beach during the oil spill and observers estimated that 10 of these were visibly oiled. Monitoring efforts by consulting biologists revealed that three of the oiled birds were banded and that two of these individuals died the following winter (Ron LeValley, Mad River Biologists, Inc., personal communication). None were captured for further assessment. Impacts to Snowy Plovers were considered along with the beach habitat injury when designing restoration actions.

4.3.8.2 Restoration Alternatives

Direct restoration of sandy beach invertebrates, which form the prey base of the Snowy Plover, is difficult. However, there are several restoration options that focus on Snowy Plover nesting areas. These include dune restoration to increase nesting habitat, the installation and management of predator exclosures to protect nests, and the protection of nesting and chick-rearing areas from human disturbance (including off-road vehicle traffic). The Trustees considered the projects listed in the following table.

PROJECT CONCEPTS	**BENEFITS**
South Spit of Smith River acquisition and mgmt (57 acres of dune/sand)	Pelicans, gulls, shorebirds, Snowy Plovers
Island Roost at Lake Talawa – building up the island above high water	Pelicans, cormorants, gulls, Snowy Plovers, shorebirds, Aleutian geese
South Spit of Humboldt Bay acquisition (627 acres of dune and salt marsh) – protection from disturbances	Snowy Plover, shorebirds, pelicans, human rec. use
Clam Beach County Park access control project – restrict access to vehicles to protect dune species	Snowy plovers
European beachgrass eradication at up to 4 sites (Eel River WA, 115 acres; Clam Beach, 17 acres; Mad River Co. Pk. 40 acres; Little River State Beach, 53 acres)	**Snowy Plovers**
Human Disturbance Reduction for Snowy Plovers – signs and annual nest protection	**Snowy Plovers**
Anti-predator control (e.g., rats, fox, cats, dogs, etc.)	Snowy Plovers

After evaluating these projects using the initial and additional screening criteria, the Trustees identified a contribution towards dune restoration and Snowy Plover nest protection as a tentative preferred project.

Dune Restoration and Snowy Plover Nest Protection Project: This project would contribute toward dune restoration, including vegetation restoration, as well as toward the maintenance of signs and barriers to protect Snowy Plover nesting areas.

4.3.8.3 Scaling for Primary and Compensatory Restoration

Restoration scaling was based upon the quantified injury to sandy beach habitat. As section 4.3.8.1 described, the total injury to this injury category was 58.6 acre-years (discounted) of resource services. For restoration scaling, the Trustee-RP technical working group focused on dune restoration, estimating the increased number of acre-years of resource services that would derive from restored acres of dune habitat. While slightly out-of-kind, the Trustee-RP technical working group directly scaled dune restoration to sandy beach impacts.

Assuming that project benefits begin in the year 2004 and continue for 30 years, the Trustee-RP technical working group calculated that such a project would generate 8.9 additional acre-years of services per acre. Because 58.6 acre-years were lost due to the spill, a total of **6.6 acres** of restoration would be appropriate to compensate for the injury.

Additional funding from other sources may augment the size of this project.

Appendix K provides additional details regarding the HEA for this injury category.

4.3.8.4 Environmental Consequences (Beneficial and Adverse)

Beneficial Effects

This project will both enhance the natural dune habitat and improve nesting habitat for Snowy Plovers. By eliminating non-native vegetation, the dune habitat will return to a more natural state. By protecting Snowy Plover nesting areas, the birds should experience less disturbance and greater nesting success. This project provides the additional benefit of pro-actively minimizing conflicts between human recreational beach use and nesting plovers. By providing strategically placed protective fencing, the project will focus direct human access to the beach in ways to minimize disturbance to plovers.

Adverse Effects

Because human access will not be allowed inside the Snowy Plover nesting area, some of the beach will be lost for recreational opportunities during the nesting season. However, these nesting areas are in the foredunes, located high on the beach and well away from the water where most human activity occurs. Human recreational uses are typically minimal in the foredune area; it is primarily used as a transit area to the lower beach. The protective fencing will be placed such that human access from parking areas to the beach will be facilitated, although narrowed to more defined paths.

Another potential adverse effect is the impact of fencing on Snowy Plover nesting. Fencing very small areas immediately around nests may cue predators to nest sites. Fencing with small mesh

size may restrict the plovers. This project will incorporate lessons learned from other plover fencing projects to avoid these kinds of pitfalls.

4.3.8.5 Probability of Success

This project has a high likelihood of success. Both dune restoration projects and protective fencing for Snowy Plovers have been successfully implemented at many sites along the west coast. This project will follow previous successful projects and build on past experience.

4.3.8.6 Performance Criteria and Monitoring

This project will include monitoring of plover nesting areas and plover nests. The functioning of the protective fencing and the success of the nests will be documented. Successful fledging of chicks will be the goal of the project.

4.3.8.7 Evaluation

This project should result in positive benefits by improving nesting habitat for Snowy Plovers, which were directly impacted by the Spill. The Trustees have evaluated this project against initial and additional screening criteria developed to select restoration projects and concluded that this project is consistent with these selection factors.

4.3.9 Human Recreational Beach Use Losses and Restoration

Several types of recreational activities were impacted by this spill: general beach use (e.g., walking, running, etc.), skilled beach use (e.g., surfing, horseback riding), and offshore boating, (e.g., salmon fishing from private boats). Two types of impacts were considered, lost trips and diminished trips. Lost trips included trips that were not taken as a result of the spill. Diminished trips included trips that were taken, but the value to the visitor was reduced in some way as a result of the spill.

4.3.9.1 Injury Quantification

The following table summarizes the estimated damage to recreational services affected by the *Stuyvesant* oil spill.

Table X. Summary of Recreational Losses and Damages.

Location	Activity	Number of Lost Trips	Value per Lost Trip	Number of Diminished Trips	Value per Diminished Trip	Total Value[a]
General Beach Use	Walking	5,547	$20.52	0		$113,825
	Other	557	$20.52	0		$11,437
Skilled Beach Use						
	Surfing	2,111	$25.65	0		$54,140
	Driving	492	$25.65	0		$12,612
	Camping	126	$25.65	0		$3,237
Mad River Beach	General use	197	$20.52	197	$4.10	$4,840
Trinidad Harbor (Boat Launch)	Fishing	135	$54.75	0		$7,368
Trinidad Harbor (Moored Boats)	Fishing	79	$189.07	0		$14,903
Patrick's Point Tidal Pool	Tidal pool viewing	172	$25.65	0		$4,418
TOTAL[a]		**9,415**		**197**		**$226,780**

a. Due to rounding, calculated values may not match presented values.

The majority of the value of human use loss, about $130,000, was due to losses of general beach use activities. These uses made up approximately 67 percent of the number of lost trips and 100 percent of the number of diminished trips. The damage to these activities accounted for about 57 percent of the total recreational damages resulting from the *Stuyvesant* oil spill.

The total estimated damage of $226,780 (in 1998 dollars) approximates the total decrease in the value of recreational services provided by the area that was affected by the spill. The entire period of injury was not directly observed, but was assumed to be roughly three weeks, from September 8 through September 28, 1999. The complete assessment of human use loss is contained in a report developed for the Trustee-RP technical working group (Entrix, Inc. and Industrial Economics, Inc. 2002), available as part of the Administrative Record (see section 3.1.1.4 for information on accessing the Administrative Record).

Because these losses occurred in 1998, the Trustees are adjusting the value to account for inflation and discounting. The recommended approach under the NOAA regulations is to use the U.S. Treasury borrowing rate on marketable securities, as this best reflects the opportunity cost of the money (*Federal Register* 1994, p. 1184). For the relevant time period (adjusting from 1998 to 2004), this rate is approximately 3%. With this adjustment, the lost value (in 2004 dollars) is **$270,787**.

4.3.9.2 Restoration Alternatives

The Trustees considered a variety of projects in Humboldt Bay and along the outer coast. Projects considered provide a range of benefits, including increased beach access, boating and harbor improvements, educational facilities/materials, and enhancements of public use of wildlife areas.

PROJECT CONCEPTS	BENEFITS
South Spit recreational access facilities – complete plan of proposed projects	Human rec. use
Education center for Humboldt Bay NWR – build and maintain	Human rec. use
Interpretive signs at boat launches in Humboldt Bay	Human rec. use/education
Eel River boat ramp – construction of new ramp to replace non-functional one	Human rec. use
Wildlife Area parking areas – at Eel River, Elk River, Fay Slough, and Mad River WAs	Human rec. use
Education center for DFG Wildlife Area – build and maintain	Human rec. use
EcoAtlas of Humboldt Bay watershed – for education	Human rec. use/education
Interpretive displays – at Arcata Marsh, Woodly Is Marina, Elk River WA, others	Human rec. use/education
Palmer's Point Enhancement Project – access improvements, educational aids (interpretive panels) and tide pool study	Human rec. use/education
Trinidad Bay/Trinidad Rancheria harbor improvements	Human rec. use/education
Ocean foods study – short and long term effects of oil spills on consumers of ocean food resources	Human rec. use/education
Indian Island cleanup and restoration	Human rec. use/education
Humboldt Bay Trails Project– planning, design, and easements	Human rec. use

After evaluating these projects using the initial and additional screening criteria, the Trustees identified two tentatively preferred projects: Palmer's Point Enhancement Project and Humboldt Bay Trails Project.

Palmer's Point Enhancement Project: Palmer's Point, located within Patrick's Point State Park, is one of the most popular areas for whale watching, tide pool exploration, and seal and sea lion observation on the North Coast. Many students visit the area to investigate the unique ecosystems in the area. The Palmer's Point Enhancement Project will provide the following:

- Baseline study and assessment of the tide pool area
- A barrier free trail from the parking lot to the viewing area
- Safety enhancing rock work around the viewing area and along the barrier free trail
- Eight interpretive panels in three locations (covering whales, seals and sea lions, sea stacks, sleeper waves, birds, tides-waves-currents-upwelling, intertidal zone biota, tide pool etiquette and safety)
- Two ADA accessible spotting scopes at the viewing areas
- Budget for one time 6 month Park Interpretive Specialist position (CA State Parks)
- Create a tide pool video for use in the Patrick's Point Visitor Center
- Create a brochure explaining the fragility and importance of tide pools

This project will enhance public use and educational benefits of the Palmer's Point area, while protecting the existing habitat for long term public enjoyment. The project is anticipated to provide a high quality outdoor/educational experience for the visiting public and students. The proposed budget for this project is $102,000.

Humboldt Bay Trails Project: The Humboldt Bay Trails Project is intended to implement a variety of projects that, in general, provide non-motorized access to and around Humboldt Bay, and create the Humboldt Bay segment of the California Coastal Trail. Program components include:

- A bay-wide access signage program to increase awareness of access opportunities in Humboldt Bay (i.e., roadway signs, kiosks, interpretive signs)
- A 'water trails' program consisting of facilities, routes and information for recreational paddle boating in Humboldt Bay
- Improved access to wildlife areas in Humboldt Bay
- Arcata-Eureka Highway 101 bicycle path

This program is intended to significantly improve the use and enjoyment of Humboldt Bay natural areas for both local residents and visitors. The program is also anticipated to contribute to community infrastructure planning by fostering a balance of natural systems, commercial operations, and residential areas in the region. This tentatively preferred project would contribute to one or more components of the Humboldt Bay Trails Project. The proposed contribution to this project would be $168,787.

4.3.9.3 Scaling for Primary and Compensatory Restoration

For this injury and restoration category, the Trustees have elected to use the value-to-cost approach to restoration scaling. In this approach, a dollar value is attached to the injury, and that value becomes the damages that are then spent on restoration projects.

Under the NOAA guidelines for damage assessment, the Trustees must first consider and reject the service-to-service (or, implicitly, value-to-value) approach (e.g., REA) before using the value-to-cost approach to restoration scaling (see NOAA 1997, page 4-9). In this case, use of the service-to-service or value-to-value approach would require either the estimation of increased user days over time from the restoration projects and/or an estimate of the value of the project to the public in the future. Given the relatively small size of the recreational use injury, the technical working group concluded that the increased assessment costs required to employ the service-to-service approach could likely exceed the value of the injury. It was concluded that the value-to-cost approach was the most cost-effective and reasonable method to use in this case. Thus, the cost of the restoration projects for human recreational uses shall be approximately **$270,787**.

4.3.9.4 Environmental Consequences (Beneficial and Adverse)

Beneficial Effects

These projects should result in positive benefits by enhancing the quality and amount of public use near the areas affected by the spill. Improvements to public access at Palmer's Point, and at various natural areas of Humboldt Bay, will enhance public enjoyment of natural resources. These improvements will also be implemented in ways that protect and minimize future adverse impacts to habitats subject to frequent human use/visitation. Implementation of these projects will result in improved public education regarding the project areas and will expand appropriate public access to areas that could not formerly be accessed safely or without harm to habitats. The Humboldt Trails Project will not only provide local benefits, but will contribute to the continuity of the California Coastal Trail. The California Coastal Trail is a state-supported project intended to ensure public access along the entire coast of California.

Adverse Effects

No significant adverse economic impacts are expected to occur as a result of the projects. Potential environmental impacts will be addressed through the permit process. The improvements brought about by these projects will likely result in increased visitation which may result in negative impacts on wildlife due to noise and other physical disturbance. Such effects can be minimized by careful selection of specific geographic areas for development, keeping in mind that not all natural areas are appropriate or amenable as public access points. Negative impacts can also be reduced by fostering adequate public awareness of human disturbance effects on wildlife; feasible mechanisms for increasing awareness include signage and interpretive displays.

4.3.9.5 Probability of Success

Considering the relatively unimproved condition of the sites targeted for improvement, the probability of success for these projects is very high. Palmer's Point will use standard methods for access and education improvements utilized at other state and federal facilities. With respect to the Humboldt Bay Trails Project, similar projects along the California Coast have been successfully implemented, and the project design will continue to receive careful public and agency review in order to ensure increased public use and improved safety.

4.3.9.6 Performance Criteria and Monitoring

Performance criteria for these projects will be the completion of the project elements described above. Monitoring is not practical or cost-effective for these projects. Ongoing maintenance of the new facilities will be provided by California State Parks (Palmer's Point) and various cooperating entities for the Humboldt Bay Trails project.

4.3.9.7 Evaluation

These projects should result in positive benefits by enhancing the quality and amount of public use at Palmer's Point and Humboldt Bay, which were directly affected by the Spill or are adjacent to affected areas. The Trustees have evaluated these projects against initial and additional screening criteria developed to select restoration projects and concluded that these projects are consistent with these selection factors. The Trustees determined that this type and scale of project would effectively provide appropriate compensation for lost or diminished active human use that occurred as a result of the spill and have identified these projects as tentatively preferred projects.

5.0 References

Atkinson, I.A.E. 1978. Evidence for the effects of rodents on the vertebrate wildlife of New Zealand Islands. Pages 7-31, in P.R Dingwall, I A E Atkinson, and C Hay (Eds.). The Ecology and Control of Rodents in New Zealand Nature Reserves. New Zealand Department of Lands and Survey Information Series No. 4.

Bart, J. and S. Earnst. 2002. Double sampling to estimate density and population trends in birds. Auk 119:36-45.

Beissinger, S.R. 1995. Population Trends of the Marbled Murrelet Projected From Demographic Analysis. *In* Ecology and Conservation of the Marbled Murrelet. USDA Forest Service Gen. Tech. Rep. PSW-152.1995, p. 385-393.

Beissinger, S.B. and N. Nur. 1995. Population trends of the Marbled Murrelet projected from demographic analyses. *In*: Recovery plan for the threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. U.S. Fish and Wildlife Service, Portland, Oregon. 203 pp.

Beissinger, S.R. and N. Nur. 1997. Appendix B: Population Trends of the Marbled Murrelet Projected from Demographic Analysis. In *Marbled Murrelet Recovery Plan.* United States Department of the Interior, Fish and Wildlife Service.

Beissinger, S.R. and M.Z. Peery. 2003. Range-wide analysis of juvenile ratios from Marbled Murrelet monitoring programs: implications for demographic analyses. Report submitted to U.S. Fish and Wildlife Service, Arcata, California.

Boarman, W.I. 2002. Reducing predation by common ravens on desert tortoises in the Mojave and Colorado Deserts. Bureau of Land Management, U.S. Geological Survey, Western Ecological Research Center. San Diego, California.

Brand, L.A. and T.L. George. 2000. redation Risks for Nesting Birds in Fragmented coast Redwood Forest. *Journal of Wildlife Management.* 64(1): 42-51.

Burger, A.E. 2002. Radar Inventory and Watershed-level Habitat Associations of Marbled Murrelets in Clayoquot Sound, 1996-1998 *In* Multi-Scale Studies of Populations, Distribution and Habitat Associations of Marbled Murrelets in Clayoquot Sound, British Columbia. Ministry of Water, Land and Air Protection, Victoria BC. pp. 35-56.

Burger, A.E. 2001. Using Radar to Estimate Population s and Assess Habitat Associations of Marbled Murrelets. *Journal of Wildlife Management.* 65(4):696-715.

Burger, A.E. and A.R.M. Tillmanns. 2002. Density and spacing of Marbled Murrelets in forest nesting habitat: Evidence of territoriality? Presentation at Pacific Seabird Group 29th Annual Meeting, 20-23 February, 2002, Santa Barbara, CA.

Carter, H.R., Wilson, U.W., Lowe, R.W., Rodway, M.S., Manuwal, D.A., Takekawa, J.E. & Yee, J.L. 2001. Population trends of the Common Murre (*Uria aalge californica*). Pages

33-132 *in* Manuwal, D.A., Carter, H.R., Zimmerman, T.S. & Orthmeyer, D.L., editors. *Biology and conservation of the Common Murre in California, Oregon, Washington, and British Columbia. Volume 1: Natural history and population trends.* U.S. Geological Survey, Information and Technology Report USGS/BRD/ITR-2000-0012, Washington, D.C.

Colwell, M.A., R.R. LeValley, S.E. McAllister, C.B. Millett, J.J. Meyer, S.J. Hurley, H.E. Beeler, K.G. Ross & V. Loverti. 2003. *Final report: 2003 Snowy Plover breeding in northern California, with emphasis on Humboldt County.* Submitted to MRB Research, Inc.

Conroy, C.J., V. Bahn, M.S. Rodway, L. Ainsworth, and D. Newsom. 2002. Estimating Nest Densities for Marbled Murrelets in Three Habitat Suitability Categories in the Ursus Valley, Clayoquot Sound. *In* Multi-Scale Studies of Populations, Distribution and Habitat Associations of Marbled Murrelets in Clayoquot Sound, British Columbia. Ministry of Water, Land and Air Protection, Victoria BC. pp. 121-137.

Entrix, Inc. and Industrial Economics, Inc. 2002. Lost Active Human Use Cooperative Assessment. Report prepared for Bean Dredging, LLC, California Department of Fish and Game Office of Spill Prevention and Response, California State Lands Commission, U.S. Fish and Wildlife Service. Industrial Economics, Inc., Cambridge, MA.

Ford, R.G., M.L. Bonnell, D.H. Varoujean, G.W. Page, H.R. Carter, B.E. Sharp, D. Heinemann and J.L Casey. 1996. Total Direct Mortality of Seabirds from the *Exxon Valdez* Oil Spill. American Fisheries Society Symposium 18:684-711.

Ford, R.G., G.W. Page and H.R. Carter. 1987. Estimating mortality of seabirds from oil spills. *1987 Oil Spill Conference Proceedings.* Baltimore, MD.

Ford, R.G. and J.C. Ward. 1999. Carcass scavenging rates study following the M/V Kure/Humboldt Bay Oil Spill. Draft report to the CDFG OSPR, Sacramento, CA. R.G. Ford Consulting Company, Portland, OR.

Grinnell, J. and A.H. Miller. 1944. *The Distribution of the Birds of California.* Artemisia Press. Lee Vining, CA.

Helvie, J. and R. Lowe. 1985. Environmental assessment update. Proposed land acquisition for Humboldt Bay National Wildlife Refuge, Humboldt County, California. U.S. Department of the Interior, Fish and Wildlife Service, Region 1, Portland, Oregon.

Huff, M., P. Jodice, J. Baldwin, S. Miller, R. Young, K. Ostrom, C.J. Ralph, M.G.Raphael, C. Strong, C. Thompson, and G. Falxa. 2003. Marbled Murrelet Effectiveness Monitoring, Northwest Forest Plan, 2002 Annual Summary Report (Version 2). U.S. Department of Interior; U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station and Pacific Southwest Research Station; Oregon State University; Crescent Coastal Research, Washington Department of Fish and Wildlife. September 2003. 27 pp.

Jaques, D.L. 1994. Range expansion and roosting ecology of non-breeding brown pelicans. Unpublished M.S. thesis. University of California, Davis, California. 49 pp.

Jaques, D.L. and C. Strong. 2002. Disturbance of brown pelicans at communal roosts in Southern and Central California. Prepared for the American Trader Trustee Council, California Department of Fish and Game, U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration. October 2002.

Jaques, D.L. and D.W. Anderson. 1987. Conservation implications of habitat use and behavior of wintering Brown Pelicans. Unpublished report. UC Davis, PSRDP program. 49 pp.

Jones, C. 2000. Sooty shearwater (*Puffinus griseus*) breeding colonies on mainland South Island, New Zealand: evidence of decline and predictors of persistence. *New Zealand Journal of Zoology* 27:327-334.

Knechtel, H.A., N.M. Jones, M.A. Murphy, A.H. Robinson, K.J. Vickers, G.J. McChesney, M.W. Parker, J. Buffa, H.R. Carter, S.W. Kress, R.T. Golightly, and K.A. Peluso. 2003. Restoration of Common Murre Colonies in Central California: Annual Report 2002. US Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex. Newark, CA.

LeValley, R. 1999. Snowy Plover nesting season 1999. Report prepared for Humboldt County Planning Department. Mad River Biologists, McKinleyville, California.

LeValley, R., S. McAllister and A.Transou. 2001. Effects of the Stuyvesant Spill on Reproductive Success of the Western Snowy Plover at Clam Beach, Humboldt County California. Year 2000 season. Draft report submitted to the California Department of Fish and Game, Office of Spill Prevention and Response. Sacramento, CA

Liebezeit, J.R. and T.L. George. 2002 "A Summary of Predation by Corvids on Threatened and Endangered Species in California and Management Recommendations to Reduce Corvid Predation". California Department of Fish and Game, Species Conservation and Recovery Program Rpt. 2002-02, Sacramento, CA. 103pp.

Lyver, P., O'B H. Moller, and C. Thomson. 1999. Changes in sooty shearwater (*Puffinus griseus*) chick production and harvest precede ENSO events. *Marine Ecology Progress Series* 188:237-248.

Miller, G.S., S.R. Beissinger, H.R. Carter, B. Csuti, T.E. Hamer, and D.A. Perry. 1997. *Recovery Plan for the Threatened Marbled Murrelet (Brachyramphus marmoratus) in Washing, Oregon, and California*. U.S. Fish and Wildlife Service, Portland, OR.

Monroe, G.W. 1973. The natural resources of Humboldt Bay, California. Dept. of Fish and Game Coastal Wetland Ser. 6. 160 pp.

Moskoff, W. 2000. The impact of oil spills on birds: Looking back at the *Exxon Valdez. Birding,* February, 2000: 44-49.

McIntyre, J.W. and J.F. Barr. 1997. Common Loon (*Gavia immer*). *In* The Birds of North America, No. 313 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

Meyer, C.B. and S.L. Miller. In press. Marbled Murrelet use of fragmented landscapes for nesting in southern Oregon. *Conservation Biology.*

Miller, S.L., C.B. Meyer, and C.J. Ralph. 2002. Land and seascape patterns associated with Marbled Murrelet abundance offshore. *Waterbirds 25* (1): 100-108.

Nelson, S.K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*). *In* The Birds of North America, No. 313 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

Nelson, S.K. and T.E. Hamer. 1995. Nest success and the effects of predation on Marbled Murrelets. *In*: C.J. Ralph, G.L. Hunt, M.G. Raphael, and J. F. Piatt (Tech. eds.), Ecology and Conservation of the Marbled Murrelet. Gen. Tech. Rept. PSW-GTR-152. Albany, California: Pacific Southwest Experiment Station, Forest Service, U.S. Dept. of Agriculture; 420 pp.

NOAA. 1995. Habitat Equivalency Analysis: An Overview. Policy and Technical Paper Series, No. 95-1, (Revised 2000).

NOAA. (1997). Natural Resource Damage Assessment Guidance Document: Scaling Compensatory Restoration Actions (Oil Pollution Act of 1990). NOAA Damage Assessment and Restoration Program, Washington, D.C., December, 1997.

NOAA. (1999). Discounting and the Treatment of Uncertainty in Natural Resource Damage Assessment. NOAA Damage Assessment and Restoration Program, Washington, D.C., February, 1999.

Newman, S.H. and J.A. Mazet. 2001. Post-release survival of Common Murres (Uria aalge) following the Stuyvesant oil spill. Abstract only. Presented at OWCN Research Symposium, May 2001, Sacramento.

Oedekoven, C.S., D.G. Ainley, and L. Spear. 2001. Variable responses of seabirds to change in marine climate: California Current, 1985-1994. *Marine Ecology Progress Series* 212:265-281

Oka, N. and M. Okuyama. 2000. Nutritional status of dead oiled rhinoceros auklets (*Cerorhinca monocerata*) in the Southern Japan Sea. *Marine Pollution Bulletin* 40(4): 340-347.

Peery, Z., et al. 2002. Marbled Murrelet (Brachyrampus marmoratus) Demography in Central California: 2001 Progress Report. Prepared for the California Department of Fish and Game, US Fish and Wildlife Service, California State Parks.

Peery, Z., S.R. Beissinger, B. Becker, S. Newman. *In review.* Applying the declining population paradigm: Diagnosing causes of poor reproduction in the Marbled Murrelet.

Ralph, C.J. and S.L. Miller. 1995. Offshore Population Estimates of Marbled Murrelets in California In Ecology and Conservation of the Marbled Murrelet. USDA Forest Service Gen. Tech. Rep. PSW-152.1995, p. 353-360.

Rogers, J.D. 1981. Net Primary Productivity of *Spartina foliosa, Salicornia virginica, and Distichlis spicata* in Salt Marshes at Humboldt Bay, California. M.A. Thesis, Humboldt State University, Arcata, California. 122pp.

Sharp, B.E. 1996. Post-release survival of oiled, cleaned seabirds in North America. *Ibis* 138(2): 222-228.

Sperduto, M., C. Hebert, M. Donlan , and S. Thompson. Injury Quantification and Restoration Scaling for Marine Birds Killed as a Result of the *North Cape* Oil Spill. March 25, 1999.

USDA Forest Service and U.S. Bureau of Land Management. 1994. Final Supplemental Environmental Impact Statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, Oregon. Volumes I & II, and Appendices J2 and J3.

U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; Determination of threatened status for the Washington, Oregon, and California population of the Marbled Murrelet. Final rule. Fish and Wildlife Service. Federal Register Vol. 57. No. 191:45328-45337. October 1, 1992.

U.S. Department of the Interior. 1993. Endangered and threatened wildlife and plants; determination of threatened status for the Pacific coast population of the western snowy plover, final rule. Fish and Wildlife Service. Federal Register 58(42):12864-12874.

U.S. Fish and Wildlife Service. 1997. Recovery plan for the threatened marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, Oregon. 203 pp.

U.S. Department of the Interior. 1999. Endangered and threatened wildlife and plants; designation of critical habitat for the Pacific coast population of the western snowy plover, final rule. Fish and Wildlife Service. Federal Register 64(234): 68508-68544.

U.S. Fish and Wildlife Service. 2001. Western snowy plover (*Charadrius alexandrinus nivosus*) Pacific coast population draft recovery plan. Portland, Oregon. xix + 630 pp.

Veit, R.R., P. Pyle, and J.A. McGowan. 1996. Oceanic warming and long-term change in pelagic bird abundance within the California current system. *Marine Ecology Progress Series* 139:11-18.

Wiese, F.K.. 2002. Estimation and impacts of seabird mortality from chronic marine oil pollution off the coast of Newfoundland. PhD thesis, Department of Biology, Memorial University of Newfoundland, St. John's , Newfoundland, Canada.

6.0 Preparers

The following Trustees participated in the development of this draft DARP:

Steve Hampton
Matt Zafonte
Julie Yamamoto
Kathy Verrue-Slater
California Department of Fish and Game
Office of Spill Prevention and Response
P.O. Box 944209
Sacramento, CA 94244-2090

Daniel Welsh
Charlene Hall
U.S. Fish and Wildlife Service
2800 Cottage Way, W-2605
Sacramento, CA 95825

Charles McKinley
U.S. Department of the Interior
Office of the Solicitor
1111 Jackson Street, Suite 735
Oakland, CA 94607

7.0 Appendices