

RESTORATION OF NEARSHORE BREEDING SEABIRD COLONIES ON THE CENTRAL CALIFORNIA COAST: FINAL PLAN

I. EXECUTIVE SUMMARY

Between January 28 and February 4, 1986 the transportation barge Apex Houston discharged an undetermined amount of San Joaquin Valley crude oil while in transit from San Francisco Bay to the Long Beach Harbor. The oil spill caused damage to State of California and Federal resources from San Francisco to the Big Sur coast. Approximately 9,000 seabirds were killed, including 6,000 common murres (Uria aalge), in addition to other aquatic life in and around the coastal waters of central California. Both the State and Federal governments responded to the spill and began assessing damages as a result of the spill.

The State and Federal natural resource trustees commenced litigation in this matter against potentially responsible parties in January 1989. The complaints alleged claims for natural resource damages, costs, and penalties pursuant to the Clean Water Act, 33 U.S.C. § 1251 et seq., Title III of the National Marine Sanctuaries Act, 16 U.S.C. § 1431 et seq. (formerly the National Marine Protection, Research and Sanctuaries Act, "MPRSA"), the California Harbors & Navigation Code §§ 293 and 294, and other State Law.

In August 1994 the parties settled this matter in a Consent Decree entered by the Federal District Court for the Northern District of California for a total of \$6,400,000. As part of the natural resources damage settlement, \$4,916,430 has been allocated for the restoration of common murres in central California. The common murre restoration project is the subject of this Final Plan. An additional \$500,000 has been allocated for the acquisition of habitat for the marbled murrelet (Brachyramphus marmoratus), a species that is listed under the Federal and State Endangered Species Acts and was impacted by the spill. The murrelet project is being carried out under State lead and is included, but not described in detail, in this Final Plan. The remainder of the \$6,400,000 collected in the settlement was for penalties and costs incurred as a result of the spill.

A Trustee Council, comprised of representatives of each Trustee (California Department of Fish and Game, National Oceanic and Atmospheric Administration, and U.S. Fish and Wildlife Service) was established to review and select restoration actions for natural resources injured by the spill. This Council will meet regularly during the duration of the project to review progress and make necessary changes. The Trustee Council has approved this Final Plan for restoration of common murres.

The goal of the common murre restoration project is to recolonize common murres at historic breeding colonies in the areas where colonies were extirpated or severely depleted by the Apex Houston oil spill.

Social attractants (decoys and recorded vocalizations of common murre) will be used to attract common murre to nest at historic nearshore colonies in the vicinity of San Francisco and Monterey. Common murre will be monitored at these sites and at reference sites in the vicinity of Point Reyes and the Farallon Islands in order to evaluate and refine the recolonization project. Parameters to be monitored include colony size, reproductive success, behavior, and phenology of common murre. In addition, anthropogenic factors (e.g., boat disturbance, aircraft overflights, oiling) and natural factors (e.g., predation, diet) that may affect the success of recolonization efforts will be monitored. This project may take a minimum of 10 years to achieve success because common murre have inherently low reproductive rates and do not breed until they are several years old.

II. INTRODUCTION

Nearshore breeding colonies of common murre (*Uria aalge*) throughout central coastal California (Point Arena to Big Sur) decreased by 60.1% between 1980 and 1986 (Takekawa et al. 1990). This population decline was attributed to high mortality from gill-net fishing, oil spills (including the Apex Houston spill), and a severe El Nino-Southern Oscillation event in 1982-1983 (Takekawa et al. 1990, Swartzman and Carter 1991, Carter et al. 1992). The Apex Houston oil spill, which occurred principally between San Francisco and the Monterey Peninsula, killed nearly 9,000 seabirds in February 1986 (Siskin et al. 1993). This mortality included approximately 1,293 rhinoceros auklets (*Cerorhinca monocerata*), 180 small alcids, 12 marbled murrelets (*Brachyramphus marmoratus*), and 1,206 other birds (including loons, grebes, scoters, cormorants, shorebirds, and gulls) (Siskin et al. 1993). In addition, approximately 6,000 common murre were killed (Siskin et al. 1993). The common murre colony at Devil's Slide Rock was found to be abandoned, subcolonies at Castle Rocks disappeared, and other central coastal breeding sites (e.g., Hurricane Point Rocks, Point Reyes) were greatly reduced after the spill (Takekawa et al. 1990, Swartzman and Carter 1991, Carter et al. 1992)(Figure 1).

In the early 1900's, common murre bred at Prince Island in southern California (Carter et al. 1992). However, the central California population currently represents the southernmost range for breeding common murre in the Pacific. Future oil spills and other catastrophic events (e.g., disease, predation, climate change) could result in the extirpation of this population as well as a reduction in the species' geographic range. The restoration of former common murre colonies would aid in securing the central coastal California common murre population and would spread the risk of future disasters among colony sites over a wider range of the California coast.

The goal of this project is to restore common murre at historic breeding colonies in areas where colonies were extirpated or severely

depleted by the Apex Houston oil spill. The project will be conducted over approximately 10 years. A total of \$4,916,430 was obtained for this project via the court settlement.

III. PURPOSE

The restoration funds were recovered under the Federal Clean Water Act and National Marine Sanctuaries Act, the California Harbors & Navigation Code §§ 293 and 294, and other State Law. A Trustee Council, comprised of representatives of each Trustee, was established to review and select restoration actions. As part of the settlement in the Apex Houston litigation, approximately \$4.92 million has been allocated for the restoration of common murre colonies that suffered damage from the Apex Houston oil spill. This project should aid in restoring the central California common murre population at historic breeding colonies in areas where colonies were extirpated or severely depleted by the Apex Houston oil spill. Restoring this population to a larger part of its historic range will aid in spreading the risk of future catastrophic events (e.g. oil spills, disease, storms) between more colony sites and over a broader section of the California coast.

IV. RESTORATION ALTERNATIVES CONSIDERED AND SELECTED

A) Alternatives Considered

The Federal Clean Water Act and other Federal law states that natural resources damages "shall be used to restore, rehabilitate, or acquire the equivalent of" natural resources damaged or destroyed as a result of a discharge of oil (Clean Water Act § 311(f)(5), 33 U.S.C. § 1321(f)(5)). In addition, the Service's Natural Resource Damage Assessment program in Region 1 has found the following criteria helpful in setting priorities when evaluating options for restoration of natural resources damaged due to releases of oil or hazardous substances (Wickham et al. 1993):

- (1) on-site and in-kind, in which restored resources occur at the injured site and are physically and biologically the same as those lost;
- (2) off-site and in-kind, in which restored resources occur at a site other than that injured, but similar physical and biological resources are restored;
- (3) on-site and out-of-kind, in which restored resources at the impact site are physically and biologically different from those lost;
- (4) off-site and out-of-kind, in which restored resources are at a site other than the impact site and are physically and biologically different from those lost; and,
- (5) In special cases, acquisition of equivalent existing resources/services under private ownership, which does not replace lost resources, but reduces potential future loss

by placing acquired resources under public management and protection (e.g., the marbled murrelet habitat acquisition project).

Therefore, the Trustees concentrated their damage assessment and restoration efforts on the recovery of central California seabird populations, especially alcids, since these birds incurred the greatest losses due to the Apex Houston oil spill (Siskin et al. 1993).

Alternatives considered for seabird restoration included active recolonization/restoration projects and habitat acquisition projects. Alternatives were compared based on the criteria described above, as well as the technical feasibility of the project, importance to the public interest, and monetary costs. Two projects have been selected for immediate implementation. These are the acquisition of marbled murrelet breeding habitat and the recolonization of common murres using social attraction techniques. The Trustee Council will reevaluate these two projects and consider additional restoration projects and/or supplemental methodology at least annually. The Trustee Council will reappropriate and reauthorize funds as needed.

Recolonization/restoration efforts were considered for common murres and rhinoceros auklets, two seabird species that suffered high mortality as a result of the spill. The rhinoceros auklet project involved use of artificial nest sites to enhance breeding populations along the central California coast. This project was not chosen for immediate implementation for several reasons. A large increase in the California rhinoceros auklet population occurs during the winter months and far exceeds the summer estimated breeding population (Briggs et al. 1987). It is believed that this large increase is due to migrants moving into the area from more northern colonies (Briggs et al. 1987). In addition, the rhinoceros auklet population within the area of the spill (i.e. the local population) had been increasing since the early 1980's and continued to increase after the Apex Houston spill (Ainley and Boekelheide 1990, Carter et al. 1992). This suggests that many of the 1,293 rhinoceros auklets estimated to have been killed by the Apex Houston spill (Siskin et al. 1993) were probably wintering birds from outside the local breeding population. As a result, restoration of rhinoceros auklets received a lower priority.

The common murre recolonization project (describe herein) was given higher priority than rhinoceros auklet restoration because its potential benefits were linked more closely to the injuries caused by the spill. The extirpation of the Devil's Slide Rock colony and a severe reduction at the Castle and Hurricane rocks colonies were attributed to the common murre mortalities that resulted from the Apex Houston oil spill (Swartzman and Carter 1991). As a result, damage to the local breeding population was demonstrated (Swartzman and Carter 1991).

An additional site (Bodega Rock in Sonoma County) for common murre

recolonization was suggested during the public comment period. Bodega Rock is an active seabird colony and in 1989 it contained 558 Brandt's cormorant (Phalacrocorax penicillatus) nests and 12 western gull (Larus occidentalis) nests (Carter et al. 1992). This location was not selected for implementation of murre recolonization techniques because there are no known records of common murre breeding on this rock.

A third restoration project involving construction of a seabird breeding and rehabilitation facility was rejected because its cost was prohibitive relative to funds available, and because the California Department of Fish and Game's Office of Oil Spill Prevention and Response is already implementing a statewide oiled wildlife care network.

Four habitat acquisition projects were considered: purchase of Cape Vizcaino in northern Mendocino County to protect nesting seabirds, purchase of coastal land near Castle Rock to protect a mainland colony of common murre, purchase of lands within San Francisco Bay, and purchase of marbled murrelet nesting habitat along the central California coast. The first three projects were given lower priorities because they were outside of the area impacted by the spill (Cape Vizcaino), were too costly (mainland site near Castle Rock), or were beneficial primarily to species that were not affected by the spill (sites in San Francisco Bay). The purchase of marbled murrelet nesting habitat along the central California coast was selected for immediate implementation with settlement funds allocated specifically for that project.

B) Alternatives Selected

1. Acquisition of Marbled Murrelet Nesting Habitat

The acquisition of marbled murrelet nesting habitat along the central California coast was selected because acquisition would occur within the area impacted by the spill and damage to the local population could be demonstrated. In addition, this project has great importance to the public because it will provide long-term protection of a species listed under the Federal and State Endangered Species Acts. The Trustee Council believes that the \$500,000 allocated to this project will be sufficient to obtain suitable habitat to compensate for the murrelets injured in the spill, provided that it is leveraged with other resources. The Trustees regard augmentation of the budget for the marbled murrelet project as the highest priority for any funds that may become available from the murre recolonization project.

2. Recolonization of Impacted Common Murre Colonies

The second project the Trustee's have selected for immediate implementation is the recolonization of common murre colonies at Devil's Slide and San Pedro rocks in San Mateo County and Castle and

Hurricane Point rocks in Monterey County.

a. Devil's Slide and San Pedro Rocks Common Murre Recolonization:

Recolonize common murres at Devil's Slide and San Pedro rocks (San Mateo County, California) using social attraction methods (decoys and recorded vocalizations) and develop reference information needed to evaluate and refine restoration efforts.

Location(s): Devil's Slide and San Pedro rocks, San Mateo County, California; Point Reyes area (Point Reyes, Point Resistance, Double Point, and Miller Point rocks), Marin County, California; Farallon Islands, San Francisco County, California

Justification: Common murres are an extremely important and visible part of the California seabird community (Carter et al. 1992). Common murres are the most abundant nesting species and have the greatest biomass of all breeding seabirds in the state (Sowls et al. 1980, Ainley and Boekelheide 1990). In addition, common murres comprise 40% of the breeding seabirds found in central California (Carter et al. 1992). This population sustained severe losses from commercial and subsistence eggging in the 1800's and early 1900's, from chronic oil pollution and spills in the early to mid 1900's, and from chronic oil pollution and gill-netting in the 1980's and 1990's (Ainley and Lewis 1974, Takekawa et al. 1990, Carter et al. 1992).

Common murres were last recorded breeding at San Pedro Rock in 1908, when the colony was in the process of being extirpated by egg collectors (Ray 1909). During the 1980's common murres in central California declined dramatically due to mortality from gill nets, oil spills (including the 1984 Puerto Rican and 1986 Apex Houston), as well as the severe 1982-83 El Nino event (Ainley and Boekelheide 1990, Takekawa et al. 1990, Carter et al. 1992). The Apex Houston spill in 1986 contributed significantly to the loss of the Devil's Slide Rock colony near San Francisco (Swartzman and Carter 1991). The San Pedro and Devil's Slide rocks colonies are in close proximity and constitute the only common murre colonies between San Francisco and Monterey. This is a large portion of the range of the central California common murre population. The recolonization of abandoned common murre colonies in central California will contribute to the restoration of this seabirds' historic geographic range.

Given the current depleted condition of the central California common murre population (Ainley and Boekelheide 1990, Takekawa et al. 1990, Swartzman and Carter 1991, Carter et al. 1992, Ainley et al. 1994), extirpated colonies are not likely to be reestablished in the foreseeable future without human assistance. The San Pedro Rock colony has not recolonized over the past 85 years and the Devil's Slide Rock colony has not been recolonized in the 8 years following the Apex Houston spill (Carter et al. 1992, Carter and Takekawa, unpubl. data). Similarly, the Prince Island colony in southern California has not been recolonized since extirpation in the early 1900's (Carter et al. 1992). Furthermore, all six nearshore colonies in central California

have remained severely depleted since the mid-1980's (Carter et al. 1992). The reductions of the geographic range and small numbers of breeding common murres along the central California coastline increase the risk that future catastrophic events will result in extinction of the central California population.

Studies of seabird colony formation in Maine demonstrated that recolonization can be achieved using social attractants (Kress 1978, Kress and Nettleship 1988, Kress et al. 1992). The use of decoys and tape recordings has attracted prospecting seabirds, which have then bred once a threshold group size has been reached. These techniques have assisted in the recolonization of several colonial nesting seabird species (Podolsky 1985; Podolsky and Kress 1989, 1992). These techniques have been utilized in an effort to recolonize common murres in Maine. The common murre recolonization project began when 15 life-size common murre decoys were deployed on Matinicus Rock in summer 1992 (National Audubon Society, unpubl. data). The closest common murre nesting colony to Matinicus Rock is located approximately 75 miles east on Murre Ledge, a small Canadian island. Common murres began landing among the decoys within two days of starting the vocalization tapes (National Audubon Society, unpubl. data). As many as four common murres were sighted at one time among the decoys and at least two birds were present throughout May and June 1992 courting and copulating among the decoys (National Audubon Society unpubl. data). This effort has included the use of various combinations of social attractant techniques to determine the most effective combination, e.g., decoys with and without sound, sound only, decoys with sound and with and without egg decoys, and sound variations (Schubel 1993). Results indicate that a combination of visual and sound stimuli are essential to attract common murres. The highest common murre numbers and activity were observed where egg and murre decoys were accompanied by sound, and decoys were most densely arranged. The recolonization project has continued during 1993 and 1994 with promising results. Common murres continue to exhibit pre-breeding behavior (such as courtship displays, copulation, and passing of fish between potential mates), and the number of common murres attracted to the decoys has increased to approximately 25 birds (National Audubon Society, unpubl. data). However, social attraction techniques must be applied for many years before breeding begins and a self-sustaining breeding colony can be attained (Kress and Carter 1991).

In order to refine recolonization methods and evaluate their success, reference information will be needed on the reproductive biology, behavior, and phenology of common murres at an unmanipulated nearshore site in the local area. However, little information is available from near-shore colonies in central California. Monitoring attendance patterns, arrival dates, reproductive success, and behavior of breeding and nonbreeding common murres at accessible colonies in the Point Reyes area will provide a comparison to evaluate recolonization of Devil's Slide and San Pedro rocks. The Point Reyes colonies (i.e., Point Reyes, Point Resistance, Double Point, and Miller Point rocks) are the

closest to the recolonization sites and should provide a reference for what would normally be expected in a nearshore common murre colony as well as a good comparison with the recolonization site. The monitoring conducted at these unmanipulated colonies will be used to assess recolonization responses and common murre activity patterns at recolonization sites, as well as aid in supporting refinement of recolonization methods.

In addition, unique information will be needed from the common murre colony at the South Farallon Islands at Farallon National Wildlife Refuge in order to evaluate recolonization responses and refine techniques. Common murre reproductive success, diet, and breeding biology have been studied for over 20 years at the South Farallon Islands as part of long-term monitoring of seabird populations required for the Farallon National Wildlife Refuge and other research conducted by the Point Reyes Bird Observatory (Ainley and Boekelheide 1990, Ainley et al. 1994). As a result of these studies, a small number of individually marked birds of known age and sex exist at the Farallon Islands. Limited information is available concerning the attendance of breeding and nonbreeding common murres at breeding sites, especially during winter. Information obtained on individually-marked birds, where age and sex are known, would give a better understanding of expected time-in-attendance and behavior at breeding sites for adult and subadult common murres during the breeding and nonbreeding seasons. Detailed information on common murre attendance and prospecting in the winter will make it possible to evaluate the significance of winter attendance at the recolonization sites. If winter attendance is crucial to successful breeding, social attraction methods may have to be deployed for a longer period. In addition, all accessible subcolonies of common murres at the South Farallon Islands would be examined for more general attendance patterns throughout the year.

Attendance, breeding biology, and behavior will be monitored during the breeding season in marked and unmarked birds in plots at the South Farallon Islands so that recolonization responses at recolonization sites can be more effectively evaluated. Certain colonies with potential for future intensive monitoring efforts may be examined in greater detail, including reproductive success. This information will be important in evaluating and modifying the social attraction methods used at the restoration sites. Information that is only available at this larger, more accessible, and closely monitored common murre colony, including information on known-aged common murres, will be used to refine and assess recolonization efforts. All research conducted on the Farallon National Wildlife Refuge must be approved by the U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex. All research conducted is evaluated by Refuge staff to ensure that the activities associated with the research are compatible with the purposes for which the refuge was established.

Proposed Actions: Social attraction techniques will be used to

recolonize common murres at Devil's Slide and San Pedro rocks. The use of social attraction techniques, similar to those used elsewhere to encourage recolonization by several seabird species, will be employed (Kress 1983, Podolsky 1985, Podolsky and Kress 1989). It is possible that small numbers of common murres are still alive that originally bred at Devil's Slide Rock. Therefore, it is important to begin the recolonization project as soon as possible in order to attract any remaining common murres that have a history of attachment to this colony. Preliminary work will consist of selecting observation points to view recolonization sites, constructing and installing observation blinds, obtaining access permits, and purchasing needed equipment. Aerial surveys of central California breeding seabird colonies and periodic observations of breeding colonies from mainland vantage points will be conducted in spring and summer 1995. Additional aerial reconnaissance of Devil's Slide and San Pedro rocks will be conducted to obtain photographs for mapping the restoration sites. Reconnaissance trips to Devil's Slide and San Pedro rocks will take place to determine equipment and procedures needed to deploy social attraction equipment. Ladders may be installed to allow safe access onto the colonies for project personnel.

Decoys and audio equipment will be placed on the rocks in fall 1995 before common murres begin to frequent nesting islands. Recordings of common murre breeding vocalizations will be made at the Farallon NWR. Between 100 and 200 life-size common murre decoys will be positioned on suitable nesting habitat on Devil's Slide and San Pedro rocks. The decoys will be secured to the rock in a fashion that simulates occupied common murre colonies. Densities and locations of decoys will be based on past aerial photos of the active Devil's Slide Rock colony (taken in 1982) and observations of common murres at existing reference sites from mainland vantage points and aerial photos. Several omnidirectional weather resistant loudspeakers will be positioned at the recolonization sites. Compact disks of California common murre vocalizations will be played prior to and throughout the breeding season from December to August. Daily observations of the recolonization sites will begin once decoys have been deployed and will continue through July. Devil's Slide Rock will be observed from the mainland using a portable blind and telescope. San Pedro Rock observations will occur from a blind located on the rock, from a boat, and/or from the mainland.

Data collected will include common murre arrival date, number of common murres present, behavior of common murres, interaction with other species (e.g., Brandt's Cormorants), location on rock, attendance patterns, diet or feeding behavior, and presence of predators. Prospecting common murres will be plotted by location on maps of the recolonization site. One or more aerial photographic censuses of the central California common murre colonies will be conducted annually between May and June. The censuses will be used to calculate annual breeding population sizes at the recolonization sites and nearby reference colonies in central California, compare trends between years,

and assist in determining numbers of common murres not visible from the mainland or boats. Social attractants will be displayed through the breeding season until after common murres normally leave the breeding sites, usually in July. The decoys and audio equipment will be collected after all bird breeding on the rock has been completed. Equipment will be checked, cleaned, and replaced as necessary. The equipment will be redeployed during the following fall before common murres begin to frequent nesting islands. Monitoring of recolonization sites will continue annually after the first social attractants are deployed. The Trustee Council will reevaluate the recolonization efforts annually and revise as necessary. In addition, the use of techniques such as time lapse photography and radiotelemetry to assist in monitoring birds will be investigated and used if technically and economically feasible. However, the placement and retrieval of such equipment in a way that does not cause undue disturbance to common murres or other seabirds and is secure from human vandalism or theft may be a problem.

The breeding behavior and colony attendance of common murres will be monitored at four nearby colonies in the Point Reyes National Seashore and/or the Gulf of the Farallones National Marine Sanctuary: Point Reyes, Point Resistance, Double Point Rocks, and Miller Point Rocks. These sites will serve as reference sites for the recolonization sites. Several variables will be monitored to allow comparison to recolonization sites, including population size and status, attendance patterns, timing, breeding phenology and success, behavior, interaction with other species, diet or feeding behavior, impacts of predators, human perturbations, and other disturbances. The population size and status would be determined using methods similar to those employed by Birkhead and Nettleship (1980), Gaston et al. (1983), Mudge (1988), and Hatch and Hatch (1989). Only subcolonies that can be viewed from a safe location will be selected. Reconnaissance work and preliminary observations and logistics would begin in spring/summer 1995. This work would consist of obtaining access permits to conduct work, selecting subcolonies to be studied, selecting plots within subcolonies, and conducting aerial surveys of the colonies. The monitoring period would parallel that followed at Devil's Slide and San Pedro rocks.

Winter and summer attendance, selected aspects of breeding biology of banded and unbanded common murres, and many of the same parameters measured at recolonization and nearshore reference sites will also be monitored at breeding sites at the South Farallon Islands. Established and new study plots, individually-banded birds, blinds, and other facilities will allow for the study of summer and winter attendance in more detail than at nearshore locations. Monitoring would include determining arrival dates, winter attendance patterns (breeding versus nonbreeding common murres), winter behavior of nonbreeding and breeding common murres, site fidelity of breeding common murres, reproductive success, population size, and impacts of predation. Monitoring at the South Farallon Islands will continue for two years and may be continued if needed to support refinement of recolonization methods or to

facilitate interpretation of data at other colonies.

This restoration project will provide unique opportunities to enhance public knowledge concerning seabirds, seabird conservation, and the marine environment. Every attempt will be made to educate the public through presentations, news coverage, and other appropriate venues. Emphasis will be placed on greater awareness of seabird resources in the area, the problems caused by oil pollution and oil spills, gill nets, and other anthropogenic factors as well as the restoration efforts conducted by the cooperating agencies, environmental organizations, and biologists. In addition, the location of the recolonization sites near San Francisco along scenic Highway 1 provides excellent viewing opportunities for the public and attracts large numbers of visitors each year. Therefore, opportunities for public outreach will be explored at this site.

Schedule:

Spring-summer 1995: Begin preliminary work, including contracting, planning, logistics, and permits. Conduct aerial surveys of seabird colonies in central California in May or June to obtain baseline data, conduct aerial flights of Devil's Slide and San Pedro rocks to obtain aerial photos for mapping purpose, and record breeding common murre vocalizations at the Farallon NWR for use in the recolonization project. Select colonies and study plots to be monitored in the Point Reyes area. Conduct safety training for personnel as required.

Fall and winter 1995-1996: In fall 1995, conduct reconnaissance trips to recolonization sites in preparation for deployment of social attractants. Before December 1995, deploy social attractants and initiate daily observations of recolonization sites. Initiate daily observations of study plots in December 1995. Complete field season in August when common murres generally leave breeding colonies. Observations of study plots will continue from December through August for a minimum of 5 years to 10 years in order to provide necessary information to adequately evaluate the recolonization project. Work at the South Farallon Islands will begin the winter of 1995-1996 and will continue for a minimum of two years. Regular progress reports and an annual report will be submitted to the Trustee Council by the persons conducting work with funding from the Apex Houston Trustee Council.

Spring 1996 - winter 2004: Continue recolonization and monitoring efforts as necessary to accomplish project goals.

b. Castle and Hurricane Point Rocks Restoration: Restore common murres at Castle and Hurricane Point rocks using social attraction methods (decoys and recorded vocalizations).

Location: Castle and Hurricane Point rocks, Monterey County, California

Justification: As described above, the recolonization of historic common murre colonies in central California will contribute to the reversal of the dramatic reduction of this seabird's historic geographic range. The 1986 Apex Houston spill negatively impacted the breeding colonies that make up the southern half of the central California breeding range (Swartzman and Carter 1991). The Castle and Hurricane Point rocks colonies were severely impacted by the Apex Houston spill based on locations of Apex Houston oil slicks, depleted size of the Monterey colonies and subcolonies after the spill, and locations of recovery of oiled common murres during the spill (Swartzman and Carter 1991, Siskin et. al 1993). Adult common murres are known to attend breeding colonies during winter months at the Southeast Farallon Island in central California (Ainley and Boekelheide 1990, Sydeman 1993). Also, common murres have been observed attending the Castle and Hurricane Point rocks colonies during the winter (Carter, unpubl. data). Castle and Hurricane Point rocks were in the direct path of oil slicks occurring from the Apex Houston spill (Swartzman and Carter 1991). In addition, approximately 1,600 common murres were recovered in Monterey Bay near these two colonies. As a result, the Apex Houston spill was responsible for a severe reduction in numbers observed at these two colonies following the spill.

Currently, common murres occur on five rocks and the mainland at Castle Rocks and two rocks at Hurricane Point Rocks. Aerial surveys conducted during the 1994 breeding season indicate that common murre numbers at subcolonies have remained low since the Apex Houston oil spill (Carter and Takekawa, unpubl. data). Each subcolony is comprised of less than a hundred to several hundred common murres, and the breeding status of these subcolonies is unknown (Carter and Takekawa, unpubl. data). Given the low numbers of common murres that occur at these subcolonies, it is possible that breeding success is limited. Due to the small size of the subcolonies and other factors (e.g., gillnet fishing in Monterey Bay, El Nino events, future oil spills, and other human disturbances) the colonies at Castle and Hurricane Point rocks continue to be in danger of extirpation. These colonies are particularly important because they are at the current southern end of the range of the central California population as well as the southern extreme of the species' range in the Pacific Ocean. These colonies are in close proximity to each other and constitute the only active common murre colonies south of San Francisco, representing a large portion of the range of the central California common murre population. Given the current fragile condition of the overall central California common murre population and the lack of recovery over time (Ainley and Boekelheide 1990, Takekawa et. al 1990, Swartzman and Carter 1991, Carter et. al 1992, Ainley et al. 1994), colonies once lost are not likely to be reestablished in the foreseeable future without human assistance. Based on established principles of conservation biology, if the colonies at Castle and Hurricane Point rocks are lost, the resulting reductions in the geographical range, numbers, breeding locations, and productivity of common murres further increase the risk of extinction of the entire central California population.

Proposed Action: The common murre colonies at the Castle and Hurricane Point rock complexes will be evaluated to determine the best means of employing social attractants at these locations. A minimum of two years would be required to determine appropriate methods. Both of these colonies are composed of several subcolonies on different rocks. Subcolonies will be examined to obtain a comprehensive understanding of colony dynamics in a severely depleted condition. Breeding population levels, reproductive success, attendance patterns, behavioral observations, and nesting locations will be determined at as many subcolonies as possible. Particular attention will be paid to prospecting birds within established subcolonies and at unoccupied rocks. In addition, all unoccupied rocks and potential mainland breeding habitats will be assessed for the use of social attractants to encourage common murre breeding. Habitat will be assessed for suitability to support a common murre subcolony, including such factors as slope, size, protection from human and other disturbance, surf conditions, and predation threats. The unoccupied rocks will be regularly monitored to detect prospecting common murres.

A phased approach to employing social attractants will be used to refine the use of social attractants on the colony. Criteria to be used to determine the use of social attractants include: loss of subcolonies or colonies, below normal reproductive success, lack of colony growth, limited availability of breeding sites in existing subcolonies, high numbers of prospecting common murres in existing subcolonies, presence of prospecting common murres in areas with no breeding, and population status at each colony. The use of social attractants would be employed at sites where it was deemed necessary to encourage common murres to recolonize lost subcolonies or prospect and nest on unoccupied rocks. The goal would be to prevent colony loss without negatively impacting existing subcolonies. If, for any reason, social attractants are not deemed advisable after two years, the colonies at these sites will be evaluated for three more years. This monitoring will occur to ensure adequate reproductive success, colony survival, and recovery and, if necessary, to develop alternative restoration techniques.

This restoration project will provide unique opportunities to enhance public knowledge concerning seabirds, seabird conservation, and the marine environment. Every attempt will be made to educate the public through presentations, news coverage, and other appropriate venues. Emphasis will be placed on greater awareness of seabird resources in the area, the problems caused by oil pollution and oil spills, gill nets, and other anthropogenic factors as well as the restoration efforts conducted by the cooperating agencies, environmental organizations, and biologists. In addition, the location of the recolonization sites near Monterey along scenic Highway 1 provides excellent viewing opportunities for the public and attracts large numbers of visitors each year. As a result, informal public outreach will be conducted at the recolonization sites.

Schedule:

Spring and Summer 1995: Preliminary work will begin, including selection of observation points, obtaining access permits, planning, and purchasing. Aerial surveys of breeding common murre colonies will be conducted in May or June to obtain baseline data. These surveys will be conducted in conjunction with aerial common murre surveys for central California. Observations of breeding colonies will continue each year from December 1995 until August 1997, at a minimum. In August 1997, the use of social attractants will be assessed to restore these common murre colonies. In fall 1997, social attractants will be deployed where suitable. These efforts will continue until at least 2004, unless success is achieved, or failure declared, prior to that date.

V. COMMON MURRE PROJECT GOALS

The Apex Houston oil spill killed an estimated 6,000 common murres, was a major factor in the eradication of the Devil's Slide Rock colony, and damaged colonies at Castle and Hurricane Point rocks. If the latter two colonies are lost, over 75% of the recent range of the central California common murre population will have been lost. The Trustees have selected restoration alternatives designed to restore common murres to colonies in the areas most severely affected by the spill. Both short-term and long-term goals have been established for this restoration project.

The short-term goal of this project is to restore common murres at historic breeding colonies in areas where colonies were extirpated or severely depleted by the Apex Houston oil spill. The time frame needed for common murres to become established at extirpated colonies is unknown but is suspected to be several years. Therefore, the Trustees will consider the short-term goal achieved if significant progress is made toward the establishment of 100 breeding pairs of common murres at the Devil's Slide Rock and San Pedro Rock colonies. The Trustees believe this goal can be achieved within ten years if oceanic conditions are favorable for murre breeding during most of the years of the project.

The long-term goal is to restore the colonies to pre-spill population levels. Ultimately, this restoration project should aid in restoring the portion of the central California common murre population most affected by the Apex Houston spill to its historic range, colony sizes, and reproductive potential. However, the time frame needed for common murres to reach pre-spill population levels is unknown and is suspected to take several generations (i.e., more than ten years). Thus, the accomplishment of the long term goal of restoring the central California common murre population to its historic range and colony sizes is likely to occur only after the conclusion of the recolonization project. The Trustees believe that this is appropriate because the social facilitation that results from the presence and activity of the

birds that were attracted to breed at the recolonization sites will take the place of the artificial stimuli provided by the decoys and recorded vocalizations, enabling long-term goals to be achieved without continued human intervention.

The Trustees plan to review the common murre restoration project at least annually at which time the effectiveness of the project and possible improvements will be considered. In addition, public comments will be taken and considered by the Trustee Council throughout the project. The annual review process may result in revisions to the plan.

VI. COMMON MURRE PROJECT IMPLEMENTATION

The U.S. Fish and Wildlife Service (Service) has been designated as Lead Trustee for the common murre recolonization project and will utilize staff and facilities of the San Francisco Bay National Wildlife Refuge Complex and the Sacramento Ecological Services Field Office to implement the project. The National Biological Service's Dixon Field Office will be asked to provide the Service with technical expertise and field support to assist in the implementation of this project through an inter-agency agreement. The Service will obtain additional assistance from one or more experts in seabird recolonization/restoration via contracts or cooperative agreements. Reference site work conducted at the South Farallon Islands may be accomplished through an existing cooperative agreement between the San Francisco Bay NWR Complex and the Point Reyes Bird Observatory. Other contracts or agreements may be developed as necessary to achieve project goals over the anticipated ten-year duration of this project.

VII. ENVIRONMENTAL COMPLIANCE

The Service has determined that the project is categorically excluded from the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq, according to the Department of Interior's Departmental Manual, 516 DM 6, Appendix I, 516 DM 2, Appendix I. Resource management activities such as the type described for this project, which include research, reintroduction of established species into their historic range, and small structures or improvements, are categorically excluded from NEPA. The U.S. Fish and Wildlife Service has prepared an Environmental Action Memorandum setting forth the basis for the categorical exclusion of this project.

The California Department of Fish and Game has also determined that the project is categorically exempt from the California Environmental Quality Act (CEQA), Cal. Pub. Resources Code 21000 et seq., and has filed a Notice of Exemption with the State Clearinghouse.

The California Coastal Commission staff has concurred with the Trustees negative determination made pursuant to 15 C.F.R. Section 930.35(d) of

the National Oceanic and Atmospheric Administration implementing regulations relative to the Coastal Zone Management Act.

VIII. COMMON MURRE RESTORATION PROJECT BUDGET

As part of the settlement, \$4,916,430 has been allocated for common murre restoration. This amount, plus any interest earned, is available to fund the recolonization project for ten years. A budget has been developed that lists the range of annual and cumulative costs anticipated for each major budgetary category (Table 1). Availability of sufficient money to fund the project through years 9 and 10 may depend on interest earnings, because the upper end of the range of anticipated project costs exceeds the amount of the settlement. A more detailed budget will be available following the completion of contracting procedures.

Major budget categories include equipment (boats, motors, decoys, photo and audio equipment, decoys, vehicles, etc.); operating costs (gas, aerial survey flights, travel, administrative support, etc.); salaries (salaries for agency personnel conducting recolonization project); contracts/agreements (seabird recolonization consultant, cooperative agreement for Farallon Islands work); public education/outreach (public meetings, press releases, press conferences, presentations, publications in popular and technical literature, etc.).

Table 1. Estimated Murre Project Budget

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
EQUIPMENT	155,000- 210,000	50,000- 70,000	75,000- 105,000	50,000- 70,000	55,000- 75,000
OPERATING COSTS	130,000- 175,000	125,000- 170,000	120,000- 160,000	120,000- 160,000	120,000- 160,000
SALARIES	70,000- 95,000	195,000- 260,000	205,000- 275,000	215,000- 290,000	225,000- 305,000
CONTRACTS/ AGREEMENTS	20,000- 25,000	80,000- 110,000	80,000- 110,000	30,000- 45,000	35,000- 45,000
PUBLIC EDUCATION/ OUTREACH	5,000- 10,000	5,000- 10,000	5,000- 10,000	5,000- 10,000	5,000- 10,000
ANNUAL TOTAL	380,000- 515,000	455,000- 620,000	485,000- 660,000	420,000- 575,000	440,000- 595,000
CUMULATIVE PROJECT TOTAL	380,000- 515,000	835,000- 1,135,000	1,320,00 0- 1,795,000	1,740,00 0- 2,370,000	2,180,000- 2,965,000

	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
EQUIPMENT	50,000- 70,000	50,000- 70,000	55,000- 70,000	50,000- 70,000	50,000- 70,000
OPERATING COSTS	120,000- 160,000	120,000- 160,000	120,000- 160,000	120,000- 160,000	120,000- 160,000
SALARIES	225,000- 305,000	235,000- 320,000	250,000- 335,000	260,000- 350,000	275,000- 370,000
CONTRACTS/ AGREEMENTS	25,000- 30,000	25,000- 35,000	25,000- 35,000	30,000- 35,000	30,000- 40,000
PUBLIC EDUCATION/ OUTREACH	5,000- 10,000	5,000- 10,000	5,000- 10,000	5,000- 10,000	5,000- 10,000
ANNUAL TOTAL	425,000- 575,000	435,000- 595,000	455,000- 610,000	465,000- 625,000	480,000- 650,000
CUMULATIVE PROJECT TOTAL	2,605,00 0- 3,540,000	3,040,00 0- 4,135,000	3,495,00 0- 4,745,000	3,960,00 0- 5,370,000	4,440,000- 6,020,000

IX. RESPONSES TO COMMENTS

The Service received numerous oral and written comments at a public meeting held on November 17, 1994 in Sausalito, California, and during the public comment period that began with the November 4, 1994, Federal Register notice (Federal Register/Vol. 59, No. 213/55282). The Service appreciates the time and effort expended by the respondents.

A. General Comments Concerning this Plan

1. Length of the Public Comment Period

Comment: Several respondents stated that the initial 30-day public comment period was not sufficient to allow detailed review of the draft Plan.

Response: The Service extended the public comment period to 45 days.

2. Value of the Project

Comment: Many respondents expressed their belief that this project was an appropriate use of the settlement money and would help restore the bird species that was most impacted by the spill.

Response: The Service appreciates the support the public has shown for this project.

Comment: Several respondents said that the project was a waste of money and should not be implemented.

Response: In their legal complaints against the parties allegedly responsible for this oil spill, the State and Federal plaintiffs sought recovery for injuries to the natural resources under the trusteeship of the United States and the State of California. During the pendency of this action, the United States and the State, through their designated Natural Resource Trustees, proposed certain projects to restore natural resources injured as a direct result of the spill. These projects included the common murre recolonization project that is the subject of this Final Plan, as well as the marbled murrelet habitat acquisition project. The plaintiffs and defendants agreed, and the court by entering a Consent Decree found, that the proposed projects were reasonable and appropriate measures to restore the affected natural resources.

The Consent Decree states that the Trustees may make other use of the proceeds of the settlement if they "determine that either of the proposed restoration projects are not feasible, practicable, or in the public interest". However, the Trustees have not obtained any convincing information through the public comment process, or through their own continued review of the project, to indicate that either of the proposed projects is not feasible, not practicable, or not in the public interest. On the contrary, nearly all of the public comments

supported the project in concept and focused on technical details that could be improved or clarified. Therefore, the Trustee Council has authorized the Service to proceed with this project as described in this Final Plan.

3. Compliance With Environmental Regulations

Comment: Several respondents asked for clarification on how the Service will comply with the National Environmental Policy Act (NEPA) and other legislation designed to prevent adverse impacts of Federal projects on the environment.

Response: Preparation of an Environmental Impact Report or Environmental Assessment under NEPA is not required for this project because the restoration of species to their native range is an activity that is categorically exempt from NEPA and from its State equivalent, the California Environmental Quality Act. The Service has prepared and filed appropriate documentation of these exemptions. In addition, the Service has asked for and received a negative consistency determination from the California Coastal Commission, as required by the Coastal Zone Management Act.

The installation of decoys, tape recorders, cameras, and ladders at breeding colonies will take place during the non-breeding season to avoid disturbance of murres, cormorants, gulls, and other species protected by the Migratory Bird Treaty Act. Control of gulls and other predators is not currently a component of this project. The Service will obtain all necessary Federal, State, and local permits, and access permission from private landowners, before initiating field work.

B. Comments Regarding Alternative Projects

Comment: Several respondents suggested that the murre recolonization project should be implemented as a pilot study at a reduced level of funding, and that the savings should be used to fund other projects, including: rhinoceros auklet restoration, additional habitat acquisition for marbled murrelets, acquisition of property containing a common murre colony at Cape Vizcaino in Mendocino County, a fisheries task force to reduce mortality of seabirds in gillnets of the central California fishing industry, efforts to reduce impacts of chronic oil pollution on seabirds, gull control and other projects on the Farallon Islands, and genetic studies of Pacific coast murres.

Response: The draft Plan was revised and more detail has been provided in the Restoration Alternatives Considered and Selected section of the Final plan. The Service intends to approach this project in phases. The initial phase focuses on direct restoration activities at Devil's Slide and San Pedro rocks, and monitoring at other sites. The project will be scaled up to include implementation of recolonization techniques at Hurricane Rock and Castle Rock after several years of monitoring, if appropriate. This phased approach was implicit in the

Draft Plan and has been further clarified in the Final Plan. A reduced level of effort will not provide sufficient information to evaluate whether the project is working, and diversion of money to other projects may not allow implementation of the project over the entire ten year period that may be necessary to achieve the project's goals. Consequently, the Service does not feel it would be acting in the public interest to shift large sums of money from the murre recolonization project to other projects at this time.

This decision does not mean that the Service or the Trustees reject the argument that some of the alternative projects that were suggested would be beneficial to natural resources injured by the Apex Houston Oil Spill. On the contrary, many of these projects, including rhinoceros auklet restoration and acquisition of the murre colony at Cape Vizcaino, were considered during settlement negotiations. Other suggested projects, including projects to reduce seabird mortality from gill nets and chronic oiling, are already underway with funding from other sources within the Trustee agencies. The murre recolonization project and the murrelet habitat acquisition project were given priority because the Trustees feel that these two projects best address restoration needs of local populations of the species that were most seriously impacted by the spill. The Alternatives Considered section of the Final Plan has been expanded to better address these concerns.

The Service intends to carefully manage project expenditures to stay within the proposed budget, and will attempt to realize savings wherever possible. In addition, the settlement money will be invested in an interest-bearing account within the Department of the Interior's Natural Resource Damage Assessment and Restoration fund. In general, the priority for use of any savings realized through this strategy will be continuation of murre restoration efforts beyond 10 years and acquisition of marbled murrelet nesting habitat, as per the Consent Decree. Other alternatives that are cost effective and have clear benefits to injured resources will receive future consideration from the Trustee Council on a case-by-case basis if their implementation will not compromise the objectives of the two main projects.

C. Comments Regarding Details of the Plan

1. Project Duration and Goals

Comment: Several respondents expressed concern that 10 years may not be long enough to achieve the goals of this project because murres have inherently low reproductive rates, usually do not breed until they are several years old, and may not breed in years when oceanic conditions are not favorable.

Response: The Service agrees that 10 years may be the minimum amount of time necessary to achieve the goal of recolonizing common murres at sites from which they have been extirpated. The long-term goal of restoring these colonies and the central California population to pre-

spill numbers will almost certainly require more than 10 years. The Goals section was revised in the Final Plan to clarify the Service's short and long-term goals. The Service believes that the goals of the project can best be achieved through immediate implementation of recolonization efforts, and through continued efforts via other State and Federal programs to protect central California murrelets from human disturbance, chronic oiling, and entanglement in gill nets while the recolonization efforts are underway.

2. Disturbance of Murrelets and Other Nesting Seabirds

Comment: Several respondents cautioned the Service to either forego or proceed carefully with implementation of restoration efforts at Hurricane Rock and Castle Rock to avoid disturbing the remaining murrelets nesting at these sites.

Response: The Service agrees that unnecessary disturbance of the remaining murrelets nesting at these sites should be avoided. This concern was expressed in the Draft Plan and has been clarified in the Final Plan. Efforts at these sites will be limited to monitoring of behavior and reproductive success for the first two years of the project. After two years, the Service may deploy social attractants at these sites, but only where it is deemed necessary to encourage murrelets to recolonize lost subcolonies or suitable, unoccupied rocks.

Comment: Several respondents cautioned the Service to minimize disturbance of Brandt's cormorants and western gulls that nest at Devil's Slide Rock and other sites where recolonization is proposed.

Response: The Service agrees that disturbance of other nesting seabirds should be minimized during this project. Human disturbance will be minimized by deploying social attractants during the non-breeding season, conducting aerial surveys at appropriate heights to be determined in consultation with the Gulf of the Farallones National Marine Sanctuary and other agencies, and by making behavioral observations through telescopes located in blinds, on boats, or on the mainland, rather than in the middle of colonies.

In the few instances where formation of new murre colonies has been observed in central California, these new colonies were established within existing Brandt's cormorant colonies, possibly because these locations provided greater protection from gull predation (Ainley and Boekelheide 1990). Common murrelets and Brandt's cormorants also nest together at several colonies along the coasts of California and Oregon (Carter et al. 1992, Carter and Takekawa unpubl. data, R. Lowe pers. comm.). Because common murrelets can sometimes supplant cormorants and gulls from nesting areas, the potential exists for cormorant reproductive success to be reduced at recolonization sites (Ainley and Boekelheide 1990). However, the Service believes this problem can be minimized by deploying social attractants in such a way that murrelets obtain the benefits of proximity to nesting cormorants without usurping cormorant nest sites. Behavior and reproductive success of cormorants

and gulls nesting on recolonization sites will be monitored to help determine the effect of murre recolonization on local seabird communities.

3. Farallon Islands Component of the Project

Comment: Several respondents asked for expansion or clarification of the scope of the Farallon Islands component of the project and pointed out that an understanding of the status and phenology of the large colony at Southeast Farallon Island is critical to restoration efforts at the smaller, near-shore colonies. Also, some respondents suggested that experiments with decoys be conducted at the Farallon Islands in order to refine and validate social attraction methodologies and protocols.

Response: The Service agrees that Farallon Islands are an important component to the conservation and understanding of the central California common murre population. Monitoring of common murres at the Farallon Islands, especially individually banded murres, will be important for evaluating the success of the recolonization efforts at the nearshore colonies and has been included in the Final Plan. The Service believes that the efforts described in the Final Plan are appropriate for the Farallon Islands, given National Wildlife Refuge management objectives and protocols. The Service does not believe that the colonies on the Farallon Islands merit greater emphasis in restoration than the nearshore colonies. The murre colonies on the Farallon Islands were impacted by the spill, but may still contain sufficient birds to accomplish any necessary social facilitation of breeding without human intervention.

Research on decoy placement and on effectiveness of combinations of auditory and visual attractants has been underway in Maine for several years (Schubel 1993). This research provides empirical data on numbers and densities of decoys sufficient to attract murres when combined with auditory stimuli. The Service believes that the information from Maine is sufficient to guide initiation of the Final Plan. Therefore, the Service believes it is not essential at this time to conduct methods-oriented research and experimental validation of common murre recolonization techniques at the Farallon Islands for the recolonization project to be successful. However, the Trustees will reevaluate the restoration projects and consider additional projects at least annually.

4. Additional Sites for Murre Recolonization

Comment: One respondent suggested that the Service could do more to expand the range of common murres in central California by using social attraction techniques to start a new colony at Bodega Rock in Sonoma County.

Response: The Service did not consider this site for murre recolonization because, as far as the Service is aware, it has no prior history of use for nesting by murres. Lack of prior use suggests that this may not be a suitable location for a murre colony.

5. Prey Resources for Common Murres

Comment: Some respondents questioned whether ecological resources, such as prey, might be insufficient to support growing murre populations and thereby could limit the success of the project.

Response: The Service is aware of this theory and would welcome any additional information for consideration on this subject at any time. Currently, the Service believes that insufficient information exists to conclude that prey resource limitations would preclude the success of this project. In addition, Pacific Sardines (Sardinops sagax) are beginning to recover in central California (Wolf 1992). Sardines had disappeared north of Point Conception by 1951, probably due to a combination of overfishing and an extended period of cold water (described in Ainley and Lewis 1974). Their recovery may strengthen food resources in the vicinity of the recolonization sites; for example, the once abundant sardines were believed to be an important food to larger seabirds, including cormorants and puffins (Ainley and Lewis 1974). In addition, more detail was added to the plan to clarify that common murre diet and feeding information would be collected at recolonization and reference sites where feasible, in order to gain more information on prey resources.

6. Public Outreach and Education

Comment: Several respondents emphasized the importance of making public outreach and education an integral part of the project.

Response: The Service agrees that public outreach and education should be an integral part of this project, and has allocated up to \$10,000 annually for this purpose. Relevant public outreach and education opportunities will be sought throughout the project, and will be funded to the extent possible without compromising project goals.

7. Budget

Comment: Several respondents requested a more detailed budget.

Response: A more detailed budget has been included in the Final Plan. This budget contains anticipated ranges of annual costs for major budgetary categories for the duration of the project. Actual costs for cooperators and contractors will be known when negotiations are completed, and/or when contracts have been advertised and bids received.

8. Coordination With Other Trustee Councils

Comment: One respondent recommended that the Apex Houston Trustee Council coordinate its activities with the Trustee Councils that are guiding restoration projects for seabirds injured in other oil spills along the Pacific Coast.

Response: The Apex Houston Trustee Council will coordinate and communicate with other Trustee Councils.

LITERATURE CITED

- Ainley, and T.J. Lewis. 1974. The history of Farallon Island marine bird populations, 1854-1972. *Condor* 76:432-446.
- Ainley, D.G. and R.J. Boekelheide, editors. 1990. *Seabirds of the Farallon Islands: Ecology, dynamics, and structure of an upwelling-system community*. Stanford University Press, Stanford, California. 450 pages.
- Ainley, D.G., W.J. Sydeman, S.A. Hatch, and U.W. Wilson. 1994. Seabird population trends along the west coast of North America: causes and extent of regional concordance. *Studies in Avian Biology* No. 15:119-133.
- Birkhead, T.R. and D.N. Nettleship. 1980. Census methods for murre, *Uria* species: a unified approach. Canadian Wildlife Service Occasional Papers. Paper Number 43. 25pp.
- Briggs, K.T., W.B. Tyler, D.B. Lewis, and D.R. Carlson. 1987. Bird communities at sea off California: 1975-1983. *Studies in Avian Biology* No. 11.
- Carter, H.R., G.J. McChesney, D.L. Jaques, C.S. Strong, M.W. Parker, J.E. Takekawa, D.L. Jory, and D.L. Whitworth. 1992. Breeding populations of seabirds in California, 1989-1991. Unpublished reports, U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Dixon, California.
- Gaston, A.J., D.G. Noble, and M.A. Purdy. 1983. Monitoring breeding biology parameters for murre, *Uria* spp.: levels of accuracy and sources of bias. *Journal of Field Ornithology* 54:275-282.
- Hatch, S.A. and M.A. Hatch. 1989. Attendance patterns of murre at breeding sites: implications for monitoring. *Journal of Wildlife Management* 53(2):486-493.
- Kress, S.W. 1978. Establishing Atlantic Puffins at a former breeding site. Pp. 373-377 *in* S.A. Temple (ed.). *Endangered birds:*

management techniques for preserving threatened species.
University of Wisconsin Press, Madison, Wisconsin.

Kress, S.W. 1983. The use of decoys, sound recordings, and gull control for re-establishing a tern colony in Maine. *J. Field Ornith.* 59(2):161-170.

Kress, S.W. and D.N. Nettleship. 1988. Re-establishment of Atlantic Puffins, *Fratercula artica*, at a former breeding site in the Gulf of Maine. *Colonial Waterbirds* 6:185-196.

Kress, S.W., and H.R. Carter. 1991. Recolonization of Common Murres to abandoned nesting islands on the central California coast. Unpublished report, U.S. Department of Justice.

Kress, S.W., D.N. Nettleship, and R.H. Podolsky. 1992. Reintroduction of Atlantic Puffins, Terns, and Leach's Storm-Petrels at former breeding sites in the Gulf of Maine *in* B.D. Bell and J. Kromdeur (editors). Management methods for populations of threatened birds. ICBP Technical Publication. Cambridge, England. in press.

Mudge, G.P. 1988. An evaluation of current methodology for monitoring changes in the breeding populations of Guillemots *Uria aalge*. *Bird Study* 35:1-9.

Podolsky, R.H. 1985. Colony formation and attraction of the Laysan Albatross and Leach's Storm-Petrel. Ph.D. dissertation. Ann Arbor, University of Michigan.

Podolsky, R.H. and S.W. Kress. 1989. Factors affecting colony formation in Leach's Storm-Petrel. *Auk* 106(2):332-336.

Podolsky, R.H. and S.W. Kress. 1992. Attraction of the endangered dark-rumped petrel to recorded vocalizations in the Galapagos Islands. *Condor* 94:448-453.

Ray, M.S. 1909. The passing of the Pedro Island sea-bird rookery. *Condor* 11:94-96.

Schubel, S. 1993. A common murre attraction project on a Maine Island. 1993 Season Report on Matinicus Rock Project. National Audubon Society. Ithaca, NY.

Siskin, B.R., G.W. Page, and H.R. Carter. 1993. Impacts of the 1986 Apex Houston oil spill on marine birds in central California. Unpublished report, U.S. Department of Justice.

Sowls, A.L., A.R. Degange, J.W. Nelson, and G.S. Lester. 1980. Catalog of California seabird colonies. U.S. Department of Interior, Fish and Wildl. Serv., Biol. Serv. Prog. FWS/OBS 37/80.

- Swartzman, G. and H.R. Carter. 1991. Response of the California population of Common Murres (Uria aalge) to mortality from the 1986 Apex Houston oil spill. Unpublished report, U.S. Department of Justice.
- Sydeman, W.J. 1993. Survivorship of Common Murres on Southeast Farallon Island, California. *Ornis Scand.* 24:1-7.
- Takekawa, J.E., H.R. Carter, and T.E. Harvey. 1990. Decline of the Common Murre in Central California 1980-1986. *Studies in Avian Biology* 14:149-163.
- Wickham, D.A., C.C. Kahl, G.F. Mayer, and E. Reinharz. 1993. Restoration: The goal of the Oil Pollution Act natural resources damage actions. *Baylor Law Review* 45:405.
- Wolf, P. 1992. Recovery of the Pacific Sardine and the California sardine fishery. *California Cooperative Oceanic Fisheries Investigations Reports* 33:76-86.