

Section 6. Direct, Indirect, and Cumulative Effects on Snowy Plovers and Snowy Plover Habitat

6.1. Introduction

This Section discusses the effects of the covered activities on snowy plover and suitable snowy plover habitat, as well as critical habitat designated under ESA Section 4, that may result in take or adverse effects. A take estimate, as a result of implementation of the covered activities and provisions of the HCP, is provided in appendix G.

Direct effects are those that are directly caused by the covered activities outlined in this Habitat Conservation Plan (HCP). Examples include crushing of nests or failure of broods because of intentional or unintentional disturbance by beach users or their pets.

Indirect effects are those that are caused by the covered activities that may happen later, but still are reasonably certain to occur. An example of an indirect impact would be the loss of particular beach segment as suitable snowy plover breeding habitat due to increased recreational use of that beach segment or through the spread of invasive species, such as European beachgrass.

Cumulative effects are the incremental environmental effects of the action together with the effects of past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes those actions.

6.2. Oregon Parks and Recreation Department Management Activities

6.2.1. Public Use/Recreation Management

Camping

The effects of camping on the beach are similar to those described for general pedestrian use or picnicking, but may be compounded if people remain in sensitive areas for extended periods. Nighttime gatherings of people around a campfire may cause serious harm by disrupting incubation and brooding for long periods, thereby increasing the exposure of nearby chicks and eggs to hypothermia.

Debris left behind by campers may attract predators to areas being used by snowy plovers. Prolonged human presence near a nest site may also increase predator detection of nests or chicks, particularly by avian predators such as ravens and crows.

As described in Section 5, camping is not allowed on beaches adjacent to State parks.

Dog Exercising

Dogs, particularly those that are not restrained on a leash, represent a significant threat to both nesting and wintering snowy plovers (Fahy and Woodhouse 1995; Lafferty 2001). Unleashed dogs can chase snowy plover adults and chicks, cause chicks to become separated from adults, and trample nests. Unrestrained pets may traverse a much larger area and thus disrupt a greater percentage of nesting or foraging habitats than restrained animals. Leashed or unleashed dogs can interrupt brooding, incubating, and foraging behavior, much as pedestrians can.

Snowy plovers will flush sooner and remain off their nests longer when approached by pedestrians with a dog as opposed to pedestrians alone (Page et al. 1977). This condition leaves the nest exposed for longer periods, making it vulnerable to predation, extreme temperatures, and risk of being buried or blown by wind. Brooding and incubating snowy plovers respond to dog presence with avoidance or active distraction displays, thus exposing chicks or eggs to inadvertent trampling or predation; these disturbances may lead to the eventual separation of chicks from adults.

A study in Santa Barbara County, California, found wintering snowy plovers were more likely to fly from dogs and horses than from humans (Lafferty 2001). This study also found that wintering snowy plovers reacted to disturbance at half the distance reported for snowy plovers in breeding areas in California. Dogs are not likely to affect wintering snowy plovers directly, but repeated disturbance may indirectly harm populations by reducing time spent feeding and roosting and increasing time spent in predator avoidance behaviors. By decreasing the time snowy

plovers can spend feeding and roosting, dogs may negatively alter the birds' ability to successfully survive the winter and breed the following summer although this level of disturbance on wintering populations is not anticipated to rise to the level of take.

As described in Section 5, dogs are required to be leashed within State parks, including the beaches that front them. Although this is difficult to enforce and poorly understood by the public, the provisions of the HCP focusing on increased enforcement and outreach efforts will help to address this concern..

Pedestrian Traffic

Pedestrian traffic at both high and low levels can negatively affect nests and nesting birds directly or indirectly. The highly cryptic nature of nest scrapes, eggs, and chicks make them nearly undetectable by most people. Nests may be easily crushed underfoot by walkers or joggers. As snowy plover chicks crouch to the ground to avoid detection by humans or predators they may be crushed. In one California study, three times as many chicks were lost on weekends and holidays as on weekdays, suggesting that increased recreational activity is linked to increased chick loss (Ruhlen et al. 2003). At South Beach in Newport, the number of snowy plovers declined from more than 25 in 1969 to 15 in 1971 when South Beach State Park was opened (Hoffman 1972). No snowy plovers have used the area since the early 1980s.

People can disturb birds if they approach too closely or quickly (Lafferty 2001). Pedestrians may flush adult birds incubating a nest or brooding chicks. Page et al. (1977) found that adult snowy plovers flushed off the nest 78 percent of the time when humans approached on foot to within 1 to 50 m (3 to 164 feet). The response was only slightly lower, with a 65-percent flush rate, when people approached to within 50 to 100 m (164 to 328 feet). Pedestrians who passed within 100 to 250 m (328 to 820 feet) flushed adult birds off the nest 34 percent of the time. High levels of pedestrian traffic may cause repeated flushing of the adults.

Repeated flushing can result in eggs becoming overheated or excessively cooled to the point that the nest fails. Nests that are not continuously incubated may take longer to hatch, rendering the nest and incubating adults vulnerable to predation for a longer period. Suspended feeding and the expenditure of energy during a flushing event may affect both reproduction and survivorship (Lafferty 2001). Even short flights are energetically costly for small birds and these birds may not be able to gain the necessary fat reserves, an outcome that affects their survival rate (Brown et al. 2000).

On beaches that experience moderate to high levels of pedestrian traffic, repeated and frequent flushing of birds off their nests may result in disruption of normal incubation and increased predation on adult birds, eggs, or chicks that otherwise would have been protected by motionless, camouflaged adults. Snowy plovers that become acclimated to human intrusion and thereby exhibit a reduction of the tendency to

flush from the nest have been found to suffer higher levels of natural predation (Persons and Applegate 1977).

Snowy plovers nesting on beaches that experience low levels of pedestrian traffic may be highly sensitive to human intrusion and may flush off nests and stay off nests for much longer periods than snowy plovers nesting on beaches with higher levels of pedestrian traffic. Pedestrian traffic may also limit snowy plover use of otherwise suitable nesting habitats (Fish and Wildlife Service 1985).

Walkers or joggers may displace broods from optimal foraging locations. Prolonged pedestrian disturbances may prevent chicks from resting and foraging. Chicks separated from adults are more vulnerable to predators and trampling and have little chance of survival. In a study of piping plovers in Nova Scotia, chicks foraged less and were brooded less often when humans were within 160 meters, and significantly fewer chicks survived in areas with heightened levels of disturbance (Flemming et al. 1988).

Pedestrians may leave behind trash that attracts predators to snowy plover breeding areas. Pedestrian traffic is likely to increase at Oregon's beaches, thus the chances for direct and indirect effects on snowy plovers will increase.

With respect to wintering snowy plover populations, it is anticipated that recreational use along with the other covered activities would occur during a short time and would likely occur in areas that would not be as attractive to nesting snowy plover populations. The normal behavior of wintering plover is also to flock and avoid disturbance. It is anticipated that the effects on wintering populations would be minimal and unlikely to result in take.

Picnicking

Picnicking can cause the same direct and indirect effects as pedestrian traffic, but when picnicking occurs near snowy plover nests, these impacts occur over a longer period. Birds flushed from a nest by picnickers may not return to the nest for an extended period, exposing the eggs to the elements and increased risk of predation. Under windy conditions, eggs may be buried or blown out of the nest. Picnickers may also leave behind garbage that may attract predators to the area. Prolonged human presence near a nest site may also increase predator detection of nests or chicks, particularly by avian predators such as ravens and crows.

Picnicking on Oregon beaches occurs primarily during the nesting season, but picnicking activity may disturb wintering birds as well. Repeated disruption of wintering birds' feeding and roosting activities may alter energy balances, making the birds less likely to survive to breed the following summer.

Near Shore Activities/Surf Sports

The use of sandy shorelines for small boat, surfboard, or kayak launchings and landings may result in disturbance similar to that described for general pedestrian use. These activities may disrupt a large percentage of waterfront, thus displacing adults and broods from critical foraging areas. Intensive use of an area for these purposes may result in the displacement of both nesting and wintering snowy plovers (Neuman 2001). Kite surfing and parasailing are increasing in popularity. Also, flat sandy beaches are attractive for land sailing. Such activity can be particularly disruptive to foraging snowy plovers. Fishing and clamming activities, while they occur on the Ocean Shore, are regulated by ODFW.

Driving

Vehicle use (motorized or non-motorized, including all-terrain vehicle [ATV]/off-highway vehicle [OHV] use) on beaches has the potential to adversely affect snowy plovers and their habitat. Unrestricted vehicle use can disturb large areas of both remote and readily accessible beach, and vehicle traffic has been known to result in the destruction of eggs, chicks, and adults (Burton et al. 1996; Warriner et al. 1986). Chicks harassed by vehicles may die of exhaustion (Powell et al. 1995, 1997) or be separated from adults (Stern et al. 1990b). Adults and chicks may roost and move about in tire tracks. Chicks may be unable to climb out of tire tracks and are consequently more vulnerable to vehicular traffic since most people use the same tracks when they return. Vehicle use can also cause displacement of foraging, roosting, brooding, or incubating adult snowy plovers. Extensive vehicle use may destroy or prevent snowy plovers from using the wrack line, where they forage. Newly emerging, non-motorized recreation vehicles, such as kite buggies, are expected to have similar impacts on snowy plovers as motorized vehicles.

As described in Section 5, during the snowy plover breeding season, permits are required for public vehicle use at five of the 16 SPMA/RMAs. At some of these areas where vehicle use is prohibited, illegal vehicle use occurs on a regular basis.

Horseback Riding

Although most equestrian traffic is on the wet sand area and therefore not as likely to directly affect snowy plovers, equestrians often enter the beach via dune accesses. Some equestrians may also ride in the dune area. Horses can significantly affect nesting and wintering snowy plovers in ways similar to pedestrians. Additionally, horses may trample nests. At New River, horses came close to crushing a nest before it was protected with an enclosure (Craig et al. 1992; Lauten pers. comm. 2004). Monitors have documented at least four clutches on Morro Spit, California that were destroyed by horses trampling the nests, during the 2000 and 2001 breeding season (Persons & Ellison 2001; Ellison 2001). Horses and other pack animals leave depressions in an otherwise naturally flat wave-washed shoreline that can disrupt or

impede the movement of chicks and adults (Neuman 2001). Unleashed dogs are also frequently associated with equestrians.

Beach Fires

As with camping, the presence of people around fires can disturb nearby nesting snowy plovers, causing the nest to be left unattended for long periods and eggs to be exposed to predators and extreme temperatures. Collecting driftwood or other naturally occurring materials such as wrack, shells, and rocks for fires may crush eggs (especially in the dark) and may reduce the quality of natural cover for chicks and adults used by snowy plovers for shelter from wind or predators.

When used for cooking, fire rings and discarded debris may attract predators such as coyotes, foxes, and corvids, thereby increasing the potential for adult, egg, or chick predation.

Beachcombing

Effects of beachcombing are very similar to pedestrian traffic described above and driftwood collection described below.

Driftwood Collection and Removal

Some amount of naturally occurring driftwood is an essential part of snowy plover nesting habitat. Wintering and breeding snowy plovers often use driftwood to provide shelter from wind. They may also hide behind driftwood to escape detection by predators. However, too much driftwood can change the open nature of the habitat. Large driftwood also provides perches for hunting avian predators.

Collection of driftwood by individuals for personal use from occupied snowy plover nesting areas could reduce the suitability of the habitat, and may result in disturbances similar to those listed above for pedestrians. Cumulatively, driftwood removal can render habitat unsuitable by removing shelter and nesting material. Commercial removal of driftwood can have more direct effects on snowy plovers. Vehicles used for collecting driftwood can crush eggs or chicks and leave ruts in the sand that chicks may not be able to escape. Human activity associated with driftwood removal can disturb nesting or wintering snowy plovers in ways similar to pedestrian activity.

Kite Flying

Biologists believe snowy plovers perceive kites as potential avian predators. Reactions to kites have ranged from increased vigilance while roosting, to walking or running away (Fish and Wildlife Service 2001a). Studies of other plovers found them to be intolerant of kites compared to other human disturbances such as pedestrian movements or dogs. Kites caused the birds to flush or move a greater

distance from the disturbance, to move the longest distance away from the disturbance, and to stay away the longest compared with other human disturbances (Hoopes et al. 1993). It is expected that stunt kites would cause a greater response from snowy plovers than traditional, more stationary kites because of the fluttering tails and noisy, rapid, erratic movements.

6.2.2. Beach Management

Mammal Strandings and Removal

Removal or burial of dead mammals found on the Ocean Shore usually requires heavy equipment to be brought onto the beach. This process can disturb wintering or nesting snowy plovers for an extended period, separate broods from adults, and can result in the crushing of eggs or chicks although these activities are not anticipated to rise to the level of take. Burial of mammals can disturb a large area of sandy beach and may disrupt foraging areas. However, removal or burial mammals may be preferable to leaving carcasses on the Ocean Shore, where they will attract predators, possibly exposing snowy plovers to increased levels of predation.

Public Safety

Activities related to maintaining emergency access points and removing public hazards such as beach logs or toxic material spills can involve multiple vehicles having unrestricted access to the beach. By their nature, these activities are difficult to predict. Impacts to snowy plovers are similar to those described for pedestrian use and driving. Removal of hazardous materials from the beach can benefit snowy plovers by reducing their potential exposure to these hazardous materials. Toxins that may not themselves directly affect snowy plovers may accumulate in their prey and affect snowy plovers' ability to survive and reproduce.

External Law Enforcement

Vehicle use by Oregon Parks and Recreation Department (OPRD) personnel may cause unpredictable disturbances, often involving multiple vehicles and unrestricted access to the shoreline. Patrol activities also involve emergency medical and law enforcement responses, important for maintaining human safety, but high-speed travel necessary for response or the introduction of vehicles into areas not frequently accessed (e.g., SPMA/RMA) may result in significant effects on adult birds, nests, or chicks during the nesting season.

Internal Law Enforcement

Park staff members spend considerable time investigating large gatherings on the beach. The effects these patrols may have on snowy plovers are offset by the

benefits of enforcement of beach restrictions and removal of groups gathering in restricted areas.

Boat Strandings and Other Salvage Operations

OPRD's involvement in salvage operations is to issue the necessary permits and to monitor the activities as they are occurring. Monitoring activities will involve vehicle use and may result in potential effects on adult birds, nests, or chicks during the nesting season.

6.2.3. Natural Resource Management

Snowy Plover Management

Although OPRD's management of snowy plovers has the potential to impact snowy plovers, these actions are typically of short duration and offset by the benefits provided to the birds in the way of reduced human disturbance and exposure to predation, and improved habitat. Installing and maintaining fencing and signs around snowy plover nesting areas can temporarily disturb the nesting pair and cause eggs to be unattended, exposing them to extreme temperatures, wind, and predation. Prolonged human presence at a nest site may also increase predator detection of nests or chicks, particularly by avian predators such as ravens and crows. Habitat restoration work is conducted outside of the breeding season but may disturb wintering snowy plovers in the area, potentially causing birds to move to an alternate area. Because restoration tends to result in improvement of native habitats, restoration of dune vegetation can be a considerable benefit to snowy plovers, if done carefully and if the habitat is restored to the appropriate habitat type. Volunteers at beach accesses benefit snowy plovers because they inform the public and encourage compliance with beach restrictions. The effects of restoration activities on wintering populations of snowy plover are not anticipated to rise to the level of take.

Scientific Research and Collection

Monitoring, scientific research, and collection activities can be disruptive to nesting and wintering snowy plovers, with impacts similar to those described for pedestrian and vehicle use. Some research can adversely impact habitat by collecting or damaging native plants or encouraging non-native species. Snowy plover monitoring activities may involve extended or repeated visits to nesting sites, potentially intensifying negative impacts. Erecting nest enclosures and banding adults and chicks results in significant, if temporary, disturbance of birds. Nest abandonment has occurred subsequent to enclosure construction, and occasionally through vandalism of the enclosure fence (Page et al. 1994). Excluded nests may also encounter higher levels of disturbance by curious people and may attract perching avian predators. Nonetheless, monitoring of nesting snowy plovers, when carried out

in a careful manner that minimizes these effects, provides information that is critical to the development of conservation, protection, and management strategies.

Habitat Restoration/Invasive Species Removal

Habitat restoration work for species other than snowy plover has the potential to affect snowy plover during both the nesting and non-nesting season, although most restoration activities will occur outside the nesting season. In the long-term, restoration efforts would have a positive effect on snowy plover since the restoration efforts tend to result in improvement of native habitats.

6.3. Effects on Snowy Plover Designated Critical Habitat

6.3.1. Introduction

Critical habitat includes areas found to be essential to the recovery and conservation of a listed species, and may include habitat that is or is not occupied at the time of listing. Critical habitat requires Federal agencies to ensure that the activities they fund, authorize, or carry out do not jeopardize the survival of the listed species or adversely affect its critical habitat. Designating critical habitat does not, in itself, lead to recovery of a listed species, but is one of several tools that can be used to achieve recovery. Designation of critical habitat can help focus conservation activities for a listed species by identifying areas that contain the physical and biological features that are essential for the conservation of that species. Designation of critical habitat alerts the public as well as land-managing agencies to the importance of these areas.

Critical habitat for the snowy plover was initially designated in December 1999 (Fish and Wildlife Service 1999). In May 2003, a Federal judge determined that the U.S. Fish and Wildlife Service (FWS) must rewrite the critical habitat designation for snowy plovers because FWS did not adequately address economic impacts when designating critical habitat for the snowy plover. On September 29, 2005, the FWS published a final rule to re-designate critical habitat along the coasts of California, Oregon, and Washington (Fish and Wildlife Service 2005). A total of 32 areas (or units) covering 12,145 acres was designated critical habitat along the coasts of California, Oregon, and Washington. Of the 32 critical habitat units, seven are in Oregon (refer to table 2.2), totaling 2,146.5 acres.

The 16 SPMAs/RMAs in the HCP were identified as the best existing and potential snowy plover habitat by State and Federal biologists who used the Draft Recovery Plan as guidance. Many designated critical habitat areas coincide with existing occupied areas. However, some of the SPMAs/RMAs include additional potential

habitat not originally included in designated critical habitat (e.g., Netarts Spit, Nehalem Spit, Necanicum Spit, and Columbia River South Jetty). The following passage describes the potential effects of the covered activities on critical habitat.

6.3.2. Public Use/Recreation Management

Heavy recreational use of critical habitat may render existing snowy plover habitat unsuitable for nesting or wintering activities. For example, snowy plovers regularly nested at what is now South Beach State Park until shortly after the park was developed and began to receive heavy public use (Hoffman 1972). In some cases snowy plovers may continue to use areas heavily used by humans, but their productivity may suffer. Although several of the public use/recreation management activities covered in the HCP may occur in critical habitat, the impacts from such activities are relatively small. However, driving and driftwood collection have the potential adversely to affect snowy plover critical habitat, as described below.

Driving

Vehicle use (either motorized or non-motorized) on beaches has the potential to adversely affect snowy plover critical habitat. Unrestricted vehicle use can disturb large areas of both remote and readily accessible beach, and vehicle traffic has been known to result in the destruction of eggs, chicks, and adults (Burton et al. 1996; Warriner et al. 1986). Adults and chicks may roost and move about in tire tracks. Chicks may be unable to climb out of tire tracks and are consequently more vulnerable to vehicular traffic since most people use the same tracks when they return. Vehicle use can also cause displacement of foraging, roosting, brooding, or incubating adult snowy plovers. Extensive vehicle use may destroy or prevent snowy plovers from using the wrack line, where they forage.

Driftwood Collection and Removal and Beach Logging

Driftwood removal and beach logging may adversely impact critical habitat for snowy plovers. Snowy plovers benefit from some level of driftwood being left on the beach. Driftwood provides shelter from the wind and cover from predators for snowy plover adults and chicks. Removal of driftwood can negatively impact critical habitat. Alternatively, in some areas there is so much driftwood that the beach is no longer an open habitat. In these cases, removal of a portion of the driftwood would benefit snowy plovers.

Management of public access ways may or may not adversely affect critical habitat, based largely on whether the access is within a SPMA. Public access will be limited in SPMA's, and should not harm critical habitat.

6.3.3. Beach Management Activities

Although activities associated with beach management may disturb snowy plovers, they should not adversely impact snowy plover critical habitat. In fact, beach cleanup activities can positively affect critical habitat by removing unnatural debris from the beach. Removal or burial of stranded marine mammals can temporarily affect critical habitat by digging up the beach and wrack line; however, leaving carcasses can attract additional predators, and this outcome may be more harmful to snowy plovers than the disturbance involved in burial or removal.

6.3.4. Natural Resource Management

Snowy plover management activities covered under this HCP will not adversely impact critical habitat.

6.4. Effects on Federally Listed Plant Species

The Federal Endangered Species Act does not prohibit the incidental take of federally listed plant species; however, Section 7 prohibits jeopardizing the continued existence of listed plants. Only one species, the Western lily (*Lilium occidentale*), is a federally listed plant species.

6.4.1. Western Lily

The western lily is a perennial with attractive crimson flowers. The lily was listed as federally endangered in 1994 (Fish and Wildlife Service 1994b); it is listed by the State of Oregon as endangered. Critical habitat has not been proposed. The western lily has an extremely restricted distribution within 4 miles (6 kilometers) of the Pacific coast, from Hauser, Coos County, Oregon, to Loleta, Humboldt County, California. This range encompasses approximately the southern one-third of the Oregon coast and the northern 100 miles (161 kilometers) of the California coast.

The western lily grows at the edges of sphagnum bogs and in forest or thicket openings along the margins of ephemeral ponds and small channels. This species also grows in coastal prairie and scrub near the ocean where fog is common. Habitat destruction due to development is the primary threat to the western lily. Other threats include forest succession, cranberry farm development, livestock grazing, plant collectors, and highway construction. Although the western lily occurs in close proximity to snowy plover habitat, it is not a dune species and should not be impacted by activities associated with snowy plover management on OPRD properties. Appendix B provides additional information on the western lily.

6.5. Incidental Take

6.5.1. Introduction

The FWS will issue an Incidental Take Permit (ITP) upon a finding that the actions proposed by OPRD will not appreciably reduce the likelihood of the survival and recovery of the species in the wild, and that OPRD has minimized and mitigated the effects of their activities to the maximum extent practicable. The management actions described in Section 5 have the ability to reduce both direct and indirect effects of the covered activities managed by OPRD, and provide benefits to the snowy plover, such that the FWS should be able to make a finding that meets the two most critical criteria above.

6.5.2. Scope of Incidental Take Permit

Permit Period and Area

OPRD is seeking a 25-year ITP for the snowy plover. This HCP identifies the measures intended to assure that the effects of the incidental take will, to the maximum extent practicable, be minimized and mitigated.

The ITP is for all 230 miles of sandy Ocean Shore, including the 126.5 miles of Ocean Shore identified as snowy plover habitat in the Recovery Plan.

Type of Take

The ITP will cover potential incidental take occurring in connection with otherwise lawful OPRD management activities on the Ocean Shore. Incidental take is anticipated to occur if the covered activities are allowed to occur on the Ocean Shore in snowy plover habitat. The two types of take anticipated to occur are (1) mortality or harassment of breeding snowy plovers, their eggs, and chicks during the breeding season due to any of the activities managed by OPRD and covered by the ITP; and (2) harm due to significant habitat modification or degradation that results in death or injury to snowy plovers by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering.

Take can result from direct or indirect effects. Direct effects include, but are not limited to stepping on eggs, and crushing eggs by means of vehicles, horse hoofs, or feet. Indirect effects include, but are not limited to, the deliberate feeding of gulls and corvids (ravens and crows) and the leaving of food scraps, trash, and fish waste that can attract large numbers of these predators, and the flushing of adults off the nest that may result in eggs being buried by wind-blown sand, or the eggs becoming too hot or too cold thereby killing the embryo. Repeated disturbances of this type may cause nest abandonment. Indirect effects may also include disturbance of

foraging or resting birds on beaches during the winter, although the potential effects on wintering birds are not anticipated to rise to the level of take.

Description of Take

A description of the amount and extent of incidental take that is expected to occur because of implementing the covered OPRD management activities (including the conservation measures) addressed in the HCP is provided in appendix G and summarized below.

6.5.3. Take Estimate Summary

Population data indicate that the Pacific Coast population of Western snowy plover is increasing. However, some take of eggs, hatchlings, fledglings, and adults from recreational activities on the Oregon Coast is ongoing as the population increases. Egg, hatchling, and fledgling stages are directly exposed to take from recreational activities. Breeding adults are generally able to avoid take in the form of mortality or bodily injury from recreational activities because they are strong flyers (Lauten et al. 2006; FWS unpublished data); however, they may still experience take in the form of harassment.

Natural resource management activities at SPMA's, including habitat restoration and predator control measures, and recreational use restrictions at SPMA's and RMA's are expected to help compensate for the take. Egg, hatchling, and fledgling stages can benefit directly from management activities due to reduced predation, reduced exposure to dogs, and improved foraging habitat. Nesting birds can benefit from management due to improved nesting habitat and reduced harassment from predators, which would likely express itself in terms of greater egg production.

Approach

The take assessment, fully described in appendix G, is based on trends in the number of snowy plover nests, eggs, chicks, and adults at the occupied site (Bandon HRA) and the five occupied sites owned by other landowners on the Oregon Coast between 2000 and 2006. Necanicum Spit and Floras Lake were excluded from the model analysis because of low numbers over a limited number of years. Proxy data for Sutton Beach was developed to allow this site to be included in the model. Population performance at the currently occupied sites depends on recreation activities, management activities, and natural/environmental conditions. Recreational activities degrade the performance of habitat; natural resource management activities are in place to improve conditions, and natural/environmental conditions may either improve or degrade habitat for snowy plovers.

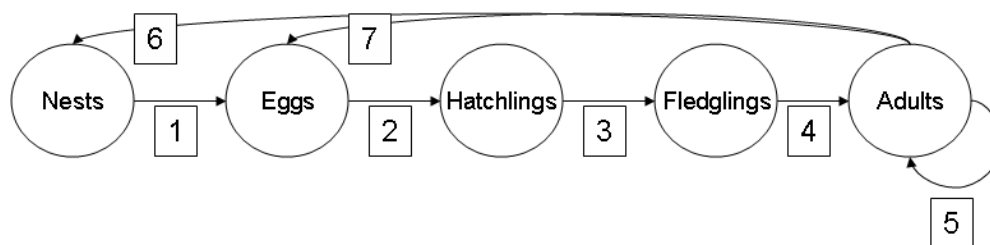
For the take assessment it was assumed that the local conditions and local performance were known with a reasonable level of certainty. It was estimated that a

similar level of future take would occur if OPRD maintains a similar set of conditions for the snowy plover population along the Oregon Coast in the future. A statistical model was used to estimate the relationships between conditions (recreation, natural resource management, and environmental) and snowy plover production at the occupied sites during the past 6 years.

Nests, eggs, hatchlings, fledglings, and adult birds are all important to the production of snowy plovers in Oregon. An additional useful indicator of population performance is the rate of historical or future population change expressed as the intrinsic capacity for change or “lambda.” Individual birds must survive each of the pathways to mature to adult-hood and produce young (figure 6.1). Therefore, there are several phases where recreation, natural resource management actions, and the environment can affect snowy plovers. Life-tables and lifecycle models were used to organize the snowy plover population information.

The peak number and proportion of beach visitors participating in specific activities was previously estimated using field observations and mail-in surveys (Shelby and Tokarczyk 2002). In addition, the number, density, and proximity of public access sites were estimated at each management area using aerial photos. The location and extent of management activities were estimated by OPRD. The snowy plover population information was used in conjunction with estimates of recreational and management activities to estimate the impacts of conditions (natural and human-caused) on performance.

Figure 6.1. Stage-Structured Life Cycle for Snowy Plover



Note: The numbered arrows represent survivals and fecundities: 1) eggs per nest, 2) egg to hatchling survival, 3) hatchling to fledgling survival, 4) fledgling to adult survival, 5) annual adult survival, 6) nest production, and 7) fecundity (eggs per adult).

Results

Recreational use appears to have a negative impact on snowy plover populations. The recent historic and future potential for population growth (lambda) was lower at sites that receive greater levels of recreation ($r^2=0.78$, $p=0.007$) in terms of the density of access points at each management area. Other performance indicators such as fecundity and survival through the egg, hatchling, and fledgling stages also appeared to be lower at sites that received greater levels of recreation. These

indicators were more strongly related to the combined effects of all recreation than to specific recreational use types.

Previous recreational use studies found that approximately one third (35 percent) of all visitors brought one to two dogs with them to the beach (Shelby and Tokarczyk 2002). The majority of dog walkers (61 percent) admitted they did not leash their dog sometime during their typical visits. The majority of this use occurred during the snowy plover breeding season. Most visitors (93 percent) did not ride horses or drive on the beach. The majority of visitors (90 percent) were groups of family and friends. Most (76 percent) were unaware of restrictions associated with snowy plovers. These surveys suggest that increased recreational use will express itself primarily in the form of groups of family and friends with their dogs.

Life-table calculations showed that recreational activities resulted in snowy plover production loss of 30 hatchlings and 11 fledglings, or the equivalent of 5 adult birds on the Oregon coast each year (table 6.1). During the 25-year period of the ITP it is estimated that recreational use will result in snowy plover production losses of approximately 750 hatchlings and 275 fledglings, or the equivalent of 125 adult birds.

Conversely, management activities appear to have a positive impact on snowy plover populations. The recent historic and future potential for population growth was higher in areas that had more years of predator management ($r^2=0.61$, $p=0.02$). Other performance indicators such as fecundity also appear to be higher at sites that receive greater levels of predator control; however, the number of years of predator management was more strongly related to these performance indicators than other management actions such as habitat restoration.

Life-table calculations showed that predator management benefited Oregon snowy plover populations through an increase of 138 eggs and 9 fledglings, or the equivalent of 8 adult birds annually (table 6.1). During the 25-year period of the ITP it is estimated that management activities will improve snowy plover production by approximately 3,450 eggs and 225 fledglings, or the equivalent of 200 adult birds.

Table 6.1. Estimated Change in the Number of Eggs, Nests, Fledglings, and Adults per Year as a Result of Habitat Restoration, Predator Management, and Recreational Use

	6-Year Average ¹	Habitat Restoration/ Predator Management Benefits ²	Recreation Activity Impacts ³	Annual Net Gain/Loss	25-Year Total for Occupied Sites
Number of Eggs (% of 6-year average)	300	+ 138 (+46%)	--	+ 138 (+46%)	+ 3,450

	6-Year Average ¹	Habitat Restoration/ Predator Management Benefits ²	Recreation Activity Impacts ³	Annual Net Gain/Loss	25-Year Total for Occupied Sites
Number of Hatchlings (% six year average)	136	--	- 30 (22 %)	- 30 (22 %)	- 750
Number of Fledglings (% of 6-year average)	62	+ 9 (+14%)	- 11 (-17%)	- 2 (-3%)	- 50
Number of Adults (% of 6-year average)	13.8	+ 8 (+58%)	- 5 (-36%)	+ 3 (+22%)	+ 75

1 Represents the number of eggs, hatchlings, fledglings, and adults produced each year on the covered lands (including SPMA and RMAs) between 2000 and 2006.

2 Represents the number of eggs, fledglings, and adults estimated to be present on the covered lands each year as a direct result of ongoing restoration activities, snowy plover management, and predator management at sites currently occupied by snowy plover. These figures are based on benefits realized between 2000 and 2006 on lands owned both by OPRD and other landowners, and are not specific to restoration, predator management efforts, or snowy plover management efforts at Bandon SPMA, the only currently occupied SPMA owned by OPRD. As such, these estimates may overstate the net benefit to plover because of OPRD actions. Of note, the figures in the table do not capture the restoration benefit that would be realized at currently unoccupied SPMA in the future should nesting populations of plover utilize those areas. It is anticipated that restoration of up to a total of 120 acres at the Columbia River South Jetty SPMA, the Necanicum SPMA, and the Nehalem SPMA, and future predator management activities, would result in additional habitat restoration benefits not captured in this table.

3 Figures represent the number of hatchlings, fledglings, and adults lost each year because of recreational use on the covered lands. Associated percentage represents the percentage of the 6-year average.

Conclusion

Activities covered under this HCP have the potential to result in take of snowy plovers during the 25-year ITP term, most specifically from the effects of recreational use activities. Take would occur because of recreational activities harassing adults foraging or tending nests and harassing young foraging on the dry and wet sand. Take is not likely to occur as a result of natural resources management or beach management activities. While the covered activities may result in some harassment of adults or fledglings and the loss of eggs and nests, when considered in the context of proposed management and restoration activities, there is not anticipated to be any take of eggs; however, there is anticipated to be potential take of hatchlings and fledglings. In spite of hatchlings and fledglings being affected, overall, there is expected to be an increase in the number of adults on the Oregon Coast.

6.5.4. Effect of Take

The level of anticipated take is not likely to result in jeopardy of the Pacific Coast population of the western snowy plover in Oregon. The management actions outlined in the HCP and incorporated into the ITP and the Implementing Agreement by reference will not permanently degrade suitable nesting habitat for the snowy plover within the OPRD-owned and managed SPMA. The protections provided by

the HCP for SPMA's and the recreation restrictions at RMA's will minimize the adverse effects of authorized activities to snowy plover habitat. Over the term of the permit, the management actions (conservation measures) outlined in this HCP will create additional suitable habitat for snowy plovers.

Adverse effects on habitat may include crushing and burying wrack, creating ruts that may impede movements of young chicks, physically occupying habitat and making it unavailable to breeding or wintering snowy plovers, and creating temporary disturbances that deter snowy plovers from using some habitat areas. The habitat affected will be a relatively small portion of all suitable habitats at a given site; thus, the HCP management actions will not jeopardize the species. Rather, they will ensure that local populations will have sufficient habitat of adequate quality to move towards recovery.

Winter disturbances are expected to be insignificant because covered activities are greatly reduced and presently there is low winter use of Oregon beaches by snowy plovers (see Section 4.2.5, "Wintering," for more information on current locations of wintering populations). In addition, the SPMA locations, based on the Recovery Plan, were chosen to avoid areas of high winter use by humans. In the event that disturbance occurs, it is expected that bird movement would be within the snowy plover's normal range of activities. Given these factors, disturbance is likely to be minimal and unlikely to result in take of wintering snowy plovers.