Appendix D

Tier 2 Evaluation of Seabird Restoration Actions

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Appendix D1

Restore Seabirds to San Miguel Island

D1.1 GOALS AND NEXUS TO INJURY

This action aims to restore seabird nesting habitat on San Miguel Island in the Channel Islands National Park by eradicating the introduced black rat (*Rattus rattus*). Target species for restoration include burrow/crevice nesting seabirds such as the ashy storm-petrel, Cassin's auklet, and Xantus's murrelet, as well as other seabirds such as the western gull, Brandt's cormorant, the pelagic cormorant, and the pigeon guillemot.

Eggshell thinning and/or elevated levels of DDTs were documented in eggs of ashy storm-petrels, Cassin's auklets, western gulls, Brandt's cormorants, pelagic cormorants, pigeon guillemots, and Xantus's murrelets in the Southern California Bight (SCB) (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of the seabird nexus to the injuries of the Montrose case.

D1.2 BACKGROUND

Island ecosystems are critical for the conservation of biodiversity. They represent about 3 percent of the world's surface, but support approximately 15 to 20 percent of all birds, reptiles, and plants (Whittaker 1998). Of the 484 extinctions that have been recorded since 1600, at least 75 percent have been island endemics (World Conservation Monitoring Centre 1992). Non-native species were implicated in the majority of these extinctions (Atkinson 1985). Introduced rats alone are responsible for about 40 to 60 percent of all bird and reptile extinctions from islands (Howald et al. 2003). Rats have been introduced onto more than 80 percent of islands worldwide, causing ecosystem-wide effects on the distribution and abundance of native flora and fauna (Atkinson 1985), including in the Channel Islands National Park (Collins 1979, Erickson 1990, Erickson and Halvorson 1990).

Seabird life history characteristics make them particularly vulnerable to increased predation from introduced predators such as rats. For example, adult Xantus's murrelets sporadically leave their eggs unattended during the incubation period while they forage at sea. The unattended eggs are then vulnerable to predation by rats. Most seabirds are long lived and have high adult survivorship (Russell 1999). Even small reductions in adult survivorship can cause drastic reductions in annual population growth and colony persistence (Keitt et al. 2002). Rats affect multiple life history stages of seabirds and have been known to significantly reduce or eliminate seabird colonies in ecologically short periods of time (Kaiser et al. 1997, Atkinson 1985).

Introduced rats have an ecosystem-wide impact on the California Channel Islands. As documented on nearby Anacapa Island, introduced rats are known to feed and prey on many floral and faunal organisms, including terrestrial and intertidal invertebrates, reptiles and amphibians, land birds, and a wide variety of plant material (Erickson 1990). In addition, black rats likely contributed to the 20-year extirpation of the Anacapa deer mouse (*Peromyscus maniculatus anacapae*) from East Anacapa Island (Collins et al. 1979, Drost, pers. comm., 2000). In 2001 and 2002, the American Trader Trustee Council successfully implemented the Anacapa Island Restoration Project, eradicating black rats in an effort to restore seabird populations on the island. Given the similar goals and biological setting between the two projects, the Anacapa Island Restoration Project will serve as a successful model for the proposed effort on San Miguel Island.

D1.2.1 San Miguel Island and the Introduction of Rats

San Miguel Island is the westernmost island of the Channel Islands National Park and is managed by the National Park Service (NPS). This island totals 37 square kilometers (km^2) (14 square miles) in size and is about 13 km (8 miles) long and 6 km (4 miles) wide. The island is primarily a plateau of about 150 meters (500 feet) in elevation with two 244-meter (800-foot) rounded hills. San Miguel Island is dominated by grassland, which covers most of the deeper, stabilized soils on the island terrace (Hochberg et al. 1979). San Miguel Island has a primitive campground, miles of hiking trails, and several large beaches.

It is unclear when rats were introduced to San Miguel Island. In the late 1980s, a small rat population appeared to have been restricted to the west side of the island along the coast from Harris Point to Tyler Bight (Erickson and Halvorson 1990). Collins (1979) documented rats using seabird nesting burrows for denning. Rats have also been documented on beaches and on the upper terraces of the island (Erickson and Halvorson 1990**,** Collins 1979). In March and July of 2004, a survey on San Miguel Island documented that rats are distributed along shorelines and within canyons on the island, but a more comprehensive survey is needed to determine the full extent of rat distribution on the island (IC 2004a). The many dry arroyos and erosion drainages provide key habitat and travel corridors for rats on the island, allowing rats to penetrate deep inland and across the island (Howald, pers. comm., 2004).

D1.2.2 Seabirds

San Miguel Island and its associated islets, Prince Island and Castle Rock, support regionally important and diverse seabird colonies, including one-third of the breeding seabirds in the Channel Islands (Wolf 2002). This area hosts at least 11 species of breeding seabirds, including significant populations of Brandt's cormorants, ashy storm-petrels, and Cassin's auklets. Other breeding species include Leach's storm-petrel, double-crested cormorant, pelagic cormorant, western gull, pigeon guillemot, and rhinoceros auklet. San Miguel Island and its associated islets represent the southern range on the west coast of North America for rhinoceros auklets, tufted puffins, and common murres. Similarly, this area is the northern end of the range for Xantus's murrelets and possibly black storm-petrels. Tufted puffins were recently observed on Prince Island (McChesney et al. 1995), and common murres were also observed in breeding plumage on Prince Island in 2004 (Whitworth, pers. comm., 2004).

Prince Island and Castle Rock are located 0.8 km (0.5 miles) and 1.2 km (0.75 miles) from San Miguel Island, respectively. There are currently no rats on either of these islets. The presence of rats on San Miguel Island presents a risk to the seabird colonies on Prince Island and Castle Rock, given their close proximity. It is possible that rats could disperse to these adjacent islets (e.g., via vegetation rafts or boats) and threaten these important seabird colonies.

D1.2.3 Marine Mammals

San Miguel Island is the only known place in the world where three different species of pinnipeds breed and the only area where five species are found. Breeding species include the California sea lion (*Zalophus californianus*), northern fur seal (*Callorhinus ursinus*), and northern elephant seal (*Mirounga angustirostris*). Harbor seals (*Phoca vitulina*) and Guadalupe fur seals (*Arctocephalus townsendi*) are also known to visit San Miguel Island.

D1.2.4 Endemic Species

The following endemic species on San Miguel Island are important considerations in the planning of this action: Channel Island song sparrow (*Melospiza melodia graminea*), San Miguel Island deer mouse (*Peromyscus maniculatus*), and San Miguel Island fox (*Urocyon littoralis littoralis*).

The Channel Island song sparrow is a resident sparrow endemic to the Channel Islands. This subspecies is considered to include the now-extirpated populations on San Clemente and Santa Barbara Islands (Patten 2001), and the formerly classified San Miguel song sparrow (*M.m. micronyx*).

The island fox (*Urocyon littoralis*) is a very small canid that inhabits six of the largest Channel Islands. The diminutive island fox is the largest native carnivore on the Channel Islands. Recent morphological and genetic studies support the division of the *U. littoralis* complex into six subspecies that are each limited in range to a single island, including San Miguel Island (USFWS 2004). The three most important food items in the diet of the San Miguel Island fox (*U.l. littoralis*) are deer mice, sea-fig (*Carpobrotus chilensis*), and insects (Collins and Laughrin 1979). Mice may be especially important prey during the breeding season because they are large, energy-rich food items that adult foxes can bring back to their growing pups (Garcelon et al. 1999).

The San Miguel, Santa Rosa, Santa Cruz, and Santa Catalina Island foxes have experienced precipitous declines in the last eight years (Coonan et al. 1998, Coonan et al. 2000, Roemer 1999, Roemer et al. 2001, Timm et al. 2000). Annual population monitoring documented a substantial decline in island fox populations on San Miguel Island between 1994 and 1999 (Coonan et al. 1998; Coonan et al. in press). During this time period, island fox populations dropped from an estimated 450 adults in 1994 (Coonan et al. 1998) to 15 foxes in 1999 (T. Coonan, unpublished data, as cited in USFWS 2004) as a result of predation by golden eagles (*Aquila chrysaetos*). Deer mouse densities rose sharply after the population crash of the island fox since the fox is the primary predator in the San Miguel Island ecosystem. The USFWS listed the San Miguel Island fox as an endangered species on March 5, 2004 (USFWS 2004).

In 1999, the NPS captured 14 (4 males and 10 females) of the 15 remaining foxes from San Miguel Island to protect the subspecies from further losses from predation by golden eagles and to initiate a captive propagation program. In 2003, the one remaining wild island fox was brought into captivity. In October 2001, NPS moved half of the captive foxes into a second breeding facility on the island to minimize the risk of a catastrophic event (e.g., wildfire or disease). The San Miguel Island fox captive population increased from 14 to 50 foxes after five years of captive breeding, and 10 of those foxes were released to the wild on San Miguel Island in fall 2004 (Coonan, pers. comm., 2005). Full recovery of the San Miguel subspecies may require annual releases of 10 to 20 foxes for as long as a decade (Coonan 2003).

In 2005, the NPS captive breeding program designed to restore the endangered island fox to the Northern Channel Islands produced a record 38 pups (NPS 2005). On San Miguel Island, 10 pups were born into captivity, bringing the total number of foxes in captivity to 49. A total of 4 new pups were recorded in the wild on San Miguel Island in 2005, thus increasing the total estimated number of foxes in the wild to 14 (NPS 2005).

D1.2.5 Project Goals

The goals of this action are to eradicate the introduced black rat, increase seabird populations, and prevent future rodent introductions. Due to the scale and complexity of the action, the NPS, with the assistance of the Natural Resource Trustees for the Montrose case (Trustees), will prepare a subsequent Environmental Impact Statement (EIS) or Environmental Assessment (EA) that will undergo public review and comment. This subsequent document will detail the specific methodologies of the action, the expected benefits and impacts, and the mitigation measures to reduce potential impacts. A general outline of the action is summarized below.

D1.3 PROJECT DESCRIPTION AND METHODS

D1.3.1 Approach

The use of rodenticides is critical to the successful eradication of rats from islands. Rats have been successfully removed from over 250 islands worldwide, the vast majority of which have been by the use of rodenticides (IC 2004b, Veitch and Bell 1990, Buckle and Fenn 1992, Taylor 1993). Nine rodenticides are registered for use in the United States. The anticoagulants (such as brodifacoum, warfarin, and diphacinone) are the only rodenticides that have resulted in complete eradication on islands. One or more of the anticoagulant rodenticides will be proposed for use on San Miguel Island. The U.S. Environmental Protection Agency (EPA) will be consulted to obtain registration of a rodenticide for rat eradication on San Miguel Island. Factors that will determine the rodenticide of choice include (1) previous successful use in island restoration projects, (2) demonstrated ability to eradicate the rat population, and (3) potential adverse effects on the San Miguel Island environment. Brodifacoum has been demonstrated to provide the greatest efficacy against the target species and has been used in the vast majority of successful island restoration projects, including the Anacapa Island Restoration Project.

Successful eradication requires the delivery of bait into every potential rat territory on the island, either by using bait stations deployed on a grid and/or by aerial broadcast from a helicopter, or, in some cases, broadcast by hand, or a combination of these techniques. Trapping rats has proven to be ineffective except on very small islands (e.g., Moors 1985b). San Miguel Island is within the size range of successful rat eradications that used bait stations or aerial broadcast. The specific methodology to be used on San Miguel Island will be determined by a combination of topography and size, previous successful uses, and a host of other biological constraints and considerations.

D1.3.2 Timing

The removal of the rats will be timed according to a set of biological conditions maximizing the probability of eradicating rats and minimizing the potential impact to the San Miguel Island environment (see below). Typically, eradication is more likely to be successful if bait is delivered during the dry season, when there is a food shortage and the rat population is in decline. The entire island will likely have to be treated at one time to prevent reinvasion of treated portions of the island.

D1.3.3 Mitigation Measures

This action will be designed and implemented in a manner that avoids, minimizes, and mitigates impacts to the natural environment on San Miguel Island. Measures to avoid and mitigate any impacts from the action will be developed during the planning phases and will be addressed in the subsequent EIS or EA. The successful mitigation program used on Anacapa Island will be considered during the development of a mitigation program for San Miguel Island. The following mitigation measures are examples that may be incorporated into the program design:

- Birds
  - Color and size bait appropriately to minimize direct consumption by seed-eating birds.
  - Use bait that will break down rapidly in the San Miguel Island maritime climate.
  - If possible, avoid bait application during bird breeding season and peak of land bird migration.
  - Design field transects in a manner that minimizes disturbance to seabird roosting habitat.
  - Avoid working for extended periods of time in vicinity of seabird roosts.
  - Reduce non-target poisoning of predatory birds with use of techniques such as live capture, holding, and/or translocation.
  - Protect Channel Island song sparrows by captive holding subset of the population of birds and releasing them once threat of exposure is removed.
- Marine Mammals
  - Avoid bait application during marine mammal pupping seasons.
  - Design field transects in a manner that minimizes disturbance to marine mammal haul outs.
  - Avoid working for extended periods of time in vicinity of rookeries and haul outs.
  - Work cautiously and slowly around animals using techniques that minimize disturbance.
- San Miguel Island Deer Mouse
  - Design a comprehensive protection plan for the deer mouse that incorporates successful techniques used in the Anacapa Island Restoration Project. Strategies to reduce impacts will likely include captive holding, as well as breeding mice in facilities on San Miguel Island for later release onto the island. Because the deer mouse is an important food source for the island fox, it will be necessary to protect more mice than would be necessary to strictly protect the species.
- San Miguel Island Fox
  - The presence of the endangered island fox presents a unique challenge since there is no precedent for rat eradication from an island with an endemic carnivore such as the island fox. An initial planning step will be to assemble a team of experts, including ecologists, veterinarians, NPS managers, behaviorists, toxicologists, and rodent control technicians, to address the feasibility of the project in light of the potential impacts of the project on the island fox. During this initial step, a comprehensive avoidance, minimization, and

mitigation program will be developed to reduce the potential impacts to the island fox to acceptable levels.

D1.4 ENVIRONMENTAL BENEFITS AND IMPACTS

D1.4.1 Biological

Benefits

The eradication of rats from San Miguel Island will benefit a variety of seabirds by increasing the amount of available seabird nesting habitat and decreasing predation on eggs, chicks, and adults. A reduction in predation will lead to increased population size and breeding success of seabirds on San Miguel Island. Small crevice-nesting seabirds, such as the ashy storm-petrel, Cassin's auklet, and Xantus's murrelet, will likely benefit from the elimination of a predator that is known to take eggs, chicks, and adults. Ecological monitoring on Anacapa Island after bait application has demonstrated an increase in the number of breeding Xantus's murrelets, and these birds were found in new habitat areas from which rats had previously excluded them (Howald et al. 2005). Within four months following bait application, two Cassin's auklet nests were found with chicks on Anacapa Island. This observation represented the first recorded nesting of this species on the island (Howald et al. 2005).

Although small burrow-nesting seabirds are particularly vulnerable to rat predation, larger seabirds have also been predated by rats. Studies have shown rats to be a source of predation to larger seabird eggs and chicks, including herring gulls and northern fulmars (Zonfrillo 2000), as well as Laysan albatrosses (Moors and Atkinson 1984). Therefore, larger seabirds on San Miguel Island (e.g., western gulls) are also likely to experience increased reproductive success from the elimination of rats on the island. Although the presence of the island fox limits the utility of much of San Miguel Island for seabirds, there are steep areas of suitable seabird habitat on the island that are accessible to rats but not to foxes. These areas in particular will benefit from rat eradication.

Prince Island and Castle Rock are located within less than 1 mile of San Miguel Island; therefore, the eradication of rats on San Miguel Island will remove a threat to the regionally significant seabird populations that nest on these islets. Eliminating this risk of rat introduction to these islets is an important benefit of the project.

In addition to benefiting seabirds, eradicating rats from San Miguel Island will likely have ecosystem-wide benefits. Based on the results of post-application monitoring efforts from Anacapa Island, positive changes have already been measured in the Anacapa Island deer mouse, side-blotched lizard, and vegetation. Monitoring results on Anacapa Island demonstrated a two-fold increase in the survival of juvenile side-blotched lizards after rat removal (Comendant and Sinervo 2002). As was observed on Anacapa Island, land birds, lizards, and other species will likely benefit from the action on San Miguel Island. Because peregrine falcons consume seabirds on the Channel Islands, they are also expected to benefit from an increase in their prey base.

In summary, rat eradication on San Miguel Island should result in: (1) increases in small crevice-nesting seabird populations (such as alcids and storm-petrels); (2) decreased predation on ground-nesting seabirds such as western gulls; (3) protection of the important seabird colonies on

Prince Island and Castle Rock from rat invasion; (4) decreased predation of some terrestrial and marine intertidal invertebrates; and (5) broad ecological benefits to the San Miguel Island ecosystem.

Impacts

To successfully eliminate rats from San Miguel Island, a highly efficacious rodenticide must be used to ensure complete eradication. Because there are no rat-specific toxicants, the use of a rodenticide to eradicate rats will pose a risk of poisoning non-target species on San Miguel Island. Non-target species are defined as those species that are unintentionally exposed to the rodenticide. Although non-target poisoning is likely, the probability of poisoning depends on the toxicity of and the organism's exposure to the rodenticide.

Non-target poisoning is generally categorized as primary or secondary poisoning. Primary poisoning occurs when a non-target species consumes the bait directly. The species most at risk for primary poisoning on San Miguel Island are the deer mouse (Erickson and Halvorson 1990), song sparrow and other granivorous birds, and the island fox. Any individual that feeds on a primarily poisoned organism is at risk of secondary poisoning (e.g., a bird that feeds on a poisoned rodent). Species most at risk for secondary poisoning include predatory birds and the island fox.

Record and Marsh (1988) and Taylor (1993) identified elements involved in determining whether a rodenticide poses a poisoning hazard to non-target species: (1) chemical and toxicological properties of the rodenticide; (2) composition of the bait and how it is applied; (3) behavior of non-target species at risk; (4) behavior of the target species both when intoxicated and at death; and (5) local environmental factors. Each of these variables will be analyzed and presented in the EIS or EA developed by NPS. Studies will be conducted to evaluate the potential risk of poisoning non-target species and to develop appropriate mitigation measures. This action will proceed only if the risks to non-target species, in particular the endangered island fox and endemic deer mouse, can be minimized to an acceptable level.

The recent successful rat eradication on Anacapa Island can be used to predict some of the potential impacts from the proposed action. Subsequent planning will determine whether the mitigation measures used on Anacapa Island will be appropriate for use on San Miguel Island. The presence of the endangered island fox, however, is a unique feature of the San Miguel Island project that will require a complete analysis of the feasibility of the project, the potential impacts of the project on the island fox, and the development of a comprehensive mitigation program for the island fox.

Birds

During the Anacapa Island Restoration Project, a total of 94 individual birds are known to have died from the use of brodifacoum, but the impact had a negligible effect at a population level (Howald et al. 2005). The presence of the endemic song sparrow on San Miguel Island will require additional effort to minimize and mitigate exposure risk, such as the captive holding of a representative population. Although there will likely be short-term impacts, the elimination of the non-native rats should directly benefit the sparrow population as a whole in the long term. On

Anacapa Island, land birds such as the song sparrow, house finch, and Bewick's wren were breeding within six months after the bait drop (Howald et al. 2005).

Birds that consume live rodents or carcasses will be at risk for secondary poisoning. The Anacapa Island Restoration Project demonstrated that the majority of monitored rats died underground after consuming the rodenticide and were therefore unavailable as food to avian scavengers after approximately one week (Howald et al. 2005). This is consistent with other field studies that evaluated the fate of anticoagulant-poisoned rodents (Taylor and Thomas 1993, Fenn et al. 1987). Nonetheless, western gulls, common ravens, and birds of prey will still be at risk for secondary exposure. Several measures implemented successfully on Anacapa Island, such as coloring the bait and timing the project outside the breeding season, will minimize potential impacts. Impacts to predatory birds will also be minimized by capturing and holding those birds until the period of risk is over. Monitoring results from the Anacapa Island Restoration Project confirm that insectivorous birds are not likely to experience extensive secondary poisoning by preying on invertebrates that ingested bait or tertiary poisoning by preying on invertebrates that fed on poisoned rat or mouse carcasses.

Roosting seabirds may be temporarily disturbed during either an aerial or bait station operation. However, the operation will be timed to coincide with seasonal minimums in the number of seabirds and land birds. Monitoring from the Anacapa Island Restoration Project demonstrated that seabirds were only temporarily disturbed by the operation.

Deer Mouse

The presence of the endemic deer mouse poses a biological challenge to the eradication of rats from San Miguel Island. Because rodenticides are designed to kill rodents, the bait will be attractive and poisonous to mice as well as rats. It is anticipated that any deer mouse that is not in captivity will be killed by the operation. However, deer mice are prolific breeders and can undergo considerable annual population fluctuation. Any reductions in the deer mouse population caused by rat eradication measures would probably not have a significant long-term effect on the population as long as an effective population size remains (Howald, pers. comm., 2004). Therefore, a strategy that removes the potential for rodenticide exposure to all mice will be necessary for the long-term protection of this endemic population.

The Anacapa Island Restoration Project clearly demonstrated that rats can be removed from an island with an endemic rodent. With the implementation of the mitigation measures and excellent environmental conditions for release and breeding, mouse densities on Middle Anacapa Island approximately 6.5 months after release were comparable to densities measured prior to the rat eradication (Howald et al. 2005). Application of established methods used on Anacapa Island (e.g., captive holding/breeding techniques) should effectively mitigate temporary impacts on the native mouse population of San Miguel Island.

Island Fox

There is no precedent for the eradication of rats from an island with an endemic carnivore such as the island fox. Any form of anticoagulant bait application on the island will present a secondary exposure risk to foxes through the consumption of any dead rodents that may be available. Because of the high likelihood of exposure to foxes, an effective mitigation strategy

must be implemented to ensure that direct exposure is avoided. Such a strategy will involve captive holding of foxes for a period of time. Foxes may also be impacted by the temporary reduction in available mice following bait application. Strategies to minimize and mitigate potential short-term and long-term impacts to the foxes (e.g., captive holding) will be developed during the preparation of additional environmental documentation. Also, future consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act will ensure that the proposed action does not jeopardize the survival and recovery of the San Miguel Island fox.

Marine Mammals

Marine mammals hauled out on beaches may be temporarily disturbed during either an aerial or bait station operation. The operation will minimize disturbance to marine mammals using the minimization measures outlined earlier. However, minor disturbances to marine mammals from the helicopter activity and hand bait application are anticipated.

Erosion

Project implementation and monitoring may result in minor soil erosion and compaction. However, the benefits of the eradication (including stopping weed seed dispersal by rats) will offset any potential impacts from soil erosion. Careful planning and ongoing monitoring will minimize any negative impacts due to soil erosion and compaction. Procedures for staff will be implemented to minimize risks of weed seed dispersal.

Summary

The eradication of rats worldwide has documented ecosystem-wide benefits. In some cases, there have been short-term negative impacts; however, the impacts have been of short duration, and recoveries of some species to higher population levels and/or greater productivity than pre-eradication conditions have been documented (e.g., Towns 1991). In most cases, wildlife managers have determined that long-term benefits to island ecosystems with the removal of introduced rats greatly outweigh the short-term impacts to non-target species. All of the potential benefits and impacts of this action will be fully evaluated during the planning phase. Should the subsequent analysis show that this action is infeasible or that potential impacts are unacceptable, this action would not be implemented.

D1.4.2 Physical

Benefits

There are no known benefits to geology/earth resources, water resources, oceanographic and coastal processes, air quality, or noise receptors.

Impacts

There are no known impacts to geology/earth resources, water resources, air quality, and noise receptors. Specific measures will be developed and implemented to ensure that bait does not

enter the marine environment. On Anacapa Island, a small amount of bait entered the water indirectly from bouncing off of cliffs. Divers documented that the pellets began to degrade 1.5 hours after the bait drop and became scattered crumbs at 5 hours after the bait drop (Howald et al. 2005). No fish or other animals were observed feeding on the bait. No brodifacoum residues were detected in any of the fish or invertebrate samples that were collected. In addition, no brodifacoum residues were detected in water samples taken from the marine environment at either 24 or 48 hours after the application (Howald et al. 2005). Unlike Anacapa Island, San Miguel Island does not have steep cliffs; therefore, there are very few areas where bait would bounce off of cliffs and into the water.

D1.4.3 Human Use

Benefits

This action will have no known benefits to cultural, socioeconomic, aesthetic, or transportation resources.

Because rats pose health and safety hazards (e.g., Pratt et al. 1977) and can cause destruction to supplies and equipment, the eradication of rats will benefit visitors and NPS personnel on San Miguel Island. Although there have been no known rodent-vectored diseases transmitted to island staff or residents in the recent past, there is potential in any rodent population for the transmission of disease to humans. Health and safety standards will be improved at NPS facilities on the island, and a potential source of disease will be eliminated. The removal of black rats from San Miguel Island will be expected to have long-term health, safety, aesthetic, and recreational benefits and will remove a destructive nuisance to human habitation and use of the island.

Impacts

This action will have no known impacts to cultural, aesthetic, or transportation resources. Cultural resources will be avoided on the island during the operation.

To minimize potential exposure to visitors, San Miguel Island will be closed for several days. Recreational activities such as camping and hiking will not be permitted during that timeframe. However, due to its distance from the mainland and the annual visitation rate of less than 200 campers each year, the closure of the island will not have a significant impact on recreational and visitor activities.

With the exception of possible skin irritation caused by contact with bait by project workers, negative impacts of the rodenticide on humans is not expected. Project workers will follow proper safety procedures to avoid contact with the bait.

D1.5 LIKELIHOOD OF SUCCESS/FEASIBILITY

The eradication of rats from offshore islands has been successfully demonstrated worldwide. As of 2002, rats have been removed from more than 250 islands (IC 2004b). San Miguel is within the size range of successful eradications using bait stations or aerial broadcast. The recent successful removal of rats from Anacapa Island demonstrates that such a project can successfully

overcome the complex regulatory and biological challenges facing these types of restoration projects in the United States. Although the presence of the endangered San Miguel Island fox is a significant factor not present on Anacapa Island, the experience, knowledge, and lessons learned from the Anacapa Island Restoration Project will be applied to this action. All of the potential benefits and impacts of this action will be fully evaluated during the planning phase through additional environmental documentation. Should the subsequent analysis show that the action is infeasible or that potential impacts are unacceptable, this action would not be implemented.

A key factor to the success of the action is the development and implementation of a plan to prevent the reintroduction of rats to San Miguel Island. The effort and conservation gains made from the eradication could be negated with the reintroduction of rodents or other non-native species. Invasive species, including vertebrates, invertebrates, weeds, and pathogens can all be transported to the island inadvertently and have detrimental impacts on breeding seabirds. The rodent reintroduction prevention plan will be one component of a comprehensive program designed to prevent many non-native species from being introduced onto the island. This program will build upon the rodent reintroduction prevention plan that is being implemented on Anacapa Island by the NPS. The plan will address rat spill[1] kits, quarantine, monitoring, and response actions.

With the use of techniques employed in successful eradication programs elsewhere and implementation of a comprehensive prevention plan, the probability of successful eradication of rats on San Miguel Island is high.

D1.6 PERFORMANCE CRITERIA AND MONITORING

The success of restoration activities on San Miguel Island will be measured by the complete removal of the rats from the island and subsequent increases in seabird populations. A long-term monitoring plan, to be developed and detailed in the subsequent EIS or EA, will expand on the following proposed research and monitoring actions:

- Collect baseline data on rat and mouse distribution patterns, relative abundance, and habitat use.
- Use a combination of trapping and ecological indicators to evaluate the presence/absence of rats using pre-eradication survey data to compare to post eradication data.
- Conduct mouse/seabird/land bird/fox monitoring before and after the bait application to quantify impact and recovery of these populations.
- Test unarmed bait consumption by non-target animals.
- Monitor the island fox captive breeding program following standard guidelines.
- Monitor populations of native fauna and flora before, during, and after bait application to document potential benefits and impacts.
- Develop long-term monitoring to detect any introductions as early as possible, and build the capacity to respond to and eliminate any introduction of non-native rodents or other species.

[1] A rat spill is the accidental importation of rats to a rat-free island.

The benefits of rat removal to seabirds that breed and roost on the island may be evaluated by increase in population number, increase in habitat availability, and reduced predation. Measuring statistically meaningful population increases in any seabird species on San Miguel Island may take years or even decades. However, increased habitat availability and reduced predation were demonstrated as soon as five months after the eradication of rats on Anacapa Island. In the absence of rats, sea cave nest monitoring of Xantus's murrelets demonstrated high nesting effort and hatching success, no nest depredation, and signs of an expansion of their nesting range on Anacapa Island (Whitworth et al. 2003).

Protocols for seabird monitoring in the Channel Islands were developed in the 1980s. Consequently, the methods for seabird monitoring in the Channel Islands are well established and standardized. The NPS periodically monitors seabirds on Prince Island (primarily Cassin's auklets), and historical information is available. However, currently no seabird monitoring occurs on San Miguel Island or Castle Rock, and minimal historical information exists. To evaluate the benefits of the action, baseline surveys of seabird populations will be conducted before project implementation.

D1.7 EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and concluded that this action is consistent with these selection factors. The Trustees determined that this type and scale of action will provide long-term benefits to seabird populations, including small crevice-nesting seabirds such as the ashy storm-petrel, Cassin's auklet, and Xantus's murrelet as well as ground-nesting seabirds such as the western gull. This action will likely also have benefits to peregrine falcon populations in the Northern Channel Islands and will likely provide long-term benefits to the ecosystem on San Miguel Island.

Multiple government agencies and experts will be involved in the development, evaluation, and implementation of the rat eradication program. Consultation with these agencies is required before implementation of the rat eradication program. The USFWS will be consulted regarding potential effects to endangered species under Section 7 of the Endangered Species Act. Based on the Anacapa Island Restoration Project, this action will also seek a Migratory Bird Take Permit from the USFWS to address potential impacts to migratory birds. The EPA will be consulted to obtain registration of a rodenticide for rat eradication on San Miguel Island. In addition, a subsequent EIS or EA will be prepared for public review prior to project implementation.

D1.8 BUDGET

Project management (development, implementation, and monitoring)	$1,065,000
Project environmental compliance/project management (NPS)	$330,000
Eradication	$513,000
Mitigation (deer mice, birds)	$300,000
Mitigation (fox)	TBD
Supplies	$75,000
Equipment	$65,000

Transportation	$75,000
Public outreach	$30,000
Estimated Total	**$2,453,000**

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Appendix D2

Restore Alcids to Santa Barbara Island

D2.1 GOALS AND NEXUS TO INJURY

The goal of this 5-year action is to re-establish an active Cassin's auklet breeding population on Santa Barbara Island through social facilitation and habitat improvement, and to improve recruitment and productivity of Xantus's murrelets through the installation of artificial nest boxes and habitat improvement. Eggshell thinning and/or elevated levels of DDT were documented in eggs of the Cassin's auklet and Xantus's murrelet in the Southern California Bight (SCB) (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of seabird nexus.

D2.2 BACKGROUND

The Channel Islands are critical nesting habitat for seabirds in the SCB. Santa Barbara Island is the smallest of the Channel Islands, measuring 2.6 square kilometers (km^2) (1 square mile [mi^2]) in size. This island is within the Channel Islands National Park and is owned and managed by the National Park Service (NPS). The vegetation communities contain a mixture of grass and shrublands, and eight community types have been identified (Hochberg et al. 1979). Habitat modification and degradation on Santa Barbara Island has been severe in the past due to human activities such as farming, burning, and livestock grazing. Vegetation and soil changes from non-native grazing mammals and past agricultural practices likely led to a large historical decline in seabird populations and may have caused an increase in the number of deer mice on the island (Murray et al. 1983). The endemic deer mouse is a known predator of seabird eggs on Santa Barbara Island (Murray et al. 1983). Seabirds were also severely affected by cats that were brought to Santa Barbara Island in the late 1800s. An effort to eradicate cats from the island was under way by the 1950s, and the last cat was removed in 1978 (Murray et al. 1983).

D2.2.1 Cassin's Auklets

In 1897, Cassin's auklets bred in large numbers on Santa Barbara Island (Grinnell in Hunt et al. 1979). However, cats decimated this population and by 1908 no signs of the species were seen (Howell 1917). A trip to the island in 1911 revealed only bones and feathers of auklets all over the island, and the observer concluded "that they had been exterminated by the cats with which the island is infested" (Willett in Hunt et al. 1979). Recent surveys have demonstrated that this colony has not recovered from the impacts of cat predation (Carter et al. 1992).

In 1991, Cassin's auklets persisted in small numbers on the offshore islet of Sutil Island and in a bluff at Elephant Seal Point on Santa Barbara Island (Carter et al. 1992). A few Cassin's auklets were regularly observed on Elephant Seal Point throughout the early to mid-1990s (Martin, pers. com., 2003). In 1999, a survey of Sutil Island was carried out to specifically capture Cassin's auklets. This effort resulted in the capture of five individuals (Martin, pers. com., 2003). However, recent surveys have not documented Cassin's auklets at Sutil Island, and it is possible they no longer breed at Santa Barbara Island (Martin, pers. com., 2003).

D2.2.2 Xantus's Murrelets

The worldwide breeding range of the Xantus's murrelet is restricted to the Channel Islands and the west coast of Baja California, Mexico. Currently there are only 12 nesting islands scattered

along 500 miles of coastline (Burkett et al. 2003). The Xantus's murrelet population is highly concentrated, with approximately 82 percent of the population breeding on five islands/island groups (Santa Barbara, Anacapa, the Coronado Islands, San Benitos, and Guadalupe). Historical accounts and literature from the 1940s indicates that Xantus's murrelets were much more abundant at that time than today (Burkett et al. 2003). Currently, the Xantus's murrelet is considered an uncommon species, with approximately 3,460 breeding birds in California and less than 10,000 birds worldwide (Burkett et al. 2003). In light of the small breeding population and documented population decline of the species, the California Fish and Game Commission made a finding in February 2004 to list the Xantus's murrelet as a state threatened species under the California Endangered Species Act. This listing was finalized in June 2004. In addition, the Xantus's murrelet was identified as a candidate species in May 2004 for listing as a federally threatened species under the Endangered Species Act.

Little historical information exists on the size of the Xantus's murrelet population on Santa Barbara Island prior to the introduction of cats in the late 1800s. Similar to Cassin's auklets, this species was preyed upon by cats (Sumner and Bond 1939), and likely only persisted in small numbers on Sutil Island and inaccessible cliffs on Santa Barbara Island. Research from the 1970s to 2001 documented a decline in murrelet numbers on Santa Barbara Island. Surveys conducted on Santa Barbara Island from 1975 to 1978 estimated the number of breeding murrelets to be 3,000 (Hunt et al. 1979, Hunt et al. 1980). Surveys conducted in 1991 estimated 1,402 breeding birds (Carter et al. 1992). In 2001, surveys were again conducted to reassess the nesting population of murrelets on Santa Barbara Island. Results from this study showed a 14 percent decline in the number of active nest sites in 2001 compared to the 1991 survey. Monitoring has also documented that nest site occupancy rates have declined from approximately 35 to 70 percent in the mid-1990s to 30 percent or less since then (Wolf et al. 2000). The loss of some of these nest sites has been attributed to a reduction in shrub cover (Wolf et al. 2000).

Despite this marked decline, Santa Barbara Island has the most important colony of Xantus's murrelets within the Channel Islands National Park. This island supports 51 percent of the Xantus's murrelet population in California (Burkett et al. 2003). The Xantus's murrelet population on Santa Barbara Island is essential to the long-term survival and recovery of this species within its limited range. Efforts to increase this population on Santa Barbara Island is one focus of this proposed restoration action.

D2.3 PROJECT DESCRIPTION AND METHODS

The goal of this action is to facilitate the recovery of the Cassin's auklet and Xantus's murrelet on Santa Barbara Island. This action will improve nesting habitat for Cassin's auklets and Xantus's murrelets on Santa Barbara Island by removing exotic vegetation from nesting areas and revegetating the area with native plants. Vocalization playback systems will be used to attract Cassin's auklets to suitable nesting areas to re-establish the auklet colony. Also, artificial cavities and nest boxes will be installed for both Cassin's auklets and Xantus's murrelets to provide a stable and secure nesting area to improve productivity and assist in monitoring efforts. This habitat restoration and social attraction efforts aim to: (1) increase recruitment, (2) increase reproductive output, and (3) decrease egg and chick mortality by providing safe breeding habitat.

Several areas will likely be targeted for attracting Cassin's auklets, including the hillside behind the NPS Ranger Station and the summit and southeastern bluffs of Signal Peak. Within these

areas, exotic vegetation will be removed and native plants installed to restore the area. Native plants such as tree sunflower (*Coreopsis gigantea*), buckwheat (*Eriogonum giganteum compactum*), and purple needlegrass (*Nacella pulchra*) will be used. The removal of exotic vegetation and planting of native plants will be done during the non-breeding season to avoid impacts to nesting birds.

Once the site is prepared, vocalization playback systems will be used to attract auklets. Nest boxes will be made for Cassin's auklets and will be placed in each target area. Artificial nest sites will be insulated against the elements (heat being more of a concern than cold) with dirt, sand, or rocks depending on the topography.

In addition to habitat enhancement, nest boxes will be made specifically for Xantus's murrelets. These nest boxes will provide a secure nesting area for this species with the goal of increasing recruitment and reproductive output.

NPS will complete additional planning, review, and environmental compliance before implementation of this action.

D2.4 ENVIRONMENTAL BENEFITS AND IMPACTS

D2.4.1 Biological

Benefits

By providing additional high-quality breeding habitat, this action seeks to re-establish a historic breeding colony of Cassin's auklets and aid in the recovery of the threatened Xantus's murrelet. The combination of habitat restoration and nest boxes will provide a favorable environment for both Cassin's auklets and Xantus's murrelets on Santa Barbara Island. In Northern California, nest boxes have enhanced the population growth rate of several cavity-nesting alcid species at various sites by increasing recruitment of breeding-age birds, improving productivity, and decreasing mortality (Sydeman et al. 2000). The use of playback systems will further facilitate the recolonization of the Cassin's auklet on the island. These techniques should increase the number of breeding pairs of Cassin's auklets and Xantus's murrelets on the island, thereby increasing the number of offspring produced. This action will restore critical seabird nesting habitat in the Channel Islands, as well as aid in the recovery of this important Xantus's murrelet colony. By re-establishing the historical colony of Cassin's auklets and increasing the number of breeding pairs of Xantus's murrelets, this action will have long-term benefits to these species.

Impacts

This action is expected to have minimal short-term biological impacts. The removal of exotic vegetation and the planting of native plants will be done during the non-breeding season to avoid impacts to nesting birds. There will be additional human activity on Santa Barbara Island as a result of this action that could result in temporary displacements of native wildlife or the trampling of native plants. However, it is expected that any impacts will be short term and minimal. If it is determined that herbicides are necessary for plant removal, they will be applied in a manner that avoids or minimizes adverse impacts and is in compliance with NPS policies.

Subsequent monitoring may temporarily disturb target species; however, the use of nest boxes will minimize such impacts to nesting alcids.

D2.4.2 Physical

Benefits

Restoration of native plants could have long-term benefits to the physical environment of Santa Barbara Island by stabilizing the soil and decreasing erosion.

Impacts

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

D2.4.3 Human Use

Benefits

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

Impacts

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

D2.5 LIKELIHOOD OF SUCCESS/FEASIBILITY

Social attraction techniques, including the use of vocalization playback systems, have been successfully used for a variety of seabirds throughout the world. The use of artificial nest boxes has also proven to be successful for alcids such as the Cassin's auklet. Experts in the field of social attraction will be consulted during project planning and implementation to ensure that vocalization playback systems and artificial nest sites are designed in a manner that maximizes project success. This action will be determined to be successful when Cassin's auklets and/or Xantus's murrelets begin occupying the newly created nesting habitat.

Moderate operations and maintenance will be required for this action. Minimal maintenance is expected for cleaning and repair of nest boxes. The revegetation area may require periodic removal of exotic plants. Benefits are anticipated to be self-sustaining after project implementation.

D2.6 PERFORMANCE CRITERIA AND MONITORING

To quantify the efficacy of the restoration efforts, a minimum of four years of monitoring is proposed. Monitoring protocols for birds nesting in artificial cavities will follow those established by experts in the field of seabird ecology. A monitoring plan will be developed to allow the Natural Resource Trustees for the Montrose case (Trustees) to evaluate the success of the restoration efforts by collecting simultaneous information on reproductive success, site occupancy, and mortality. Due to the State threatened status and sensitivity to disturbance of Xantus's murrelets, no adults of this species will be handled.

D2.7 EVALUATION

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

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

D2.8 BUDGET

*Year 1 costs (*allotment of costs across categories may change):

- Labor
  (wildlife biologists, housing, etc.).....$88,000
- Supplies (nest boxes, playback systems) $30,000
- Transportation (boat, personnel).....$20,000
- **Estimated total, year 1.....$138,000**

Years 2–5 Costs:

- Labor
  (wildlife biologists, enforcement support).....$88,000
- Supplies
  (nest box replacement/maintenance, etc.).....$15,000
- Transportation (boat, personnel).....$13,000
- Estimated per year cost 116,000
- **Estimated total, years 2–5 .....$464,000**
- **Estimated total costs, years 1–5 .....$602,000**

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Appendix D3
Restore Seabirds to San Nicolas Island

D3.1 GOALS AND NEXUS TO INJURY

The goal of this action is to restore western gull and Brandt's cormorant colonies on San Nicolas Island by eradicating feral cats. Eggshell thinning and/or elevated levels of DDTs were documented in eggs of the western gull and Brandt's cormorant in the Southern California Bight (SCB) (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of seabird nexus.

D3.2 BACKGROUND

Introduced predators, in particular feral cats and rats, are one of the greatest threats to seabird populations on islands (Moors et al. 1992, Whittaker 1998). On islands worldwide, feral cats are directly responsible for a number of extinctions and extirpations across multiple taxa (Iverson 1978, Moors 1985b, Kirkpatrick and Rauzon 1986, Cruz and Cruz 1987, Towns et al. 1990, Donlan et al. 2000, Veitch 2001). Cats are opportunistic hunters and consume a wide variety of mammals, reptiles, birds, and insects (Kirkpatrick and Rauzon 1986, Konecny 1987, Fitzgerald 1988, Fitzgerald and Turner 2000). Predation by feral cats is responsible for the extinction of at least 33 bird species (Lever 1994), including the Stephen Island wren (*Traversia lyalli*, New Zealand), Socorro dove (*Zenaida graysoni*, Mexico), and Guadalupe storm-petrel (*Oceanodrama macrodactyla*, Mexico). Cats have also led to local extirpations of seabird colonies on the Channel Islands, including the Cassin's auklet from Santa Barbara Island (Willet in Hunt et al. 1979).

D3.2.1 San Nicolas Island

The U.S. Navy–owned island of San Nicolas is one of four southern Channel Islands, and totals 58 square kilometers (km^2) (22 square miles [mi^2]) in size. The island is about 15 kilometers (km) (9 miles) long and 6 km (3.6 miles) wide. The highest elevation is 277 meters (908 feet). In general, the island exhibits sparse vegetation that is mostly attributable to past sheep ranching, the island's arid climate, and high winds.

San Nicolas Island provides missile and aircraft launch facilities and radar tracking in support of the Navy's mission. Infrastructure on the island includes an asphalt runway, water wells, a desalination plant, water distribution and sewage systems, roads, telecommunication facilities, and buildings. Approximately 200 people work and live on the island. There is no public access to the island primarily due to security and safety requirements.

D3.2.2 Fauna on San Nicolas Island

San Nicolas Island supports a number of species endemic either to the Channel Islands or the island itself, including at least 20 plant species, 25 invertebrates, 1 reptile, 2 birds, and 2 mammals (U.S. Navy 2003). State and federal threatened and endangered species on the island include the threatened western snowy plover (*Charadrius alexandrinus nivosus*), threatened island night lizard (*Xantusia riversiana riversiana*), endangered California brown pelican, and threatened San Nicolas island fox (*Urocyon littoralis dickeyi*). San Nicolas Island also supports important marine mammal rookeries, as well as breeding colonies of Brandt's cormorants and western gulls.

D3.2.3 Brandt's Cormorant

Historical records have shown that Brandt's cormorants have nested on San Nicolas Island since at least the late 1800s (McChesney 1997). Most documented nesting occurred at the west end of the island. Prior to the mid-1970s, a total of 600 to 800 pairs were estimated to breed on the island (McChesney 1997). This population subsequently declined in the mid-1970s to only 100 to 200 pairs. This decline is consistent with the widespread failure of cormorant nests throughout the SCB due to DDT contamination (Gress et al. 1973). The Brandt's cormorant colony then underwent dramatic increases from the late 1970s to the early 1990s. In 1991, San Nicolas Island supported the second largest Brandt's cormorant colony in the Channel Islands, with 5,089 breeding individuals (Carter et al. 1992). Between 1991 and 1995, the population on San Nicolas Island varied annually due to a variety of factors including human disturbance, El Niño conditions, and predation by the island fox. Annual aerial surveys since 1996 have documented that the Brandt's cormorant population has expanded and shifted into intertidal environments.

D3.2.4 Western Gulls

Historically, San Nicolas Island supported one of the largest western gull colonies in Southern California. A large western gull colony was first documented in 1991 and was estimated at 6,038 breeding individuals (Carter et al. 1992). However, more recent surveys have documented a decline in the western gull colony (Smith, pers. comm., 2004). Western gulls have become more distributed across the island, perhaps due to the increases in sea lion disturbance at the main colony site and predation by island foxes. Because western gulls nest on the ground, they are particularly susceptible to predation.

D3.2.5 San Nicolas Island Fox

The San Nicolas Island fox population has remained stable and is estimated at 614 individuals (USFWS 2004). This species is listed as threatened by the State of California. The U.S. Fish and Wildlife Service (USFWS) recently determined that the federal listing of the San Nicolas population of the island fox was not warranted under the Endangered Species Act (USFWS 2004). However, its small population size, insular nature, lack of resistance to canine distemper and other diseases, high densities, and low genetic variability increase the vulnerability of this subspecies (USFWS 2004).

San Nicolas Island foxes are omnivorous, foraging on insects, vegetation, mice, and seasonally available bird eggs. Predation by the island fox has caused nesting failure and abandonment of both Brandt's cormorant and western gull colonies on the island (McChesney 1997). The San Nicolas Island fox population is negatively affected both by competition with feral cats and impacts from humans.

D3.2.6 Presence and Impacts of Feral Cats on San Nicolas Island

Cats were first introduced to San Nicolas Island during the 1800s and later by Navy personnel. Negative impacts from feral cats on the island's fauna have been documented. Humboldt State University studies from 1992 to 1996 documented impacts to nesting Brandt's cormorant and western gulls from feral cats (McChesney 1997, Carter, pers. comm., 2004). As described in the Navy's 2003 Integrated Natural Resources Management Plan (INRMP) for San Nicolas Island:

> Feral cats have long been established on San Nicolas Island and pose a serious risk to the integrity of the entire ecosystem. Cats are implicated in the decline of small animal and bird populations worldwide and have especially devastating impacts on closed island systems. Cats have detrimental impacts on San Nicolas Island land bird populations, seabird colonies, and prey upon the federally listed island night lizard and the western snowy plover. Cats directly impact the San Nicolas Island fox through competition for prey and indirectly through spatial displacement.

In an effort to protect endangered species and sensitive seabird colonies, the Navy has funded intermittent efforts to control feral cats since the 1980s. The INRMP identifies the continued control/removal of cats as a recommended guideline to protect the western snowy plover, island night lizard, resident and migratory birds, island fox, and island deer mouse. In addition, Navy personnel are prohibited from bringing pets onto the island (U.S. Navy 2003).

D3.3 PROJECT DESCRIPTION AND METHODS

The goal of this action is to eradicate feral cats and increase seabird colonies on San Nicolas Island. This action will expand the ongoing control efforts by the Navy with the goal of eradicating cats from the island over an approximate three-year time frame. Proven techniques (e.g., trapping) used worldwide in recent cat removal programs will be employed as part of this action. However, given the overlap between cats and island foxes in terms of size and diet, the methods selected to eradicate cats will be given careful consideration to avoid impacts to the fox. This action will explore various techniques for eradication, but will use methods that pose the least risk to the island fox.

The specific methodologies for this action will be developed and evaluated in future additional environmental documentation prepared pursuant to the National Environmental Policy Act (NEPA) and/or the California Environmental Quality Act (CEQA) in coordination with the U.S. Navy.

D3.4 ENVIRONMENTAL BENEFITS AND IMPACTS

D3.4.1 Biological

Benefits

Eradication of cats from San Nicolas Island will provide long-term conservation benefits for Brandt's cormorants and western gulls by removing a non-native predator from the island ecosystem. The Natural Resource Trustees for the Montrose case (Trustees) anticipate that this action will result in increased reproductive success for these species and therefore expansion of these colonies. Both of these species are endemic to the west coast of North America and have limited ranges. The colonies on San Nicolas are located within the center of their range and have historically supported large colonies. This action will contribute to the protection of these colonies, though they will still be subject to predation by the native island fox. However, it is anticipated that larger, more robust colonies will more effectively withstand the ongoing predation pressure from the island fox.

In addition to seabirds, this action will also have collateral benefits to the island ecosystem. Sensitive species such as the island fox, endemic deer mouse, threatened island night lizard, and threatened snowy plover will likely benefit from reduced predation and competition. This action will also likely benefit both resident and migratory land birds on San Nicolas Island because of the removal of this non-native predator. The Navy's INRMP identifies the control/eradication of cats as a recommended management action to protect the island's biological resources (U.S. Navy 2003).

Impacts

There is the potential for non-target impacts to the island fox due to its similarity in size and diet to the feral cat. However, techniques will be further developed to avoid and minimize potential impacts to the fox. Although there may be some short-term impacts to individual foxes, the fox population will benefit overall from the eradication of feral cats since they are competitors for food resources and habitat. The methodologies and potential impacts will be discussed fully in subsequent environmental documentation for the action.

D3.4.2 Physical

Benefits

This action will not result in benefits to the physical environment.

Impacts

This action will not result in impacts to the physical environment.

D3.4.3 Human Use

Benefits

Removal of non-native species is a critical step in the restoration of island ecosystems. The eradication of feral cats will help restore populations of native species on San Nicolas Island. Such restoration will provide aesthetic and recreational benefits to Navy personnel. Because the island has restricted access, this action will not likely provide aesthetic or recreational benefits to the general public.

Impacts

During the eradication program, there may be closures or restriction on use of certain areas for safety reasons. Such restrictions may limit recreational opportunities for Navy personnel. However, feral cat control was initiated in the 1980s and Navy personnel have accommodated this activity. Although the action is designed to be an intensive effort over approximately 3 years, it will be compatible with the military use of the island.

D3.5 LIKELIHOOD OF SUCCESS/FEASIBILITY

Although difficult, feral cat eradication has been successfully carried out on at least 48 islands worldwide (Nogales et al. 2004). In northwest Mexico, cats have been successfully eradicated from 15 islands (Wood et al. 2002). Cats have been eradicated from large islands such as Marion Island (290 km^2 [112 mi^2]) and Macquarie Island (120 km^2 [46 mi^2]) in the Indian Ocean (Nogales et al. 2004). San Nicolas Island (58 km^2 [22 mi^2]) is within the size range of successful cat eradications. The experience, expertise, and lessons learned from previous efforts will be applied to this action to ensure its success.

The greatest challenge for this action is the presence of the island fox. Proven techniques used in past eradications may not be available for this action because of the potential for impact to this sensitive species. The success of the action will be defined by complete eradication of feral cats from the island. Therefore, should subsequent project developments indicate that complete eradication is infeasible due to limited available techniques or constraints, the Trustees will not consider this action further.

Close coordination and partnering with the Navy is essential to the success of this action. By supporting the ongoing control of cats and identifying this action in its INRMP, the Navy has demonstrated its support for the action. The Navy also prohibits personnel from bringing pets to the island and will continue to do so in the future (U.S. Navy 2003). The prevention of cat reintroduction to the island in the future is a key factor to the long-term success of the action.

D3.6 PERFORMANCE CRITERIA AND MONITORING

This action will be considered successful on the complete eradication of feral cats from the island. The benefits of cat removal to seabirds that breed and roost on the island may be evaluated by increase in population number, increase in habitat availability, and reduced predation. Monitoring of the colonies will determine breeding success, distribution, and predation levels. Measuring statistically meaningful population increases of these colonies may take years or even decades. Protocols for seabird monitoring are well established and standardized. A monitoring plan will be developed during the subsequent phase of this action.

D3.7 EVALUATION

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees determined that this type and scale of action will provide long-term benefits to Brandt's cormorants and western gulls. Both of these species are priorities for restoration in the SCB. This action will also provide long-term benefits to the ecosystem on San Nicolas Island. This action will undergo additional planning and evaluation during future subsequent environmental documentation prepared pursuant to NEPA and/or CEQA.

D3.8 BUDGET

Costs for years 1–3:

- Labor.....$1,121,500
- Equipment.....$184,600
- Travel/housing $134,200
- Supplies.....$32,900
- Contingency…….$71,900
- Overhead.....$309,000
- **Estimated total $1,854,100**

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Appendix D4

Restore Seabirds to Scorpion and Orizaba Rocks

D4.1 GOALS AND NEXUS TO INJURY

The goal of this 5-year action is to restore seabird habitat on Scorpion and Orizaba Rocks through exotic vegetation removal, installation of artificial nest boxes, and disturbance reduction. This action will directly benefit the following nesting or roosting species: the Cassin's auklet, ashy storm-petrel, western gull, Xantus's murrelet, California brown pelican, and the double-crested cormorant.

Eggshell thinning and/or elevated levels of DDT have been documented in the eggs of Cassin's auklets, ashy storm-petrels, western gulls, Xantus's murrelets, California brown pelicans, and double-crested cormorants in the Southern California Bight (SCB) (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of the seabird nexus to the injuries of the Montrose case.

D4.2 BACKGROUND

Scorpion and Orizaba Rocks, located off of Santa Cruz Island, are important nesting islands for burrow-nesting seabirds in California. Scorpion Rock is the largest of a four-rock complex. Both islets are under the jurisdiction of the National Park Service (NPS) and are within the Channel Islands National Park. Scorpion Rock supports a diverse community of breeding and roosting seabirds. Both ashy storm-petrels and Cassin's auklets are confirmed breeders at the rock. Ashy storm-petrels have been recorded to breed at Scorpion Rock since 1928 (Hunt et al. 1979). In 1992, the ashy storm-petrel breeding population was estimated at 140 breeding birds (Carter et al. 1992). In 1992, the estimated breeding population of Cassin's auklets for the Scorpion Rock complex was 546 breeding birds (Carter et al. 1992). In 2000, nest boxes were installed on Scorpion Rock as part of a survey conducted by the U.S. Geological Survey on the foraging ecology of Cassin's auklets. In 2003, the boxes had a 90 percent attendance by Cassin's auklets (Martin, pers. comm., 2004). Xantus's murrelets have also been observed using the rock and are suspected breeders. In 1991, murrelet vocalizations were heard during the breeding season, although no nests or eggshell fragments were found (Carter et al. 1992). In addition, ashy storm-petrels and Cassin's auklets are confirmed breeders at Orizaba Rock. The number of active ashy storm-petrel nest sites on Orizaba Rock has been declining over the last ten years.

Other seabirds utilizing Scorpion and Orizaba Rocks include California brown pelicans, pelagic cormorants, and pigeon guillemots. California brown pelicans historically nested on Scorpion Rock (Anderson et al. 1975) but are currently not breeding there, most likely due to human disturbance. The waters around Scorpion and Orizaba Rocks are popular destinations for sea kayakers. Although Scorpion Rock is closed to the public, kayakers occasionally land on the island. This human disturbance results in the flushing of roosting seabirds (e.g., brown pelicans and cormorants) and harassment of nesting birds. Trespassers have also been documented opening the nest boxes on Scorpion Rock (Martin, pers. comm., 2004). Such disturbance can lead to the abandonment of nests and decreased productivity. Disturbance is also an issue for birds using Orizaba Rock.

D4.3 PROJECT DESCRIPTION AND METHODS

This action proposes to enhance degraded habitat on Scorpion Rock through the removal of exotic plants and revegetation with native plants. Removal of exotic vegetation, primarily ice plant, will occur by mechanical removal without the use of herbicides. Native plants used to restore the area will include tree sunflower (*Coreopsis gigantea*), seaside wooly sunflower (*Eriophyllum staechadifolium*), island deer weed (*Lotus dendroideus*), one-sided blue grass (*Poa secunda*), meadow barley (*Hortium brachyantherum*), and maritime brome (*Bromus maritimus*). The use of matting or similar method to stabilize the soil may be needed in certain areas where erosion would normally prevent native plants from being established. Such measures will also limit soil erosion after the removal of invasive plants.

In addition, nest boxes will be installed on Scorpion Rock to provide a stable and secure nesting area for seabirds to improve their productivity and assist with monitoring efforts. Nest boxes will be installed on top of the rock for Cassin's auklets and Xantus's murrelets. Additional nest boxes will be placed around the top edge of the rock for ashy storm-petrels. Artificial nest sites will be insulated against the elements with dirt, sand, or rocks, depending on the topography.

Disturbance reduction efforts will also be implemented on Scorpion Rock to protect nesting and roosting seabirds from human disturbance. Signs will be posted around the rock and in the visitor center at Scorpion Ranch to inform the public that the rock is closed to protect nesting seabirds. In addition, the action will involve contributing funding for an additional NPS presence at the rock to enforce the closure and educate visitors.

Although no non-native vegetation removal or native vegetation planting will occur at Orizaba Rock, nest boxes will be deployed on the rock for ashy storm-petrels and Cassin's auklets. In addition to making the rock more attractive to petrels, the boxes will include a mechanism for measuring and confirming attendance at the site. The use of social attraction methods via playbacks will also be explored. Similar to Scorpion Rock, disturbance reduction efforts will include the posting of signs indicating that access to offshore rocks is prohibited. Light meters will also be deployed to gather information on the potential impact of high-intensity lights near these colonies.

The NPS will complete additional project planning, review, and environmental compliance before implementation of this action.

D4.4 ENVIRONMENTAL BENEFITS AND IMPACTS

D4.4.1 Biological

Benefits

The elimination of invasive plants and the restoration of native plants will benefit burrow-nesting species by providing increased nesting habitat and stabilization of the rapidly eroding soil horizon on Scorpion Rock. By providing additional high-quality breeding habitat, the action seeks to increase the number of breeding seabirds, in particular Cassin's auklets, Xantus's murrelets, and ashy storm-petrels, on Scorpion and Orizaba Rocks. The use of nest boxes will

enhance suitable habitat, thereby increasing the number of successfully produced offspring and decreasing mortality.

Seabirds, such as the California brown pelican, are particularly sensitive to human disturbance (Schreiber and Risebrough 1972). Reducing human disturbance will have a positive influence on the energy budgets and survival of brown pelicans by reducing the energy costs associated with flushing and relocating due to human disturbance. Reducing disturbances will also protect nesting auklets and murrelets from harassment by trespassers on the rocks.

This action will target a suite of seabirds that demonstrate a strong nexus to the contaminants in the case. Also, seabirds such as the federally threatened California brown pelican, the rare ashy-storm petrel, and the state-threatened Xantus's murrelet are priority species for restoration due to their conservation status. The creation of additional habitat and a reduction in human disturbance will provide long-term benefits to these seabirds.

Impacts

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

Roosting California brown pelicans may be disturbed during this project. The NPS will consult with the U.S. Fish and Wildlife Service regarding project implementation to ensure that California brown pelicans will not be adversely affected.

D4.4.2 Physical

Benefits

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

The restoration of native plants could have long-term benefits to the physical environment of Scorpion Rock by stabilizing the soil and decreasing erosion.

Impacts

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

The removal of invasive plants may result in limited short-term impacts to soils by increasing erosion until native plants are established. However, the use of erosion-control measures (e.g., matting) will mitigate any short-term negative impacts.

D4.4.3 Human Use

Benefits

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

Impacts

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

D4.5 LIKELIHOOD OF SUCCESS/FEASIBILITY

This action will be determined to be successful when seabirds begin occupying the newly created nesting habitat. Both the habitat creation and the revegetation components of the action employ proven methods and techniques that have clearly demonstrated success in the past. As shown in Northern California and elsewhere, nest boxes have enhanced the population growth rate of several cavity-nesting alcid species at various sites by increasing recruitment of breeding-age birds, improving productivity, and decreasing mortality (Sydeman et al. 2000). Monitoring at Scorpion and Prince Rocks has demonstrated the effective use of pilot nest boxes to enhance degraded nesting habitat and facilitate monitoring for this species in the Channel Islands (Adams, pers. comm., 2003).

Minimal maintenance will be expected as part of this action to clean the nest boxes. The revegetation area on Scorpion Rock may require periodic removal of exotic plants.

D4.6 PERFORMANCE CRITERIA AND MONITORING

To quantify the efficacy of the restoration efforts, a minimum of 4 years of monitoring is proposed. The monitoring protocols for birds nesting in artificial cavities will follow those established by experts in the field of seabird ecology. A monitoring plan will be developed to evaluate the success of the restoration efforts by collecting simultaneous information on reproductive success, site occupancy, and mortality. Due to the status of Xantus's murrelets and their sensitivity to disturbance, no adults of this species will be handled. For ashy storm-petrels, monitoring will be conducted on the offshore rocks and on Santa Cruz Island to compare the effectiveness of this action to projects on other nearby colonies. Monitoring sites will include Bat Cave, Cove of the Bird Eggs, Cavern Point Caves, Dry Sandy Beach Cave, Orizaba Rock (natural and artificial sites), and Scorpion Rock (artificial sites). In addition to monitoring the caves and islets for reproductive effort and success, mist-netting will be employed at Scorpion Rock to collect population (mark/recapture) information. Also, the success of the exotic vegetation removal and the survival of native plants will be monitored using established success criteria for re-vegetation projects.

D4.7 EVALUATION

The Natural Resource Trustees for the Montrose case (Trustees) have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees have determined that this type and scale of action will provide long-term benefits to ashy storm-petrels, Cassin's auklets, and Xantus's murrelets. This action will also provide long-term benefits to California brown pelicans, western gulls, and double-crested cormorants from a reduction in human disturbance.

D4.8 BUDGET

Year 1 estimated costs:

- Labor (biologists, enforcement support, housing) $46,000
- Supplies (nest boxes, signs, plants, etc.) $ 23,000
- Transportation (boat, personnel) $6,600
- Estimated total, Year 1 $70,600

Years 2–5 estimated costs:

- Labor (biologists, enforcement support, housing) $180,000
- Supplies (nest box and sign replacement, plants) $44,000
- Transportation (boat, personnel) $26,400
- Estimated total, Years 2–5 $250,400
- **Total estimated costs, Years 1–5** **$326,000**

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Appendix D5

Restore Seabirds to Baja California Pacific Islands

The Natural Resource Trustees for the Montrose case (Trustees) have evaluated a variety of seabird restoration actions for the Baja California Pacific islands in Mexico. These islands support a wide range of seabirds that nest in or use the Southern California Bight (SCB). Restoration efforts would target a suite of seabird species, including the Cassin's auklet, Brandt's cormorant, double-crested cormorant, California brown pelican, ashy storm-petrel, and Xantus's murrelet. To streamline the evaluation of these actions, the general background and regulatory framework is provided below. Detailed project descriptions are then provided for the following islands: (1) Guadalupe Island, (2) Coronado and Todos Santos Islands, (3) San Jeronimo and San Martín Islands, and (4) San Benito, Natividad, Asunción, and San Roque Islands. The actions discussed in this appendix do not cover all of the potential seabird restoration actions for the Baja California Pacific islands; therefore, the Trustees will consider additional actions in the future for implementation under this Restoration Plan, as appropriate.

D5.1 GENERAL BACKGROUND

The Baja California Pacific islands are located in the northwestern portion of Mexico, off of the Pacific coast of Baja California (Figure D5-1). Of the 12 islands or island groups (18 total islands) in this region, nine present unique opportunities for seabird restoration. Three of these islands or island groups (Coronado, Todos Santos, and San Martín) are oceanographically considered part of the SCB. The remaining six islands (San Jeronimo, San Benito, Guadalupe, Natividad, Asunción, and San Roque) are located south of the SCB but are still part of the California Current System. This system, which extends from southern British Columbia to Baja California, is one of the most highly productive eastern boundary currents in the world.

The Baja California Pacific islands support a diverse group of breeding seabirds and are known for their overall high levels of biological diversity and endemism. As shown in Table D5-1, 17 species and 8 subspecies of seabirds breed on the Baja California Pacific islands. Ten of these species also breed on the California Channel Islands (Wolf 2002). Of these 10 shared species, 5 have special-status listings in the United States as endangered, threatened, or species of special concern.

Most of the seabird colonies in Mexico and California form part of a larger metapopulation of seabirds that breed, forage, and disperse into and through the SCB and surrounding marine environment. Breeding seabirds in this region have been documented moving between islands, and crossing the U.S./Mexico border to use islands in the Mexican portion of the SCB and other islands further south and into the Gulf of California. This is best illustrated by the California brown pelican metapopulation, which is divided into four populations: the Southern California Bight, the Baja California Coastal, the Gulf of California, and the Mexican Mainland populations (Gress and Anderson 1983). The SCB population includes colonies both on the Channel Islands and the northwestern Baja California Pacific islands of Coronado, Todos Santos, and San Martín. California brown pelicans within the SCB population have demonstrated interchange of birds, use of same prey resources, and population shifts in response to prey availability (Anderson and Gress 1983). California brown pelicans also demonstrate regular multidirectional movement across the border, with birds from the Gulf of California and Baja California moving into the SCB and Salton Sea regions (Anderson and Gress 1983).

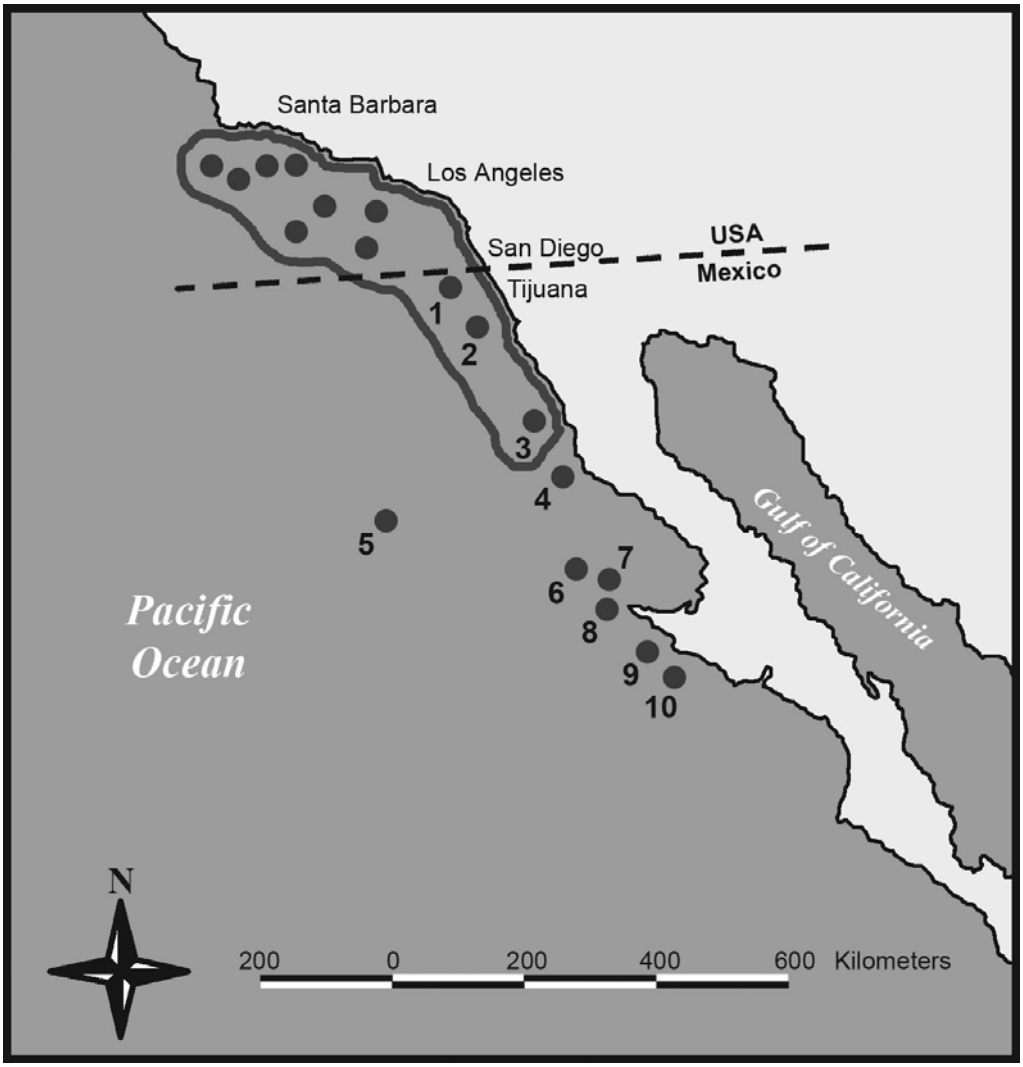

Figure D5-1. Baja California Pacific islands.

Identification of islands: (1) Coronado (2) Todos Santos (3) San Martín (4) San Jeronimo (5) Guadalupe (6) San Benito (7) Cedros (8) Natividad (9) San Roque (10) Asunción. The solid line indicates islands located within the Southern California Bight.

Table D5-1
Characteristics of Birds That Breed on the Baja California Pacific Islands

Breeding Seabirds on Baja California Pacific Islands	Breeding on Channel Islands?	Disperse/ Forage in SCB?	Status in Mexico	Status in United States	International Union for Conservation of Nature and Natural Resources (IUCN) Status
Leach's storm-petrel	Yes	Yes	FE, FT [1]		
Ashy storm-petrel	Yes	Yes	FT	SSC	LR/nt
Black storm-petrel	Yes	Yes	FT	SSC	
California brown pelican	Yes	Yes		FE, SE	
Double-crested cormorant	Yes	Yes		SSC	
Brandt's cormorant	Yes	Yes			
Pelagic cormorant	Yes	Yes			
Western gull	Yes	Yes			
Xantus's murrelet	Yes	Yes	FE	ST	VU
Cassin's auklet	Yes	Yes	FT	SSC	
Laysan albatross	No	Yes	FT		
Black-vented shearwater	No	Yes	FE		
Least storm-petrel	No	Yes	FT		
Magnificent frigatebird	No	Yes			
Heermann's gull	No	Yes	SP		LR/nt
Least tern	No	Yes	FE	FE, SE	
Craveri's murrelet	No	Yes	FT		

[1] Three subspecies are listed: *O.l. chapmani* (FT), *O.l. socrroensis* (FE), O.l. *cheimomnestes* (FT)

FE = Federal Endangered, FT = Federal Threatened, LR/nt = Lower Risk/near threatened, SE = CA State Endangered, SP = Special Protection, SSC = Species of Special Concern, ST = CA State Threatened, VU = Vulnerable

Metapopulations serve to create more stable and viable populations because each individual colony buffers the others against extinction (Petersen and Frederiksen 2000). This is especially important when populations undergo large perturbations such the DDT-induced reproductive failures of pelicans and cormorants in this region. As the SCB population of brown pelicans recovered from DDT-induced population declines, the Baja California Coastal population and most likely the Gulf of California population supplied pelicans that helped to restore the SCB population. San Martín Island in Mexico is likely one such source for pelicans in the U.S. portion of the SCB (Anderson and Gress 1983).

In addition to movement of breeding birds and natal dispersal between colonies on either side of the U.S./Mexico border, a large number of birds breeding in Mexico annually disperse during the non-breeding season into the U.S. portion of the SCB. Dispersal also occurs in the reverse direction, with birds from the U.S. going south to roost on islands in Mexico. During the fall and winter, populations of Brandt's cormorants, double-crested cormorants, and California brown pelicans increase dramatically, surpassing the total number of breeders in the U.S. alone

(Thelander 1994). Other species that breed along the Pacific coast of Baja California or in the Gulf of California but not in the U.S. portion of the SCB are also observed in large numbers during the non-breeding season, indicating that they disperse into U.S. waters for foraging. These species include the Craveri's murrelet (Deweese and Anderson 1976), black-vented shearwater (Keitt et al. 2000), Heermann's gull (Islam 2002), elegant tern (Burness et al. 1999), the southern subspecies of Xantus's murrelet (Drost and Lewis 1995), least storm-petrel, and black storm-petrel (Ainley and Everett 2001). Thus, large portions of these species' populations are exposed to threats within the U.S. and along the northwest coast of Baja California during the non-breeding season.

Because seabird populations overlap international boundaries, protection and restoration of seabird colonies in Mexico directly benefits seabirds nesting on the Channel Islands and foraging in the SCB. Robust seabird colonies in Mexico are also important to ensure the survival of shared species should catastrophic events (e.g., oil spills) lead to a severe decline in seabird numbers on the Channel Islands.

D5.1.1 Jurisdictional and Legal Framework in Mexico

The Baja California Pacific islands are owned by the Mexican government, and access to them is controlled by the Secretariat of Gobernación (Gobernación). Because these islands support globally important populations of marine birds, Mexico's federal government recognizes the Baja California Pacific islands as critical habitat (Ezcurra, pers. comm., 2004). Several seabirds that breed on the Baja California Pacific islands are listed as endangered or threatened under the Norma Oficial Mexicana 059 (the Mexican equivalent of the U.S. Endangered Species Act). The federal designation of seabirds such as Xantus's murrelet, Cassin's auklet, and the ashy storm-petrel further facilitates protection of nesting habitat on these islands (Ezcurra, pers. comm., 2004).

Several Mexican laws are applicable to the conservation of natural resources on the islands, including the General Wildlife Law of 2000 and the General Law of Ecological Balance and Environmental Protection (LGEEPA) of 1988. The General Wildlife Law is implemented primarily by the Secretary of the Environment and Natural Resources (SEMARNAT) Wildlife Directorate General and provides general authority for conservation of migratory species and species restoration, as well as more detailed regulation of wildlife management and use. The LGEEPA focuses on the preservation and restoration of ecological balance and addresses the issues of Natural Protected Areas, jurisdiction, ecological zoning, and enforcement.

Within the Mexican government, several entities are responsible for management and enforcement on the islands. Gobernación is responsible for access to the Baja California islands. Visitors to the islands must obtain permits from the Gobernación prior to landing on the islands. Regulatory enforcement on the islands is the responsibility of the Federal Environment Protection Agency (PROFEPA). Created in 1992 and operating under the SEMARNAT umbrella, PROFEPA is responsible for enforcing Mexican environmental law such as the LGEEPA. The Mexican Navy has responsibility for the waters surrounding the islands and has agreements with the Secretariats (including SEMARNAT, Gobernación, and the National Fisheries and Aquaculture Commission) to enforce their regulations.

D5.1.2 Natural Protected Areas

The National System of Natural Protected Areas was created in 1983 and is one of Mexico's fundamental biodiversity conservation policy tools. This status is meant to protect the most diverse and ecologically important areas of Mexico. The Natural Protected Areas are "areas within the national territory, where the original environmental conditions haven't been significantly altered by human activity or areas that require protection and restoration…" (LGEEPA, Article 3). There are six different categories of Natural Protected Areas in Mexico: (1) Biosphere Reserves, (2) National Parks, (3) Natural Monuments, (4) Areas for the Protection of Natural Resources, (5) Areas for the Protection of Wildlife, and (6) Natural Sanctuaries. The National Commission of Natural Protected Areas (CONANP) is a decentralized organization of SEMARNAT and is charged with management of Natural Protected Areas. PROFEPA is responsible for enforcing rules on Natural Protected Areas through inspection and surveillance.

D5.1.3 Status of Baja California Pacific Islands

The current status of the Baja California Pacific islands varies among the different islands. Because of their unique ecology and biodiversity, the islands are designated a Marine Priority Area for Conservation by the Mexican National Commission for Knowledge and Use of Biodiversity.

The islands under consideration in this proposal fall under three categories: (1) Biosphere Reserve, (2) Natural Protected Area, and (3) proposed Biosphere Reserve. Natividad Island, San Roque Island, and Asunción Island were incorporated into the Vizcaíno Biosphere Reserve in 1988. Guadalupe Island first received special status in 1928 (Munoz et al. 2003) and was designated a Biosphere Reserve on April 25, 2005, as recorded in the Diario Oficial (Mexican Federal Register).

Efforts between local groups and the Mexican government are currently under way to establish the remaining Baja California Pacific islands (including Cedros, San Jeronimo, San Martín, Todos Santos, San Benito and Coronado) as a protected area. A technical study was completed by Grupo de Ecología y Conservación de Islas in support of the designation. In July 2003, the Mexican Congress called upon Gobernación and SEMARNAT to determine the legal and environmental status of the islands (Congress of the Union 2004). On June 3, 2005, SEMARNAT published in the Mexican Federal Register a public notification of their intent to decree a new Biosphere Reserve for 19 islands off the Pacific Coast of Baja California and Baja California Sur and the marine waters around them, as recorded in the Diario Oficial. The designation of these islands as a protected area would create a legal infrastructure for enforcing regulations and developing management plans.

D5.1.4 Recent Conservation Efforts

For the past 10 years, significant efforts have been made to conserve island ecosystems in northwest Mexico. A successful collaboration between local universities, Mexican and U.S. non-profit conservation organizations, local fishing cooperatives, and Mexican governmental agencies has resulted in the removal of introduced species from 24 islands in the region, 12 of which are in the Baja California Pacific islands (Keitt, pers. comm., 2004). Of 19 recorded animal extinctions on islands in northwest Mexico, 18 can be attributed in whole or part to

introduced mammals (Donlan et al. 2000). With the recent efforts, 35 exotic mammal species have been removed from islands in the region (IC 2004b). With the removal of these introduced species, suitable habitat is once again available to seabirds for nesting and roosting. The success of this regional conservation effort has provided unique opportunities to enhance recovery of seabird populations on the Baja California Pacific islands.

D5.1.5 Risks and/or Uncertainties

The Trustees recognize that there is a certain level of uncertainty in funding actions outside of the U.S. Factors such as government support, enforcement, and accountability are of greater concern when implementing actions outside of U.S. jurisdiction. Given the limited staffing and funding in the Mexican resource agencies, there is less certainty of the long-term benefit of an action in Mexico than one in the U.S. As such, the Trustees may consider additional mechanisms or tools to enhance the viability and success of restoration actions in Mexico. Such tools may include: (1) funding a U.S. organization that can be held accountable in U.S. jurisdiction, (2) withholding full payment until project completion, (3) partnering with other conservation programs that successfully implement restoration actions in Mexico (e.g., U.S. Fish and Wildlife Service [USFWS] Sonoran Joint Venture), and (4) seeking matching payments or in-kind contributions.

D5.2 RESTORE SEABIRDS ON GUADALUPE ISLAND

D5.2.1 Goals and Nexus to Injury

The goal of this action is to eradicate feral cats and restore seabird populations on Guadalupe Island, Mexico. This action would target a suite of seabirds including Cassin's auklet, Brandt's cormorant, Xantus's murrelet (subspecies *S. h. hypoleucus*), and the western gull.

Eggshell thinning and/or elevated levels of DDT have been documented in the eggs of Cassin's auklets, Brandt's cormorants, Xantus's murrelets, and western gulls in the SCB (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of the seabird nexus to the injuries of the Montrose case.

D5.2.2 Background

Guadalupe Island measures 255 square kilometers (km^2) (98 square miles [mi^2]) with three satellite islands of <1 km^2 in size. This island group is located 386 kilometers (km) (240 miles) south of San Diego and 370 km (230 miles) off the coast of Baja California. Although outside of the SCB, Guadalupe Island is biogeographically affiliated with coastal Southern California, and is part of the critically endangered California coastal sage and chaparral ecoregion. Human presence on the island includes a small fishing community and a Mexican Navy station.

Guadalupe Island is a Biosphere Reserve managed by the Mexican government. World-renowned for its high level of biodiversity, Guadalupe Island supports 34 endemic plants (including two endemic genera), 2 endemic subspecies of seabirds, 10 endemic land birds, 11 endemic land snails, and at least 18 endemic insects. Birdlife International recognizes Guadalupe

Island as one of two regionally important Endemic Bird Areas in the California Floristic Province Hotspot (Stattersfield et al.1998).

The overwhelming threat to the degradation of the ecosystem of Guadalupe Island is the presence of introduced goats and cats. Goats introduced in the 1850s have completely transformed the island through habitat degradation and loss from erosion and trampling. The top of the island, once covered with an endemic Guadalupe Island pine forest, is now sparsely vegetated with only about 200 adult trees. In 2002, a team of international experts from Australia, New Zealand, Mexico, United States, and Ecuador visited Guadalupe Island to develop a plan for goat and cat eradication. This plan has the full support of the Mexican National Institute of Ecology, the Mexican National Commission of Natural Protected Areas, the Mexican Navy, and the local fishing community. Efforts to eradicate the goats began in 2004 with funding from the Mexican government and private donors.

Feral cats are a significant threat to seabird populations on Guadalupe Island. Introduced prior to 1880, cats are responsible for the likely extinction of the endemic Guadalupe storm-petrel and the likely extirpation of many other seabird populations from the main island of Guadalupe, including Xantus's murrelet, the black-vented shearwater, Cassin's auklet, and Leach's storm-petrel (Keitt et al. in press). These species now occur only on small offshore islets of Guadalupe Island (Jehl and Everett 1985). In addition, cats have caused the extinction of five endemic species or subspecies of landbirds on Guadalupe Island, and currently threaten the survival of one of the three Laysan albatross colonies found outside of Hawaii. Cats are known to kill large numbers of seabirds and are particularly effective at taking smaller species such as shearwaters, alcids, and storm-petrels (Keitt et al. 2002, Van Aarde 1978).

As a result of habitat degradation by goats and predation by cats, the main island of Guadalupe has likely experienced one extinction (Guadalupe storm-petrel) and possibly five extirpations of seabirds (Table D5-2). Currently the offshore islets support eight taxa of seabirds, including Brandt's cormorant, Laysan albatross, western gull, Xantus's murrelet, black-vented shearwater, Cassin's auklet, and two endemic subspecies of Leach's storm-petrel (Table D5-2). Of these eight taxa (or seven species), recent surveys have only confirmed Brandt's cormorant and Laysan albatross nesting on the main island of Guadalupe; however, it is possible small breeding populations of murrelets, shearwaters, auklets, and petrels are present in areas restricted or inaccessible to cats (Keitt et al. in press).

D5.2.3 Project Description and Methods

The goal of this action is to eradicate feral cats to restore seabird colonies on Guadalupe Island. A 4-year restoration action is proposed to achieve this goal. Proven techniques used worldwide in recent cat removal programs would be employed on this action. In general, the most successful methods used in feral cat eradication efforts have been trapping and hunting (Wood et al. 2002, Nogales et al. 2004). An important component of this action would be to ensure that cats are not reintroduced to the island after the removal. A prevention program would be developed as part of the overall management plan for Guadalupe Island.

Important seabird colonies and plant populations that still occur on small offshore islets of Guadalupe would likely serve as source populations that may naturally recolonize the main island of Guadalupe once cats and goats are removed. Additional restoration activities could be

undertaken to facilitate the recovery of seabird populations back onto the main island, such as social attraction, artificial nests and burrows, habitat enhancement, and light shielding. Although the Trustees may contribute to these additional restoration efforts in the future, the focus of the proposed action is the eradication of feral cats.

Table D5-2
Historical and Current Status of Seabird Species on Guadalupe Island

	Historically Present		Currently Present	
	Main Island	**Offshore Islets**	**Main Island**	**Offshore Islets**
Guadalupe storm-petrel	Yes	No	No[1]	No
Xantus's murrelet	Yes	Yes	Unknown[2]	Yes
Black-vented shearwater	Yes	Yes	Unknown[2]	Yes
Cassin's auklet	Unknown[5]	Yes	Unknown[2]	Yes
Leach's storm-petrel ssp.	Yes	Yes	Unknown[2]	Yes
Leach's storm-petrel ssp.	Yes	Yes	Unknown[2]	Yes
Laysan albatross	Yes[6]	Yes	Yes[3]	Unknown
Brandt's cormorant	Yes	Yes	Yes[4]	Yes
Western gull	Yes	Yes	Yes	Yes

[1]Cats likely caused extinction.

[2]Unknown, but reduced from historical numbers and likely at risk of local extirpation from main island due to cats.

[3]Cats are currently threatening the survival of colony.

[4]Confirmed nesting on main island.

[5]Cassin's auklets never recorded on main island, but suitable habitat is available.

[6]Laysan albatross colonized naturally in 1980.

D5.2.4 Environmental Benefits and Impacts

Biological

Benefits

Eradication of cats from Guadalupe Island would have both immediate and permanent conservation benefits for seabirds. In 2003, cats were removed locally around the Laysan albatross colony on Guadalupe Island to protect it from heavy predation pressure. Mortality from cats decreased from more than 30 birds found dead in the previous 60 days to zero birds over the next 60 days (Keitt et al. in press). Although no specific monitoring was done on these species, this local removal is also believed to have spared prospecting storm-petrels, Xantus's murrelets, and black-vented shearwaters from predation in the area. The immediate benefit of cat removal was also documented on Natividad Island where more than 1,000 black-vented shearwaters were found dead each month at the colony when cats were present (Keitt et al. 2002). Once cats were eradicated, fewer than 100 shearwaters were found dead each month as a result of sustainable, natural mortality (Keitt and Tershy 2003).

It is anticipated that seabirds would naturally recolonize historical habitat on the main island of Guadalupe from the nearby islets within several years of cat eradication. On Marion Island, the common diving petrel (*Pelecanoides urinatrix*) recolonized the island after cats were successfully eradicated (Hanel and Chown 1998). Because of its size and the amount of suitable nesting habitat, Guadalupe Island has significant potential for seabird recovery. Seabirds such as the Cassin's auklet, Brandt's cormorant, Xantus's murrelet, western gull, black-vented shearwater, and Leach's storm-petrel would significantly benefit from the action in terms of increased available nesting habitat and improved reproductive success as a result of reduced predation from cats.

In addition to seabirds, this action would also have collateral benefits to the island ecosystem. Endemic landbirds, such as the critically endangered Guadalupe junco (*Junco insularis*), would benefit from cat removal (Mendoza et al. in press).

Impacts

There is the potential for limited short-term soil disturbance and compaction from the proposed human activity associated with hunting and trapping. Guadalupe Island does not support other large native mammals that could be impacted by the action.

Physical

Benefits

This action would not result in benefits to the physical environment.

Impacts

This action would not result in impacts to the physical environment.

Human Use

Benefits

The eradication of feral cats and goats from Guadalupe Island is the first step in the restoration of this unique island ecosystem. Ecological restoration of the island would provide aesthetic and recreational benefits to inhabitants and visitors.

The proposed cat removal action would not result in benefits to cultural resources, transportation, or health and safety issues.

Impacts

Island users, including the Mexican military and the local fishing cooperative, have strict policies against the importation of any live animal or potential weedy plant to the island. Since Guadalupe Island is a Biosphere Reserve, these policies would be enforced in perpetuity. Therefore, the eradication program and subsequent prevention program would not impact human uses on the island.

This action would not result in impacts to cultural or socioeconomic resources, recreation, aesthetics, transportation, or health and safety.

D5.2.5 Likelihood of Success/Feasibility

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

The proposed cat removal action is a critical step in the ecological restoration of Guadalupe Island. Several Mexican agencies would oversee management and enforcement on Guadalupe Island (see Section D5.1.1), and would be responsible for ensuring that the long-term success of this action is not compromised by the introduction of exotic species. In light of Guadalupe Island's protected status, and the local, national, and international effort being directed to the restoration of the island, the cat removal action would result in long-term benefits to seabird populations and the overall island ecosystem.

D5.2.6 Performance Criteria and Monitoring

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

D5.2.7 Evaluation

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees determined that this type and scale of action would effectively provide long-term benefits to priority seabirds, including the Cassin's auklet, western gull, Xantus's murrelet, and Brandt's cormorant. All of these species also breed in the Channel Islands and are part of a larger metapopulation of seabirds that breed, forage, and disperse into and throughout the SCB and surrounding marine environment. In addition, this action would provide long-term benefits to the unique ecosystem on Guadalupe Island.

D5.2.8 Budget

Table D5-3 shows the estimated budget for a 4-year restoration action on Guadalupe Island.

Table D5-3
Estimated Budget for 4-Year Guadalupe Island Restoration Project

Personnel	$767,000
Travel	$18,000
Equipment	$67,000
Communications	$10,000
Operating Supplies	$35,000
Research/Monitoring	$194,000
Overhead	$45,000
Total	**$1,136,000**

D5.3 RESTORE SEABIRDS ON CORONADO AND TODOS SANTOS ISLANDS

D5.3.1 Goals and Nexus to Injury

The goal of this action is to restore seabird populations on the Coronado and Todos Santos Islands. These islands are oceanographically considered part of the SCB. Restoration efforts would target a suite of seabirds including the Cassin's auklet, Brandt's cormorant, double-crested cormorant, California brown pelican, ashy storm-petrel, and Xantus's murrelet.

Eggshell thinning and/or elevated levels of DDT have been documented in the eggs of the Cassin's auklet, Brandt's cormorant, double-crested cormorant, California brown pelican, ashy storm-petrel, and Xantus's murrelet in the SCB (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of the seabird nexus to the injuries of the Montrose case.

D5.3.2 Background

Coronado Islands

The Coronado Islands consist of four islands that lie 11 km (7 miles) offshore of the Mexican mainland near Tijuana, Baja California Norte. These islands total 2.5 km^2 (1 mi^2) in area. The largest two islands are the North and South Island; the Middle Island is smaller, and Middle Rock is smaller still. The topography of the islands is steep and rugged and supports several vegetation communities including maritime succulent scrub and coastal sage scrub.

Human presence is limited on the Coronado Islands. With the exception of a Mexican Navy garrison and the lighthouse on South Island, these islands do not support human habitation. The Coronado Islands are owned and managed by the Mexican government (see Section D5.1.1).

Historically, the Coronado Islands supported significant colonies of Cassin's auklets, Xantus's murrelets, and brown pelicans (Grinnell and Daggett 1903, Howell 1910). During the 1930s, the California brown pelican colony reached its maximum size, with approximately 5,000 birds nesting on the North Island, 100 on the Middle Island, and several nests on the South Island (Jehl 1973). As with other brown pelican colonies in the SCB, the Coronado colony experienced

DDT-related reproductive failure in the late 1960s and early 1970s (Jehl 1973, Risebrough 1972). Of the 375 California brown pelican nests on the Coronado Islands in 1969, no young fledged (Jehl 1973).

In addition to negative effects from DDT contamination, seabird populations on the Coronado Islands also declined due to the presence of introduced animals (cats, goats, burros) and human disturbance. The mean productivity of California brown pelicans dropped precipitously in the 1980s when increased fishing around the islands caused a high level of nest abandonment (Anderson 1988). Brown pelicans are particularly sensitive to human disturbance and have been documented crushing or knocking eggs and small nestlings from the nest when they flush in panic (Schreiber and Risebrough 1972, Kushlan and Frohring 1985). Eggs and small nestlings left unattended are then susceptible to predators and hyperthermia (Anderson and Keith 1980).

It is currently estimated that approximately 4,000 breeding seabirds of 10 species nest on the Coronado Islands, including Brandt's cormorants, double-crested cormorants, California brown pelicans, western gulls, Cassin's auklets, black storm-petrels, and Xantus's murrelets (Wolf 2002). Although recent surveys have shown signs of seabird recovery, seabird colonies remain significantly lower than historical levels. For example, a survey in 2002 documented 643 pairs of brown pelicans on North Coronado Island, and no pairs nesting on the other islands (Palacios et al. 2003). These islands also currently support one of the world's largest threatened Xantus's murrelet colonies, and support the southernmost breeding colony of the rare ashy storm-petrel. Cassin's auklets and Leach's storm-petrels have yet to recolonize North Coronado Island after their extirpation due to cat predation (Donlan et al. 2000).

In recent years, efforts have been taken to protect and conserve the flora and fauna of the Coronado Islands. In addition to important seabird colonies, the Coronado Islands support one endemic species of small mammal, four endemic species of reptiles, and two subspecies of endemic land birds. Efforts to remove introduced species from the Coronado Islands included the eradication of feral cats from North Island in 1995 and 1996, the removal of one cat from South Island in 2004, and the removal of goats and burros from South Island in 2004. The American Trader Trustee Council contributed funding to these removal efforts. With the eradication of these introduced species, suitable habitat is once again available to seabirds for nesting and roosting.

Todos Santos Islands

The Todos Santos Islands consist of two islands located approximately 90 km (60 mi) south of the U.S./Mexico border. These islands total 1.2 km^2 (0.5 mi^2) in size. Vegetation on the Todos Santos Islands consists of coastal sage scrub. The Todos Santos Islands are owned and managed by the Mexican government. Human presence on Todos Santos North is maintained by the Mexican Navy (two radio personnel) and the Secretary of Transportation (one lighthouse keeper). Todos Santos South, the larger of the two islands, has a small facility formerly used by an abalone aquaculture company and recently purchased by a tuna aquaculture company. An illegal fishing camp was recently removed from the island, and the area was cleaned up by a coalition, including the Grupo de Ecologia y Conservacion de Islas, Mexican Navy, and the National University in Ensenada.

Historically, the Todos Santos Islands supported important colonies of seabirds, including the California brown pelican and double-crested cormorant (Howell 1912). However, seabird colonies and island vegetation have been heavily impacted by introduced cats and rabbits, regular human use and development, and occasional human-caused wildfires. By 1920, the brown pelican colony had disappeared, largely due to human disturbance (Jehl 1973, Jehl 1984).

An estimated 3,500 breeding seabirds of six species currently nest on the Todos Santos Islands, including double-crested cormorants, Brandt's cormorants, pelagic cormorants, western gulls, Cassin's auklets, and Xantus's murrelets (Wolf 2002). Todos Santos North is the southernmost known breeding colony of pelagic cormorants (Palacios and Mellink 2000). Xantus's murrelets and Cassin's auklets were extirpated from Todos Santos South likely due to cat predation and have not yet recolonized this island (Donlan et al. 2000). To date, California brown pelicans have not recolonized either island for breeding, likely because of ongoing human disturbance. However, surveys in 2002 documented 108 nesting attempts by double-crested cormorants and 336 active Brandt's cormorant nests on Todos Santos South (Palacios et al. 2003). Because brown pelicans and cormorants often nest in mixed colonies, the presence of these nesting cormorants demonstrates the potential for Todos Santos to be recolonized by brown pelicans (Palacios et al. 2003).

Recent eradication efforts have been undertaken to restore the Todos Santos island ecosystem. Cats and rabbits were eradicated in 1998, and burros were removed in 2004. During the burro removal, illegal camps were cleaned up and more than two tons of garbage was removed from Todos Santos North. With the removal of these introduced animals, suitable habitat is once again available to seabirds for nesting and roosting.

D5.3.3 Project Descriptions and Methods

With the recent removal of introduced species from these islands, opportunities exist to enhance the recovery of these seabird colonies within the SCB. Due to their proximity, and to maximize restoration efforts on these islands, a combined 5-year restoration action is proposed for the Coronado and Todos Santos Islands. On the Coronado Islands, restoration actions will include using social attraction techniques (including decoys and vocalizations), improving nesting opportunities with artificial nests, and reducing human disturbance. Standard social attraction techniques that have been used successfully elsewhere would be employed on these islands. Target species for restoration on the Coronado Islands include the Brandt's cormorant, double-crested cormorant, California brown pelican, western gull, Cassin's auklet, ashy storm-petrel, black storm-petrel, and Xantus's murrelet. An example restoration activity would be to facilitate the recolonization of Cassin's auklets to North Coronado Island through the use of playback systems and artificial nests.

On the Todos Santos Islands, restoration actions would include social attraction techniques (e.g., decoys and vocalizations), improving nesting opportunities with artificial nests, shielding lights, and reducing human disturbance. For example, efforts to restore California brown pelican breeding would focus on reducing human disturbance around historical colonies. Target species on Todos Santos Islands include Brandt's cormorant, double-crested cormorant, pelagic cormorant, California brown pelican, western gull, Cassin's auklet, and Xantus's murrelet.

Although the Trustees are focusing on the above-mentioned restoration activities, consideration would be given to additional restoration opportunities that may arise in the future on these islands.

D5.3.4 Environmental Benefits and Impacts

Biological

Benefits

This action involves multiple restoration activities that will likely provide long-term benefits to target seabird populations. Social attraction efforts will facilitate the recolonization of seabirds on these islands after the removal of introduced species, and will encourage seabirds to use suitable and historically occupied habitats. Once seabirds are attracted to the island, the presence of nest boxes will further encourage the seabirds to nest in suitable habitat. The use of nest boxes will also allow biologists to effectively monitor the success of the restoration efforts and minimize disturbance to nesting seabirds. Although social attraction may only be used for a limited time, the recolonization and recovery of historically occupied colonies will provide long-term benefits to seabird populations in the SCB, as the re-established presence of a colony of birds will likely serve as an ongoing natural attractant in perpetuity.

A reduction in human disturbance around the colonies will significantly benefit roosting and breeding seabirds, particularly those that are sensitive to disturbance, such as California brown pelicans and cormorants. On islands in the Gulf of California, brown pelican subcolonies disturbed by humans produced 0.0 to 0.6 fledglings per nest compared with 1.2 to 1.5 fledglings per nest in undisturbed colonies (Anderson and Keith 1980). A reduction in human disturbance can have dramatic impacts on seabird populations, as illustrated on the Farallon Islands, off the coast of Northern California. At least six species of marine birds had experienced severe population declines on these islands due to human disturbance. Subsequent protection from disturbance resulted in almost complete recovery of all populations (Anderson and Keith 1980).

The increase in seabird populations on the Coronado and Todos Santos Islands will also likely benefit resident peregrine falcon pairs that prey on seabirds such as petrels and auklets. Because peregrine falcon pairs prey on a variety of seabird species (Huey in Kiff 1980, Nelson and Myres in Kiff 1980), increases in seabird populations may help buffer the impacts of predation.

Impacts

The proposed activities have the potential for limited short-term impacts. These impacts could include soil disturbance in the areas where nest boxes are used or short-term disturbance to seabirds during monitoring efforts. However, the proposed activities would not result in significant impacts to biological resources.

Physical

Benefits

This action will not result in benefits to the physical environment.

Impacts

This action will not result in impacts to the physical environment.

Human Use

Benefits

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

Impacts

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

The action will not result in impacts to cultural resources, transportation, or health and safety.

D5.3.5 Likelihood of Success/Feasibility

Social attraction efforts, including the use of playback systems and decoys, have been successfully used for a variety of seabirds, including terns (Kress 1983), Atlantic puffins (Kress and Nettleship 1988), Laysan albatross (Podolsky 1990), dark-rumped petrels (Podolsky and Kress 1992) and Leach's storm-petrels (Podolsky and Kress 1989). The use of artificial nests has also proven to be successful for seabirds such as the ashy storm-petrel, Leach's storm-petrel, Cassin's auklet, and the pigeon guillemot. Experts in the field of social attraction will be consulted during project planning and implementation to ensure that playback systems, decoys, and artificial nests are designed in a manner that maximizes the success of the action.

As discussed earlier, a concerted effort is under way to conserve and protect the Baja California Pacific islands. Part of that effort is the designation of the Baja California Pacific islands, including the Coronado and Todos Santos Islands, as a Biosphere Reserve. The restoration activities are both feasible and compatible with these ongoing efforts. In light of the successful efforts to remove introduced species from these islands in the last decade, the support from the Mexican government, the designation of these islands as a Marine Priority Area for Conservation, and the current momentum to designate these islands as a Biosphere Reserve, it is likely that restoration activities undertaken on these islands will be successful and will result in long-term benefits to seabird populations in the SCB.

D5.3.6 Performance Criteria and Monitoring

The benefits of these restoration activities to seabirds can be evaluated by increases in colony size, recolonization of seabirds into historically occupied habitats, and reduced disturbance to seabird colonies. Protocols for seabird monitoring are well established and standardized. Efforts to document baseline seabird populations and levels of human disturbance will be undertaken before project implementation to evaluate the benefits from the action.

D5.3.7 Evaluation

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. This action has a strong nexus to the Montrose case and is located in the SCB. Recent eradication efforts on these islands provide a unique opportunity to facilitate seabird recolonization and recovery. The Trustees determined that this type and scale of action will likely provide long-term benefits to ashy storm-petrels, Cassin's auklets, Xantus's murrelets, Brandt's cormorants, double-crested cormorants, and California brown pelicans.

D5.3.8 Additional Considerations

The Trustees are aware of plans by ChevronTexaco to build a liquefied natural gas receiving facility just east of South Coronado Island. The proposed terminal would receive tankers loaded with liquefied natural gas several times a week and process up to 1.4 million cubic feet of the fuel daily. ChevronTexaco has recently received a permit from Mexico's environmental ministry and is in the process of securing the remaining permits. It is unknown at this time if this project will be permitted and constructed. Because of the potential impacts to seabirds from the proposed terminal (from the effects of lighting, disturbance, and spills), the Trustees would carefully evaluate the potential ramifications of this liquefied natural gas project on the feasibility and long-term success of this proposed restoration action. Should the Trustees decide that the proposed liquefied natural gas terminal would compromise the success of this restoration action, the Trustees would reconsider this action and may allocate funds to other seabird restoration efforts.

D5.3.9 Budget

Table D5-4 shows the estimated budget for a 5-year restoration action on the Coronado and Todos Santos Islands.

Table D5-4
Estimated Budget for 5-Year Coronado and Todos Santos Islands Restoration Action

Personnel	$587,000
Travel	$64,000
Equipment	$92,000
Communications	$7,000

Table D5-4
Estimated Budget for 5-Year Coronado and Todos Santos Islands Restoration Action

Operating Supplies	$84,000
Overhead	$208,000
Total	**$1,042,000**

D5.4 RESTORE SEABIRDS ON SAN MARTÍN AND SAN JERONIMO ISLANDS

D5.4.1 Goals and Nexus to Injury

The goal of this action is to restore seabirds on San Martín and San Jeronimo Islands, Mexico. San Martín Island is oceanographically considered part of the SCB, whereas San Jeronimo Island is just south of this boundary. Restoration efforts would target a suite of seabirds, including the Cassin's auklet, Brandt's cormorant, double-crested cormorant, California brown pelican, western gull, and Xantus's murrelet.

Eggshell thinning and/or elevated levels of DDT have been documented in the eggs of Cassin's auklets, Brandt's cormorants, double-crested cormorants, California brown pelicans, western gulls, and Xantus's murrelets in the SCB (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of the seabird nexus to the injuries of the Montrose case.

D5.4.2 Background

San Martín Island

San Martín Island is 3.2 km^2 (1.2 mi^2) in size and is located 5 km (3.1 miles) offshore from San Quintin, Mexico (see Figure D5-1). This rugged volcanic island is dominated by cliffs except on the northeast side, which has a small sandy beach and tidal lagoon. Vegetation on the island consists of dense Californian coastal scrub vegetation. In addition to six species of breeding seabirds, San Martín Island also supports three endemic reptiles and one endemic mammal. A permanent fishing camp exists on the island as well as two automated navigational lights that receive at least biannual maintenance by personnel of the Secretary of Communications and Transportation.

San Martín Island historically supported a large mixed colony of California brown pelicans, double-crested cormorants, and Brandt's cormorants from at least 1913 until the late 1960s (Palacios and Mellink 2000). This colony was the largest historic double-crested cormorant colony in North America, estimated at close to 350,000 nests (Gress et al. 1973, Wright 1913). Although this number is thought to be an overestimate (Carter et al. 1995), San Martín Island clearly supported an important breeding colony for the double-crested cormorant. In 1969 and 1971, approximately 5,000 double-crested cormorants were documented in the colony. During the 1970s, human disturbance was thought to be the principal factor in the decline of these colonies (Anderson and Keith 1980, Jehl 1973), which were also heavily impacted by introduced

cats, fisherman, and egg harvesters (Everett and Anderson 1991). Consequently, it was believed that this colony was essentially abandoned in 1987 and 1988 (Everett and Anderson 1991).

In recent years, efforts have been taken to protect and conserve San Martín Island, including the removal of feral cats in 1999 and 2000. A survey in 1999 documented the reoccupation of this regionally important colony, including 600 occupied double-crested cormorant and 30+ brown pelican nests (Palacios and Mellink 2000). Additional nesting seabirds on San Martín Island include Brandt's cormorants, western gulls, Cassin's auklets, and Xantus's murrelets (Wolf 2002). With the removal of feral cats and the recent reoccupation of the cormorant/pelican colony, opportunity exists to facilitate the recovery of this important colony as well as other seabird colonies on the island.

San Jeronimo Island

San Jeronimo Island is 0.7 km^2 (0.3 mi^2) in size and is located south of San Martín Island (Figure D5-1). A permanent fishing camp exists on the island with up to 40 residents on the island during peak fishing seasons. A lighthouse keeper is permanently stationed on the island to maintain the lighthouse.

San Jeronimo Island historically supported large colonies of Brandt's cormorants and Cassin's auklets (Everett and Anderson 1991). The Brandt's cormorant colony was displaced and large sections of the Cassin's auklet colony were destroyed during an unauthorized guano mining operation in 1999 (Wolf 2002). Since that time, all guano mining operations have been stopped on the island (Keitt, pers. comm., 2004).

Efforts to remove introduced animals have also been undertaken on this island. Feral cats were eradicated in 2000. Seabirds currently nesting on San Jeronimo Island include the double-crested cormorant, western gull, Xantus's murrelet, and Cassin's auklet (Wolf 2002). The Cassin's auklet colony is currently the largest colony on the island. After the unauthorized guano mining operation, Brandt's cormorants did not re-nest in 2002, and it is unknown if they have reoccupied this colony since then.

D5.4.3 Project Descriptions and Methods

To maximize restoration efforts on these islands, a combined five-year action is proposed on San Martín and San Jeronimo Islands. The goal of this action is to enhance the recovery of seabird colonies following the removal of introduced species. Activities on San Martín Island would focus on restoring the California brown pelican, double-crested cormorant, and Brandt's cormorant colonies by reducing human disturbance through signage, public education, and redesign of the trail system on the island to avoid the colonies.

Efforts on San Jeronimo Island would focus on restoring the extirpated Brandt's cormorant colony through social attraction efforts (e.g., decoys) and reducing human disturbance. Additional restoration actions for Cassin's auklets and Xantus's murrelets would include shielding light sources, constructing a boardwalk to stop the destruction of burrows by fisherman walking through the colony, and controlling waste on the island.

Although the Trustees are focusing on the above-mentioned restoration activities, additional restoration opportunities would be considered for implementation under this restoration plan, as appropriate.

D5.4.4 Environmental Benefits and Impacts

Biological

Benefits

The action combines restoration activities that would provide long-term benefits to priority seabird populations, in particular Brandt's cormorants, double-crested cormorants, California brown pelicans, and Cassin's auklets. Social attraction efforts would facilitate the recolonization of seabirds on these islands after the removal of introduced species. These types of efforts would encourage seabirds to use suitable and historically occupied habitats. Although social attraction may only be used for a limited time, the recolonization and recovery of historically occupied colonies would provide long-term benefits to seabird populations in the SCB since the re-established presence of a colony of birds would likely serve as an ongoing natural attractant in perpetuity.

A reduction in human disturbance around colonies would benefit roosting and breeding seabirds. Nesting seabirds that are sensitive to disturbance, such as California brown pelicans and cormorants, would in particular benefit from a reduction in human disturbance. Protection of the seabird colonies from human disturbance would likely result in increased reproductive success. Construction of a boardwalk on San Jeronimo Island would greatly reduce the number of Cassin's auklet burrows that are crushed by fisherman walking through the colony.

Impacts

The proposed activities have the potential for limited short-term impacts. These impacts could include soil disturbance in the areas where social attractants are used or short-term disturbance during monitoring efforts.

Physical

Benefits

This action would not result in benefits to the physical environment.

Impacts

This action would not result in impacts to the physical environment.

Human Use

Benefits

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

This action would not result in benefits to cultural resources, transportation, or health and safety.

Impacts

This action proposes to limit human disturbance in the vicinity of seabird colonies. This action would likely impact fisherman on the islands; however, alternative trails would be provided. This impact is not anticipated to be significant due to the minimal number of people that inhabit the islands.

This action would not result in impacts to cultural resources, transportation, or health and safety.

D5.4.5 Likelihood of Success/Feasibility

Social attraction efforts, including the use of playback systems and decoys, have been successfully used for a variety of seabirds (see Section D5.3.5). Experts in the field of social attraction would be consulted during project planning and implementation to ensure that decoys are designed to maximizes the success of the action. Activities to reduce human disturbance (e.g., redesign of trails, posting signs, and shielding lights) are feasible and would provide long-term benefits as long as measures are complied with and enforced.

As discussed earlier, a concerted effort is under way to conserve and protect the Baja California Pacific islands. Part of that effort is the designation of the Baja California Pacific islands as a Biosphere Reserve, including San Jeronimo and San Martín Islands. The proposed restoration activities are both feasible and compatible with these ongoing efforts. In light of the successful efforts to remove introduced species from these islands, the designation of these islands as a Marine Priority Area for Conservation, and the current momentum to designate these islands as a Biosphere Reserve, it is likely that restoration activities undertaken on these islands would be successful and would result in long-term benefits to seabird populations in the SCB.

D5.4.6 Performance Criteria and Monitoring

The benefits of these restoration activities to seabirds may be evaluated by increases in colony size, recolonization of seabirds into previously occupied habitats, and reduced disturbance to seabird colonies. Protocols for seabird monitoring are well established and standardized. Efforts to document baseline seabird populations and levels of human disturbance would be undertaken before project implementation to evaluate the benefits from the action.

D5.4.7 Evaluation

The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees determined that this type and scale of action would provide benefits to priority seabirds, including the Brandt's cormorant, double-crested cormorant, Cassin's auklet, Xantus's murrelet, and California brown pelican.

D5.4.8 Budget

Table D5-5 shows the estimated budget for a 5-year restoration action on San Jeronimo and San Martín Island.

Table D5-5
Estimated Budget for 5-Year San Jeronimo and San Martín Islands Restoration Project

Personnel	$411,000
Travel	$70,000
Equipment	$76,000
Communications	$4,500
Operating Supplies	$40,000
Overhead	$150,000
Total	**$751,500**

D5.5 RESTORE SEABIRDS ON SAN BENITO, NATIVIDAD, ASUNCIÓN, AND SAN ROQUE ISLANDS

D5.5.1 Goals and Nexus to Injury

The goal of these actions is to restore seabird colonies on the central Baja California Peninsula Islands. The San Benito, Natividad, Asunción, and San Roque Islands are clustered around central Baja California (see Figure D5-1). Restoration efforts would target a suite of seabirds including the Cassin's auklet, Brandt's cormorant, double-crested cormorant, California brown pelican, and Xantus's murrelet.

Eggshell thinning and/or elevated levels of DDT were documented in eggs of the Cassin's auklet, Brandt's cormorant, double-crested cormorant, California brown pelican, and Xantus's murrelet in the SCB (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of seabird nexus.

D5.5.2 Background

San Benito Islands

The San Benito Islands consist of three islands (East, Middle, and West) with a combined area of approximately 2.5 km^2 (1 mi^2). The islands are located 65 km (40 miles) west of the mainland

(Figure D5-1). Permanent fishing camps exist on West Benito Island. The San Benito Islands are owned by the Mexican government.

The San Benito Islands support the largest and most diverse seabird colony in the California Islands (which includes the Channel Islands and Baja California Pacific islands). The islands host approximately 2 million breeding seabirds of 12 species, including three species of storm-petrel, brown pelican, western gull, double-crested cormorant, Brandt's cormorant, Xantus's murrelet (*S.h. hypoleucus*), and Cassin's auklet (*P.a. australe*) (Wolf 2002). In addition, these islands harbor at least three endemic plants (one of which is restricted only to West San Benito), three endemic landbirds, and one endemic lizard.

Recent eradication efforts have been undertaken to restore the island ecosystem. In 1998, feral goats and rabbits were removed from the three islands. Donkeys were removed in 2004. The presence of these introduced animals had degraded seabird nesting habitat on the islands, particularly on West Benito Island.

Natividad Island

Natividad Island is 7.2 km^2 (3 mi^2) in size and is located 7 km (2.7 miles) off of Punta Eugenia (see Figure D5-1). There is a town of 400 permanent residents on the south end of the island, and most inhabitants are members of a fishing cooperative. Natividad Island is owned and managed by the Mexican government and was incorporated into the Vizcaíno Biosphere Reserve in 1988.

Limited information is available on historical seabird population numbers on Natividad Island. It is estimated that Natividad Island supports approximately 160,000 breeding seabirds of five species, including the California brown pelican, double-crested cormorant, Brandt's cormorant, western gull, and black-vented shearwater (Wolf 2002). This island supports the second-largest seabird breeding population on the California Islands (after the San Benito Islands), in large part because it supports over 95 percent of the world's black-vented shearwaters (Keitt et al. 2000). It is presumed that Xantus's murrelets historically bred on Natividad Island but were extirpated by cat predation (Drost and Lewis 1995, Keitt 2000). Cassin's auklets were also extirpated by cat predation.

Recent eradication efforts have removed feral cats, goats, domestic pigs, rabbits, and sheep from the island. Cat eradication was initiated in 1998 in response to the large number (more than 1,000) of dead shearwaters found in the colony each month (Keitt et al. 2002). Despite the removal of cats, Cassin's auklets have not yet recolonized Natividad Island (Keitt 2000).

Asunción Island and San Roque Island

Asunción Island (0.9 km^2 [0.4 mi^2]) and San Roque Island(4 km^2 [0.2 mi^2]) are located inside Asunción Bay (see Figure D5-1). There are no permanent settlements on these islands, though people regularly visit from the nearby town on the mainland. Asunción and San Roque Islands are owned and managed by the Mexican government and were incorporated into the Vizcaíno Biosphere Reserve in 1988.

These islands once supported large nesting colonies of seabirds including the Xantus's murrelet, Cassin's auklet (subspecies *P. a. australe*), and Brandt's cormorant (Everett and Anderson 1991, Drost and Lewis 1995, Wilbur 1987). Asunción and San Roque Islands were once the

southernmost breeding colonies of Cassin's auklet (Kaeding 1905). However, predation by cats extirpated the large populations of Cassin's auklets on these islands by 1992 (McChesney and Tershy 1998). Xantus's murrelets were likely extirpated by cats much earlier. Human disturbance has caused abandonment of the double-crested cormorant and Brandt's cormorant colonies on San Roque Island and the brown pelican colony on Asunción Island on repeated occasions. Ongoing human disturbance has kept the populations of these species well below their historical numbers.

Within the last 10 years, efforts have been made to restore the ecosystem on these islands. In 1994, feral cats and rats were removed and human visitation was ended through education and signage. These actions resulted in secure roosting habitat for thousands of brown pelicans and cormorants. In 1996, playback devices were used to encourage the return of the Cassin's auklet and Leach's storm-petrel (*O. leucorhoa*). In 2001, Brandt's cormorants (more than 2,000 nests) and California brown pelicans (approximately 10 nests) had begun breeding again on San Roque Island (Keitt, pers. comm., 2004). However, in 2002, after a long lapse in education efforts, local fishermen began visiting the island again on a regular basis and virtually all of the cormorants and brown pelicans abandoned their breeding efforts. Currently on San Roque Island, double-crested cormorants, elegant terns, royal terns, Xantus's murrelets, and Cassin's auklets have yet to recolonize the island. On Asunción Island, brown pelicans, elegant terns, and Xantus's murrelets have yet to recolonize. In 2004, Cassin's auklets were documented using artificial burrows on the island; however, it is unknown whether breeding occurred (Keitt, pers. comm., 2004).

D5.5.3 Project Descriptions and Methods

San Benito Islands

A 5-year restoration action is proposed on the San Benito Islands that would focus on rehabilitation of degraded habitat to increase the number of breeding seabirds. Efforts would concentrate on West San Benito Island, which supports considerably lower densities of seabirds than the Middle or East Islands. Target species for restoration include Cassin's auklets, Xantus's murrelets, and Leach's storm-petrels. Restoration efforts would include removal of exotic plant species and restoration of native plant communities disturbed by human activities and burros. Efforts would also focus on reducing human disturbance through signage, shielding lights around the fishing village, and managing waste on the island.

Natividad Island

A 5-year restoration action is proposed on Natividad Island that would focus on establishing Xantus's murrelets and restoring a historic Cassin's auklet colony by using playback systems and artificial nests. The goal of the action would be to attract birds from nearby colonies on the San Benito Islands. In addition, habitat protection and enhancement would be targeted for double-crested cormorants, Brandt's cormorants, California brown pelicans, and black-vented shearwaters. A reduction in human disturbance would be accomplished through signage, light shielding, public education, and road closures.

San Roque and Asunción Islands

To maximize restoration efforts on these islands, a 5-year joint project is proposed on San Roque Island and Asunción Islands, due to their proximity. The goal of this restoration action would be to facilitate the recolonization and recovery of seabird populations on these islands. Activities would include social attraction (both decoys and playback systems), use of artificial burrows, and actions taken to reduce human disturbance. Seabirds would be attracted from large source colonies on the nearby San Benito Islands and the Gulf of California. Target species for these efforts include Brandt's cormorants, California brown pelicans, Heermann's gulls, elegant terns, Cassin's auklets, storm-petrels, and Xantus's murrelets.

D5.5.4 Environmental Benefits and Impacts

Biological

Benefits

The action combines restoration activities that would provide long-term benefits to target seabirds. Social attraction efforts would facilitate the recolonization of islands after the removal of introduced species. These types of efforts would encourage seabirds into suitable and historically occupied habitats. Once attracted to the island, the presence of nest boxes would further encourage nesting in suitable habitat. The use of nest boxes would also allow biologists to effectively monitor the success of the restoration efforts. Although social attraction may only be used for a short time, the recolonization of a historically occupied colony would provide long-term benefits to seabird populations since the re-established presence of a colony of birds would likely serve as an ongoing natural attractant in perpetuity.

A reduction in human disturbance around colonies would benefit roosting and breeding seabirds. Nesting seabirds that are sensitive to disturbance, such as brown pelicans and cormorants, would in particular benefit from a reduction in human disturbance. Protection of the seabird colonies from human disturbance would likely result in recolonization of the islands and increased reproductive success. A reduction in human disturbance would also protect existing colonies, such as the world's largest black-vented shearwater colony on Natividad Island.

Peregrine falcons would also likely benefit from this action. Because peregrine falcons prey on smaller seabirds, increased seabird populations on these islands would benefit this species.

Impacts

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

Physical

Benefits

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

Impacts

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

Human Use

Benefits

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

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

Impacts

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

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

D5.5.5 Likelihood of Success/Feasibility

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

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

D5.5.6 Performance Criteria and Monitoring

The benefits of these restoration activities to seabirds may be evaluated by increases in colony size, recolonization of seabirds into previously occupied habitats, and reduced disturbance to seabird colonies. Protocols for seabird monitoring are well established and standardized. Efforts to document baseline seabird populations and levels of human disturbance would be undertaken prior to project implementation to evaluate the benefits from the action.

D5.5.7 Evaluation

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

D5.5.8 Estimated Budget

Table D5-6 shows the estimated budget for a 5-year restoration action on San Benito, Natividad, Asunción, and San Roque Islands.

Table D5-6
Estimated Budget for 5-Year Restoration Project on San Benito, Natividad, Asunción, and San Roque Islands

	San Benitos	Natividad	Asunción/San Roque
Personnel	$382,000	$382,000	$636,000
Travel	$76,000	$70,000	$129,000
Equipment	$49,000	$63,000	$134,000
Communications	$8,000	$2,000	$6,000
Operating Supplies	$42,000	$53,000	$68,000
Overhead	$139,000	$142,000	$244,000
Total	**$696,000**	**$712,000**	**$1,217,000**

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Appendix D6

Create/Enhance/Protect California Brown Pelican Roost Habitat

D6.1 GOALS AND NEXUS TO INJURY

The goal of this action is to restore non-breeding California brown pelican habitat by enhancing and protecting coastal roosts along the Southern California mainland. Eggshell thinning and elevated levels of DDT have been documented in California brown pelican eggs in the Southern California Bight (SCB) (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of seabird nexus to the injuries of the Montrose case.

D6.2 BACKGROUND

Communal roost sites are essential habitat for California brown pelicans (Gress and Anderson 1983). The primary roost sites for brown pelicans in the western United States are offshore rocks and islands on the outer coast and sand islands within large estuaries (Briggs et al. 1987, Jaques 1994). Intense shoreline development, wetland filling, and other habitat alteration has eliminated much of the natural onshore roost habitat. Loss of historical roost habitat from human encroachment has been partially offset by the addition of artificial structures, such as jetties, breakwaters, and floating structures. Pelicans now rely heavily on these types of structures for roost sites in California (Jaques et al. 1996). Few roosts along the mainland fall under the jurisdiction of natural resource agencies, and several major roost sites on privately owned structures have been lost in recent years.

The basic requirements for California pelican roosts include (1) terrestrial substrates where pelicans can keep their bodies dry while resting and maintaining their plumage, (2) a buffer from mammalian predators and human disturbances, and (3) presence of prey resources within energetically efficient distances (Jaques et al. 1996). Human disturbance at many existing roost sites in Southern California is high relative to other portions of their range. The most frequent cause of this disturbance is recreational activities and the most heavily disturbed habitats used by pelicans are estuaries (Jaques and Anderson 1987)

D6.3 PROJECT DESCRIPTIONS AND METHODS

The goal of this action is to improve roost sites for California brown pelicans along the Southern California mainland. Several methods are being considered to improve roosting locations, including creation, enhancement, and protection. Site selection and specific methods would be determined through further project development and consultation with appropriate stakeholders. All projects would have a complementary interpretive element such as educational panels or displays.

Roost site creation projects would fill in gaps in the availability of large-capacity, high-quality roosts along the Southern California coastline. Potential creation projects that would be explored include placing a large barge or roosting structure in outer Santa Barbara Harbor, Aqua Hedionda (San Diego County), and Batiquitos Lagoon (San Diego County). In 2005, the American Trader Trustee Council installed a floating platform in the San Diego Bay National Wildlife Refuge to provide a secure roosting location for California brown pelicans. A monitoring program has been developed to evaluate the success of the project. This project will provide valuable information for the creation of additional roost sites in Southern California.

Roost site enhancement projects would be designed to increase the capacity and quality of existing roost sites. Potential enhancement projects include adding rock riprap to the tops of selected jetties, and breakwaters where pelican use is limited by high tides and large waves. Potential sites include the Zuniga Point jetty, the Channel Islands Harbor breakwater, and the Ventura Harbor breakwater.

California brown pelican roost site protection would be aimed at reducing human disturbance at selected coastal wetlands, breakwaters, jetties and offshore rocks through educational outreach panels and signs. Installation of fence barriers to prevent disturbance of favored pelican roost habitat at the tips of selected jetties would be considered if the local harbor districts would support this measure. Potential sites include the Santa Clara River mouth, Malibu Lagoon, Ventura Harbor, Channel Islands Harbor, and the outer tips of King Harbor, Dana Point, and Oceanside Harbor.

Specific roost site enhancement projects would be developed and evaluated in future environmental documentation prepared pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

D6.4 ENVIRONMENTAL BENEFITS AND IMPACTS

D6.4.1 Biological

Benefits

Improvements in the existing network of communal roosts along the coast would have a positive influence on the energy budgets of California brown pelicans by reducing the energy costs associated with (1) commuting between prey locations and roosts, (2) flushing and relocating due to human disturbance, and (3) using suboptimal microclimates within roosts. The costs of migration would also be reduced by the increased availability, quality, and capacity of stopover sites. Cumulative energy reductions should result in improved body condition of individual birds. Expected population-level effects from improving the condition of individual birds are increased juvenile and adult survival, and increased reproductive success of pelicans in California. Juvenile survival and adult reproductive success are the primary life history parameters affecting the SCB California brown pelican metapopulation (Gress and Anderson 1983).

Other bird species that occur in association with roosting pelicans are likely to benefit from the proposed roost projects as well. Bird groups that would benefit from the increased availability of island habitat and reduced human disturbance in coastal environments include gulls, terns, cormorants, shorebirds, herons, egrets, and ducks. The suite of species receiving benefits would vary with the type of roost treatment and project site. The restoration projects would inform and enrich the public through associated interpretive displays and would help foster an awareness and stewardship ethic that should result in reduced disturbance to roosting California brown pelicans and other coastal waterbirds at other locations.

Impacts

The environmental consequences of increased California brown pelican use of lagoons and other roosting areas may include impacts on water quality if guano accumulation exceeds the circulation ability of the affected lagoons. However, in some locations brown pelican guano in the vicinity of roosts could provide a desirable source of nutrient enrichment and may enhance local food webs.

Negative aspects of California brown pelican use of harbors for roosting include the increased risk of contact with environmental contaminants such as oil, the increased likelihood of injury due to scavenging (e.g., entanglement in fishing line, puncture from fishing hooks, etc.), and the development of nuisance issues. However, this action is not expected to result in major increases in pelican use of harbors. Rather, the goal would be to improve the quality of resting time within harbors.

D6.4.2 Physical

Benefits

This action would not result in benefits to the physical environment.

Impacts

This action would not result in impacts to the physical environment.

D6.4.3 Human Use

Benefits

Public enjoyment of California brown pelicans would be increased by projects that allow the public to view communal roosting groups without causing disturbance.

Impacts

Restoration projects would be designed to minimize impacts to recreational activities such as fishing, boating, and kayaking. Because California brown pelicans are very susceptible to human disturbance, projects would be sited in areas that are compatible with human uses. Potential impacts to navigation would be evaluated for each site-specific project.

Pelican roost site creation projects would be associated with variable degrees of liability, and some projects would require ongoing management oversight. Careful site selection, project design, selection of raw materials, and adequately funded maintenance programs would offset potential liability costs. Signs, posts, or fences may need to be replaced during the projected life of the project due to fading, corrosion, or vandalism. Vegetation on any earthen islands that are created may need to be periodically controlled or removed.

D6.5 LIKELIHOOD OF SUCCESS/FEASIBILITY

California brown pelicans respond readily to novel roost sites as long as key habitat elements are provided. These key elements have been described in this document and in Gress and Anderson (1983) and Jaques and Anderson (1987). All projects that involve physical manipulation of habitat are likely to succeed. The successes of projects that rely on alteration of human behavior include a wider range of uncertainties. Projects that provide the most secure island habitat in areas that harbor reliable food resources would be expected to receive the highest level of use and would function as communal night roosts as well as daytime use areas. Projects conducted under this plan would be designed and implemented using the best available expertise and information on brown pelican habitat selection, microclimate preference, and behavioral ecology. Monitoring results from similar projects, such as the American Trader Trustee Council floating dock project, would be used to improve the success of future projects.

Education and awareness programs, including displays, signs, and brochures, nearly always attract public attention. Informational and warning signs to protect seabirds have a high probability of reducing human behaviors that are detrimental to the resource.

D6.6 PERFORMANCE CRITERIA AND MONITORING

Performance criteria would be developed for each specific project. Success would be based on increases in roost attendance and increases in population abundance.

To monitor the success of restoration efforts, a combination of aerial surveys and ground-based observations at roosts would be conducted for the duration of the project, as appropriate. Ground-based observations at selected roost sites would be designed to monitor the response of pelicans to individual roost treatments. The amount of time spent observing each site would vary according to the type of roost, the type of project, and the questions that need to be addressed. A monitoring plan would be designed for each particular project prior to implementation.

D6.7 EVALUATION

The Natural Resource Trustees for the Montrose case (Trustees) have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees determined that this type of action would benefit California brown pelicans injured as a result of DDT contamination. Future environmental documentation would further develop and evaluate potential roost projects.

D6.8 BUDGET

The costs of potential projects vary considerably depending on the method used to improve pelican roosting habitat and the site selected. For example, the costs of the installation and monitoring of the American Trader floating dock in San Diego Bay totaled $47,000. An example of a larger construction project would be raising the height of Zuniga Point jetty in San Diego Bay by 1.5 meters (5 feet) to provide a dry roosting location for pelicans during high tides. The estimated cost for this larger project is $2,000,000.

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Appendix D7

Implement an Entanglement Reduction and Outreach Program to Protect Seabird Populations

D7.1 GOALS AND NEXUS TO INJURY

The goal of this action is to benefit the California brown pelican and other seabirds by reducing injuries from fish hooks and entanglement in fishing line. Hooking by anglers and entanglement in fishing line are factors affecting the survival of California brown pelicans. Eggshell thinning and elevated levels of DDT have been documented in California brown pelican eggs in the Southern California Bight (SCB) (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of the seabird nexus to the injuries of the Montrose case.

D7.2 BACKGROUND

Most avid recreational anglers have interacted with seabirds while fishing along the California coast. Seabirds may eat the same fishes being targeted by anglers or may be attracted to bait at the end of fishing lines. As a result, seabirds can accidentally be hooked or entangled. An entanglement situation is not resolved when the line breaks and the seabird flies away. Both hooks and broken lines injure and kill seabirds. Hooks that penetrate the birds' hollow bones can lead to infection, and broken lines can wrap around legs, wings, or beaks and result in death due to starvation or the inability to fly or swim.

Although seabird entanglements can occur during any type of recreational fishing activity, conflicts most often arise at piers where large numbers of bait fishes concentrate. This concentration attracts both anglers and the seabirds that primarily feed on bait fishes, such as California brown pelicans. An example of this conflict occurred in 2001 at the Santa Cruz City Pier in Northern California. Nearly 200 brown pelicans with hooks or line entanglements were rescued, and 59 of those died or had to be euthanized due to the severity of their injuries. Many other injured birds could not be rescued. Due to the severity of the problem, the City of Santa Cruz and the California Department of Fish and Game (CDFG) closed two-thirds of the city's pier to fishing for several weeks.

D7.3 PROJECT DESCRIPTION AND METHODS

This action involves expanding the American Trader Trustee Council (ATTC) Seabird Entanglement Education and Outreach Program to the fishing piers and wharves in Southern California where entanglement has occurred. The goal of the program is to provide information in the form of brochures, signs, and wildlife guides that heightens public awareness about the potential hazards to the California brown pelican and other seabird species that are vulnerable to being hooked by fishing tackle or entangled by monofilament line. This action would adopt the designs and materials from the ATTC program and modify them slightly. The program would produce a minimum of ten signs that would be placed at key areas in Los Angeles and Orange Counties. The signs would educate anglers about ways to avoid hooking birds and what to do if one is hooked. The specific locations where the signs would be installed would be identified during project implementation.

In addition to educational signs, the program would produce a brochure designed to educate anglers about measures to avoid and minimize impacts to seabirds from fishing lines and human disturbance. The ATTC has produced a brochure of this type for Southern California. By using

existing products that have been developed for Southern California, the Natural Resource Trustees for the Montrose case (Trustees) would be able to reduce the initial design costs for the signs and brochures.

D7.4 ENVIRONMENTAL BENEFITS AND IMPACTS

D7.4.1 Biological

Benefits

The use of signs and brochures would help promote public awareness and thus reduce bird injuries and deaths. The seabirds that would benefit from this action include California brown pelicans, cormorants, and gulls. A successful outreach program would aid in the ongoing recovery of the endangered California brown pelican by reducing a source of injury and mortality to the species.

Impacts

Because this action involves public outreach and education, the Trustees do not anticipate any impacts to biological resources. There would be no adverse effects to California brown pelicans from the action.

D7.4.2 Physical

Benefits

This program would provide information on the proper disposal of fishing line. A reduction in fishing line debris would provide benefits to the marine environment.

Impacts

This action would not have negative impacts to the physical environment.

D7.4.3 Human Use

Benefits

The proper handling and disposal of fishing line would result in improved health and safety because discarded hooks can injure humans as well as wildlife. Humans are also at risk of injury when attempting to disentangle a hook or line from a seabird. A reduction in seabird/angler interaction would result in improved recreation, as hooking seabirds is a frustrating and unwelcome experience for anglers. The proper disposal of fishing line would also enhance the aesthetics of the fishing structure and vicinity.

Impacts

Because this action focuses on education rather than fishing restrictions, no negative impacts would occur to human use. Minor impacts could result to aesthetics depending on the design, size, and placement of signs. The design of the signs would likely be adopted from the design developed and employed by the ATTC. The signs would be placed in consultation with appropriate local authorities in such a way as to minimize any impacts to the aesthetics of the surrounding area.

D7.5 LIKELIHOOD OF SUCCESS/FEASIBILITY

Education and awareness programs, including display signs and brochures, nearly always attract public attention. Successful public educational programs instill knowledge and appreciation of the subject considered. Informational and warning signs to protect seabirds have a high probability of reducing detrimental human behaviors in the targeted outreach areas.

D7.6 PERFORMANCE CRITERIA AND MONITORING

Public feedback and reaction would be the primary means of monitoring the success of educational activities. To be effective over time, this program would require the periodic updating and replacement of outreach materials.

D7.7 EVALUATION

California brown pelican survival is affected by factors such as entanglement in fishing line and hooking by anglers. The Trustees have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors.

D7.8 ESTIMATED BUDGET

Table D7-1 shows the estimated cost of implementing an entanglement reduction and outreach program.

Table D7-1
Estimated Budget for Entanglement Reduction and Outreach Program

Item	Estimated Cost
Signs (10)	
Design modification	$1,400
Signs	$3,600
Posts and brackets	$8,000
Sign assembly	$1,000
Subtotal	*$14,000*
Brochures	
Design modification	$1,500
Printing	$4,000
Content writer/editor	$2,500
Subtotal	*$8,000*
Total	**$22,000**

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Appendix D8

Restore Ashy Storm-Petrels to Anacapa Island

D8.1 GOALS AND NEXUS TO INJURY

This goal of this action is to establish a breeding population of ashy storm-petrels on Anacapa Island. Eggshell thinning and elevated levels of DDT have been documented in ashy storm-petrel eggs in the Southern California Bight (SCB) (Kiff 1994, Fry 1994). Section 5.1.1 provides a detailed description of seabird nexus to the injuries of the Montrose case.

D8.2 BACKGROUND

Anacapa Island is located within the Channel Islands National Park and is managed by the National Park Service (NPS). Anacapa Island consists of three separate islets (West, Middle, and East Anacapa) that together are approximately 9 kilometers (km) (6 miles) in length and 2.9 square kilometers (km^2) (1 square mile) in area. All of the islets are bordered by steep slopes that rise 50 to 250 meters (160 to 820 feet) above the sea. East Anacapa Island supports a lighthouse, dock, and several buildings. Middle and West Anacapa Islands have no permanent structures and receive little human visitation.

Island ecosystems such as Anacapa Island are key areas for conservation because they are critical habitat for seabirds and pinnipeds, species that use thousands of square kilometers of open ocean, but depend on a limited number of islands for breeding and resting. Islands represent about 3 percent of the world's surface, but support approximately 15 to 20 percent of all birds, reptiles and plants (Whittaker 1998). Unfortunately, vertebrate predators have been introduced onto islands worldwide, resulting in profound effects on the distribution and abundance of native flora and fauna (e.g., Crafford 1990, Copson 1986). Black rats were introduced onto Anacapa Island in the mid-1800s and early 1900s, and their detrimental effects on the ecosystem of Anacapa Island have been well documented (Collins 1979, Erickson 1990, Erickson and Halvorson 1990).

In an effort to restore nesting habitat for seabirds impacted by the American Trader oil spill in 1990, the American Trader Trustee Council funded a program to eradicate the black rat from Anacapa Island. Crevice-nesting seabirds, such as alcids and storm-petrels, were target species for restoration because they are particularly susceptible to predation from rats. Black rats were known to occupy prime nesting habitat on Anacapa Island and likely prevented the ashy storm-petrels from breeding over large portions of suitable habitat (ATTC 2001). Ashy storm-petrels were mist-netted on Anacapa Island in 1994, but to date no active nests have been found (Whitworth et al. 2003). Ashy storm-petrels are known to nest on adjacent Santa Cruz Island (Carter et al. 1992).

The black rat eradication program was successfully completed in 2003, and Anacapa Island has been declared rat-free. The recent removal of the rat provides an excellent opportunity for ashy storm-petrels to colonize the island, as the amount of suitable habitat for nesting seabirds has increased substantially. Anacapa Island is a high-quality nesting site for the ashy storm-petrel for multiple reasons, including lack of other non-native predators, the presence of suitable burrow habitat, such as talus slopes, native vegetative cover, and restricted human access.

The ashy storm-petrel is a globally rare seabird species that is endemic to the California islands. The ashy storm-petrel is currently listed by the International Union for Conservation of Nature and Natural Resources as "near threatened" (Bird Life International 2000), has been designated as a Category 2 Candidate Species under the Endangered Species Act (USFWS 1994), and is

considered a Species of Management Concern by the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG).

D8.3 PROJECT DESCRIPTIONS AND METHODS

The goal of this 5-year action is to establish breeding ashy storm-petrels on Anacapa Island. This action would facilitate the colonization of the island by ashy storm-petrels by attracting them to suitable nesting areas using vocalization playback systems and olfactory cues.

The conspicuous calls of nocturnal petrels, shearwaters, and storm-petrels are generally considered to promote pair establishment through sexual advertisement (Brooke 1978, Storey 1984, James 1985). The use of vocalizations has been used successfully in the past to attract ashy storm-petrels (Brown et al. 2003). A minimum of two areas would be targeted for recolonization on Anacapa Island. Optimal habitat areas would be determined based on seabird monitoring data and in consultation with seabird experts. Artificial nest boxes would also be installed in each area targeted for recolonization to provide a stable nesting area and assist in monitoring efforts.

A monitoring plan would be developed to evaluate the success of the action. Monitoring may include inspection of nesting burrows, evaluation of overhead flights, and capture. Monitoring would likely occur during every year of the action, although the intensity of the effort may vary from year to year. Reporting requirements would include annual reports that discuss data collected, data analysis, and recommendations for subsequent years.

The NPS would complete additional project planning, review, and environmental compliance before implementation of this action.

D8.4 ENVIRONMENTAL BENEFITS AND IMPACTS

D8.4.1 Biological

Benefits

The Channel Islands are critical nesting habitat for the ashy storm-petrel. With the recent removal of rats from Anacapa Island, high-quality breeding habitat is again available to crevice-nesting seabirds such as the ashy storm-petrel. The combination of social attraction and nest boxes would provide a favorable environment for the establishment of ashy storm-petrels. Although social attraction may only be used for a short amount of time, the colonization of Anacapa Island would provide long-term benefits to the ashy storm-petrel in the SCB, as the established presence of a colony of birds would likely serve as an ongoing natural attractant over the long term.

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

Impacts

This action would have minimal, short-term biological impacts. Playback of tape-recorded vocalizations causes little disturbance or trauma to birds. Researcher activity in the vicinity of nesting areas would be minimized to avoid destruction of the local habitat and disturbance (Johnson et al. 1981, Baptista and Gaunt 1997). Storm-petrels are sensitive to disturbance, including that generated by researchers, especially during the incubation period (Ainley et al. 1974). The action would be implemented in a manner that avoids impacts to nesting seabirds on Anacapa Island, especially the California brown pelican.

D8.4.2 Physical

Benefits

There are no known benefits to the physical environment.

Impacts

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

D8.4.3 Human Use

Benefits

Ashy storm-petrel adults are nocturnal and are difficult to observe. Therefore, it is unlikely that the public would benefit from viewing ashy storm-petrels on Anacapa Island.

Impacts

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

D8.5 LIKELIHOOD OF SUCCESS/FEASIBILITY

Social attraction efforts, including the use of playback systems, have been successfully used for a variety of seabirds. For ashy storm-petrels (Brown et al. 2003), playback systems have been used successfully to capture birds in mist nests. The use of playback systems has also been used to attract dark-rumped petrels (Podolsky and Kress 1992) and Leach's storm-petrels (Podolsky and Kress 1989) to nest in new habitat. Nesting ashy storm-petrels on adjacent Santa Cruz Island could be attracted to the new nesting sites on Anacapa Island. The use of artificial nests has also proven to be successful for seabirds such as the ashy storm-petrel, Leach's storm-petrel, and Cassin's auklet. Because petrels typically show a high degree of tenacity to the same nest from year to year, once pairs are established, they would likely continue to breed at the same sites. The attraction of prebreeding petrels may be a useful tool to influence the nest-site selection process by encouraging first-breeding petrels to concentrate their breeding in new areas. Experts in the

field of social attraction would be consulted during project planning and implementation to ensure that playback systems and artificial nests are designed in a manner that maximizes the success of the action.

D8.6 PERFORMANCE CRITERIA AND MONITORING

The ultimate success of this action would be the colonization and successful breeding of ashy storm-petrels on Anacapa Island. A monitoring plan would be developed to evaluate the success of the restoration effort using standardized protocols for seabird monitoring.

D8.7 EVALUATION

The Natural Resource Trustees for the Montrose case (Trustees) have evaluated this action against all screening and evaluation criteria developed to select restoration actions and have concluded that this action is consistent with these selection factors. The Trustees determined that the establishment of a breeding population of ashy storm-petrels on Anacapa Island would provide significant benefits to this rare seabird, which is endemic to the California islands.

D8.8 BUDGET

Year 1 costs:

- Labor.....$91,000
- Supplies.....$38,000
- Transportation.....$13,000
- **Estimated total, year 1.....$142,000**

Years 2–5 costs:

- Labor.....$410,000
- Supplies.....$6,000
- Transportation.....$51,000
- Estimated total, years 2–5.....$467,000
- **Estimated total costs, years 1–5.....$609,000**