BLACK OYSTERCATCHER

(*Haematopus bachmani*)

CONSERVATION ACTION PLAN

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EXECUTIVE SUMMARY

The Black Oystercatcher (*Haematopus bachmani*), a large, long-lived shorebird with a global population of roughly 10,000 individuals, is completely dependent upon marine shorelines throughout its life cycle. Favoring rocky shorelines, Black Oystercatchers occur uncommonly along the North American Pacific coast from the Aleutian Islands to Baja California. They are most abundant in the northern portions of their range, from Alaska to southern British Columbia. Breeding oystercatchers are highly territorial and nesting densities are low; however, they tend to aggregate in groups of tens to hundreds during the winter months. They forage exclusively on intertidal macroinvertebrates (e.g., limpets and mussels) and are most commonly found near sheltered areas of high tidal variation that support abundant invertebrate communities. Foraging habitat is primarily low-sloping gravel or rock beaches where prey is abundant. The Black Oystercatcher is a keystone species along the North Pacific shoreline and is thought to be a particularly sensitive indicator of the overall health of the rocky intertidal community.

Population estimates have been based mainly on incidental observations made during seabird surveys. More accurate estimates of population size and trends are needed to assess how oystercatchers are affected by limiting factors. Migratory movements of individuals in southern populations are thought to be short with individuals generally aggregating near their nesting areas; however, this is based on opportunistic observations at a small number of sites. Most individuals in northern populations migrate from nesting areas, but wintering locations and migratory routes remain largely unknown.

Black Oystercatcher populations appear to be ultimately regulated by the availability of high quality nesting and foraging habitat. Because they are confined to a narrow band of specific shoreline habitat throughout their annual cycle, and because significant portions of the population congregate during the winter, Black Oystercatchers are highly vulnerable to natural and human disturbances. Major threats include predation of eggs and young by native and exotic predators; coastal infrastructure development; human disturbance (e.g., induced nest abandonment, nest trampling); vessel wakes, especially when they coincide with high tides; shoreline contamination (resulting in both direct mortality and indirect effects such as reduction in food availability or quality); and global climate change, with its resultant effects on feeding and/or nesting resources. Information is lacking on local scale contaminant and pollutant levels and how they might affect fitness, especially in or near highly developed areas within the species' range. Black Oystercatchers have historically recovered from local extirpations caused by human-related disturbances (e.g., predation by introduced predators, *Exxon Valdez* oil spill, scientific collection) once the pressure has decreased or stopped. Because of the broad geographic range of Black Oystercatchers, specific threats are often spatially limited. Therefore, conservation actions need to match the scale of the threats.

Currently, direct conservation efforts for the Black Oystercatcher are limited by a lack of baseline information for many areas on the locations and sizes of important breeding populations; local and overall population status and trends; hatching success, fledging success and adult survival; regional threats to survival and productivity; the locations of important wintering concentration areas and the numbers of birds in those areas; movements between breeding and wintering sites; and population structure. Addressing these gaps in our understanding is a prerequisite for developing local conservation strategies to address threats or reverse declines. The Black Oystercatcher Conservation Action Plan represents the collaborative effort of professionals from federal and state agencies and institutions in California, Oregon, Washington, Alaska, and British Columbia, and is intended to be the single strategic planning resource for the conservation of this species throughout its range. Ten Focal Species Priority Actions were developed for execution within the appropriate geographic context: Rangewide, Northern Region, and Southern Region. The priorities in each geographic class are closely integrated with one another to facilitate effective conservation of the Black Oystercatcher.

Rangewide Priority Actions

- Action R1: Assess nonbreeding distribution and migratory connectivity between breeding and wintering areas.
- Action R2: Initiate a coordinated range-wide monitoring effort to estimate population size and detect trends.
- Action R3: Develop an Online International Black Oystercatcher Conservation Database.
- Action R4: Develop a geospatial map depicting the potential overlap between human activities and the distribution and abundance of Black Oystercatchers.
- Action R5: Initiate an education and outreach program to highlight the potential impacts of outdoor recreation and vessel traffic.

Northern Priority Actions

- Action N1: Initiate research to assess the impacts of vessel traffic and resulting wakes on productivity.
- Action N2: Investigate survival and other vital rates by continuing to follow the fate of banded populations.
- Action N3: Develop a breeding habitat suitability model to help target survey efforts and to improve estimates of global population.

Southern Priority Actions

- Action S1: Estimate population size of Black Oystercatchers breeding in the southern portion of the range.
- Action S2: Assess factors affecting survival and reproductive success and determine relative importance of each.

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INTRODUCTION

Legal or Priority Status

The Black Oystercatcher (*Haematopus bachmani*) was selected as a U. S. Fish and Wildlife Service (USFWS) Focal Species for priority conservation action due to its small population size and restricted range, threats to preferred habitat, susceptibility to human-related disturbances, a lack of base-line data to assess conservation status, and a suite of ongoing anthropogenic and natural factors that may potentially limit long-term viability. The species is also listed as a species of high concern within the United States, Canadian, Alaskan, and Northern and Southern Pacific shorebird conservation plans (Donaldson et al. 2000, Drut and Buchanan 2000, Brown et al. 2001, Hickey, et. al. 2003, Alaska Shorebird Working Group 2000). The Black Oystercatcher is on the Audubon Society's Watch List (National Audubon Society 2002), was listed as a Bird of Conservation Concern by the USFWS (U.S. Fish and Wildlife Service 2002); it is a management indicator species in the Chugach National Forest Plan (U.S. Forest Service 2002), and is a featured species in the Comprehensive Wildlife Conservation Strategies for the states in which it occurs (Alaska Department of Fish and Game

2005, Washington Department of Fish and Wildlife 2005, Oregon Department of Fish and Wildlife 2005, California Department of Fish and Game, S. Blankenship, pers. comm.).

Rationale for Selection as a Focal Species

Many basic aspects of Black Oystercatcher ecology remain unknown. Population estimates are largely based on incidentally-collected information; consequently, data is inadequate for determining population trends. Potential threats to oystercatchers are numerous and their effects on long-term, broad-scale population dynamics are unknown. Understanding of Black Oystercatcher ecology and population status at local and regional scales has been identified as a top priority by researchers.

Led by these concerns, researchers and land managers involved with oystercatchers across Alaska formed the Alaska Black Oystercatcher Working Group (ABOWG) in 2003 to identify and prioritize regional research needs and to facilitate interagency coordination and cooperation. Successful regional coordination in Alaska spurred the formation of the International Black Oystercatcher Working Group in 2004 (IBOWG; see Appendix 2 and 3). The IBOWG — a diverse international partnership that includes members from a number of organizations and agencies across the species' range — determined that a range-wide strategy was indispensable for coordinating research and conservation efforts, and began work on the Black Oystercatcher Conservation Plan in April 2005. The IBOWG collaborated with the Manomet Center for Conservation Sciences to ensure the new oystercatcher plan would be consistent with the site based conservation plans being developed for several shorebird species within the Western Hemisphere Shorebird Reserve Network.

When the USFWS's Migratory Bird Program launched the Focal Species Strategy in 2005, and listed the Black Oystercatcher as a focal species in 2006, the USFWS became obligated to develop an Action Plan for this species. Recognizing that a single, comprehensive plan for Black Oystercatchers would have far greater utility and efficacy than multiple, "competing" plans, biologists within Regions 1 and 7 of the USFWS's Migratory Bird Program and the IBOWG agreed to collaborate on the Action Plan, and subsequently adapted the Black Oystercatcher Conservation Plan already under development.

Spatial Extent of Action Plan

The Black Oystercatcher Action Plan represents a collaborative effort, drawing on the expertise of professionals from federal and state agencies and institutions in California, Oregon, Washington, Alaska, and British Columbia, and is intended to be the single strategic planning resource for the conservation of this species throughout its range.

Action Plan Objectives

The Black Oystercatcher Action Plan addresses five principal objectives:

1) Provide a synthesis of the current state of knowledge of Black Oystercatcher ecology and population status;
2) Identify important sites for oystercatcher conservation throughout their annual cycle;
3) Identify known and potential threats and develop conservation actions needed to address them;
4) Identify information needs critical to strategic conservation; and,
5) Facilitate collaboration among organizations and agencies addressing oystercatcher conservation.

POPULATION STATUS AND NATURAL HISTORY

Taxonomy and Geographic Morphological Variation

The Black Oystercatcher (*Haematopus bachmani*) is one of the world's 11 extant oystercatcher species; all are in the family Haematopodidae and genus Haematopus. Despite the large geographic range of the genus, there has been little morphological divergence among species. The Black Oystercatcher is closely related to the American Oystercatcher (*Haematopus palliatus*), a pied form. The majority of the two species distributions are allopatric; however, there is overlap in Baja California, Mexico. The Black Oystercatcher and American Oystercatcher are considered discrete species by the American Ornithologists' Union (1998), and preliminary molecular analyses indicate that the two species are genetically distinct (A. Baker, pers. comm. in Andres and Falxa 1995). Nonetheless, hybridization does occur within a 500-km long zone in central Baja. Three hybrid individuals were noted in the Channel Islands, California, during an assessment of breeding seabirds in California conducted 1989–1991 (Carter et al. 1992).

Geographic variation of the Black Oystercatcher is apparent in plumage coloration only. Populations from Alaska to Oregon are entirely black, but the amount of white feathers and brown on the abdomen increases south through California and Baja California (Andres and Falxa 1995, del Hoyo et al. 1996). There are no recognized Black Oystercatcher subspecies.

Range and Distribution

The Black Oystercatcher occurs along the North American Pacific coast from the Aleutian Islands to Baja California, though they are most abundant in the northern portions of their range. Only 20% of the population is found in the southern half of the geographic range, from northern Washington to the central Pacific coast of Baja California (Table 1). The majority (about 65%) of the estimated global population resides in Alaska, conferring a significant amount of the global stewardship responsibility for this species to that state (Brown et al. 2001).

Breeding Range

The Black Oystercatcher breeds entirely within North America (Fig. 1). They reside along the Aleutian Islands, the Alaska Peninsula, inner and outer marine shorelines of southcentral Alaska, and the outer coasts of southeast Alaska, British Columbia, Washington, and Oregon. In California, oystercatchers occur primarily on offshore islands (e.g., Channel Islands, Farallon Islands) and small rocky islets. They are locally distributed on the Pacific coast of Baja California and offshore islands (Fig. 1).

Black Oystercatchers are generally not colonial nesters; breeding oystercatchers are extremely territorial and aggressive toward conspecifics and breeding pairs tend to segregate themselves in discrete territories dispersed along areas of suitable habitat. Breeding density (pairs/km of shoreline) appears to be largely a function of shoreline characteristics. Density is lower along northern rocky outer coast shorelines (e.g., Strait of Georgia, British Columbia = 0.06 pairs/km; western Prince William Sound, Alaska = 0.09 pairs/km) than on small islands with numerous productive feeding areas and few terrestrial predators (e.g., Destruction Is., Washington = 4.56 pairs/km, Middleton Is., Alaska = 9.85 pairs/km). Occasionally, two to three pairs will nest within a few meters of one another, but this typically only occurs at the extreme ends of rocky intertidal peninsulas where habitat is limited (e.g., Middleton Island, B. Guzzetti, pers. comm.).

Migration and Wintering Range

As the end of the breeding season approaches, the once territorial and widely dispersed breeding pairs begin to aggregate into flocks that may persist through winter. These localized winter concentrations of oystercatchers, ranging from tens to hundreds of individuals, can represent significant proportions of the population. Although many individuals aggregate in sheltered areas, some flocks remain at exposed sites near breeding areas (Hartwick and Blaylock 1979). Wintering flocks in central California used sheltered bays only when the exposed outer coast was impacted by severe storms (Falxa 1992). In Alaska and British Columbia, winter flocks favor tidal flats of protected bays and inlets, where mussel beds occur (Hartwick and Blaylock 1979, Andres 1994b).

Incidental information suggests that oystercatchers in the southern portion of the range generally remain near nesting areas throughout the year, while individuals in northern populations use discrete locations during the breeding season and winter (Andres and Falxa 1995). In Washington, Oregon, and California, most individuals are believed to undergo only a short-distance migration coincident with flock formation and that these flocks stay relatively close to their general breeding areas (Nysewander 1977, Hartwick and Blaylock 1979, Falxa 1992). Some movement is known to occur, especially among juveniles or subadults. For example, marked individuals from the nearby Gulf Islands in British Columbia have been observed in the inner marine shorelines of Washington during winter (D. Nysewander, pers. comm., R. Butler, pers. comm.). One individual, banded at Bodega Bay, California, was sighted 340 km to the north in July, and then returned to the same banding site in September (Falxa 1992). Overall numbers of oystercatchers appear similar between summer and winter in the inner marine waters of Washington (D. Nysewander, pers. comm.), making it difficult to determine if there is considerable migration or movement. In general, little work has been conducted in the southern range to determine migratory behavior and winter habitat use. A comprehensive survey during the breeding season and winter is needed within Northern Puget Sound, Strait of Georgia, and Strait of Juan de Fuca to assess the degree of migratory connectivity in the southern range, and to better understand limiting factors during the nonbreeding period.

Very little is known about the seasonal movements of Black Oystercatchers in the northern portion of their range except that they do not maintain year-round territories. Over 75% of Black Oystercatchers breeding in Prince William Sound, Alaska, migrate out of this region, although their wintering destination is unknown (Andres 1994a). On Middleton Island, none of the estimated local breeding season population of over 700 birds (Gill et al. 2004, B. Guzzetti, pers. comm.) was present on the island during surveys conducted in February and October 2005 (B. Guzzetti, D. Tessler, unpubl. data). An October 1983 trip to Middleton also noted the absence of oystercatchers there (Nysewander et al. 1986). It is unknown where birds from Middleton Island disperse after the breeding season. On Kodiak Island, summer and winter oystercatcher numbers are very similar, suggesting that this particular population may also remain relatively sedentary (D. Zwiefelhofer, pers. comm.).

Three recent reports suggest that at least dispersing juveniles in northern populations undertake long distance migrations. Two juveniles and one adult banded in Alaska were resighted in British Columbia, over 1000 km from the original banding sites. First, a chick banded at Glacier Bay National Park in June 2005 was observed on 5 January 2006 with a flock of 12 unbanded birds near Port McNeil, Vancouver Island. Second, a chick banded in Kenai Fjords National Park in 2005 was seen on 11 June 2006 in Masset Inlet, Queen Charlotte Islands among a flock of six apparently nonbreeding birds. Third, an adult banded at Middleton Island in the summer of 2004 was seen in Clayoquot Sound, Vancouver Island in October 2006 (B. Guzzetti, unpubl. data, J. Morse, unpubl. data, D. Tessler, unpubl. data). Because the species is long lived and exhibits high breeding site fidelity, long distance juvenile dispersion may have important implications for maintaining genetic diversity in the global population.

In Alaska, local flocks that consist of nonbreeders and failed breeders increase in size throughout July and August (Andres 1994a). These staging flocks are joined by the remaining local birds and depart in September (Andres and Falxa 1995). A staging flock of over 600 individuals was observed on 6 September 1992 in Geikie Inlet, Glacier Bay National Park, Alaska (G. van Vleit, pers. comm.). In British Columbia, flocks build throughout September and October, reaching peak numbers in late October to early November before moving to sheltered beaches away from breeding islands (Campbell et al. 1990). Details on spring movements to nesting areas are speculative, but probably occur during March, with birds generally re-occupying vacated territories during March and April (Purdy 1985, Andres and Falxa 1995).

Migratory flocks fly low, less than 1 meter above the water surface, and seldom venture across land (B. Andres, unpubl. data).

Throughout the majority of the range, we have a very poor understanding of where important concentrations of wintering oystercatchers are located, the numbers of birds in these wintering areas; movements between breeding and wintering sites; and the genetic structure and connectivity within the population.

Major Habitats

Foraging Habitat

Black Oystercatchers feed exclusively on intertidal marine invertebrates, particularly mussels, limpets, whelks and other snails, and chitons. Although small gastropod mollusks dominate the diet numerically, mussels contribute the greatest prey mass (Hartwick 1976, Falxa 1992, Andres 1996). Foraging habitats are limited to those areas where prey are most abundant—rocky shores exposed to surf action; sheltered gravel, cobble, or sandy shores; and soft sediment shores in protected bays and sounds. Access to foraging habitat is strongly dependent on tides and surf action. Oystercatchers often forage in the mid-intertidal zone where mussel populations are dense. When lower intertidal zones are inundated, they will forage on rocky substrates in the high-intertidal where limpets and chitons are numerous.

Mussel beds and aquatic beds of the macrophytic algae (*Fucus gardneri)* are essential foraging habitats for Black Oystercatchers. Both mussels and *Fucus* exist under similar physical conditions of substrate and tidal regime, and often co-occur (Lubchenco 1983; Menge 1976).

The *Fucus* canopy supports many key prey species including limpets, littorines and other snails, and chitons (McCook and Chapman 1991).

Rocky benches are a particularly important foraging habitat for oystercatchers as they provide a contiguous and temporally stable substrate for sessile macroinvertebrates (mussels), sessile macrophytic algae (e.g., *Fucus*), and the communities of grazing, mobile macroinvertebrates they support. The type of rock substrate and its physical properties may also be an important determinant of the quality of foraging habitat. Both mussels and *Fucus* are more likely to become established on highly textured and creviced substrates as opposed to smooth or polished rock (Lubchenco 1983). In 2006, surveys of groups of rocky islets in southeast Alaska where nesting habitat was abundant, found oystercatchers conspicuously absent in regions dominated by granite substrates where mussel and *Fucus* beds were lacking (D. Tessler, unpubl. data).

Cobble beaches support faunal communities similar to rocky benches. However, because cobbles are not a fixed substrate, these sites are often subject to disturbance by wave action and winter storms, creating a dynamic seasonal component to intertidal algal and macroinvertebrate communities in these habitats (Ferren et al. 1996).

Nesting Habitat

Breeding habitat is unevenly distributed and occurs in a variety of shoreline habitats. Breeding territories are usually in close proximity to low-sloping shorelines with dense mussel beds. Nesting sites include mixed sand and gravel or cobble and gravel beaches, exposed rocky headlands, rocky islets, rock outcroppings, low cliffs, colluvial and alluvial outwashes, and tidewater glacial moraines. In the northern portion of their range, oystercatchers often nest on gravel beaches, wave-cut platforms, rocky headlands, and small rocky islets. In the southern portion of their range, nesting occurs primary on rocky headlands, islets, and islands. The southern range limit coincides with the change from rocky shores to predominantly sand beaches (Jehl 1985).

Breeding pairs avoid wooded or shrub covered shorelines and are most abundant on non-forested islets and islands. Gravel and shell beaches are the preferred nesting habitat in Alaska and British Columbia, although exposed cliff sides and rocky islets are also important (Nysewander 1977, Vermeer et al. 1992, Andres 1998). In the southern region where beaches are predominantly sandy, and gravel shores are often exposed to high human disturbance, rocky headlands and rock outcroppings are favored. In Washington, birds occasionally nest on gravel beaches on off-shore islands, but there are few nests found on gravel in Oregon or California. Exposure of gravel moraines by retreating glaciers, isostatic rebound following deglaciation, avalanches and landslides depositing rocky debris in intertidal zones, and tectonic uplift can create new oystercatcher nesting habitat (Gill et al. 2004, Lentfer and Maier 1995). In many cases, the amount of new nesting habitat made available by these processes will decrease over time as seral development of vegetation proceeds.

Nests on gravel beaches are generally located just above the high tide line. Nests on cliffs and islands, however, may be located 30 meters or more above the high tide line (E Elliott-Smith, unpubl. data). The nest is usually a shallow circular depression lined with shell fragments, rock flakes, or pebbles (Andres and Falxa 1995). Pairs will often build more than one nest within their territory, and the female chooses in which one to lay (Webster 1941, Purdy

1985). Although Black Oystercatchers frequently travel distances greater than 200 meters to feed, and those breeding along steep, rocky shorelines may commute to foraging areas over one kilometer from their territories (Hartwick 1976, Andres 1998), the juxtaposition of adequate nesting habitat and foraging habitat appears essential.

Wintering habitat is much the same as breeding habitat (i.e., areas near productive mussel beds). In Alaska and British Columbia, winter flocks concentrate on protected, ice-free tidal flats or rocky islets with dense mussel beds (Hartwick and Blaylock 1979, Andres and Falxa 1995); elsewhere, wintering birds often occur in exposed areas with mussel beds (Andres and Falxa 1995).

Life History, Breeding, and Demographics

Although there are few data on post-fledging and adult survival, Black Oystercatchers appear to be relatively long lived. For example, two banded birds from Cleland Island, British Columbia, were 11, and possibly 16 yrs old (Purdy 1985). Five chicks banded on the Farallon Islands, California, lived 15.5, 15, 12, 12, and nine yrs, respectively (W. Sydeman, pers. comm.). Based on resighting data, annual survivorship of birds in California (n = 26) is greater than 90% (G. Falxa, pers. comm.). Apparent overwinter adult survival, based on resightings of 197 banded adults at 147 sites in Alaska between 2003 and 2006, was 87% (D. Tessler, B. Brown, M. Goldstein, B. Guzzetti, J. Morse, A. Poe, C. Spiegal, unpubl. data).

There is little range-wide information on the age of first reproduction, though limited information from chicks banded on Farallon Island, California, indicates that it may be five years (W. Sydeman, pers. comm.). Once individuals reach breeding age, they probably attempt to breed every year. Banding data indicate the species exhibits very high mate and breeding site fidelity; 92% of all surviving banded adults in Alaska (2003-2006) returned to the same nesting territory; approximately 9% of surviving adults changed mates (Morse 2005, Spiegel et al. 2006, Tessler and Garding 2006, D. Tessler, unpubl. data). Individual females lay one to three eggs, rarely four. The range-wide average of first clutch size ranged from 2.07–2.8; in Alaska, three-year averages vary between breeding sites by as much as 0.5 eggs per clutch (Vermeer et al. 1991, Morse 2005, Spiegel et al. 2006, Tessler and Garding 2006, D. Tessler, unpubl. data). Because of the long duration of parental care, only one brood is raised per season; however, when a clutch is lost, pairs will often lay replacement clutches, which tend to be smaller than initial clutches. A small proportion of pairs may attempt a third clutch if their first two efforts fail (Andres and Falxa 1995). Lifetime reproductive success is unknown.

Hatching success, nest success, fledging success, and overall productivity vary widely between breeding areas and between years. Hatching success varied from 12–90% across the range, and varied dramatically at a given site between years: 65–90% at Middleton Island, Alaska; 13–25% in Harriman Fjord, Alaska; 12–25% in the Beardslee Islands, Alaska; 25–71% on Cleland Island, British Columbia; and 62–77% at Destruction Island, Washington (Nysewander 1977, Vermeer et al. 1992, Gill et al. 2004, Morse 2005, Spiegel et al, 2006, Tessler and Garding 2006, B. Guzzetti, unpubl. data). Within a single year, the proportion of successful nests varied markedly (10–70%) among islands in Prince William Sound, Alaska (B. Andres, unpubl. data). Average hatching success across Oregon in 2006 (n = 50 nests) was 72% (E. Elliott-Smith, unpubl. data).

Annual reproductive success (chicks hatched/pair) ranged from 0.25 to 0.95 across the range, and also varied considerably among years. Interannual variation in productivity was 0.17–0.47 at Middleton Island, Alaska; 0.2–0.89 in Harriman Fjord, Alaska; 0.15–0.51 for Kenai Fjords, Alaska; 0.44–0.74 for the Beardslee Islands, Alaska; 0.19–0.31 on Cleland Island, British Columbia, and 0.4–1.4 on Destruction Island, Washington (Nysewander 1977, Vermeer et al. 1992, Morse 2005, Spiegel et al, 2006, Tessler and Garding 2006, B. Guzzetti, unpubl. data). In a study of productivity at four Alaskan breeding sites from 2003 to 2006, 572 clutches produced 1340 eggs. From these, 363 chicks hatched, 175 fledged, and the remainder were lost. Overall hatching success was 27% (range 13-82%), and average fledging success for all sites was 13% (range 5–25 %). Overall productivity was 0.42 (range 0.15–0.89), with no significant differences between areas (D. Tessler, B. Brown, B. Guzzetti, J. Morse, A. Poe, C. Spiegal, unpubl. data). Productivity data are lacking in the southern portion of the range; however, a 2006 study of 50 nest sites across Oregon determined that average productivity was 0.74 (E. Elliott-Smith, unpubl. data).

Although nonbreeding flocks, including second-year birds, often use traditional feeding and roosting areas near natal sites, only a few individuals have been known to breed at their specific natal site. No hatching-year birds banded on Cleland Island, British Columbia from 1970 to 1972 were found breeding on the island during 1976–1978 (Groves 1982). At least two birds banded as chicks on the Farallon Islands, California, were reported on the California mainland, but later returned to the Farallon Islands (DeSante and Ainley 1980). Of 193 chicks banded in Alaska between 2003 and 2006, only six have been resighted in their natal areas in subsequent breeding seasons—all in Kenai Fjords, Alaska (J. Morse 2005, unpubl. data, D. Tessler, unpubl. data).

Although long-term information on marked adults is limited, pairs appear to use the same territories in subsequent years. Three pairs on Cleland Island, British Columbia, defended the same territories for seven years (Groves 1982). Consistent territory occupation for three years is common in Prince William Sound, Alaska, and for more than five years in central California (B.Andres, unpubl. data, G.Falxa, pers. comm.). Between 2003 and 2005, 197 adults were banded on 184 monitored territories in Alaska; 91% of birds that returned in subsequent years (until 2006) renested in the same territory, and only 6% switched mates. Apparent over-winter adult mortality in Alaska from 2003 to 2006 was about 10% (D. Tessler, B. Brown, M. Goldstein, B. Guzzetti, J. Morse, A. Poe, C. Spiegal, unpubl. data).

Population Estimate, Status, and Trend

The global population is estimated at between 8,900 and 11,000 birds (median = 10,000; Morrison et al. 2001, Brown et al. 2001; Wetlands International *in press*; Table 1). This estimate, however, is based largely on observations from seabird surveys that do not specifically target oystercatchers. To date, there has been no systematic effort to census the entire population. Consequently, it is not clear how well this estimate reflects the actual number of individuals. Even if the population is 50–100% above the current estimate, the Black Oystercatcher is still one of the least abundant shorebird species in North America. Due to the lack of a systematic sampling effort, broad-scale population trends are unknown. Survey count data are provided in Table 2.

Alaska Population and Trend Information

Although the species' population is thought to be stable, data from surveys specifically targeting oystercatchers are limited and trend data are virtually nonexistent. Available data come from a variety of sources that vary both temporally and spatially, as well as in methodology and effort, making standardized comparisons tenuous or impossible over a broad geographic scale.

One of the largest sources of data on oystercatchers is the North Pacific Pelagic Seabird Database (NPPSD). The NPPSD is a repository of geospatial pelagic seabird survey data collected in Russia, Alaska, and Canada from 1972 to 2003, and is a joint project of the U.S. Geological Survey and the USFWS. The NPPSD includes incidental observations of oystercatchers, and although not specifically designed to survey oystercatchers, these data are spatially extensive and represent the only oystercatcher data available in many areas. As a consequence, the current oystercatcher population estimate is largely based on such observations. For Alaska, the NPPSD includes records for 4106 individual oystercatchers (Drew and Piatt 2005).

Below we summarize population estimates for Black Oystercatchers throughout Alaska. NPPSD data is included here, as well as specific estimates where available. In general, the NPPSD data underestimate the numbers of birds compared to surveys that specifically targeted oystercatchers. Bristol Bay, with its extensive coastline, has not been surveyed and the NPPSD has records of only two birds on Round Island. Oystercatchers are fairly common throughout the Aleutian Islands as far west as the Rat Islands with the highest estimated densities in the eastern and central Aleutians (Gibson and Byrd *in press*). In the Aleutian Islands, a total of 998 oystercatchers were recorded during marine bird surveys conducted by the USFWS in 1980 and

1981 (Nysewander et al. 1982). These surveys included 79 islands in the eastern Aleutian archipelago, located between Unimak and Samalga passes. Oystercatchers were found on 50 of these islands, with the greatest concentrations on Vsevidof Island and the Baby Islands, with 77 and 88 oystercatchers, respectively. High numbers of breeding oystercatchers were also found on Aiktak, Kaligagan, Kigul, and Ananiuliak islands. Ten islands were devoid of any nesting bird species, presumably due to the documented presence of non-native rats and foxes. USFWS has monitored Aiktak Island since 1995, where the breeding population of oystercatchers has remained relatively stable at about 30 individuals; the maximum number of oystercatchers was only slightly higher in most years, with the exceptions occurring in 2000 and 2006, when the total count was 100 and 160 birds, respectively (Helm and Zeman 2006). During August and September of 2003 and 2005, 269 and 270 oystercatchers were observed on the same four islands within the Rat Island complex, respectively (V. Gill, pers. comm.). No birds were observed on the Near Islands in July of 2003 (V. Gill, pers. comm.). The NPPSD documents 637 oystercatchers for the western Aleutians, and 562 oystercatchers in the eastern archipelago.

The majority of the Alaska Peninsula, a vast stretch of coast nearly 900 linear km long, has not been surveyed specifically for oystercatchers. Winter aerial surveys of the western tip of the Alaska Peninsula, between Morzhovoi Bay and Pavlov Bay, recorded 121 oystercatchers in 2005 (K. Sowl and D. Tessler, unpubl. data). The NPPSD lists 50 oystercatchers from summer seabird surveys. In 1994, further east along the peninsula, 154 oystercatchers were observed in the Shumagin Islands group, just prior to fox eradication on two of the islands. When the island group was resurveyed in 1995, the overall number of oystercatchers was about the same (n = 148), but on the islands where foxes were removed, pairs increased from seven to 10, and actual nests had increased from zero to five (Byrd et al. 1997). This area has not been surveyed since. The NPPSD contains records for 43 oystercatchers in the Shumagin Islands, 82 for the Semidi Islands, and 846 along the remainder of the Alaska Peninsula.

On Kodiak Island, systematic monitoring surveys collected along the coast for Harlequin Duck (*Histrionicus histrionicus*) in August 2004 and 2005 suggest the breeding season oystercatcher population for the Archipelago (excluding Chiniak Bay) was between 1370 and 1,750 individuals (D. Zwiefelhofer, unpubl. data). In 2005, winter surveys in three regions of Kodiak found 1,716 birds, of which 1,155 were in Chiniak Bay (D. Zwiefelhofer and D. Tessler, unpubl. data). The similarity in the winter and summer estimates suggests that oystercatchers breeding on Kodiak are likely year-round residents (D. Zwiefelhofer, pers. comm.). The number of birds detected in Chiniak in 2005 was much higher than that reported by Dick et al. (1977) who estimated that 100–150 Black Oystercatchers wintered there in 1976. Because the rest of Kodiak Island was not surveyed in 1976, it is unknown whether this apparent increase in birds in Chiniak is the result of a change in population size or the movement of birds into the area from elsewhere. Nysewander and Barbour (1979) reported 30–32 breeding pairs in Chiniak Bay and six additional pairs on nearby Spruce Island. The NPPSD documents 563 oystercatchers for Kodiak Island and an additional 326 on Afognak and Shuyak islands, where no other data are available.

The Cook Inlet region has not been extensively surveyed for oystercatchers. NPPSD has records of 143 birds in Cook Inlet and Kachemak Bay, and 83 on the Barren Islands. Intensive oystercatcher research was conducted in Aialik Bay and Northwestern Fjord, Kenai Fjords National Park. The number of breeding pairs remained nearly constant between 2000 and 2005, with about 22 and 15 pairs in Aialik and Northwestern, respectively (Morse 2005). The NPPSD contains records for only 19 individuals on the Kenai Peninsula.

In Prince William Sound, oystercatcher surveys conducted by personnel from the Chugach National Forest between 1999 and 2005 detected at least 566 oystercatchers, including 176 breeding pairs along 928 km of shoreline in the eastern portion of the Sound, and 94 breeding pairs along 1,943 km in the western Sound (Meyers and Fode, 2001, Brown and Poe 2003, Poe 2003, P. Meyers, unpubl. data). During research on the impacts of the 1989 *Exxon Valdez* oil spill, Murphy and Mabee (1999, 2000) found 79 pairs within their study area (Knight, Green, Little Green, Channel, and Montague islands). Between 1991 and 1998, oystercatcher numbers in this area remained constant in un-oiled zones and had increased by 27% in oiled zones, suggesting local recovery following the spill. Recovery of breeding pairs had occurred by 1993 (Andres 1997). Recent Forest Service surveys indicate the population in the same area is stable. The NPPSD lists 184 birds in the entire Prince William Sound.

On Middleton Island, the total number of birds increased from two in 1976 to 718 in 2002 (Gill et al. 2004). This increase is attributed to the creation of substantial new nesting and foraging habitat following local tectonic uplift from the 1964 earthquake. Since 2002, oystercatcher numbers have remained more or less constant. For example, in 2004, there were 781 oystercatchers comprised of 285 territorial pairs and 211 nonbreeders and in 2005, 716 birds comprised of 238 pairs and 240 nonbreeders were detected. In 2006, there were 703 oystercatchers, comprised of 244 pairs with 215 not breeding (B. Guzzetti, unpubl. data). This stable trend suggests the island is at or near maximum carrying capacity. The NPPSD contains 46 oystercatcher observations for Middleton Island.

Much of the Copper River Delta and the entire "lost coast" of the Gulf of Alaska, stretching 500 linear km from Prince William Sound south to Glacier Bay, have not been surveyed for oystercatchers. However, 40 pairs of breeding oystercatchers were found in Russell and Nunatak fiords in 2000 (Stephensen and Andres 2001). The NPPSD contains records for 31 Black Oystercatchers in this region.

Most of the 15,000 km of Southeast Alaska coastline have not been surveyed. In Glacier Bay, park-wide surveys of ground nesting birds documented 128 oystercatchers in 2003 and 229 in 2004 (Arimitsu et al. 2004, 2005). In the Beardslee Islands subunit, these surveys found only 23 and 31 territorial pairs in 2003 and 2004, respectively; an apparent decrease from the 63 pairs observed in 1987 (Lentfer and Maier 1995). However, intensive surveys of the Beardslee Islands in 2005 located 58 territorial pairs (Tessler and Garding 2006). These higher numbers suggest that the breeding population in the Beardslees has likely been stable since 1987. These intensive surveys also indicate that the park-wide oystercatcher population was likely underestimated in 2003 and 2004. The NPPSD contains 270 oystercatcher records for Glacier Bay.

In 2006, the Alaska Department of Fish and Game conducted surveys in Sitka Sound and select groups of rocky islets suspected of supporting breeding oystercatchers. Historical declines had been observed in the islands of Sitka Sound, where breeding numbers dropped from 102 individuals in 1940 to four individuals in 1985 (J.D. Webster, pers. comm.). The 2006 surveys found a total of 23 oystercatchers (10 pairs and three individuals) in Sitka Sound. The NPPSD contains records for 38 oystercatchers in the general vicinity. The 2006 surveys also detected six pairs and 14 individuals in the Myriad Islands; 19 pairs and 10 individuals in the Necker Islands (including the Guibert and Slate islets); only five birds around the remaining coast of Baranof

Island; and four oystercatchers on the islets in Tebenkof Bay. Surveys of remote Lowrie Island found one nesting pair, one territorial pair, and one single bird. Neighboring Forrester Island had 39 oystercatchers, including 11 pairs and 17 single birds (D. Tessler, unpubl. data).

Seabird surveys provide the sole source of information for the remainder of Southeast Alaska. For the northern portion of the region, including the mainland and Chichagof, Baranof, and Admiralty islands, NPPSD lists 93 Black Oystercatchers. From Baranof Island south to the Canadian border, the NPPSD contains only 57 oystercatcher observations, 37 of which are in the remote, off-shore Forrester Island group.

In Alaska as a whole, an analysis of overall trend is not possible because of the lack of spatial contiguity and temporal overlap in these local population estimates, coupled with the various non-standardized survey methods used to derive them. Though species-specific data are lacking for the vast majority of Alaska's coastline, a significant portion has been covered by seabird surveys, and despite obvious shortcomings (i.e., typically underestimating numbers) in these data sets, they do provide relative distribution information. Because seabird surveys are often repeated at decadal intervals, these data sets may eventually provide some insight into trends. Recent intensive surveys of select breeding areas provide a foundation for monitoring population trends at a few key sites in the future.

British Columbia Population and Trend Information

Overall, little information is available regarding the abundance and trend of Black Oystercatchers in British Columbia (del Hoyo et al. 1996). Similar to Alaska, most of the coastline has not been surveyed specifically for oystercatchers due to logistical difficulty and the associated costs. With a few notable exceptions, the available data are from surveys of pelagic seabird colonies; however, much of this information is not recent and using it to estimate population size and trend, even for the species targeted, is problematic (Thomas and Martin 1996). In their "Preliminary Assessment of Shorebird Populations in Canada," Morrison et al. (1994) concluded that for Black Oystercatchers in British Columbia, the available "…information is inadequate to provide an authoritative assessment of status or trends." Although oystercatchers are thought to breed along the majority of coastline, no nests have been detected on the mainland (Campbell 1968). The centers of abundance are the Queen Charlotte Islands and the west coast of Vancouver Island, and the estimated breeding population is approximately 1,000 pairs (Rodway 1991).

The northern and central mainland and numerous islands of British Columbia have not been surveyed. Portions of the Queen Charlotte Islands are surveyed regularly for oystercatchers, and there is some historical data for specific locations. Along the western coast of Queen Charlotte Island, 40 individuals were counted on Frederick Island in 1985 (Rodway 1991). In Tian Bay, the number of breeding oystercatchers decreased from 62 birds in 1977, to 48 in 1984, and to 26 in 1986 (Rodway et al. 1990). This area has not been surveyed since. Further south along the western coast, 18 birds were found in the Englefield Bay Islands in 1986, and on Anthony Island, breeding birds increased from 32 to 38 birds between 1977 and 1986 (Rodway et al. 1990). In Masset Inlet, on northern Queen Charlotte Island, 41 oystercatchers and nine nests were detected in 2006 (A.J. Gaston, pers. comm.).

Along the eastern Queen Charlotte Island coast, 88 birds were found in Skidegate Inlet in 1990 (Vermeer et al. 1992a). Oystercatchers may be increasing in the Laskeek Bay region, but this trend is unclear. Forty-seven oystercatchers were counted in Cushewa Bay in 1975 (Savard and Kaiser 1982), and only 10 pairs (20 birds) were reported in Laskeek Bay in 1985 (Rodway et al. 1988). The Laskeek Bay Conservation Society has been monitoring oystercatchers in northern Laskeek Bay south to the Lost Islands since 1992. In 2006, they located 35 breeding territories (A.J. Gaston, pers. comm.). Also in 2006, the Society found 60 territories in southern Laskeek Bay, northern Juan Perez Sound, and associated channels (A.J. Gaston, pers. comm.). Thirty pairs were previously documented in this general area, stretching from Dodge Point south to Ramsay Island (Rodway et al. 1988).

Surveys conducted in 1988 and 1991 in Queen Charlotte Strait and coastal waters to the south detected 20 pairs of nesting oystercatchers in the Smith Sound Islets in Bull Harbor, and 23 pairs in the Duke of Edinburgh Ecological Reserve (Rodway and Lemon 1991a). In 1988, 79 pairs were located on Moore and Byers islands, and the Goose Island Group supported 17 pairs (Rodway & Lemon 1991b).

Much of the northwest coast of Vancouver Island has been surveyed historically. The Scott Island Group had 29 pairs in 1989 (Rodway et al. 1992). In 1988, 13 pairs were identified on Gilliam Island in Quatsino Sound, and nine pairs were found in the Solander Island / Brooks Bay region of the Brooks Peninsula. In Kyuquot Sound, 125 pairs were found on the Kyuquot Channel islets, and 23 pairs were located in Checleset Bay (Rodway and Lemon 1990). Further south, 110 pairs were located in the Clayoquot and Barkley sounds in 1989. This included 56 pairs in Clayoquot Sound, 50 pairs in Barkley Sound, and four pairs along the coast between the two sounds (Vermeer et. al. 1991). More recent (2000–2005) systematic surveys conducted by Pacific Rim National Park personnel suggest the local population is either stable or increasing.

Approximately 150 pairs were located along 80 linear km of coastline that included both Barkley and Clayoquot sounds. The largest concentration of oystercatchers in the region is on Cleland Island in Cloyoquot Sound, where numbers have remained stable at about 44 pairs since 1982 (P. Clarkson, pers. comm.). The total estimated breeding population for the outer coast of Vancouver Island between Port Renfrew and Tofino is about 320 pairs, or 640 individuals.

On Eastern Vancouver Island, 28 individuals were found between Little Qualicum Estuary and Nanoose Bay, near Parksville (Campbell et al. 1990). In the Strait of Georgia, Vermeer et al. (1989) estimated 67 breeding pairs on 51 islands. Of these, the majority (44 breeding pairs) were located on the Southern Gulf Islands. In 1999, Hazlitt (2001) resurveyed a subset of Vermeer's survey area and found 34 breeding pairs where Vermeer (using other methods) had estimated only 16 pairs. Hazlitt concluded that this increase was due to greater survey effort, that the oystercatcher population in the Strait of Georgia was likely greater than previously estimated, and that all available nesting habitat was occupied. In 2005, the most recent nest survey of the Strait of Georgia region recorded 122 individuals and 38 nesting pairs (R. Butler, pers. comm.). Five islets that contained nests during Vermeer's 1987 survey were unoccupied in 2005. It is suspected that predation from river otters (*Lutra canadensis*), raccoons (*Procyon lotor*), and domestic cats (*Felis silvestris catus*) may be responsible. Much of this area has recently been designated as the Gulf Islands National Park, but it faces significant pressures from urban growth, outdoor recreation, and shoreline development (R. Butler, pers. comm.). Sidney Channel, along the extreme southeast shore of Vancouver Island, supported 20 pairs in 1997 (Butler 1997).

Washington Population and Trend Information

More is known about Black Oystercatchers in the inner marine waters of Washington than on the outer coast. In the case of the *inner marine shorelines*, information on trends is scarce. Historically, oystercatchers were seen occasionally in southern and central Puget Sound (Dawson 1909), but are no longer observed there (Nysewander, pers. comm.). The earlier document reports anecdotal information on presence/absence, therefore any comparison of data is not possible. Surveys have been conducted in the inner marine waters from 2000-2003, and 2005-2006 however varying levels of sampling effort, coverage, and methodologies preclude a formal comparison of data (D. Nysewander pers. comm.). In 2006, surveys were conducted on a subset of sites in the inner marine waters with 108 breeding pairs and as many as 112 nonbreeders on 68 of the 98 sites visited (R. Milner and D. Nysewander, pers. comm.).

Some trend information is available for Protection Island National Wildlife Refuge, which is monitored by USFWS staff annually. Since the 1980s, when the island was closed to public access, the number of oystercatcher nests decreased from 13 to five in 2006, with total oystercatcher numbers decreasing from 43 to 14. The decline may be a consequence of the documented increase in the populations of eagles and breeding gulls on Protection Island, which may have either decreased the population directly though predation or by dispersing breeding oystercatchers over a wider area. In contrast, at nearby Dungeness National Wildlife Refuge, oystercatcher nests have increased after areas of the Refuge were closed to pubic access in 1997; six nests were detected in 2006 (P. Sanguinetti, pers. comm.).

Less is known about trends of Black Oystercatchers on the *outer coast*. Few, if any, surveys have been conducted in this area of rugged coastline since it was designated as wilderness in the 1970s. Washington Islands National Wildlife Refuge, however, which includes more than 600 islands, has identified the need for population estimates as a priority. The Catalog of Washington Seabird Colonies (Speich and Wahl, 1989) reports approximately 295 Black Oystercatchers during the breeding season along the outer coast of Washington. This represents the most comprehensive estimate for the species, however the most current data reported for each island are from 1908-1982. Some sites on the outer coast, like Destruction Island, once had staffed lighthouses that were automated in the late 1960s. Jewett (1953) noted that four oystercatcher nests were the largest number ever found in one season during the staffed lighthouse period on Destruction Island. In 1975, 12 nests were found (Nysewander 1977), but surveys have not been conducted at Destruction Island in recent years.

Oregon Population and Trend Information

There is little information about trends in Oregon. The USFWS conducted a seabird survey in 1988 and collected incidental sightings of Black Oystercatchers, resulting in an estimate of 350 birds for the state, although portions of the central coast were not surveyed (R. Lowe, pers. comm.). In 2005, approximately 325 adults were counted during intensive statewide land and boat surveys, including 97 between Tillamook Head and Heceta Head, and 226 from Cape Arago to the California border (E. Elliot-Smith and L. Kelly, pers. comm.). The 1988 and 2005 population counts can only be qualitatively compared because of differences in survey methods and effort. Annual surveys conducted from 1997 to 2004 on the central coast from Seal

Rock to Heceta Head indicated interannual variability in the number of birds, but no discernible trend over time (L. Kelly, pers. comm.).

During the breeding season birds appear to be most abundant in the southern portion of the state, south of Cape Arago, where approximately 67% of the Oregon population was observed during the 2005 survey. The central coastline, from Coos Bay to Florence, is characterized by immense sand dunes; consequently, there are no oystercatchers in this region. The remainder of the Oregon population is found along the northcentral and northern portions of the Oregon coastline, from Tillamook Head to Heceta Head, which contains rocky shorelines and cliff habitats, but fewer offshore islands than are found along the southern coastline (E. Elliot-Smith and L. Killey, unpubl. data).

During the 2005 survey, nesting pairs and unpaired birds were recorded in all habitat types and regions including nearshore islands, outer islands, and mainland rocky shores and cliffs. The majority of oystercatchers were observed on nearshore islands; approximately 15–20% of birds were recorded on outer islands (E. Elliot-Smith and L. Kelly, pers. comm.). Data (n = 50 nests) from the 2006 breeding study suggest that oystercatchers rarely nest successfully on the mainland, likely due to increased levels of disturbance and predation. In the south, where islands and islets are numerous, no nests were located on the mainland (E. Elliot-Smith and L. Kelly, pers. comm.).

California Population and Trend Information

Currently, there is no statewide monitoring of this species in California, and little standardized monitoring of local sites. However, as in other jurisdictions, surveys of seabird colonies may give an approximate indication of population size. Oystercatcher numbers from these surveys should be interpreted with caution because the surveys were not designed to estimate population size or trend. Seabird colony surveys from 1989 to 1991 suggest oystercatchers may have increased from 688 to 888 birds, or 29%, since the late 1970s throughout the state (Carter et al. 1992). The increase may be an artifact of changes in survey design and increased effort in the more recent surveys. Concentrations were reported in :Humboldt and Del Norte counties (128 birds) in the north; Mendocino County (105), Sonoma County (129) located north of San Francisco Bay; and on the Channel Islands (267) to the south (Carter et. al. 1992). Point Reyes Bird Observatory enumerated breeding oystercatchers at three additional sites in 2006, including 36 birds on Southeast Farallon Island (San Francisco County), 20 on Ano Nuevo Island (San Mateo County), and 26 on Vandenberg Air Force Base in Santa Barbara County (A. Brown, pers. comm.). Lower numbers of oystercatchers were reported for the mainland coast of southern California (189 total from San Francisco Bay south to the U.S. border), approximating only 20% of total population of the state (Carter et.al, 1992)..

Baja California, Mexico Population and Trend Information

Jehl (1985) estimated the oystercatcher population in Baja California, Mexico to be approximately 100 birds. Currently, there is no available information on the population status and trend of oystercatchers in the region.

CONSERVATION SITES

The Black Oystercatcher often occurs at low densities and typically uses rocky coastlines that tend to be isolated and difficult to access. Consequently, we often lack information on precise locations of birds. Moreover, because of the tendency of this species to be widely distributed, it is generally more appropriate to think in terms of regions that are important to the conservation of this species as opposed to specific sites. Because oystercatchers, especially in the northern portions of their range, are known to migrate from breeding areas to wintering areas, this section is organized by breeding and winter seasons. It is important to note that the following sections include areas of known importance; potentially important areas may remain undocumented, primarily due to constraints in accessing the isolated coasts used by this species in substantial portions of its range. Available abundance information for specific sites is summarized in Table 2.

Alaska

Important Breeding Regions

The majority of the breeding population occurs in southcentral Alaska. Oystercatchers are most common along the Alaska Peninsula, the Kodiak Archipelago, Middleton Island and in Prince William Sound. Both the Aleutian Archipelago and the Alaska Peninsula have about 1000 breeding oystercatchers. Kodiak Island supports about 1500 birds during the breeding season, and Afognak and Shuyak islands support at least 270 birds. Middleton Island supports about 700 breeding birds. Prince William Sound is home to at least 500 breeding oystercatchers, with the largest concentrations in Harriman Fjord, and along the coasts of Montague and Green islands. The above areas alone comprise between 45–72% of the estimated global population. In Southeast Alaska, the largest known concentrations occur in Glacier Bay, with at least 270 breeding oystercatchers; 120 of which occur in the Beardslee Islands. Nearly all of the above areas are federally managed, and are under the protection of the National Wildlife Refuge System, the National Park Service, or the US Forest Service. The lone exception is Middleton Island, the only site not under direct management of a federal or state resource management agency.

Important Wintering Regions

Kodiak Island is currently the only documented area in Alaska that supports large concentrations of oystercatchers, with approximately 1700 birds present in January 2005 (D. Zwiefelhofer and D. Tessler, unpubl. data). Oystercatcher flocks ranging from 20 to 300 birds were concentrated at the Kodiak harbor breakwater, Kalsin Island, Cape Chiniak, Uganic Bay, and Uyak Bay. Prince William Sound supports oystercatchers in winter, principally in Constantine Harbor on Hinchinbrook Island, and around Green Island east to the northern portion of Montague Island, including Port Chalmers and Zaikof Bay. In February 1994, 157 birds were recorded in these locations (Andres 1994a).

Large flocks have been observed in Geikie Inlet, Glacier Bay in September including 124 birds in 1965 and over 600 in 1992 (G. vanVliet, pers. comm., Wik and Streveler 1967). This is one of the largest known concentrations of Black Oystercatchers and demonstrates the importance of this location as a traditional post-breeding staging area. During average winters, it appears that oystercatchers disperse to locations outside of the bay including Cape Spencer, south Icy Strait, and the outer coast of Yakobi and Chichagof islands (B. Paige, pers. comm.). During mild winters <100 birds are estimated to remain within Glacier Bay (Bodkin et al. 2001, Robards et al. 2003, B. Paige, pers. comm.). Land ownership of these areas is primarily under federal management.

British Columbia

Important Breeding Regions

Centers of Black Oystercatcher abundance are in the Queen Charlotte Islands, Queen Charlotte Strait, the southern Gulf Islands, and the west coast of Vancouver Island from the Scott Islands south to Barkley Sound. Approximately 400 oystercatchers breed in the Queen Charlotte Islands and 240 in the Queen Charlotte Strait. The west coast of Vancouver Island has roughly 700 individuals during the breeding season, with the highest concentrations associated with exposed rocky islet groups in Nootka, Kyuquot, Quatsino, Clayoquot, and Barkley Sounds. Georgia Strait may support 250 birds during the breeding season. Land ownership of coastal British Columbia is primarily under the jurisdiction and management of the provincial government. The southern portion of Moresby Island in the Queen Charlottes is protected as Gwaii Haanas National Park, and relatively small tracts of coastline on the west and southwest coasts of Vancouver Island are under the jurisdiction of Pacific Rim and Gulf Islands National Parks. Several of the southern Gulf Islands are ecological reserves.

Important Wintering Regions

Wintering concentrations likely occur in locations similar to important breeding regions, as seasonal movements are hypothesized to be minimal. The largest known winter concentration occurs at Skidegate Inlet, Queen Charlotte Islands, where over 200 birds are typically recorded

(Christmas Bird Count 2005). Recent winter reports of juveniles banded in Alaska suggest British Columbia may also be important to oystercatchers breeding further north.

Washington

Important Breeding Regions

Black Oystercatchers occur in Washington in inner marine waters and outer coastal regions. The *inner marine waters* support a total of 350-400 oystercatchers, including at least 250 breeding birds occurring on at least 71 islands in 2005(D. Nysewander, pers comm.). Highest densities occur in the San Juan Islands and nearby portions of Deception Pass and Bellingham Bay as well as Smith and Protection islands in the eastern Strait of Juan de Fuca. Important *outer coast sites* include the rocky northern coastline from Neah Bay and the offshore islands/islets. The Catalog of Washington Seabird Colonies (Speich and Wahl 1989) estimated 280 oystercatchers associated with the rocky northern outer coast and offshore islands. Larger islands, such as Destruction Island, are believed to be important breeding areas, in particular sites along the outer coast.

Inner marine waters with Black Oystercatcher habitat are more susceptible to development and disturbance due to higher population and recreational use (e.g., San Juan Islands). Outer coast areas have refuge, sanctuary, or wilderness status and are relatively less impacted due to this protected status.

Important Wintering Regions

Based on incidental observations, important wintering regions are likely similar to important breeding regions as seasonal movements are hypothesized to be limited. However, little work has been conducted to determine winter habitat use.

Oregon

Important Breeding Regions

There are no specific sites that support high densities of oystercatchers. Given the low numbers reported for the state, however, all rocky habitats may be important. In 2005, approximately 325 adults were counted during intensive statewide land and boat surveys, including 97 between Tillamook Head and Heceta Head in the northern portion of the state, and 226 from Cape Arago to the California border in the south (E. Elliot-Smith and L. Kelly, pers. comm.). The total coastline of Oregon is approximately 635 km, which includes 259 km (41%) classified as rocky shore (excluding jetties). Rocky intertidal habitat, a subset of rocky shore, accounts for 132 km (21%) of the shoreline (Oregon Department of Fish and Wildlife 1994). Rocky shores and rocky intertidal habitat provide potential sites for breeding oystercatchers, which are found in every coastal county in Oregon except on the central coast in Douglas County. In general, oystercatcher habitat is more plentiful in the southern portion of the state from Cape Arago to the California border; this area supports 67% of the state's oystercatchers.

The majority of Black Oystercatcher habitat is on publicly-owned land administered by either the USFWS or the Oregon Parks and Recreation Department. The USFWS manages three marine refuges—Oregon Islands, Cape Meares, and Three Arch Rocks—that include 1,853 rocks, reefs, and islands; all are closed to the public except for Cape Meares. The 1967 Oregon Beach Bill granted free and uninterrupted use of beaches to the public and management of much of the coastline is administered by Oregon Parks and Recreation Department. In some cases management of breeding sites is shared, and a small percentage of oystercatcher habitat is privately owned. Other owners and managers of the rocky coastline in Oregon include Division of State Lands, Oregon Department of Fish and Wildlife, Oregon Department of Transportation, Bureau of Land Management, county and city governments, The Nature Conservancy, and private owners.

Important Wintering Regions

All information about wintering flocks in Oregon is anecdotal as no organized surveys or studies for this species have been conducted. Cape Arago has supported flocks of at least 40 birds in multiple winters. Moolach Beach (Yaquina Head), Beaver Creek (Ona Beach), and Port Orford each have one or more records of at least 30 wintering birds. Short Beach, Depoe Bay, Devil's Punchbowl (Otter Rock), Seal Rocks, Yachats, Bandon Beach, and Lone Ranch (Cape Ferrelo) have one or more records each of at least 20 birds (R. Bayer, pers. comm., M. Hunter, pers. comm., B. Woodhouse, pers. comm.).

California

Important Breeding Regions

Based on Seabird Colony Surveys from 1989–1991 (Carter et al. 1992), approximately 267 oystercatchers or 30% of the state estimate of 890 birds were reported in the Channel

Islands, which fall under the jurisdiction of the National Park Service. Along the central California coast, less than 70 individuals were reported in any one region (roughly 120 linear km). Approximately 27% of the state population is reported to occur along the coast of Sonoma and Mendocino counties, with 129 and 105 birds, respectively. Another important region that supports 14% of the California population (approximately 128 birds) lies just south of the Oregon border in northern Humboldt and Del Norte counties.

Landownership of California coastline varies and includes a combination of private, state, and federal owners. However, most offshore rocks in California are part of the California Coastal National Monument, which was established in 2000 and is administered by the Bureau of Land Management.

Important Wintering Regions

Incidental observations from California indicate that oystercatchers likely spend the winter in the areas where they occur in the breeding season, although some local movements occur (e.g., from offshore rocks which are very exposed to winter storms to mainland rocky intertidal areas that are more protected). Thus, the same California regions described above as important during the breeding season are likely also important in winter

Baja California

Important Breeding Regions

Los Coronados, Todos Santos, and San Martin islands in Baja California Norte each support a maximum of five pairs (E. Palacios, unpubl. data). However information on abundance and distribution of Black Oystercatchers is incidental at best. Surveys are needed to accurately assess the status of Black Oystercatchers in Mexico.

Important Wintering Regions

Wintering areas are likely similar to breeding areas. Little is known on whether birds exhibit seasonal movements.

LIMITING FACTORS AND THREATS

This section presents a synthesis of the known and hypothesized limiting factors and threats that Black Oystercatchers may experience throughout their range. Please see the Conservation Strategy, Appendix 1, for a detailed account of potential threats following the *Unified Classifications of Direct Threats and Conservation Actions* created by the World Conservation Union (IUCN) and the Conservation Measures Partnership.

Predation on Eggs, Chicks and Adults

Predation is the major cause of mortality to eggs and chicks (D. Tessler, B. Brown, M. Goldstein, B. Guzzetti, J. Morse, A. Poe, C. Spiegal, unpubl. data). In a study of productivity at four breeding areas in Alaska from 2003 to 2006, predation accounted for 48% of all egg losses where a cause could be positively identified (range = 31–85%, n = 407 eggs). Because 27% of all egg losses were of unknown cause, egg depredation could be even higher. In Alaska, egg predators include mink (*Mustela vison*), marten (*Martes americana*), river otter, sea otter (*Enhydra lutris*), wolverine (*Gulo gulo*), red fox (*Vulpes vulpes*), arctic fox (*Alopex lagopus*), brown bear (*Ursus arctos*), black bear (*Ursus americanus*), Glaucous-winged Gull (*Larus* *glaucenscens*), Northwestern Crow (*Corvus caurinus*), and Common Raven (*C. corax*). In the southern portion of the range, the suite of egg predators also includes raccoon, striped skunk (*Mephitis mephitis*), Glaucous Gull (*Larus glaucescens*), and domestic and feral cats and dogs (Webster 1941, Kenyon 1949, Vermeer et al. 1989, Vermeer et al. 1992a, R. Butler, pers. comm., G.Falxa, pers. comm., B.Andres, unpubl. data, C. Spiegel, et al. 2006). In Baja California, domestic cats and coyotes (*Canis latrans*) are suspected predators (Kenyon 1949, B. Walton, pers. comm.).

All egg predators also prey on small chicks, with chicks being most vulnerable during the first two weeks after hatching (Andres and Falxa 1995). Although average hatching success on Middleton Island is between 65% and 90% (Gill et al 2004, B. Guzzetti unpublished data), predation of young chicks by Glaucous-winged Gulls is largely responsible for reducing fledging success to 16% (B. Guzzetti unpublished data). Common Ravens, Bald Eagles (*Haliaeetus leucocephalus*), and possibly foxes take larger chicks (Webster 1941b, Nysewander 1977, B. Andres, unpubl. data). Eradication of foxes on several Aleutian islands resulted in re-colonization by oystercatchers (Byrd et al. 1997, Byrd 1988). Predation on eggs and young by both birds and mammals is significant and, probably, a strong selective force for nesting on offshore rocks; nests are rare on accessible mainland sites (Nysewander 1977, Campbell et al. 1990, G. Falxa, pers. comm., D. Tessler, unpubl. data) and nests on beaches accessible to mammalian predators have higher predation rates than nests on offshore rocks (Vermeer et al. 1992). Pinnipeds hauling out on land may also cause decreased reproductive success by crushing eggs and chicks and causing oystercatchers to leave nest sites during incubation or brooding periods (Warheit et al. 1984). Predation on free-flying Black Oystercatchers is poorly documented. In California, Peregrine Falcons (*Falco peregrinus*) have been observed preying on oystercatchers.

Human predation may potentially impact Black Oystercatchers in areas where subsistence harvest is allowed. Due to their strong fidelity to breeding territories, easy accessibility, conspicuous behavior, and limited reproductive potential, they are particularly vulnerable to local extirpation through persistent subsistence harvest of either breeding adults or eggs. Subsistence harvest of Black Oystercatchers and their eggs is currently allowed for native peoples in Alaska. According to the most recent data available from the Alaska Migratory Bird Co-Management Council (http://alaska.fws.gov/ambcc/Index.htm), there were only 44 oystercatchers harvested between 1992 and 2000; 22 during the Spring/Summer season, and 22 during the Fall/Winter season. However, because these reports are from voluntary household surveys that incompletely canvass the region, the actual number harvested may be much larger.

Petroleum Contamination of Shorelines

Shoreline contamination, especially from petroleum spills, is also a threat throughout the species' range. The 1989 *Exxon Valdez* oil spill in Prince William Sound, Alaska, had a major impact on breeding oystercatchers. During this one event, between 4 and 20% the population in the spill area was thought to have been killed by oiling (Andres 1994b), breeding activity was disrupted in 39% of oystercatcher pairs attempting to nest on the heavily oiled shorelines (Andres 1997), and chick survival was significantly reduced (Andres 1997). Post-spill clean-up activities continued to disrupt breeding birds into 1990 (Andres and Falxa 1995). The presence of elevated hydrocarbon concentrations was detected in feces of chicks in 1993 (Andres 1999).

In a 2004 study, P450 analysis of liver biopsies from oystercatchers nesting in oiled areas of Prince William Sound showed evidence of continued trophic uptake of oil residues persisting on shorelines of Prince William Sound over 15 years later (B. Balachey, pers. comm.).

In addition to tanker traffic, freight vessels also pose a potential threat of oil contamination. In December 2004, the M/V Selendang Ayu, hauling 55,000 metric tons of soybeans, went aground in the Aleutian Islands near Unalaska Island, broke in half, and spilled nearly a million and a half liters of petroleum products. The oiling required cleanup on over 110 km of shoreline in an area used by wintering oystercatchers. The effect of the spill on oystercatchers is unknown. Over 1,700 bird carcasses of various species were recovered after the spill, but because of the delayed response and the quick retrieval of carcasses by natural predators (i.e., typically <24 hrs), the actual tally by species remains unknown (P. Flint, pers. comm.). The wreck of the Selendang Ayu demonstrates the risk of contamination exposure for oystercatchers, even in areas managed specifically for conservation. In this case, most of the oil-affected area is part of the Alaska Maritime National Wildlife Refuge, and is reachable only by air and sea. Furthermore, oystercatchers and their prey may be at risk from low-level contamination by diesel fuel, gasoline, oil residues, and other contaminants along shorelines resulting from oil tankers expelling water from their ballast tanks and increased recreational activities. In the southern portion of the range, oystercatchers may face significant pressures from urban growth. Expanding human population and infrastructure may pose management concerns for oystercatchers through attendant effects from increasing vessel traffic and the increasing potential for coastal contamination from industrial and residential sources.

In northern Puget Sound, approximately 57 billion liters of oil was transported through the area in 2002. Refineries there are located to the northeast and southeast of the San Juan Islands, an aggregation site for Black Oystercatchers year-round. Six major oil spills occurred in northern Puget Sound from January 1994 to February 2003 (see <http://www.ecy.wa.gov/ecyhome.html>). This situation is similar in the Strait of Georgia where oil exploration has expanded in recent years.

Flooding and Recreational Disturbance at Nest Sites

Clutches are also regularly lost to high tides or wave action, especially in the northern region where the majority of nests occur on low sloping gravel beaches and wave cut platforms. While Andres and Falxa (1995) found flooding was responsible for less than 10% of losses, a three year study of four important Alaskan breeding areas demonstrated that flooding was responsible for 32% of attributable nest losses overall (n = 407 nests), with differences between areas and years ranging between 3–63% (D. Tessler, B. Brown, M. Goldstein, B. Guzzetti, J. Morse, A. Poe, C. Spiegal, unpubl. data). Periods of particularly high tides, storm surges, tsunamis, and boat wakes may all contribute to nest flooding. In an area of high breeding density (e.g. Harriman Fjord in Prince William Sound), a single wave or wake event coincident with monthly high tides could destroy the majority of nests. In Oregon, the loss of two nests built in depressions was attributed to flooding by rain (E. Elliott-Smith, unpubl. data).

Growing pressure from recreational activities in and around breeding areas could also have deleterious effects. The susceptibility to flooding may be exacerbated by growing boat traffic, especially in Alaska, where important breeding areas in Prince William Sound, Kenai

Fjords, and Glacier Bay are receiving ever-increasing pressure from the tourist industry. Growing visitation by private boats, sightseeing vessels, water taxis, and cruise ships heightens the probability that nests will be flooded by large wakes, especially when vessel traffic coincides with periods of the highest tides. Easing vessel size and displacement restrictions in certain protected areas (e.g., Glacier Bay National Park) could further exacerbate this problem.

Oystercatcher productivity was unaffected by low levels of recreational activity, principally kayak camping, in Kenai Fjords National Park during the early 2000s (Morse et al. 2006). However, increasing human presence by campers, kayakers, and fishermen in remote coastal areas may directly impact oystercatcher productivity through inadvertent trampling of nests and eggs, or indirectly through interference with foraging, parental care, or causing nest abandonment. Expanding human population and the subsequent increased usage of oystercatcher habitat by recreationists are management concerns in the southern portion of the species' range. Oystercatcher nests in Oregon and Washington have been located in or near areas that receive frequent visits by humans and dogs. In Oregon, the majority of nests accessible to humans failed, presumably as a result of high disturbance levels (E. Elliot-Smith, pers. comm.).

Amelioration Affects of Protected Lands on Threats

Many of the key breeding and wintering areas for Black Oystercatchers are on lands already in protected conservation status; they are largely federal, state and provincial parks, refuges, and forests. The blanket legal protection of these lands, however, affords little protection from many of the greatest natural and anthropogenic threats facing oystercatchers.

Sites on protected lands are not immune to the effects of predation, tidal and wave flooding, recreation, and shoreline contamination. Ultimately, the conservation of this species will depend greatly on our understanding of local populations and on creative management responses to local limiting factors.

FOCAL SPECIES OBJECTIVES

Population data for this species are largely based on a wide range of non-systematic surveys conducted haphazardly and/or piggy backed on other studies. Consequently, population objectives are difficult to establish with accuracy. Until accurate population estimates can be derived, the immediate population objective is to maintain local populations at current, estimated levels throughout the range. For geographic regions in which oystercatcher numbers are suspected to have declined or are declining, limiting factors must be evaluated before the most effective local conservation measures can be initiated by partners.

ADDITIONAL RESEARCH NEEDS

Although fragmented data on the distribution and abundance is available throughout most of the species range, almost no reliable data on trends exists. Information on movements between breeding and wintering areas (e.g., Kodiak, Prince William Sound, Middleton Island, Glacier Bay National Park, Olympic Peninsula National Park in Washington, and the coasts of Oregon and California), and the locations of important wintering concentrations are lacking. Breeding and wintering site fidelity, natal philopatry, and dispersal are important areas of ecological knowledge that must be addressed range-wide. Although some information is now available on reproductive success, data on other key demographic parameters, such as adult survival, and juvenile recruitment, as well as the factors that drive them, are not available across most of this species' range. Further, the relative importance of various limiting factors and their demographic impacts on different populations throughout the range is unknown. Understanding regional and local differences in the factors responsible for regulating populations is essential for formulating appropriate and effective localized responses.

FOCAL SPECIES PRIORITY ACTIONS

In this section, we present the conservation planning priorities for the Focal Species initiative with a focus on the top ten priorities for immediate conservation actions. A summary of the priority actions is found in Table 3. Progress toward completion of these actions is dependent on suitable funding levels and workloads. A comprehensive list of conservation issues and actions currently proposed by the IBOWG, including items of lesser priority not developed here, are addressed in the Conservation Strategy, Appendix 1. It is not the authors' intent to proscribe work on the full range of conservation actions found in Appendix 1 until results from the priority actions are reported.

Given that information needs exist at both range-wide and regional scales, and that logistical considerations differ greatly between the northern and southern portions of the range, we present priorities in three geographic scales: range-wide, northern region, and southern region. The top priorities in each of the three geographic classes are equally important to the success of subsequent conservation actions, and all actions described are integrated to facilitate the conservation of the Black Oystercatcher.

A Note on Projected Costs

The cost projections for each priority action reflect only the estimated costs for actually conducting the work in question and do not include any overhead or indirect costs levied by institutions. Because indirect costs vary from 13.5% to over 50% depending on the institution, and often vary according to the source of funding, it is not possible to accurately estimate them in this document. To ensure that realistic funding is secured, the IBOWG and all partners need to be aware of these indirect costs as funds are sought to complete these action items. All cost projections reflect total project costs with the fiduciary contributions of all partners, and should be considered absolute minimums. All estimates are in U.S. dollars.

Range-wide Priority Actions

Action R1: Assess nonbreeding distribution and migratory connectivity between breeding and wintering areas.

Virtually no information exists on the locations of important wintering areas, the number of birds in those wintering areas, movements between breeding and wintering sites, inter-seasonal habitat use, and important limiting factors and threats during the nonbreeding period. These gaps in our understanding remain a significant impediment to the conservation of this species and to understanding the likely response of the intertidal community to natural or anthropogenic perturbations (e.g., climate change, oil spills). This is of particular concern because the species' preferred rocky shoreline habitat is vulnerable to contaminant spills, especially in areas of high tanker traffic (e.g., Prince William Sound, Strait of Georgia, northern Puget Sound).

We propose a range-wide investigation of inter-seasonal movements utilizing satellite transmitters, VHF radio transmitters, and/or GPS data loggers to determine migratory connectivity between breeding and wintering areas, inter-seasonal habitat use, and the locations of wintering aggregations of birds. Because of the scale of this project, it is imperative that it involves a broad collaborative partnership between the various agencies that have jurisdiction over the species and local habitats. We propose the instrumentation of between 5 and 10 Black Oystercatchers at a minimum of 10 breeding sites range-wide. These included four in Alaska, two in British Columbia, two in Washington, one in Oregon, and one in California. Target breeding sites should include different regions of Alaska, including Kodiak Island, Kenai Fjords National Park, Middleton Island, Prince William Sound (Harriman Fjord, Dutch Group, Green/Knight Islands), Glacier Bay National Park, and Stephens Passage near Juneau. In British Columbia, potential sites include Queen Charlotte Islands (Laskeek Bay, Gwai Haanas National Park) and Vancouver Island (Cleland Island, Barkley Sound). In Washington, sites might include the San Juan Islands, Bellingham Bay, Protection Island, and Destruction Island. In Oregon, sites include the area between Cape Arago and the California Border, while in California, sites include the Channel Islands National Park and Farallon Islands. Birds breeding in areas where lengthy migrations are likely will require satellite or GPS loggers, whereas birds suspected of remaining near their breeding sites during winter could be outfitted with less expensive VHF transmitters. Logistical and field operations will be handled on the ground by the local partner organization. The movement data of birds from all sites will be collected, summarized, and analyzed in concert to ensure that methodologies remain consistent and that the analyses and their interpretations are useful for all partners. Data will be integrated into the Online International Black Oystercatcher Conservation Database (See Action R2).

Cost: Cost is dependant on type of instruments utilized, number of sites targeted, and the number of birds instrumented. Costs are expected to be covered in part by cooperators. Per-site costs are anticipated to be approximately $24,000, both for sites where satellite devices will be deployed and those where VHF transmitters are monitored. The initial lower per unit cost of VHF transmitters will be cancelled out by the vessel fuel and personnel costs of manually tracking birds throughout the remainder of the year. Targeting the recommended minimums of 5 to 10 birds in 10 sites will cost approximately $250,000. Cost of data analyses, write up, and publication are likely to be $18,000.

Timeline: Within the next 5 years:
AK and BC - May-June 2007: Deployment of transmitters. Field operations should conclude by the end of June 2007. Transmitters / instruments should function for a minimum of eight months. Final analyses will be conducted after all instruments ultimately fail, and should be complete by approximately May 2008.
WA, OR and CA: Transmitter acquisition, deployment, tracking, and data analysis will be dependent on future funding.

Lead Agency: USFWS, Migratory Bird Management, Regions 1/CNO and 7

Partners: USFWS:
- Alaska Maritime National Wildlife Refuge
- Izembek National Wildlife Refuge
- Kodiak National Wildlife Refuge
- Washington Maritime National Refuge Complex
- Oregon Coast National Wildlife Refuge Complex
- Newport Field Office (Ecological Services)

U.S. Forest Service:
- Alaska Region
- Chugach National Forest
- Tongass National Forest

U.S. Geological Service
- Alaska Science Center, BRD
- Forest and Rangeland Ecology Science Center

National Park Service:
- Channel Island National Park

Glacier Bay National Park
Kenai Fjords National Park
Parks Canada:
Gwaii Haanas National Park
Pacific Rim National Park
Canadian Wildlife Service
Laskeek Bay Conservation Society
Alaska Department of Fish and Game
Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
California Department of Fish and Game

Action R2: Initiate a coordinated range-wide monitoring effort to determine population status and detect trends.

The current global population estimate is based largely on observations from haphazard surveys employing various methodologies that do not specifically target oystercatchers. To date, there has been no systematic effort to census the entire population in a standardized fashion. Given this, it is impossible to conduct a meaningful trend analysis for any region of the species' range. Although obtaining a more reliable global abundance estimate and the ability to monitor trends in population size is desirable, an intensive range-wide survey would require tremendous effort and expense. Below we present a phased approach for accomplishing this objective, which by the sheer difference in geographic extent, is different for the Northern and Southern regions.

Northern Range

Comprehensive surveys to detect trends in Alaska are particularly problematic because breeding habitat is extensive (approximately 1,500 km of shoreline along the Alaska Peninsula, 25,000 km of shoreline in Southeast Alaska) and remote. At present there is no shoreline or beach inventory of sufficient resolution to target oystercatcher breeding habitat or to stratify sampling effort. As a result, there is no way to sub-sample the coastline in a statistically sound fashion. For the immediate future, it is imminently more feasible to monitor population trends by monitoring a selected number of known, important breeding sites. The majority of these sites are readily accessible, can be monitored with a minimal amount of money and effort, and have already been intensively surveyed. Suggested areas for coordinated monitoring might include Kodiak Island, Middleton Island, Kenai Fjords National Park (Aialik and Northwestern Fjords), Prince William Sound (Harriman Fjord), and Glacier Bay National Park (Beardslee Islands) in Alaska. In British Columbia sites might include Queen Charlotte Islands (Laskeek Bay and Northern Juan Perez Sound, Gwai Haanas National Park), and Vancouver Island (Pacific Rim National Park including Clayoquot and Barkley Sounds). The survey interval and coordination of these efforts have yet to be determined among the various jurisdictions.

Monitoring only previously known breeding areas has the potential disadvantage of missing sites that may become important in the future due to changes in distribution, but will never be included in a survey (Bart et al. 2007 and references therein). To correct for this potential problem, we propose designing a survey program that surveys a stratified, random sample of sites at a pre-determined interval of years. First, a Black Oystercatcher habitat association model would be developed (see Action N3) to identify high, medium, low, and zero quality habitat for the species throughout the northern range. Second, prior data on oystercatcher distribution and variation in numbers among years and across habitats would be used in a power analysis to determine the number of random sites and survey frequency necessary to detect a designated change in population size over a number of years (e.g., 80% power to detect 50%

decline in 20 years with $\alpha = 0.15$). This information would then be used to select a random sample of sites within each strata. Given the high costs of visiting distant coastline sites (a likely outcome with a random sampling design), the number of sites that would be visited may need to be further stratified by the jurisdictional boundaries of parks, forests, and other federal lands to ensure land managers participate in the survey. The ultimate intent is that land managers pool their resources at a given survey interval (e.g., every 3-5 years) to ensure a systematic range-wide survey is conducted in a given year. Such range wide surveys, which combine federal, state and private partners, have become more common in the past decade (see e.g., Long-billed Curlew, Nations and McDonald 2006). Funds should be directed toward developing this systematic survey effort so that a reliable population estimate (and subsequent trends) for the species can be ascertained in the future.

Southern Range

Black Oystercatcher habitat in the southern portion of the range (Washington to California) is relatively accessible. Therefore, we propose to conduct standardized surveys at randomly selected sites throughout the region to assess trend. This effort will build on results achieved from Regional Priority Action S1 and draw from the same sampling framework to assess trends. Partners have completed initial planning tasks including plotting historic distribution of breeding sites throughout the southern range, developing draft land and boat-based survey protocols, and are working with statisticians to assess detectability of oystercatchers using land and boat-based survey methodologies. Repeat visits to randomly selected sites to assess trends in the population using the sampling frame developed to complete Action S1 is the second objective of the overall project in the southern range.

<u>Range Wide</u>

We propose a coordinated Black Oystercatcher monitoring strategy that integrates initial monitoring efforts at known breeding sites across the range at some preset interval, and phases into periodic rangewide, systematic stratified sampling. The monitoring effort should focus on the numbers of breeding pairs at a given site, but if budgets permit, follow-up visits to assess apparent productivity would be useful. Monitoring surveys should employ a standardized methodology. Data will be placed in the Online International Black Oystercatcher Database to determine local, regional, and range-wide trends in abundance (see Action R3). Finally, we propose distributing a list of important breeding, migration, and wintering sites to organizations wishing to nominate these areas for inclusion in the Western Hemisphere Shorebird Reserve Network or as an Important Bird Area.

Cost: Costs will be borne in part by participating cooperators, but will be largely dictated by amount of land under each agencies jurisdiction. Until the systematic random sampling design is implemented, sampling will be conducted on a per site basis.
Northern Range: Per site costs are likely to be between $5,000 and $7,500 for personnel and logistics. Subsequent visits at any particular site to assess apparent productivity would approximately double the per site cost. Cost of data analyses, write up, and publication are likely to be $20,000 for all sites combined. The cost for systematic, random sampling will depend on the location and number of sites to survey. Initial estimates, however, suggest between $75K and $125K would be needed during the year when all the surveys are conducted (costs to be shared by all partners).
Southern Range: Costs for initiating surveys to assess trends will be relatively low since costs associated with initial planning and statistical oversight will largely be covered by Action S1. Once results from Action

S1 are available, power analysis of the data will provide much more accurate assessment of the magnitude of effort required to accurately assess trends. However, we estimate that approximately $75K will be needed to visit a subset of sites throughout the southern range each year surveys are conducted.

Timeline: Within the next 10 years (2 years minimum required for completion):
1. Action S1 and N3 to be conducted. Stakeholder / IBOWG meeting to discuss final site selection, methodologies, and protocols. This will be held in conjunction with database development meetings.
2. Consultation with statistician(s).
3. Efforts to obtain funding by collaborating institutions.
4. First effort at coordinated range-wide monitoring.
5. Data reporting and inclusion in database (see Action R2).

Lead Agency: USFWS, Migratory Bird Management, Regions 1/CNO and 7

Partners: USFWS:
- Alaska Maritime National Wildlife Refuge
- Kodiak National Wildlife Refuge
- Oregon Fish and Wildlife Office – Newport Field Office
- Washington Maritime National Wildlife Refuge Complex
- Oregon Coastal National Wildlife Refuge Complex
- Newport Field Office (Ecological Services)

U.S. Forest Service:
- Alaska Region
- Chugach National Forest
- Tongass National Forest

National Park Service:
- Channel Island National Park
- Glacier Bay National Park
- Kenai Fjords National Park

USGS Forest and Rangeland Ecosystem Science Center

Parks Canada:
- Gwaii Haanas National Park
- Gulf Islands National Park
- Pacific Rim National Park

Canadian Wildlife Service
Laskeek Bay Conservation Society
Alaska Department of Fish and Game
Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
Point Reyes Bird Observatory
Pronatura Noroeste

California Department of Fish and Game

Action R3: Develop an Online International Black Oystercatcher Conservation Database

Prior to the development of this action plan, the IBOWG began to develop a rough range-wide database of 1) distribution and abundance data, 2) current research and conservation actions underway, 3) an assessment of localized threats, and 4) associated literature on the species. However, this database was never completed, nor was it formatted to facilitate sharing with more commonly used databases such as the Northern Pacific Pelagic Seabird Database, NBII, eBird, or the Avian Knowledge Network. This action item will create an online, searchable repository of Black Oystercatcher data and methodologies that will be instrumental in identifying information gaps, tracking local or regional population changes, and facilitating trans-jurisdictional collaboration. Methodologies would include detailed, standardized protocols for conducting surveys, productivity assessments, methods for capturing birds, color banding protocols, etc., to facilitate the use of common practices and to increase the comparability of data collected in the future. The database will be centrally managed, organized, and updated, as well as an index of associated literature that references where the various datasets reside and who owns them. Development of this database would necessarily be a key component to each of the priority actions listed in this section. We propose that this database be developed in a format suitable for sharing information that has recently been collected. Because there are several years of historic data on a variety of issues, at multiple scales, and divergent formats, these older data sets will not likely, at least initially, be incorporated due to the expense and difficulty of entering, integrating, and consolidating them. The institutional home of the database—where it is housed, maintained, and served from—will depend on the interests of all stakeholders in the IBOWG. Potential entities might include NatureServe and one of its associated Natural Heritage Programs (U.S) and Conservation Data Centers (Canada). The data should ultimately be shared with NBII and the Avian Knowledge Network; however, neither of these entities are likely the best choice for the primary data manager. The key to the utility of this database will be in developing a small, but continuous source of funding for maintaining and entering data as it is collected.

Cost: Initial costs of database development will be high relative to the limited ongoing costs of updating and managing the database. It is anticipated that initial development will cost $40,000 for equipment and up to six months of salary time, while subsequent management will take no more than one month a year, and should cost $7,500-$10,000 annually. Funding is expected to come from participating cooperators to a certain extent; however, overall participation will be dependant in large part on USFWS funding and leadership.

Timeline: Within the next 5 years (on-going thereafter):

1. Stakeholder / IBOWG meetings to discuss database structure, types, inclusion, data ownership, and roles. Identify what institution should create, house, maintain, and disseminate the database.
2. Consult with network specialists about online data-delivery, security, hardware and software, and internet service provider. Consult with ESRI and other GIS specialists about geographically linked online information service. Purchase equipment and software.
3. Begin developing trial database architecture and populating it with actual data.
4. Revise database architecture and continue populating database.
5. Receive data from partners and populate database.
6. Begin testing online data retrieval and use.
7. Activate database online.

Partners: NatureServe:

- Alaska Natural Heritage Program
- British Columbia Conservation Data Center
- Washington Natural Heritage Program
- Oregon Natural Heritage Program
- California Natural Heritage Program
- Environmental Systems Research Institute, Inc.

USFWS:

Migratory Bird Management, Region 7
Migratory Birds and Habitat Programs, Region 1/CNO
Alaska Maritime National Wildlife Refuge
Izembek National Wildlife Refuge
Kodiak National Wildlife Refuge
Oregon Fish and Wildlife Office – Newport Field Office
Oregon Coast National Wildlife Refuge Complex
Newport Field Office (Ecological Services)
Washington Maritime National Wildlife Refuge Complex

U.S. Forest Service:
Alaska Region
Chugach National Forest
Tongass National Forest

National Park Service:
Channel Island National Park
Glacier Bay National Park
Kenai Fjords National Park

Parks Canada:
Gwaii Haanas National Park
Pacific Rim National Park

Canadian Wildlife Service
Laskeek Bay Conservation Society
Alaska Department of Fish and Game
Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
USGS Forest and Rangeland Ecology Science Center, Oregon
California Department of Fish and Game
Point Reyes Bird Observatory
Pronatura Noroeste

Action R4: Develop a geospatial map depicting the potential overlap between human activities and the distribution and abundance of Black Oystercatchers.

This priority action item will determine areas where human-oystercatcher conflicts are likely to occur by overlaying the distribution of oystercatchers with human use. To accomplish this, we will first map existing and new information (see priority action R1, R2, N3, and S1) collected on the distribution and abundance of breeding, migrating and wintering Black

Oystercatchers throughout the species range. Second, we will identify major routes used by tour operators, cruise lines, water taxis, and other commercial vessel operators, as well as areas and routes used by kayakers, campers, backcountry tour operators, and outdoor leadership schools. Finally, these two sources of information will be overlaid using GIS technologies. This action item may need to be initially implemented at local or regional levels, especially in cases where known human-oystercatcher conflicts currently exist and immediate action to reduce disturbance is needed.

Cost: Costs will be supported by participating cooperators, but overall participation and ultimate efficacy will be dependant largely on USFWS funding and leadership. Initial efforts to consolidate existing information requires salary support of between $25,000 and $30,000, however, this will depend on economies of scale and how the programs are instituted. Continued updating of both oystercatcher distribution and abundance, and changes in human activities will be necessary, requiring annual influxes of $5,000 to update maps and feed this information into existing outreach/education programs (action item R5).

Timeline: Within the next 5 years (on-going thereafter):

1. IBOWG meeting to discuss project. Select regional lead persons/offices/agencies for the effort. This meeting will be held in conjunction with monitoring and database development meetings. Begin seeking funding for the program.
2. Collate existing detailed distribution and abundance data on oystercatcher breeding, migrating and wintering.
3. Gather information on human activities from relevant industries.
4. Overlay oystercatcher and human activity information and determine areas with high, medium and low levels of potential overlap
5. Update both oystercatcher and human activity databases as new information becomes available.
6. Provide information on oystercatcher-human overlap to land managers, and education/outreach specialists

Lead Agency: USFWS, Migratory Bird Management, Regions 1/CNO and 7

Partners: USFWS:

Alaska Maritime National Wildlife Refuge
Izembek National Wildlife Refuge

Kodiak National Wildlife Refuge
Washington Maritime National Refuge Complex
Oregon Coast National Wildlife Refuge Complex
Newport Field Office (Ecological Services)

U.S. Forest Service:
Alaska Region
Chugach National Forest
Tongass National Forest

National Park Service:
Channel Island National Park
Glacier Bay National Park
Kenai Fjords National Park

Parks Canada:
Gwaii Haanas National Park
Pacific Rim National Park

Canadian Wildlife Service
Laskeek Bay Conservation Society
Alaska Department of Fish and Game
Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
California Department of Fish and Game

Action R5: Initiate an education and outreach program to highlight the potential impacts of outdoor recreation and vessel traffic.

Increasing human presence by campers, kayakers, beach combers, pet walkers, and fishermen in coastal areas may directly impact oystercatcher productivity through inadvertent trampling of nests and eggs, or indirectly through interference with foraging, parental care, or causing nest abandonment. In Alaska, growing visitation by private boats, sightseeing vessels, water taxis, and cruise ships heightens the probability that nests will be flooded by large wakes, especially when vessel traffic coincides with periods of the highest tides. Expanding human population and recreational use also increases the probability of egg, nest, or chick loss due to exposure of unrestrained domestic pets.

We propose a program of education and outreach directed towards mitigating losses at breeding areas from major impacts. We propose to target three separate groups with tailored campaigns: 1) boat operators (including recreational boaters, tour operators, cruise lines, water taxis, and other commercial vessel operators) on how to avoid swamping oystercatcher nests with wakes during periods of the highest tides; 2) recreationists and sightseers (including kayakers, campers, backcountry tour operators, and outdoor leadership schools) on recognizing breeding territories and selecting camping sites to avoid oystercatcher territories and mitigating recreational impacts on breeding oystercatchers and other ground nesting shorebirds; and 3) pet owners in coastal areas on how to recognize breeding territories, and keeping pets leashed in breeding areas to prevent losses to eggs and chicks. Each target group will likely require a variety of materials and methods of outreach. To be successful, the approaches will have to be tailored locally. The first steps are to census partners and inventory the educational materials on these topics currently available and in use, and then to work with partners to develop an overall strategy to increase awareness of human-oystercatcher interactions throughout the range. The development of the materials and on-the-ground campaigns will require a high degree of local input from both stakeholders and partners. This is a range-wide need; however, partners may feel that approaching it regionally would work best. Ultimately, efforts will need to be made to develop site management plans in collaboration with partners and users, which could include shoreline site closures, for breeding sites that are highly susceptible to human-induced disturbance or have high densities of breeding oystercatchers. Finally, we propose implementing a monitoring program to assess the effectiveness of the management plans and education on reducing human-induced disturbance and increasing oystercatcher reproductive success. To ascertain the effectiveness of the program, information on oystercatcher productivity in disturbed and undisturbed areas will need to be collated or collected.

Costs are likely to include salary time from education and outreach personnel in a number of jurisdictions, as well as the development and publication of brochures, flyers, wallet cards, boat launch signs, or other materials.

Cost: Costs will be supported in part by participating cooperators, but overall participation and ultimate efficacy will be dependant largely on USFWS funding and leadership. Total partner investment in education salaries maybe $25,000 to $30,000 / year, with initial costs to develop training materials at $20,000; however, this will depend on economies of scale and how the programs are instituted. Annual costs thereafter anticipated to be $20K depending on number of programs on-going.

Timeline: Within the next 10 years (on-going thereafter):

1. IBOWG meeting to discuss roles and methodologies. Select regional lead persons/offices/agencies for the effort. This meeting will be held in conjunction with monitoring and database development meetings. Begin seeking funding for the program.
2. Inventory materials and efforts already underway. Begin meeting with local stakeholders.
3. Begin development of management plans, materials and campaigns.
4. Launch and run campaigns.
5. Evaluate effectiveness of outreach/education efforts by monitoring reproductive effort and productivity at select sites.

Partners: USFWS:

- Migratory Bird Management, Region 7
- Migratory Birds and Habitat Programs, Region 1/CNO
- Alaska Maritime National Wildlife Refuge
- Izembek National Wildlife Refuge
- Kodiak National Wildlife Refuge
- Oregon Coast National Wildlife Refuge Complex
- Newport Field Office (Ecological Services)

U.S. Forest Service:

- Alaska Region
- Chugach National Forest
- Tongass National Forest

National Park Service:

- Channel Island National Park

Glacier Bay National Park
Kenai Fjords National Park
Parks Canada:
Gwaii Haanas National Park
Pacific Rim National Park
Canadian Wildlife Service
Laskeek Bay Conservation Society
Alaska Department of Fish and Game
Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
California Department of Fish and Game

Northern Priority Actions

Action N1: Initiate research to assess the impacts of vessel traffic and resulting wakes on productivity.

Extremely high levels of nest loss (up to 63%) are due to inundation with seawater in Prince William Sound, Glacier Bay, and Kenai Fjords (D. Tessler, B. Brown, M. Goldstein, B. Guzzetti, J. Morse, A. Poe, C. Spiegal, unpubl. data). Because this species nests very close to the tidal limits, there is a real concern that when scheduled visits from tour boats or cruise ships coincide with high tide events, entire populations of nests within a geographic area could be destroyed on a recurring basis. We do not yet know the extent of the threat, or with what frequency it occurs; however, it may be significant enough to warrant some action on the part of management agencies (i.e., staggering vessel visitation schedules to avoid wakes at the times of highest tide events, recommending operators to run slowly at the highest annual tides in May and June, or education and outreach to operators). Periodic nest visits by researchers have not been sufficient for researchers to determine whether nest failure was a result of tidal flooding or an overwash from a boat wake. Thus, we propose to instrument nests with saltwater data loggers capable of discriminating between a short abrupt flooding (a wave or wake) from a slower, consistent inundation (tidal flooding), and monitor Black Oystercatcher hatching success, re-laying effort, and productivity. Thirty of these data loggers have already been purchased from Advanced Telemetry Solutions. They need only to be deployed at a minimum of two discrete breeding areas and the nests monitored. The ideal locations for this investigation include Kenai Fjords National Park, Glacier Bay National Park, and Harriman Fjord, Prince William Sound, because of the regular cruise ship traffic that occurs in these areas. Once this study is completed, we will incorporate these results with existing information on effects of vessel wakes on oystercatcher nest flooding and develop spatially-explicit recommendations on maximum vessel size and speed.

Cost: The initial cost of the 30 instruments was $10,000, and has already been paid by the Alaska Department of Fish and Game. The remaining costs are for crews to monitor nest fates for 1.5 months. Ultimately the cost will depend on whether two or three breeding areas are investigated. Estimated costs for personnel, logistics, food, and per diem are between $15,000 and $20,000. Cost of data analyses and write up are likely to be $7,500.

Timeline: January 2008: Meet with partners to determine roles. Seek funding to support field work.
May 2008 or May 2009: Conduct field investigation.
September–December 2008 or 2009: Data analyses and write up.

Lead Agency: Alaska Department of Fish and Game

Partners: USFWS, Migratory Bird Management, Region 7
U.S. Forest Service:
Chugach National Forest
National Park Service:
Glacier Bay National Park
Kenai Fjords National Park

Action N2: Investigate survival and other vital rates by continuing to follow the fate of banded populations.

Between 2003 and 2006, 460 Black Oystercatchers (4–6% of the global population) were banded in Alaska, including 267 adults and 193 chicks. This coordinated banding effort took place during breeding at Kenai Fjords National Park, Middleton Island, Harriman Fjord in Prince William Sound, and the Beardslee Islands in Glacier Bay National Park. In each of these areas, a coordinated productivity study was conducted between 2004 and 2007. This study provided important preliminary demographic information, but the time span did not allow estimation of critical vital rates including adult survival, life span, and age of first reproduction. These marked populations represent a tremendous opportunity to determine fundamental demographic parameters across four of the most important breeding sites in Alaska.

We propose continued annual monitoring of the marked individuals at these four sites for two more years (after which bands will have likely to have fallen off); we do not propose any additional banding efforts at this time. Efforts to relocate banded birds could be completed in approximately a week with no more than two people at each site, and could be incorporated into coordinated telemetry or monitoring efforts (see Actions R1 and R2). The cost at each breeding site would be approximately $5,000, and would include logistic support and about one week of salary time for two individuals. Data analyses would be conducted annually and at the conclusion of the effort. Data will be included in the Online International Black Oystercatcher Database (see Action R3).

Cost: Per site costs are likely to be between $5,000 for personnel and logistics. Costs will be borne in part by participating cooperators. Cost of data analyses, write up, and publication are likely to be $10,000.

Timeline: December 2007: ABOWG meeting to develop partner agreements. Begin seeking funding to support field work.
May–June 2007: Band resighting efforts.
May–June 2008: Band resighting efforts.
September 2008–December 2008: Data analyses and write up.

Lead Agencies: Alaska Department of Fish and Game
USFWS, Migratory Bird Management, Region 7

Partners: U.S. Forest Service:
Chugach National Forest
National Park Service:
Glacier Bay National Park
Kenai Fjords National Park

Action N3: Develop a breeding habitat suitability model to help target survey efforts and to improve estimates of global population.

Current population estimates are based largely on incidental surveys that are either not standardized or not specifically conducted to count oystercatchers. Given that approximately 25,000 km of shoreline in Southeast Alaska and the majority of British Columbia coastline are unsurveyed, any systematic effort to census oystercatcher populations in these vast areas would be cost prohibitive. These costs could be minimized, however, if surveys were stratified by habitat and targeted primarily at areas likely to support oystercatchers. Furthermore, accuracy of global population estimates could be improved with better estimates of how breeding density varies by habitat type. This action item would use geospatial habitat modeling to create spatially explicit estimates of the likelihood of encountering oystercatchers, which in turn could be used to target and stratify surveys, and to extrapolate population densities from randomly sampled areas to the entire survey area. This model should be constructed through a combination of inductive and deductive methods, and built using habitat data previously collected, as well as remotely collected datasets on topography, bathymetry, geology, terrestrial habitat type, oceanography, and climate. The model (or models) would be trained using a subset of occurrence data, tested, and ultimately verified in an iterative process using the remaining occurrence data. Cost for the project would include the salary and overhead of a modeler for development and statistical analyses, as well as any costs for acquiring spatial data. Costs are estimated at $35,000, but will vary with data acquisition costs. Initial modeling efforts can begin immediately with limited financial investment using spatially explicit data sets already available from Glacier Bay National Park and the National Oceanic and Atmospheric Association.

Cost: Estimated at $35,000. Writing and publishing may cost an additional $7,500.

Timeline: Within next three years
1. Initiate ABOWG meeting to discuss roles and develop partner agreements. Begin seeking funding.
2. Initiate contract with modeler and determine appropriate datasets of Black Oystercatcher occurrence and habitat to be used in model
3. Test model statistically and on the ground.
4. Use model to geospatially determine high, medium and low quality Black Oystercatcher habitat.
5. Incorporate model results in to R2 Action Item.

Lead Agencies: U.S. Forest Service, Alaska Region
USFWS, Migratory Bird Management, Region 7
University of Alaska Fairbanks

Partners: USFWS, Kodiak National Wildlife Refuge
NatureServe: Alaska Natural Heritage Program
Environmental Systems Research Institute, Inc.
National Park Service:
Glacier Bay National Park
Kenai Fjords National Park
U.S. Forest Service:
Chugach National Forest
Tongass National Forest

Canadian Wildlife Service
Alaska Department of Fish and Game

Southern Priority Actions

Action S1: Estimate population size of Black Oystercatchers breeding in the southern portion of the range.

A comprehensive, standardized survey to estimate the population size is particularly important in the southern portion of the range where oystercatchers are more widely, but sparsely distributed, and population estimates are based on seabird surveys conducted mainly in the 80's. These surveys were typically conducted later in the breeding season when oystercatchers are less vocal and visible. More importantly, seabird colony surveys focus primarily on large colonies, while oystercatchers occur on widely distributed islets and rocky intertidal areas that are not used by seabirds. This action will establish a strong foundation from which to initiate specific conservation actions and assess changes in trend over time (see Action R2). Progress has been made in initiating this action, including the development of a georeferenced database of historic breeding locations from northern Washington to southern California, boat- and land-based survey protocols, and an assessment of detectability using both protocols in 2006. Given appropriate funding levels, state and agency partners plan to implement the southern range survey during the spring of 2008. Data analyses would be conducted at the conclusion of the effort, and data will be stored in the Online International Black Oystercatcher Database (see Action R3).

Cost: Total cost for the effort will be approximately $150,000, with an additional cost for data analyses, write up, and publication of approximately $15,000. Costs will be borne in part by participating cooperators, however, overall participation and ultimate efficacy will be dependant largely on USFWS funding and leadership.

Timeline: FY2005: Developed a geospatial database of historic distribution
FY2006: Conducted detectability studies for boat-and land-based survey methodologies for Black Oystercatchers
July 2007: Initial development of study design and selection of sites to survey, refinement of protocols. Begin seeking funding to support field work.
September 2007: Meeting with project partners to begin survey planning.
May–June 2008: Breeding season survey.
September–December 2008: Analyses of data and write-up.

Lead Agency: USFWS, Migratory Birds and Habitat Programs, Region 1/CNO

Partners: USFWS:
- Oregon Fish and Wildlife Office – Newport Field Office
- Washington Maritime National Wildlife Refuge Complex
- Oregon Coastal National Wildlife Refuge Complex

National Park Service:
- Channel Island National Park

USGS Forest and Rangeland Ecology Science Center
Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
Oregon Parks and Recreation Department
California Department of Fish and Game
Point Reyes Bird Observatory
Pronatura Noroeste

Action S2: Assess factors affecting survival and reproductive success of the species and determine relative importance of each.

As a long-lived species that is not believed to disperse great distances, long-term declines in reproductive success or recruitment could lead to local extirpations. While surveys represent one very important tool for assessing the conservation status of this species, monitoring reproductive success is also essential, as declines may not be immediately apparent if adult survival is high. An assessment of the relative importance of these demographic parameters in the southern half of the range is integral to maintaining the viability of the species and extent of its geographic range. This assessment will allow a more comprehensive understanding of the species' ecology and will help evaluate whether increased management (predator control, recreation regulations, etc.) are necessary. Given the variety of issues this species faces and its fidelity to breeding locations, localized, regional information is critical to complete a full assessment of the species' status and provide for its conservation.

Although intensive productivity investigations are just concluding in Alaska, productivity is not well studied in the southern portion of this species range. Until 2006, the only productivity information came from a small study conducted in the inner marine waters of Washington in the late 1970s. In 2006, Oregon conducted a statewide productivity study and monitored a total of 50 nests and broods on nearshore islands and mainland sites.

We propose to continue the productivity study in Oregon and to initiate productivity studies elsewhere (likely, the San Juan Islands, Washington, Channel Islands National Park or Farallon Islands, California) in the southern portion of the range. Productivity monitoring will include an assessment of nesting and fledging success through weekly visits. We will use protocols already developed for assessing productivity in Alaska and Oregon. Productivity estimates obtained from this study will be compared to those from the northern portion of the species' range, and if they are found to be lower on average, then we will use cameras (which have successfully been used in Alaska) or other means to identify the threats to reproductive success.

In addition to productivity monitoring, we would like to initiate a banding project in the southern portion of the species' range to assess annual survival, inter-annual site fidelity, recruitment, and natal philopatry. This would involve color-banding chicks and adults and would be carried out in conjunction with productivity monitoring. Since many nest sites in the southern portion of the range are on narrow ledges found on otherwise sheer faces of tall off-shore haystacks, banding will likely be challenging or impossible at many sites. However, banding would greatly improve our understanding of demographic parameters, and should be attempted wherever feasible. Resighting of individual birds would be accomplished through targeted monitoring efforts and periodic surveys. These resighting efforts would most likely be conducted by volunteers, especially within nearshore areas.

Costs will depend on the number of breeding sites selected and the number of years of monitoring conducted at each site. Approximate costs to meet the minimum recommendation of monitoring two sites would be $20,000–$30,000 per year per site. We anticipate that studies will need to last a minimum of two but preferably four years to obtain necessary demographic data. These per site / per year cost estimates include salary for two technicians for three months, equipment, and logistical support to live in the field during the research period. Ultimate costs will depend on the level and number of technicians hired, and the level of partner participation. Actual costs for monitoring productivity along the road system in Oregon are likely to be somewhat lower. Data will be analyzed upon completion and will be added to the Online International Black Oystercatcher Database to facilitate comparison with northern sites (see Action R3).

Cost: Total cost for the effort will be approximately $180,000 (over 3 years), with an additional cost for data analyses, write up, and publication of approximately $10,000. Costs will be supported in part by participating cooperators; however, overall participation and ultimate efficacy will be dependant largely on USGS and USFWS funding and leadership.

Timeline: Within the next 10 years (3 year minimum timeline required for completion):
FY2006: Initiated reproductive surveys along the central Oregon coast.
1. Meeting of project partners to discuss roles and methodologies, and to select regional lead persons/offices/agencies for the effort. Begin seeking funding for the program.
2. First year of productivity and banding at two sites minimum. The start date will depend on availability of funding.
3. Second year of productivity and banding at two sites minimum.
4. Third year of productivity and banding at two sites minimum.
5. Data analyses and write up.

Partners: USGS Forest and Rangeland Ecology Science Center
USFWS:
- Migratory Birds and Habitat Programs, Region 1/CNO
- Oregon Fish and Wildlife Office – Newport Field Office
- Washington Maritime National Wildlife Refuge Complex
- Oregon Coastal National Wildlife Refuge Complex

National Park Service:
- Channel Island National Park

Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
California Department of Fish and Game
Point Reyes Bird Observatory

EVALUATING ACCOMPLISHMENTS

Because the conservation and management of any species is an iterative process, we consider this plan to be a "living" document. To be of value, it is critical that this plan be revised following periodic consultation and review by collaborators. Specifically, progress in completing each identified conservation action item must be monitored, along with the effectiveness of the action items in achieving their prescribed goals. The planning horizon for this plan is ten years, and the authors recommend that it be revisited and revised with the development of a work plan at the beginning of each Federal Fiscal year (October 1). Work plans will outline progress toward completing Priority Action Items including a timeline for the work to be completed, responsibilities of each partner involved in the project and an estimated budget.

Because this plan is range-wide in scale and comprehensive in scope, its effectiveness depends on the collaboration of multiple federal and state agencies and NGOs in the United States, Canada, and Mexico. Success, measured in terms of completing the priority action items, will depend in large part on the USFWS working closely with the IBOWG to foster cooperation between the partners in developing roles, setting responsibilities, obtaining adequate funding, and ultimately implementing and completing action items. The principal performance indicators will be achieving the stepwise goals set forth in the timeline of each priority action item. Each partner has its own internal reporting mechanisms and the Chair of the IBOWG will request updates from partners on progress and new needs to facilitate reporting on range wide efforts. Responsibility for achieving the goals in this cooperative plan must be shared among all partners.

The ultimate efficacy of the plan will depend largely on USFWS using its leadership and funding resources to leverage partner participation.

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Figure 1. Distribution of the Black Oystercatcher. Map provided by Andres and Falxa (1995) and Birds of North America.

Table 1. Rangewide population estimates (number of individuals) for Black Oystercatchers (from Andres and Falxa 1995 and references therein).

Location	Population Estimate	Source
Southwestern Alaska / Aleutian Islands	2,000-3,000	Andres and Falxa 1995
Southcentral Alaska	1,500-2,000	Andres and Falxa 1995
Southeastern Alaska	1,000-2,000	Andres and Falxa 1995
British Columbia	1,000-2,000	Jehl 1985, Campbell et al. 1990
Washington	250-350	Nysewander 1977, Speich and Wahl 1989
Oregon	350	NOAA and USFWS 1991
California	700-1,000	Sowls et al. 1980
Baja California	100	Jehl 1985
Total	6,900-10,800	

Table 2. Important sites for Black Oystercatchers with abundances by region and season.

B = breeding, W = winter, M = migration

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
AK	Statewide	N/A	4106	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Western Aleutians	All (or most of) Western Aleutians	637	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Western Aleutians	Amchitka Island, Aleutian Islands	300	1977	B	White et al. 1977
AK	Western Aleutians	Amchitka Island, Aleutian Islands	37	1979	W	Christmas Bird Count
AK	Western Aleutians	Rat Islands (Amchitka, Kiska, Little Kiska and Rat islands)	384-389	2003-2005	B	V. Gill, unpubl. data
AK	Western Aleutians	Adak Island, Aleutian Islands	43	1991	W	Christmas Bird Count
AK	Eastern Aleutians	All (or most of) Eastern Aleutians	562	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Eastern Aleutians	79 Islands between Unimak and Samalga passes	998	1980-1981	B	Nysewander et al. 1982
AK	Eastern Aleutians	Vsevidof Island, Aleutian Islands (from 79 islands)	77	1980-1981	B	Nysewander et al. 1982
AK	Eastern Aleutians	Baby Islands, Aleutian Islands (from 79 islands)	88	1980-1981	B	Nysewander et al. 1982
AK	Eastern Aleutians	Aiktak Island, Aleutian Islands	160 (30 breeding)	2006	B	Helm and Zeman 2006

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
AK	Eastern Aleutians	Unalaska Island, Aleutian Islands	89	2005	W	Christmas Bird Count
AK	Alaska Peninsula	Western Tip of AK Peninsula; Morzhovoi Bay to Pavlov Bay	50 (40 on Amagat I.)	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Western Tip of AK Peninsula; Morzhovoi Bay to Pavlov Bay	121	2005	W	D. Tessler, unpubl. data
AK	Alaska Peninsula	Shumagin Islands	148	1995	B	Byrd, Bailey, and Stahl 1997
AK	Alaska Peninsula	Shumagin Islands	43	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Semidi Islands	82	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	All Eastern Peninsula (east of Pavlov Bay, excluding Shumagin and Semidi islands.)	846	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Wide Bay Islands (from Eastern Peninsula)	90	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Cherni Group (from Eastern Peninsula)	70	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Ugaiushak Island (from Eastern Peninsula)	52	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Ninagiak Island (from Eastern Peninsula)	51	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Douglas Reef (from Eastern Peninsula)	50	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Alaska Peninsula	Chankliut Island (from Eastern Peninsula)	30	1973-2003	B	NPPSD, Drew and Piatt 2005

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
AK	Alaska Peninsula	Let Island (from Eastern Peninsula)	30	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Kodiak Archipelago	Afognak and Shuyak islands	326	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Kodiak Archipelago	Northwestern Afognak Island	250-300	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	All Kodiak Island	563	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Kodiak Archipelago	All Kodiak Island (excluding Chiniak Bay)	~ 1350-1750	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Chiniak Bay, Kodiak Island	~ 100-150	1976	B	Dick 1977
AK	Kodiak Archipelago	Uganik/Viekoda Bay, Kodiak Island	200-250	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Uyak Bay, Kodiak Island	250-300	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Village Island, Kodiak Island	80-90	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Alf Island group, Kodiak Island	80-90	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Noisy Islands, Kodiak Island	60-70	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Chief Cove, Bird Rock, Kodiak Island	80-90	~ 1994-2005	B	D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	All Kodiak Island	1716	2005	W	D. Tessler and D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Chiniak Bay, Kodiak Island	1155	2005	W	D. Tessler and D. Zwiefelhofer, unpubl. data

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
AK	Kodiak Archipelago	Uyak Bay, Kodiak Island	240	2005	W	D. Tessler and D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Uganik Bay, Kodiak Island	240	2005	W	D. Tessler and D. Zwiefelhofer, unpubl. data
AK	Kodiak Archipelago	Sitkalidak St., Kodiak Island	75	2005	W	D. Tessler and D. Zwiefelhofer, unpubl. data
AK	Gulf of Alaska	Middleton Island	703-750	2006	B	B. Guzzetti, unpubl. data Gill et al. 2004
AK	Gulf of Alaska	Middleton Island	0	2005	W	D. Tessler, unpubl. data
AK	South-central	Cook Inlet	143	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	South-central	Barren Islands	83	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	South-central	Aialik Fjord, Kenai Fjords	44	2004	B	Morse 2005
AK	South-central	Northwestern Fjord, Kenai Fjords	30	2004	B	Morse 2005
AK	South-central	Eastern Prince William Sound	378	1999-2005	B	A. Poe, unpubl. data
AK	South-central	Western Prince William Sound	188	1999-2005	B	P. Meyers, unpubl. data
AK	South-central	Eastern Prince William Sound	157	1991	W	Andres 1994b
AK	Southeastern	Glacier Bay	395	2000	B	Bodkin et al. 2001
AK	Southeastern	Glacier Bay	128	2003	B	Arimitsu et al. 2004

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
AK	Southeastern	Glacier Bay	229	2004	B	Arimitsu et al. 2005
AK	Southeastern	Glacier Bay	270	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Southeastern	Beardslee Islands, Glacier Bay	126	1987	B	Lentfer and Maier 1995
AK	Southeastern	Beardslee Islands, Glacier Bay	116	2005	B	Tessler and Garding 2006
AK	Southeastern	Glacier Bay	98	2000	W	Bodkin et al. 2001
AK	Southeastern	Glacier Bay	74	2001	W	Robards et al. 2003
AK	Southeastern	Glacier Bay	25	2002	W	Robards et al. 2003
AK	Southeastern	Geikie Inlet, Glacier Bay	600	1992	M	van Vliet 2005
AK	Southeastern	Geikie Inlet, Glacier Bay	124	~ 1965	M	Wik and Streveler 1967
AK	Southeastern	Sitka Sound	102	1940	B	Webster (1941)
AK	Southeastern	Sitka Sound	4	1994	B	J.D. Webster, pers. comm.
AK	Southeastern	Sitka Sound	23	2006	B	D. Tessler, unpubl. data
AK	Southeastern	Sitka Sound	38	1973-2003	B	NPPSD, Drew and Piatt 2005
AK	Southeastern	Myriad Islands	26	2006	B	D. Tessler, unpubl. data

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
AK	Southeastern	Baranof Island	53	2006	B	D. Tessler, unpubl. data
AK	Southeastern	Forrester Island Group	44	2006	B	D. Tessler, unpubl. data
AK	Southeastern	Forrester Island Group	37	1973-2003	B	NPPSD, Drew and Piatt 2005
BC	Province-wide	N/A	2022	1991	B	Rodway 1991
BC	Queen Charlotte IS.	Frederick Island	40	1986	B	Rodway 1991
BC	Queen Charlotte IS.	Tian Bay	62 48 26	1977 1984 1986	B	Rodway et al. 1994
BC	Queen Charlotte IS.	Englefield Bay Anthony Island	18 38	1986	B	Rodway et al. 1990
BC	Queen Charlotte IS.	Masset Inlet	41	2006	B	A.J. Gaston, pers. comm.
BC	Queen Charlotte IS.	Skidegate Inlet	88	1990	B	Vermeer et al. 1992
BC	Queen Charlotte IS.	Skidegate Inlet	248	2006	W	Christmas Bird Count
BC	Queen Charlotte IS.	Northern Laskeek Bay	70	2006	B	A.J. Gaston, pers. comm.
BC	Queen Charlotte IS.	Southern Laskeek Bay and Northern Juan Perez Sound	120	2006	B	A.J. Gaston, pers. comm.
BC	Queen Charlotte IS.	Southern Laskeek Bay and Northern Juan Perez Sound	60	1987	B	Rodway et al. 1988
BC	Queen Charlotte IS.	Smith Sound Islets Duke of Edinburgh Ecol. Res.	40 46	1991	B	Rodway and Lemon 1991a

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
BC	Queen Charlotte IS.	Moore and Byers Islands Goose Island Group	158 34	1988	B	Rodway and Lemon 1991b
BC	Vancouver Island	Scott Island Group to Barkley Sound	~ 350	1989-1990	B	Vermeer et al. 1992a
BC	Vancouver Island	Scott Island Group	58	1989	B	Rodway et al. 1992
BC	Vancouver Island	Quatsino Sound Brooks Bay Kyoquot Sound Checleset Bay	26 18 250 46	1988	B	Rodway and Lemon 1990
BC	Vancouver Island	Clayoquot Sound and Barkley Sound	220	1989	B	Vermeer et al. 1991
BC	Vancouver Island	Clayoquot Sound and Barkley Sound	~ 300	2000–2005	B	P. Clarkson, pers. comm.
BC	Vancouver Island	Cleland Island (within Clayoquot Sound)	90	2000–2005	B	Clarkson et al. 2005
BC	Vancouver Island	Near Parksville	28	~ 1985	B	Campbell et al. 1990
BC	Vancouver Island	Victoria	84	2005	W	Christmas Bird Count
BC	Vancouver Island	Deep Bay	81	2005	W	Christmas Bird Count
BC	Strait of Georgia	51 islands in the Strait	134	1987	B	Vermeer et al. 1989
BC	Strait of Georgia	Islands similar to Vermeer (above)	122	2006	B	R. Butler, pers. comm.
BC	Strait of Georgia	Sidney Channel	40	1997	B	Butler 1997

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
WA	Inner Marine Waters	San Juan Islands	~328	2006	B	D. Nysewander, unpubl. data
WA	Inner Marine Waters	Protection Island	14 (down from 43 historically)	1980-2006	B	P. Sanguinetti, pers. comm.
WA	Outer Coast	Cape Flattery to Pt. Grenville	~295	1908-1982	B	Speich and Wahl, 1989
WA	Outer Coast	Destruction Island	24	1975	B	Nysewander 1977
OR	Statewide	N/A	350	1988	B	R. Lowe, pers. comm.
OR	North Coast	Tillamook Head to Heceta Head	97	2005	B	E. Elliott-Smith, L. Kelly, pers. comm.
OR	South Coast	Cape Arago to CA border	226	2005	B	E. Elliott-Smith, L. Kelly, pers. comm.
CA	Statewide	N/A	888	1989-1991	B	Carter, et.al., 1992
CA	North	Humboldt and Del Norte counties	128	1989-1991	B	Carter, et.al., 1992
CA	North-central	Sonoma County	129	1989-1991	B	Carter, et.al., 1992
CA	North-central	Mendocino County	105	1989-1991	B	Carter, et.al., 1992
CA	Southern	Vandenberg Air Force Base (Santa Barbara County)	26	2005	B	D. Robinette, pers. comm.
CA	Offshore Islands	Channel Islands (Santa Barbara County)	267	1989-1991	B	Carter, et.al., 1992
CA	Offshore Islands	Ano Nuevo Island (San Mateo County)	20	2005	B	J. Thayer, pers. comm.

State / Province	Region	Site	Count or Estimate (individual birds)	Year(s)	Season	Source
CA	Offshore Islands	Southeast Farallon Island (San Francisco County)	36	2005	B	A. Brown, pers. comm.

Table 3. Summary of high priority action items, estimated timelines, estimated costs, cooperating partners, and anticipated results.

Action	Estimated Timeline *	Estimated Costs	Lean (in bold) and Cooperating Partners	Anticipated Results
R1. Assess nonbreeding distribution and migratory connectivity between breeding and wintering areas	2007–2008 for Northern Region, To be determined as funding becomes available for Southern Region	$24K per site $18K write-up Total = $268K	**USFWS Regions 1 and 7**; State departments of Fish and Game; USFS; USGS; CWS; Parks Canada, others	Increased knowledge of important migration routes and nonbreeding areas. Ability to target important sites for conservation actions.
R2. Initiate a coordinated range-wide monitoring effort to determine population status and detect trends	Next 10 years	$75 - $125K for Northern Region, $75K for Southern Region	**USFWS, Regions 1 and 7**; State departments of Fish and Game; USFS; USGS; CWS; Parks Canada, others	Increased knowledge of population size and trends for management. Statistically reliable and standardized protocols.
R3. Develop an online international black oystercatcher conservation database	Next 5 years	$40K Start-up $7.5K to 10K annual upkeep	State departments of Fish and Game, USFWS, Regions 1 and 7; USFS; USGS; CWS; Parks Canada, others	Improved data management, ability to conduct meta-analyses, and communication among partners.
R4. Develop a geospatial map depicting the potential overlap between human activities and the distribution and abundance of Black Oystercatchers	Next 5 years (on-going thereafter)	$25K - $30K Start-up $5K annual upkeep	**USFWS Regions 1 and 7**; State departments of Fish and Game; USFS; USGS; CWS; Parks Canada, others	Determine overlap between human activities and oystercatchers; assist in development of management plans and outreach/education

Action	Estimated Timeline *	Estimated Costs	Lean (in bold) and Cooperating Partners	Anticipated Results
R5. Initiate an education and outreach program to highlight the potential impacts of outdoor recreation and vessel traffic	Next 10 years (on-going thereafter)	$45K to $50K start-up $20K annual upkeep	State departments of Fish and Game, USFWS, USFS, USGS, Canadian Wildlife Service, and Parks Canada	Increased public and commercial business awareness of potential limiting factors and conservation concerns. Involvement of government agencies and communities in the proactive management of important sites.
N1. Initiate research to assess the impacts of vessel traffic and resulting wakes on productivity	2008–2009	$32.5 – $37.5K	**ADFG**, USFS, NPS	Determine frequency and magnitude of flooding events. Increased knowledge of productivity and life-history information.
N2. Investigate survival and other vital rates by continuing to follow the fate of banded populations	2007–2008	$25K	**ADFG**; NPS; USFS; USFWS, Region 7; CWS	Increased knowledge of how northern populations are regulated. Knowledge of where and when conservation actions will be most effective.
N3. Develop a breeding habitat suitability model to help target survey efforts and to improve estimates of global population	Next 3 years	$35K	**USFS;** USFWS, Region 7; ADFG; NPS; UAF; CWS, others	Ability to predict abundance and distribution and extrapolate across remote areas. Increased knowledge of important remote-sensed habitat parameters. Improved population estimates.
S1. Estimate population size of black oystercatchers breeding in the southern portion of the range	2005-2008	$165K	**USFWS, Region 1**; NPS; USGS; State departments of Fish and Game	Increased knowledge of abundance, distribution, and habitat associations.

Action	Estimated Timeline *	Estimated Costs	Lean (in bold) and Cooperating Partners	Anticipated Results
S2. Assess factors affecting survival and reproductive success and determine relative importance of each	Next 10 years	$190K	USGS; USFWS, Region 1; PRBO;NPS; State departments of Fish and Game	Increased knowledge of how southern populations are regulated. Knowledge of where and when conservation actions will be most effective.

* This timeline is an estimate based on suitable funding levels and workloads. Progress toward completion of these goals will be posted annually.

APPENDIX 1. CONSERVATION STRATEGY

The principal conservation and management objective is to ensure that Black Oystercatcher populations remain stable at current population levels across the entire range. To accomplish this goal, we must: 1) develop a reliable baseline of local population sizes against which to detect changes; 2) determine vital demographic rates and how they vary throughout the range; and 3) recognize the threats facing the species at various spatial scales and how they affect each of the various demographic parameters, especially adult survival and reproductive success. This appendix includes an exhaustive review of existing and potential threats to the Black Oystercatcher, as well as the specific research, management, and policy actions necessary to address each. Because our understanding of the ecology of the species is currently limited, the recommended actions for many threats are similar; they involve developing our understanding of the distribution, abundance, and connectivity of the population, and investigating and comparing vital rates to correctly interpret the consequences and magnitude of any particular threat.

Limiting Factors and Conservation Actions

This assessment of threats and conservation actions follows the nomenclature of the *Unified Classifications of Direct Threats and Conservation Actions* created by the World Conservation Union (IUCN) and the Conservation Measures Partnership (see http://www.iucn.org/themes/ssc/sis/classification.htm). The following actions have been proposed by members of the IBOWG and have been reviewed for completeness by the Group and other stakeholder agencies and organizations; however, they have not been prioritized or expanded in this appendix. The highest priority actions are presented in the main body of this document under the heading “Focal Species Priority Actions.” These priority actions are slated to be addressed over the next five years (2007–2012), and for each action, a lead organization and/or partners have been identified, the geographic scale of the action is defined, and a rough timetable is outlined. For the non-prioritized, general actions included below, detailed project plans have yet to be developed. We consider this document to be iterative and expect to revise it once results from the priority action projects are available and a more comprehensive assessment of the species’ status, limiting factors, and likely conservation actions are available.

1. Residential and Commercial Development

Although some shoreline development has likely displaced a small but unknown number of breeding pairs in the southern portion of the range, large-scale development and direct alteration of oystercatcher habitat is unlikely over most of the species range. Consequently, no actions are currently identified.

2. Agriculture and Aquaculture

To date, there is no evidence that agriculture or aquaculture have had any impact on oystercatchers. The most likely effects from these industries would be potential changes in intertidal species composition and prey availability resulting from agricultural runoff or nitrogen pollution from fish or shellfish farms (see “Pollution” section, below). Consequently, no actions are currently identified.

3. Energy Production and Mining

Drilling for oil and gas, and developing mineral mines and quarries has not had direct, negative effects on Black Oystercatchers. However, oil-refining facilities along the Strait of Georgia, British Columbia and in the Northern Puget Sound area represent potential point sources for petroleum spills. The development of renewable energy sources is not thought to represent any threat: Because oystercatchers fly near the water surface in their daily movements and migrations, wind farms located in coastal areas are likely to pose few hazards. Consequently, no actions are currently identified.

4. Transportation and Service Corridors

Building of roads, utility lines, and railroads have not had direct, negative effects on Black Oystercatchers. Flight paths for air and space transport are not considered threats. However, marine transport of commodities and oil through areas inhabited by oystercatchers is a continual risk to breeding and nonbreeding birds.

Chemicals and toxins present potential threats to oystercatchers, particularly at high-density breeding, wintering, and migration stopover sites. Water-borne pollutants can directly kill eggs, chicks, and adults and indirectly affect oystercatchers through contamination of shoreline habitats and their food resources. Black Oystercatchers' reliance on marine shorelines increases their vulnerability to acute and chronic exposure to oil and other chemicals released into marine waters. For more information, see "Petroleum Contamination of Shorelines" section, page 43-45.

<u>Research Actions</u>

- Assess abundance and distribution of breeding, migrating, and wintering oystercatchers along major shipping lanes throughout the range of the species. Much of the distribution and abundance data will be collected by carrying out priority actions R1, R2, N3 and S1. This is an essential first step in providing a baseline against which to assess likely damages should a spill or other event occur.
- Determine where ocean currents or wind will likely carry pollutants should a spill occur.
- Identify migratory connectivity between breeding and wintering sites to evaluate the real population wide impact of a local event.
- Determine effects of marine discharges of non-oil chemicals into Black Oystercatcher foraging sites.

<u>Policy Actions</u>

- At oystercatcher aggregation sites (see Table 2, and new sites identified during implementation of priority action items), ensure oil or chemical spill response plans have been developed and important oystercatcher sites are adequately addressed.
- Work with seabird biologists along major shipping lanes, ensure “rat spill” response plans have been developed in areas important to oystercatchers and other ground nesting birds, and that the necessary equipment is forward deployed to insure rapid response.
- Support the deployment of a rescue tug at Neah Bay, Washington (located at the entrance to the Strait of Juan de Fuca) through the fall and winter months with funding if necessary. With the nearest response tug 5–6 hours east of the mouth, this tug significantly reduces the

chance of a tanker running aground in the Strait during often turbulent winter weather. Funding for the tug is never certain from year-to-year. This action has the potential to benefit numerous threatened or endangered species, marine mammals, and other Migratory Bird Focal Species (including waterbirds, seaducks, and the Black Oystercatcher).

- Encourage support of legislative or policy actions that enhance oil spill prevention methods.

5. Biological Resource Use

Neither the gathering of terrestrial plants (non-timber plants) nor fishing / harvesting of aquatic resources are currently known to be detrimental to Black Oystercatchers. However, there may be adverse effects if shellfish is harvested extensively in key oystercatcher breeding or wintering areas.

Black Oystercatchers are particularly vulnerable to local extirpation through persistent subsistence harvest of either breeding adults or eggs in some areas due to their strong fidelity to breeding territories, easy accessibility, conspicuous behavior, and limited reproductive potential. Although a small number (n = 44) of Black Oystercatchers have been harvested for subsistence purposes in Alaska (see Alaska Migratory Bird Co-Management Council database at http://alaska.fws.gov/ambcc/Index.htm), this information is out of date, poorly collected in many cases, and is incomplete for many locations in Alaska.

Although logging itself does not pose a threat to oystercatchers, errant logs from marine transport systems and other solid waste may reduce the availability of supratidal nest sites, or could conceivably impact local productivity through destruction of nests. This may be particular problematic in Southeast Alaska and British Columbia where commercial logging is prevalent.

In Sitka Sound, Alaska, a dramatic decrease in breeding pairs was noted between the 1940s and 1990s, which might be attributed to nest site lost (J. Webster, pers. comm.).

Research Actions

- Update current subsistence harvest surveys and expand survey coverage to determine the spatially-explicit harvest of Black Oystercatcher eggs and adults throughout Alaska. Assess if local oystercatcher population can sustain harvest level.
- Determine if errant logs have reduced the availability of nest sites in Sitka Sound, Alaska, and were the likely cause of the dramatic decrease of oystercatchers observed there.

Policy Action

- If warranted by subsistence harvest assessment results, develop and submit to the Alaska Migratory Bird Co-Management Council recommendations to discourage consumption of oystercatchers for subsistence and remove Black Oystercatchers from allowable birds to be harvested.

Compliance Action

- Develop a monitoring plan for subsistence harvest assessment.

6. Human Intrusions and Disturbance

Fortunately, Black Oystercatchers face no current danger from wars, civil unrest, or military exercises. The wakes from large vessels, as well as recreational activities, including motorized and non-motorized activities, can have negative impacts on Black Oystercatchers;

these issues have been thoroughly addressed in the section "Flooding and Recreational Disturbance at Nest Sites ", as well as Priority Actions R4 and R5, and N1.

7. Natural System Modifications

Currently no direct or indirect threats to Black Oystercatchers are believed to stem from fire and fire suppression, dams and water management, or other similar ecosystem modifications. Consequently, no actions are currently identified.

8. Invasive and Other Problematic Species and Genes

Predation by introduced mammals and feral pets has had significant, negative effects on Black Oystercatcher reproduction throughout their range. Introduction of foxes caused local extirpations of breeding Black Oystercatchers from islands along the Alaska coast. Later eradication of foxes on several of these islands resulted in re-colonization by oystecatchers (Byrd 1988, Byrd et al. 1997). Inadvertent "rat spills" can have tremendous impacts on ground nesting birds, and could result in the complete extirpation of local populations.

Farther south, feral cats and domestic pets (i.e., dogs) have had deleterious effects on breeding oystercatchers (Ainley and Lewis 1974, Warheit et al. 1984). Increased populations of natural predators such as raccoons (*Procyon lotor*), Common Ravens (*Corvus corax*), and Bald Eagles (*Haliaeetus leucocephalus*) may reduce oystercatcher reproductive success and long-term population persistence (B. Andres and G. Falxa 1995, D. Nysewander, pers. comm.). For more information, see "Limiting Actions and Factors" section, and Priority Action S2.

Species Restoration Action

- Identify sites where exotic predator removal will positively affect Black Oystercatcher occupancy and reproduction. Develop strategies to implement removal/control methods.

Outreach and Education Actions

- Inventory current educational materials and develop a strategy to increase awareness of the effects that free-ranging pets may have on oystercatchers.
- Mitigate the effects of unleashed pets on breeding oystercatchers by collaborating with seabird partners to develop educational materials for pet owners in areas where urban expansion coincides with oystercatcher presence.

Policy Action

- Work with seabird biologists and land resource management agencies along major shipping lanes, to ensure "rat spill" response plans have been developed in areas important to oystercatchers and other ground nesting birds, and that the necessary equipment is forward deployed to ensure rapid response.

9. Pollution

Household sewage and urban wastewater have not posed problems for oystercatchers to date, but as human populations continue to increase from Vancouver Island southward, future effects cannot be discounted. Industrial or military effluents are not currently perceived to be major threats to oystercatchers or their habitat. Garbage and solid waste are only likely to impact oystercatchers as flotsam and jetsam accumulating on shore, and the effects are envisioned to be much the same as errant logs and silvicultural waste (i.e., reducing the availability of nest sites or the physical destruction of nests). Airborne pollutants and inputs of excess energy (heat, sound, or light) are not currently identified as threats to Black Oystercatchers. Based on the current lack of pollution related threats to oystercatchers, no actions have been identified.

10. Geologic Events

Because much of the global population occurs along the eastern edge of "the Ring of Fire," volcanic eruptions will continue to be threats, albeit relatively rare, to local populations from the Aleutian Archipelago south into Washington. Volcanic events occurring during the winter, near areas where oystercatchers concentrate in large numbers, could conceivably destroy a significant proportion of the population. Earthquakes and tsunamis are a more consistent and widespread threat, especially during the breeding season. Because nests are located so close to the high tide line, even relatively small tsunamis could result in the flooding of every nest along the coast of the effected area. Just as the tectonic uplift of the 1964 Alaskan earthquake created new oystercatcher nesting and foraging habitat on Middleton Island (Gill et al. 2004), tectonic subsidence is capable of reducing the amount of available nesting and foraging habitat in key areas of the species' range. Avalanches and landslides can create limited amounts of new supratidal nesting habitat, but the effects of such small scale changes are likely to be inconsequential for the species. Because there are no management actions that can be taken to mitigate such large-scale events as earthquakes and tsunamis, the only real action is to understand the distribution, abundance, and connectivity of the population to correctly interpret the consequences and magnitude of a particular event.

Research Action

- Conduct priority action items R1, R2, N3, and S1 to assess breeding, migration, and wintering abundance and distribution of oystercatchers. This is an essential first step to provide a baseline used to assess how many birds are likely to be affected should a geological event occur.

11. Climate Change and Severe Weather

The effect of a warming climate on the overall availability of oystercatcher breeding habitat is unknown. On one hand glacial retreat may increase habitat, although studies need to be conducted to determine if the local conditions (e.g., substrate and food) are appropriate in the newly created areas. In contrast, habitat used by oystercatches may become unavailable through vegetative succession. Droughts and changes in temperature extremes are not expected to pose significant threats to Black Oystercatchers.

Rising sea levels may also affect oystercatchers, although the net effect on Black Oystercatcher breeding and foraging habitat is not consistent throughout their range. In the southern region, rising sea levels are likely to reduce the availability of low-lying rocky islets and headlands for nesting. In Alaska, however, the rise in mean sea level is largely offset by isostatic rebound and tectonic uplift (see the National Oceanic and Atmospheric Administration web page http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml). In areas of uplift and rebound, new nesting habitat is being created, but in many cases, the amount of new nesting habitat made available by these processes will decrease over time as seral development proceeds.

The prediction of increased frequency and magnitude of storm events could negatively affect oystercatchers in two ways. First, winter storms of higher frequency or greater intensity may reduce winter survival of adults and juveniles, and decrease recruitment. Second, summer storm events may reduce productivity as a consequence of waves and storm surges.

Changes in oystercatcher food resources could occur if ocean temperature and fresh water inputs increase. Increased ocean temperatures may increase the likelihood of harmful algal blooms (such as the dinoflagellate *Alexandrium tamarense* and the diatom *Pseudo-nitzschia australis*), which have been attributed to substantial mortality in African Black Oystercatchers (*Haematopus maquini*; Hockey and Cooper 1980).

<u>Research Actions</u>

- Monitor information on changes in ocean temperature and corresponding marine plant and animal response. Participate in studies where the link between changes in marine food resources can be linked to Black Oystercatcher biology.
- Document oystercatcher use of glacial moraines exposed during glacier retreats.
- Document changes in the frequency of storms, and their associated tidal surges, on breeding and wintering areas.

<u>Policy/Legislative Action</u>

- Support legislative and policy decisions that reduce emissions of greenhouse gases in the U.S., Canada, and Mexico.

APPENDIX 2. PROGRAM OR RESEARCH COLLABORATORS DIRECTLY INVOLVED IN RESEARCH, CONSERVATION, AND MANAGEMENT OF BLACK OYSTERCATCHERS.

Agencies and organizations that have been involved in Black Oystercatcher research, surveys, and/or monitoring, which may represent potential future collaborators for combined efforts to investigate outstanding questions about Black Oystercatcher are listed below. More details regarding specific individuals and their contact information are included in Appendix 3.

The International Black Oystercatcher Working Group.

Individuals interested in being added to the list serve should contact D. Tessler (David_Tessler@fishgame.state.ak.us) for more information.

Alaska

University of Alaska Fairbanks

Alaska Department of Fish and Game

Alaska Natural Heritage Program

National Park Service

    Kenai Fjords National Park

    Wrangell Saint-Elias National Park

    Glacier Bay National Park.

U.S. Fish and Wildlife Service

Alaska Maritime National Wildlife Refuge

Izembek National Wildlife Refuge

Kodiak National Wildlife Refuge

Migratory Bird Management

U.S. Forest Service

Alaska Regional Office

Chugach National Forest

Tongass National Forest

U.S. Geological Survey

Alaska Science Center

British Columbia

Canadian Wildlife Service

Laskeek Bay Conservation Society

Pacific Wildlife Foundation

Parks Canada

Gwaii Haanas National Park Reserve

Gulf Islands National Park Reserve

Pacific Rim National Park Reserve

Washington

U.S. Fish and Wildlife Service

Migratory Birds and Habitat Programs Region 1/CNO

Washington Maritime National Wildlife Refuge Complex

Washington Department of Fish and Wildlife

Oregon

Oregon Department of Fish and Wildlife

Oregon Institute of Marine Biology

Oregon Natural Heritage Information Center

Oregon Parks and Recreation Department

Oregon State University

Department of Fish and Wildlife

U.S. Fish and Wildlife Service

Migratory Birds and Habitat Programs

Oregon Coast National Wildlife Refuge Complex

Newport Field Office

Ecological Services, Divisions of Habitat Conservation and Recovery

U.S. Geological Survey

Forest and Rangeland Ecosystem Science Center, Corvallis

California

California Department of Fish and Game

Bureau of Land Management

National Park Service

Point Reyes Bird Observatory

U.S. Fish and Wildlife Service

Arcata Fish and Wildlife Office

Migratory Birds and Habitat Programs

Baja California

Pronatura Noroeste

APPENDIX 3. INDIVIDUALS DIRECTLY INVOLVED IN RESEARCH, CONSERVATION, AND MANAGEMENT OF BLACK OYSTERCATCHERS.

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