The Distribution and Reproductive Success of the Western Snowy Plover along the Oregon Coast - 2007

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The Oregon Natural Heritage Information Center
Institute for Natural Resources
Oregon State University
1322 SE Morrison Avenue
Portland, Oregon 97214

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Coos Bay District Bureau of Land Management
1300 Airport Way
North Bend, Oregon 97459

Oregon Dunes National Recreation Area
855 Highway Ave.
Reedsport, Oregon 97467

U.S. Fish and Wildlife Service
2127 SE OSU Drive
Newport, Oregon 97365

Oregon Department of Fish and Wildlife
3406 Cherry Avenue NE
Salem, OR 97303

Oregon Department of Parks and Recreation
10965 Cape Arago Highway
Coos Bay, Oregon 97420

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Abstract

From 3 April – 21 September 2007, we monitored the distribution, abundance and productivity of the federally Threatened Western Snowy Plover (*Charadrius alexandrinus nivosus*) along the Oregon coast. From north to south, we surveyed and monitored plover activity at Sutton Beach, Siltcoos River estuary, the Dunes Overlook, North Tahkenitch Creek, Tenmile Creek, Coos Bay North Spit, Bandon Beach, and New River. Our objectives for the Oregon coastal population in 2007 were to: 1) estimate the size of the adult Snowy Plover population, 2) locate plover nests, 3) continue selected use of mini-exclosures (MEs) to protect nests from predators and evaluate whether exclosure use can be reduced, 4) determine nest success, 5) determine fledgling success, 6) monitor brood movements, 7) collect general observational data about predators, and 8) evaluate the effectiveness of predator management.

We observed an estimated 181-184 adult Snowy Plovers; a minimum of 162 individuals was known to have nested. The adult plover population was the highest estimate recorded since monitoring began in 1990, and we found the highest number of nests since monitoring began in 1990 (n = 202). Overall Mayfield nest success was 33%. Exclosed nests (n=38) had a 66% success rate, and unexclosed nests (n=164) had a 41% success rate. Nest failures were attributed to unknown depredation (20%), one-egg nests (20%), corvid depredation (17%), abandonment (16%), unknown cause (7%), unknown mammal depredation (7%), overwashed (3%), infertility (3%), coyote depredation (3%), wind/weather (3%), raccoon depredation (1%), and adult plover depredation (1%). We monitored 89 broods, including four from unknown nests, and documented a minimum of 123 fledglings; the highest number of fledglings since monitoring began in 1990. Overall brood success was 82%, fledgling success was 54%, and 1.60 fledglings per male were produced.

Continued predator management, habitat improvement and maintenance, and management of recreational activities at all sites are recommended to achieve recovery goals.

TABLE OF CONTENTS

Introduction

The Western Snowy Plover (*Charadrius alexandrinus nivosus*) breeds along the coast of the Pacific Ocean in California, Oregon, and Washington and at alkaline lakes in the interior of the western United States (Page *et al.* 1991). Loss of habitat, predation pressures, and disturbance have caused the decline of the coastal population of Snowy Plovers and led to the listing of the Pacific Coast Population of Western Snowy Plovers as Threatened on March 5, 1993 (Federal Register 1993).

We have completed our 18th year of monitoring the distribution, abundance, and productivity of Snowy Plovers along the Oregon coast during the breeding season. In cooperation with federal and state agencies, plover management has focused on habitat restoration and maintenance at breeding sites, predator management through both lethal and non-lethal predator control methods, and management of human related disturbances to nesting plovers. The goal of management is improved annual productivity leading to increases in Oregon's breeding population and eventually sustainable productivity and stable populations at recovery levels. Previous work and results have been summarized in annual reports (Stern *et al.* 1990 and 1991, Craig *et al.* 1992, Casler *et al.* 1993, Hallett *et al.* 1994, 1995, Estelle *et al.* 1997, Castelein *et al.* 1997, 1998, 2000a, 2000b, 2001, and 2002, and Lauten *et al.* 2003, 2005, 2006, 2006b). Our objectives for the Oregon coastal population in 2007 were to: 1) estimate the size of the adult Snowy Plover population, 2) locate plover nests, 3) continue use of mini-exclosures (MEs) to protect nests from predators when and where needed, and further reduce the use of exclosures at nesting areas where predation pressure was minimized, 4) determine nest success, 5) determine fledgling success, 6) monitor brood movements, 7) collect general observational data about predators, and 8) evaluate the effectiveness of predator management. The results of these efforts are presented in this report.

Study Area

We surveyed Snowy Plover breeding habitat along the Oregon coast, including ocean beaches, sandy spits, ocean-overwashed areas within sand dunes dominated by European beachgrass (*Ammophila arenaria*), open estuarine areas with sand flats, a dredge spoil site, and several habitat restoration/management sites. From north to south, we surveyed and monitored plover activity at Sutton Beach, Siltcoos River estuary, the Dunes Overlook, North Tahkenitch Creek, Tenmile Creek, Coos Bay North Spit (CBNS), Bandon Beach, and New River (south from Bandon Beach to the south end of the habitat restoration area) (Fig. 1). Due to field staff limitations and general lack of plover use, North Siuslaw and Floras Lake were not surveyed. A description of each site occurs in Appendix A.

Methods

In early April 2007, pre-breeding season surveys of historical nesting areas were completed and in late May 2007 breeding season window surveys were completed. State and federal agency personnel and volunteers surveyed sites between the Columbia River

south to Pistol River, Curry Co. The surveys were implemented to locate any prospecting plovers at locations not known as currently active nesting sites. The following additional areas were either surveyed in early spring or during the breeding window survey: Fort Stevens, Necanicum Spit, Nehalem Spit, Bayocean Spit, Netarts Spit, Sand Lake Spit, Nestucca River Spit, Whiskey Run to the Coquille River, Elk River, Euchre Creek, and Pistol River.

Breeding season fieldwork was completed from 3 April to 21 September 2007. Survey techniques, data collection methodology, and information regarding locating and documenting nests can be found in Castelein *et al.* 2000a, 2000b, 2001, 2002, and Lauten *et al.* 2003. No modifications to survey techniques were implemented in 2007.

All exclosed nests in 2007 were exclosed with mini-exclosures (MEs). Lauten *et al.* 2003 describes the materials, design, and erection procedures of MEs. Predator management occurred at all active nesting areas; corvids were targeted at all nesting sites and some mammal trapping, specifically targeting red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*) skunks (*Mephitis sp.*), raccoon (*Procyon lotor*) and coyote (*Canis latrans*), occurred at specific sites. A Great Horned Owl (*Bubo virginianus*) that was targeting adult plovers was removed from Tenmile. For information regarding the predator management program, see Little 2007. Nests were not exclosed during April and into early May in accordance with the previous practice of delaying the placement of exclosures around nests until peak raptor migration was believed to have passed (Castelein *et al.* 2001, 2002, Lauten *et al.* 2003). We further attempted to leave nests unexclosed to evaluate whether nests can successfully hatch at acceptable rates without exclosures. However, on Forest Service sites predation pressure was intense enough that we were unable to leave most nests unexclosed after early May. At CBNS, Bandon Beach, and New River, we left nests unexclosed except at seven nests at Bandon and New River where we felt predation pressure was high.

Male Snowy Plovers typically rear their broods until fledging. In order to track the broods we banded most nesting adult males, sometimes the female, and most hatch-year birds with both a USFWS aluminum band and a combination of colored plastic bands. Trapping techniques are described in Lauten *et al.* 2005 and 2006. We monitored broods and recorded brood activity or adults exhibiting broody behavior at each site. Chicks were considered fledged when they were observed 28 days after hatching.

We estimated the number of Snowy Plovers on the Oregon coast during the summer of 2007 by determining the number of uniquely color-banded adult Snowy Plovers observed during the breeding season, and added our estimate of the number of unbanded Snowy Plovers that were also present. We determined the number of unbanded plovers by using the daily observation evaluation method described in Castelein *et al.* 2001, 2002 and Lauten *et al.* 2003. We estimated the breeding population by tallying the number of known breeding plovers. Not all plovers recorded during the summer are Oregon breeding plovers; some plovers are recorded early or late in the breeding season indicating that they are either migrant or wintering birds. Plovers that were present throughout or during the breeding season but were not confirmed breeders were

considered Oregon resident plovers. We estimated an overall Oregon resident plover population by adding the known breeders with the number of plovers present during the breeding season but not confirmed nesting.

We determined the number of individual banded female and male plovers and the number of individual unbanded female and male plovers that were recorded at each nesting area along the Oregon coast from the beginning of the 2007 breeding season until the end of the 2007 breeding season. Data from nesting sites with a north and south component (Siltcoos, Overlook, and Tenmile) were pooled because individual plovers use both sides of these estuaries. Data from Coos Bay North Spit nesting sites were all pooled for the same reason. We also pooled the data from Bandon Beach and New River because despite the relatively long distance from the north to the south end (6-8 miles), the plovers that use these nesting sites interchange and move freely between the areas. A tally from each site would suggest more plovers are using the area than each site actually supports. The total number of individual plovers recorded at each site indicates the overall use of the site, particularly where plovers congregate during post breeding and wintering. We also determined the number of individual breeding female and male plovers for each site. The number of individual breeding adults indicates the level of nesting activity for each site.

We calculated nest success using apparent nest success and the Mayfield method of nest success (Mayfield 1961, Mayfield 1975). We calculated overall apparent nest success, which is the number of successful nests divided by the total number of nests, for all nests and for each individual site, and overall Mayfield nest success for all nests. We also calculated an adjusted Mayfield nest success for both exclosed and unexclosed nests. The adjusted nest success calculations for exclosed nests eliminated infertile nests because they did not fail due to an extrinsic cause (i.e., depredation or an environmental factor) and adults incubated the eggs longer than the typical incubation period, which would bias the Mayfield calculations. One egg nests and nests found that had already failed or hatched were eliminated from unexclosed nest success calculations. For the Mayfield calculations, these failed nests have a survival rate of zero because the nests have no known active dates, and therefore the calculation is divided by zero unexclosed days. Adding nests with no survival rates would bias the calculations to lower estimates of survival. We compared apparent nest success of mini-exclosures and unexclosed nests by Chi-square analysis.

We calculated brood success, the number of broods that successfully fledged at least one chick; fledgling success, the number of chicks that fledged divided by the number of eggs that hatched; and fledglings per male for each site.

We continue to review plover productivity prior to lethal predator management activities compared to after implementation of lethal predator management. We specifically continue to evaluate the changes in hatch rate, fledgling rate, productivity index, and fledglings per male from prior to lethal predator management compared to years with lethal predator management. For a five-year review of the predator

management program and its effect on plover productivity, see Appendix C of Lauten *et al*. 2006.

We evaluated the activity patterns of plovers on four habitat restoration/management areas (HRAs): Overlook, the HRAs at CBNS, Bandon Beach HRA, and the New River HRA. We defined four main usage types: roosting, foraging, nesting, and brooding. Our intent was to show in a simple manner the response of plovers to restored habitats, and therefore, the potential benefits to plovers afforded by habitat management projects.

Results

Abundance

Pre-breeding April surveys and the late May window survey at sites between the Columbia River and Pistol River, Curry Co. did not detect any plovers or plover activity outside of known nesting areas.

During the 2007 breeding season, we observed an estimated 181-184 adult Snowy Plovers at breeding sites along the Oregon coast (Table 1). Of 181-184 plovers, 140 were banded. Using the daily observation evaluation method of estimating unbanded plovers, a minimum of 41 unbanded plovers and a maximum of 44 unbanded plovers were present during the breeding season. For the breeding season, we observed 73 banded females, 67 banded males, 24-27 unbanded females, and 17 unbanded males.

Of the total estimated population, 162 plovers (89%) were known to have nested (Table 1), above the mean percentage for 1993-2006 (79%). A minimum of 61 banded females and 24 unbanded females nested and 60 banded males and 17 unbanded males nested. An additional 12 banded females, one to three unbanded females, and seven banded males were present during the breeding season but were not confirmed nesting. The overall estimated Oregon resident plover population was 174-177.

In 2006 the estimated adult plover population was 177-179, of which 153 were banded. Of these 153 banded adult plovers, 59 (39%) were not recorded in 2007 and therefore are presumed not to have survived winter 2006-2007. The estimated overwinter survival rate based on returning banded adult plovers was 61%.

During the 2007 season, we captured and rebanded 15 banded adult plovers - seven were males and eight were females; we banded eight unbanded adult plovers - six were males and two were females; and we banded 169 chicks.

2006 Hatch-Year Returns

Due to analysis of hatch year returns, we adjusted the 2006 fledgling total to 110. Thirty-two of the 110 hatch-year plovers from 2006 returned to Oregon in 2007. The return rate was 29%, well below the average return rate of 45% (Table 2). Of the

returning 2006 hatch-year birds, 18 (56%) were females and 14 (44%) were males. Twenty-six of the hatch year 2006 returning plovers attempted to nest (81%), and they accounted for 23% of the banded adults.

Distribution

Table 3 shows the number of individual banded and unbanded adult plovers and the number of breeding adult plovers recorded at each main nesting area along the Oregon coast in 2007. At Sutton Beach, we recorded a maximum of seven adult plovers, four of which were known to have nested. At Siltcoos, 36-37 individual adult plovers were recorded, and 26 adult plovers were known to have nested. At Overlook, 28-30 individual plovers were recorded during the breeding season and 20-21 plovers were breeders. At Tahkenitch, 18 individual adult plovers were recorded and nine nested. At Tenmile, 52 individual adult plovers were recorded and 38 were confirmed breeders. At CBNS, 37 individual adult plovers were recorded and 27 of these nested. At Bandon Beach/New River, 71 individual plovers were recorded and 53 of these were confirmed breeders.

Nest Activity

We located 202 nests during the 2007 nesting season (Table 4), the highest number of nests found since monitoring began in 1990. In addition we recorded four broods from nests that we did not locate prior to hatching.

Sutton Beach had three nests in 2007 (Figure 2). One nest was located on the Berry Creek HRA, one nest was located on the Holman Vista HRA and one nest was along the foredune behind the ropes between Holman Vista and Baker Beach access.

At North Siltcoos (Figure 3), 15 nests were found, the highest number of nests for any year at this site. All nests except two were within the roped nesting area; two nests were south of the roped area on the open spit, but both were overwashed and failed. At South Siltcoos, 13 nests were found, the same number of nests as in 2006. All the nests except two were within the roped nesting area; two nests were on the open spit to the north of the main nesting area. One of these nests was overwashed. Siltcoos had nearly the same number of nests in 2007 as in 2006 (28 compared to 25 in 2006, Table 4).

At North Overlook 13 nests were found in 2007, the highest number of nests found in any year at this site (Table 4, Figure 4). In additional, one brood from an undiscovered nest was found at North Overlook. Three nests were found at South Overlook in 2007.

At North Tahkenitch, 10 nests were found in 2007 (Figure 5). Eight of the nests were within the roped nesting area, but two of the nests were north of the roped area along the foredune. There continues to be no available habitat on the south side. The number of nests in 2007 increased compared to 2006 and was similar to the number of nests found in 2003 to 2005 (Table 4).

At Tenmile, 41 total nests were found in 2007, almost twice as high as in 2006, which was to date the highest total number of nests ever found at this site in one year (Table 4). This is the highest number of nests found at any nesting area since monitoring began in 1990. The north spit had 20 nests, double the number of nests in 2006 and the highest number of nests ever for this side of the estuary. Most nests were within the roped nesting area on the north side; however one nest was along the foredune several hundred meters north of the roped nesting area, and another nest was found east of the roped nesting area (Figure 6). Ropes were erected around the nest along the foredune north of the nesting; the nest east of the ropes failed quickly and therefore was not roped off. At South Tenmile, 21 nests were located, the highest number of nests on the south side for any given year. All the nests except three were within the roped area. One nest was south of the nesting area along the foredune, one nest was on the open spit north of the roped nesting area, and one nest was east of the roped nesting area near the lagoon. The nest south of the nesting area failed within days of discovery, the nest on the spit was a one-egg nest, and the nest east of the ropes failed, so ropes were never moved or erected around these nests.

At CBNS (Figure 7), 39 nests were found in 2007, the highest number of nests ever found at this site and the second highest number of nests for any given site since monitoring began in 1990 (Table 4). There was also one brood from an undiscovered nest. South Spoil had 12 nests and the 94HRA had nine nests. The 95HRA had six nests and the 98EHRA had four nests. South Beach had eight nests, the highest number of nests found on South Beach in any given year. In addition, the one brood from an undiscovered nest was found on South Beach and likely hatched on the beach.

At Bandon Beach (Figure 8), 30 nests were found in 2007, the second highest total since monitoring began in 1990 (Table 4). The north end of the habitat restoration was improved in winter 2006/2007, but the south end remained heavily vegetated and was not extensively used in 2007. Plovers continued to nest in and around the China Creek overwash, with several nests within the overwash and one on the north side of the dunes. Another pair of plovers also continued to nest around the vicinity of the Christian Camp trail access. Nesting occurred along the foredune south of the camp trail to the north end of the HRA. Plovers used the north and central area of the HRA where the habitat was maintained during winter restoration work. Several nests were found on the south end of the HRA, either within the thick grassy area or along the southern boundary, however, none of those nests were successful.

At New River (Figure 9), 35 nests were found in 2007, the highest number of nests found at this site since monitoring began in 1990 (Table 4). On the BLM HRA, 14 nests were found and one brood from an undiscovered nest. From the beginning of the season, plover use was spread from the north end of the HRA to the south end. Predation pressure by ravens at the south end of the HRA earlier in the season pushed some of the plovers further north toward the middle and north end of the HRA. After the early part of the season, plover use was mostly concentrated from the north end to the New Lake breach area. While nesting was spread throughout the HRA, increasing grass growth due

to a lack of maintenance work has degraded some of the HRA. Several nests were along the foredune instead of on the HRA, exposing them to more recreational activity, and several other nests were located on the open Croft Lake breach area. One brood from an undiscovered nest was found on the beach adjacent to the north end of the HRA and likely hatched either on the beach or on the HRA in that vicinity. There were no nests along the beach adjacent to private land or in any privately owned overwashes in 2007. Five nests were found on Coos County land, two within overwash areas and three along the riverside. On state land, 16 nests were found on the open spit. Nests were spread out from the mouth of the river south to the state boundary line just north of the Lower Fourmile access area. One brood from an undiscovered nest was also found on the open spit on state land; it was not clear where this brood originated, but it was likely hatched somewhere on the open spit. Bandon Beach State Natural Area from China Creek to the south boundary north of Coos County land had a total of 46 nests in 2007.

Nest initiation by plovers in the 2007-nesting season was average in April (Figure 10). The first nest was initiated 16 March, one of the earliest dates ever, but most nesting activity was initiated in early April. Starting in early May, the number of active nests was considerably higher than the average. Over the past several years there has been a pattern of higher than average number of active nests. This pattern is expected and is a result of increasing plover populations. The maximum number of active nests during 10-day intervals was 68 during 10 – 19 June time period, the same period that had the highest number of active nests in 2006. This is the highest number of active nests recorded during any time interval since monitoring began in 1990, and is the second year in a row that had the highest number of active nests for any time period. The last nest initiation occurred on 24 July.

Nest Success

The overall Mayfield nest success in 2007 was 33%, lower than past five years and below the mean (Table 5). This low rate was partly a result of a fairly high number of one-egg nests and abandoned nests that had very few to no exposure days. Adjusted Mayfield nest success for all exclosed nests in 2007 was 66%, nearly equal to the mean. The number of days nests were unexclosed was considerably higher than the number of days nests were exclosed (2267 unexclosed days, 746 exclosed days). This is the first year since exclosure use began in 1991 that the number of days unexclosed exceeded the number of days exclosed. The increase in the number of days unexclosed was a result of no exclosure use at CBNS, minimal exclosure use at Bandon Beach and New River, fewer days nests were exclosed on Forest Service nesting sites, and improved survival of unexclosed nests largely due to predator management. The adjusted Mayfield nest success rate for unexclosed nests in 2007 was 41%, the second year in a row that unexclosed nests hatched at this rate. These two years, 2006 and 2007, are the only years with sample sizes for unexclosed nests (in terms of number of exposure days) were equal to or higher than sample sizes for exclosed nests.

In 2007, the overall annual apparent nest success rate was 42%, lower than in 2005 and 2006 (47% for both years) and lower than the 18-year mean of 49% (Table 6

and Figure 11). Apparent nest success for exclosed nests in 2007 was 71%, higher than 2006 (66%), but there was nearly half the number of exclosed nests in 2007 (n=38) compared to 2006 (n=68). Apparent nest success for unexclosed nests in 2007 was 35%, similar to 2006 (32%), but there were twice as many unexclosed nests in 2007 (n=164) compared to 2006 (n=79). While nest success of unexclosed nests continues to be significantly lower than nest success of exclosed nests (for 2007, $\chi^2 = 19.891$, df = 1, $P < 0.01$), the past two years have had much improved nest success rates of unexclosed nests compared to the average of the previous ten years ($x = 9\%$).

No exclosures were used at CBNS in 2007, the first time any site had no exclosure use since 1990. Of a total of 39 nests, 19 successfully hatched (49%, Table 6). Nests on South Spoil and the HRA's hatched at a 42% rate, however an unknown small mammal depredated a number of nests during a short time period and the plovers responded by moving to South Beach. On South Beach, nests success was 75%. At Bandon Beach, only one of 30 nests was exclosed. The unexclosed hatch rate at Bandon was 31%, however nearly half the failures were one egg nests or abandoned nests (Table 7). These nests did not fail due to depredation, and exclosure use would have had no effect on these nests. If we exclude these nests from nest success calculations, then unexclosed nests at Bandon Beach hatched at a 43% hatch rate. At New River six nests were exclosed and 29 nests were unexclosed. All six exclosed nests hatched. Five of six of these nests were unexclosed for more than half the incubation period and had a short period of time before they hatched. Exclosures were errected due to increased corvid activity and the depredation of several nests at New River. Unexclosed nests at New River hatched at an overall 48% rate. Unexclosed nests on the BLM HRA hatched at an excellent 64% rate, and overall at New River nest success was 57%.

On Forest Service sites, unexclosed nests did not hatch at rates as high as on the southern nesting sites (Table 6). Tenmile had the best overall unexclosed nest success rate (34%), however South Tenmile only had a 14% unexclosed hatch rate while North Tenmile had a 50% unexclosed hatch rate. Tenmile is further complicated by the fact that nine nests had exclosures, and then the exclosures were removed because of a Great Horned Owl that was targeting adult plovers at exclosed nests. After removal of exclosures, seven of these nests successfully hatched and two failed. The data in Table 6 includes these nests as unexclosed nests, however, we cannot be sure all these nests would have hatched if they were left unexclosed for the entire incubation period. At all other Forest Service nesting sites, unexclosed nest success was 25% or lower. Nest success for exclosed nests on Forest Service sites ranged from 57% at Siltcoos to 78% at Tenmile. At Tahkenitch only one nest was exclosed and it failed. Overall nest success for Forest Service sites was below average in 2007 (compare Table 6 to Figure 11); this is partly due to the high number of unexclosed nests at most sites, which tended to be much less successful than exclosed nests.

Nest Exclosures

Of the 202 nests in the 2007 breeding season, only 38 were exclosed with mini-exclosures (19%). In April and into early May, we did not exclose any nests in

conjunction with the policy of delaying erection of nest exclosures until approximately mid-May (Lauten *et al.* 2004). At CBNS, Bandon Beach, and New River, we continued to not exclose nests unless predator activity was determined to be significant enough that exclosure use was felt necessary. On Forest Service sites, we began erecting exclosures in early May because predation pressure appeared significant and unexclosed nests were not successfully hatching. We continued to monitor predation pressure and modified our approach at each site based on the conditions of that site and the amount and type of predator activity.

At Sutton, all three nests were found in April and all three failed quickly and were not exclosed. At North Siltcoos, all early season unexclosed nests failed, several due to corvid depredation. After early May we exclosed all nests (n=9). Two nests were on the open spit and were overwashed by high tides. Most exclosed nests after mid-May were successful. One exclosed nest failed when the eggs apparently rolled out of the exclosure and corvids then depredated the eggs. One other nest at North Siltcoos was exclosed and had three eggs, and then another female began to lay new eggs in the same nest bowl. The nest eventually had six eggs. The original three eggs hatched, and the original adults took those chicks away except one that died, possibly from being attacked by one of the adult plovers of the second set of eggs. The other three remaining eggs were tended to for another week before the second set of adults abandoned the nest. At South Siltcoos one early season unexclosed nest hatched. Only two unexclosed nests at South Siltcoos failed due to egg depredations, one by a coyote and one by an unknown predator, but we exclosed nests after early May due to the level of predator activity. One exclosed nest was overwashed by high tides. One other nest that was exclosed failed due to weather, however at the time Canada Geese (*Branta canadensis*) were noted spending time around the exclosure and were noted perching on the exclosure, which may have contributed to the abandonment of the nest. Three exclosed nests hatched.

We exclosed five nests at North Overlook and two nests at South Overlook. One of five exclosed nests failed at North Overlook, most likely due to an adult plover being depredated around an exclosure. There have been several cases over the past few years of adult plovers being depredated at Overlook. One of the exclosed nests at South Overlook this year may also have had an adult plover depredated. We have not found direct evidence that plovers were depredated, but adults that have been associated with these nests have disappeared and the nests were eventually abandoned. Our field staff along with Wildlife Service's field staff believes that a Northern Harrier (*Circus cyaneus*), or a pair, which likely was nesting nearby, may be responsible for these depredations. Harriers have been repeatedly seen hunting the area, and have been noted diving at adult and fledgling plovers. In addition, the location of the exclosed nest in 2007 (in the northeast corner of the HRA) was near the location of a 2006 exclosed nest that likely had an adult plover depredated. This location was near grassy dunes at the north end of the HRA, and we suspect that the harrier may be flying low over the dunes and surprising the adult plover inside the exclosure. In the future we intend not to exclose nests that may be vulnerable to sudden attacks. We also intend to closely monitor the area in the future and may possibly recommend removal of the harriers if

problems persist. However, we believe that it would be best if predator management efforts were sufficient to allow us to eliminate use of exclosures.

Only one nest at North Tahkenitch was exclosed, and this nest was abandoned due to unknown reasons. There was no evidence of an adult plover being depredated. Early in the season both corvids and an unknown small mammal depredated nests. Later in the season two unexclosed nests hatched.

At Tenmile, one early season nest on the north side hatched unexclosed, but most unexclosed nests were failing due to predation pressure, so we began exclosing nests in early May. We exclosed 20 of the 41 nests. However, in early June one adult plover was depredated at an exclosure by a Great Horned Owl, and another nest may have failed due to an adult plover being depredated. We then removed all exclosures on the north side, and several exclosures on the south side. The owl was trapped within a couple of nights. After removing the exclosures, seven of nine nests then hatched without exclosures, and two failed. A tenth nest had the exclosure removed, but it was replaced again several days before the hatch date and it then hatched. We did not exclose nests after mid-June; three nests successfully hatched and three nests failed to depredations after that time.

At CBNS, we did not use any exclosures in 2007, the first year since 1990 that no exclosures were used. We did not record a single nest depredation by corvids at CBNS. We did record two nest depredations by coyotes, which continue to hunt all nesting areas from CBNS north. In mid to late June we also recorded a series of nest depredations by an unknown small mammal. The mammal left no footprints, but we found evidence of crushed and eaten eggs just outside the perimeter of the nest bowls. This mammal depredated both plover and Killdeer (*Charadrius vociferus*) nests that were spread out throughout the HRA's and spoil. Despite the sudden increase in predation pressure, we decided not to exclose any new nests because we believed that the mammal was potentially small enough to go through the exclosure fencing, and we did not want to trap adults inside exclosures especially if a mammal was walking up to the nests at night. We worked with Wildlife Service's staff to attempt to identify the mammal and trap it, but we were unsuccessful. We suspect the mammal was either a weasel or a small skunk. Plovers responded to the increased predation pressure by moving to South Beach, where they successfully nested without exclosure use.

In 2006 at Bandon Beach we experienced problems with exclosure use and adult depredations. In 2007 we were concerned about avian predators hunting along the foredune and potentially depredating adult plovers. We also continued to be concerned about exclosures on the beach at Bandon due to past vandalism and recreational problems. Since predator management has been successful at keeping corvid depredations fairly low, we attempted in 2007 to eliminate exclosure use as much as possible. Early in the season corvid predation pressure was relatively low, but in mid-May we noted a spike in raven activity. At this point several nests failed on the HRA, so we exclosed the one remaining nest on the HRA and it hatched. WS removed the ravens and we did not exclose any other nests for the rest of the season. We did not record any adult plover depredations at Bandon in 2007. Only seven of the 20 failed nests were

predator related failures, which indicates that for 13 failed nests, exclosures would have provided little to no additional protection.

Of 35 nests at New River, we exclosed just six, all of which hatched. Predation pressure at New River was very similar to Bandon Beach. At the beginning of the season predation pressure was fairly low, but in mid-May raven activity increased and several nests were depredated, particularly on the BLM HRA. We then exclosed the remaining three nests on the HRA, two of which were hatching within several days. We also exclosed three nests on county land because we felt raven activity was increasing in that area. After mid-May, corvid activity remained reasonable, and we did not exclose any more nests. Of the 15 nest failures, only four were egg depredations, all due to corvids. All other failures were non-predator related, again indicating that exclosure use would not have provided any additional protection to these nests.

Adult Mortalities

During the 2007 nesting season, eight females disappeared, died, or were depredated. Of these eight, three were HY06 and therefore had no previous history nesting in Oregon. Two of these females were seen four times each, one disappearing after 27 April and one disappearing after 23 May. Both of these females could have migrated out of the area. The third HY06 female was associated with an exclosed nest at South Overlook. The nest was abandoned and the female was never seen after 7 June. We found no evidence that the female was depredated, but the failure of the nest and the female's disappearance suggests she may have been depredated. Of the remaining five females, all were Oregon residents in 2006 with nesting history. One female was associated with a nest that hatched and then she was not recorded after 20 June. It is possible she migrated out of the area. One female was associated with an exclosed nest at North Overlook and it is believed that she was depredated, possibly by a Northern Harrier. One female was recorded once early in the season at South Spoil where she was a known nester in previous years; it is possible she was depredated. Another female was recorded four times through 30 April at Siltcoos where she was a known nester in 2006; she may have been depredated. The last female was incubating a nest at New River that drifted during high winds under a log. The log eventually collapsed due to continuing sand movement, pinning the female and killing her.

Nine males disappeared, died or were depredated during the 2007 nesting season. All nine males were adults with previous nesting history in Oregon. Two of the males were recorded at CBNS repeatedly, and one was confirmed nesting in 2007. These two males disappeared after 26 June and 3 July, and could have migrated from the area at that time of the year. One male from New River was found with a suddenly broken leg in late April. He was captured and transported to Newport Aquarium, and he then died during an operation to attempt to set his broken leg. One male at North Tenmile was known to have been depredated by a Great Horned Owl at an exclosed nest. The remaining five males all disappeared and likely were depredated. One male from CBNS disappeared after 23 May; he was known to have nested on South Beach in 2006 but was not associated with any known nest in 2007. Another male from CBNS who typically nests

with a particular female disappeared after 8 May. The female at the time was associated with a nest, and that nest was abandoned shortly after this time period with three-week-old embryos still developing. We had not confirmed that this male was the male associated with this nest, but based on the history of this pair, the nest being abandoned, and the male's sudden disappearance, we believe he was depredated. A male that has been a regular nester at Bandon Beach, in the China Creek overwash, had an early season nest that hatched and he fledged one chick. There were then two new nests initiated in the China Creek overwash again, and both were eventually abandoned. This male was last recorded on 11 June, and he was almost always seen around the China Creek overwash area. Based on the disappearance of this male and the unexplained abandonment of these nests, we strongly suspect that this male was depredated. This male also wintered in this same location. A male who was a known North Tahkenitch nester in previous years was recorded at this site twice in April, and then he disappeared after 27 April. It is possible he was depredated. One other male known to have been a resident at Siltcoos in previous years was recorded through 7 May, and then he disappeared. It is also possible that he was depredated. Based on our previous experience, breeding resident plovers that disappeared during the nesting season, especially early in the season, have most likely died or been depredated.

Nest Failure

Exclosed nests in 2007 had an overall failure rate of 29% (11 of 38), similar to most previous years (34% in 2006, 27% in 2005, 15% in 2004, and 23% in 2003). Unexclosed nests (excluding nests that were exclosed, then exclosures were removed, n=9) had an overall failure rate of 66% (103/155), similar to 2006 (68%), and less than the 2000-2005 average (94%). Overall nest failures were attributed to unknown depredation (20%), one-egg nests (20%), corvid depredation (17%), abandonment (16%), unknown cause (7%), unknown mammal depredation (7%), overwashed (3%), infertility (3%), coyote depredation (3%), wind/weather (3%), raccoon depredation (1%), and adult plover depredation (1%, Table 7). The main causes of nest failure of exclosed nests (Table 8) were abandonment (n=5, 45%) and overwashing (n=3, 27%). One exclosed nest was depredated by corvids, but this was actual a result of windy weather blowing the eggs out of the exclosure which resulted in crows depredating the eggs. One exclosed nest failed due to an adult plover being depredated. The main causes of failure for unexclosed nests were unknown depredation (n=23, 22%), one egg nests (n=23, 22%), corvid depredation (n=19, 18%), abandonment (n=13, 12%), unknown mammal depredation (n=8, 8%), and unknown cause (n=8, 8%). Coyotes depredated three (3%) unexclosed nests and one nest was depredated by a raccoon (1%). Four unexclosed nests were infertile (4%), two were buried by wind blown sand (2%), and one was overwashed (1%). Corvid and unknown depredations combined were responsible for 37% of the failures and 78% of egg depredations. Based on known egg depredations, it is likely that approximately two-thirds of unknown egg depredations are caused by corvids, or approximately 14 of the 23 unknown depredations in 2007. Combining this estimate with known corvid depredations (14 + 20 = 34), then corvids were likely responsible for 62% of egg depredations and about 30% of all nest failures. Corvids continue to be the main cause of nest failures, particularly of unexclosed nests. For unexclosed nests, abandoned,

one-egg nests, infertile nests, wind blown nests and overwashed nests combined (n=43) were responsible for 41% of the failures. These nests did not fail due to predator related causes, therefore exclosure use in these cases would have had no impact on the outcome of these nests.

In 2007, there continued to be a high number of one-egg nests (n=23, nearly twice the number found in 2006). Since exclosures are not used on these nests, management activities are not the cause for these nest attempts being abandoned. It is possible that the strong field crew in 2007 contributed to finding more newly laid nests and one egg nests than in previous years, but it also appears that with increasing numbers of plovers we are simply finding more one egg nests. There were also a high number of abandoned nests (n=18) in 2007. Five of these nests were exclosed and 13 were not exclosed, also suggesting that management activities (i.e., exclosure use) are not necessarily the cause of nest abandonment.

Fledgling Success and Productivity

We monitored 89 broods in 2007 including 4 broods from undiscovered nests. This is the highest total number of broods monitored in any year. A minimum of 123 fledglings were confirmed, the highest number of fledglings since monitoring began in 1990 (Table 9). Overall fledgling success was 54%, well above average and the second highest rate since monitoring began in 1990 (Table 10). The overall number of fledglings per brood was 1.38 (123/89) compared to 1.30 in 2006 and 1.46 in 2004, the other two years which had over 100 fledglings (Table 9). The overall number of fledglings per male was 1.60 (123/77, Table 12), similar to 2006 (1.56). Using the productivity data from Siltcoos to New River only (Tables 13-19), this is fifth year in a row that fledglings per male was greater than 1.00 (Table 11).

The overall brood success rate was 82% (Table 12) compared to 76% in 2006, 69% in 2005, and 88% in 2004. At Siltcoos and Overlook approximately 75% of the broods were successful (n=7/9 and n=6/8 respectively). There were only two broods at Tahkenitch this year, one of which was successful (50%). At Tenmile overall brood success was 89% (n=16/18). CBNS had a 70% overall brood success rate (n=14/26), however two broods were never confirmed fledged and may have fledged some chicks, but are considered failed for these rates. At Bandon Beach, overall brood success was 80% (n=8/10), and at New River, overall brood success was 95% (n=21/22).

Fledgling success rates for individual sites was greater than 40% (Table 12) except at South Overlook and North Tahkenitch (33% each) where the sample size was very small (n=1 and n=2, respectively). At Siltcoos, fledgling success rate was 47% on the north side and 44% on the south side. The only other side with fledgling success rate less than 50% was South Beach (44%), but as noted above two broods were never confirmed fledged and may have had fledglings, but are considered failed in these rates. Overlook had a 56% fledgling success rate, and Tenmile had a 57% rate on the north side and a 70% rate on the south side. At CBNS, both South Spoil and the HRA's had 50% fledgling success rates, and at Bandon Beach fledgling success was 54%. At New River,

the HRAs had a fledgling success rate of 52% while the other lands had a 75% fledgling success rate.

Post predator management fledgling success rates and the number of fledglings per male continue to be much improved compared to pre predator management years (Tables 13-19). At Siltcoos (Table 13), fledgling success was 46% in 2007, well above the average prior to predator management, but below the last several years. Siltcoos had 1.10 fledglings per male in 2007, the fourth year in a row over 1.00. At Overlook, fledgling success in 2007 was well above average, and 1.22 fledglings per male were produced (excluding the brood from the unknown nest), although North Overlook produced most of the fledglings (Table 12 and Table 14). Tahkenitch had the lowest overall productivity in 2007 (Table 15), and was below the average for post predator management years for hatch rate, fledgling rate and fledglings per male. Tenmile had the most productive year to date (Table 16). Fledgling success was 63%, higher than average for post predator management years, and 1.50 fledglings per male were produced, slightly higher than the average for post predator management years. CBNS continues to be the most productive site on the coast (Table 17), producing 2.17 fledglings per male, the fourth time in six years that this area surpassed 2.00. Bandon Beach had its most productive year since monitoring began (Table 18). Fledgling success (54%) and fledglings per male (1.63) were the highest since monitoring began. New River was also extremely productive (Table 19) with a 64% fledgling success rate, well above average for post predator management years. The number of fledglings per male (excluding broods from unknown nests) was 1.70, one of the highest years to date.

Siltcoos produced a total of 11 fledglings in 2007, the fourth year in a row with greater than nine fledglings for this site (Table 9). North Overlook had 12 fledglings in 2007, the highest number of fledglings ever for this site, and overall Overlook produced 13 fledglings. North Tahkenitch declined for the third consecutive year, having produced only two fledglings in 2007. Tenmile was very productive, with both the north and south side producing the highest number of fledglings ever for each side (13 and 14 respectively). CBNS produced 26 fledglings in 2007, slightly down from 2006 (n=30). South Beach had the highest total (n=10) of the three nesting areas at CBNS, the first time since prior to the creation of the habitat restoration areas that South Beach had the highest total, and only the second time since monitoring began that South Beach had more than 10 fledglings. At Bandon Beach, the 13 fledglings produced in 2007 was the fourth year in a row of over 10 fledglings produced. At New River a total of 31 fledglings were produced in 2007, the highest total for this site since monitoring began in 1990. The BLM HRA produced 14 fledglings, the highest total for this area. Coos County lands produced three fledglings and state land produced 12 fledglings.

Brood Movements

As noted in past years, broods movements are unpredictable and variable, and are difficult to assess without focused efforts on this aspect of plover ecology. Since our focus tends to be on surveying and enhancing plover productivity, observations of broods

and their movements are mostly opportunistic, and thus we have little data on what habitats broods are using, and when, where, and why they actually move.

Roped nesting areas act as a safe refuge from recreational activity on the beach, but plover broods do not stay within the confines of the nesting area and broods are often found in the wrackline and on wet sand, particularly in the morning before beach activity increases. In 2007, at Siltcoos, we did not note any unusual brood behavior. Broods apparently stayed within the confines of the nesting area and the spits. No broods were noted crossing the river, and there was no noted brood use south of Waxmyrtle trail to the Carter Lake trail area. At Overlook, at least two broods moved south along the foredune towards North Tahkenitch. One brood was noted at North Tahkenitch before being confirmed fledged back at Overlook, and a second brood was noted running along the foredune well south of South Overlook before it was confirmed fledged at North Overlook. This shows that broods can and will move considerably far from their hatch location, and will use the open beaches between nesting sites. At North Tahkenitch there were only two broods, one of which failed quickly. The other brood was noted mostly at the south end of the spit, often in the wrackline, and was confirmed fledged towards the north end of the spit. At Tenmile brood activity was typical, with broods staying on the HRAs, moving around on the spits, and occasionally moving north or south along the foredune. One brood was observed swimming across the creek from the south side to the north side.

At CBNS, broods that hatched from South Spoil, 98EHRA, and 94HRA tended to move west towards the 95HRA and South Beach. The southern section of the 95HRA, along the foredune with South Beach, tends to be an area of high brood use. This is likely due to the proximity of the beach, where food resources are likely highest, yet affords the broods good protection from predators due to the vegetated foredune. Many broods eventually moved to the beach, particularly in the latter part of the brood stage. Broods that originated on the 95HRA tended to stay on the 95HRA and also moved to South Beach. Broods rarely, but occasionally, moved east from the 95HRA or beach to the 94HRA. At the end of the season there were a number of broods on South Beach. Nesting was concentrated on the beach south of the 95HRA, but one nest was much further north. Most of the nests hatched within a short period of time of each other. Broods were concentrated at the south end of the beach at first, but as time went on several broods moved much further north, so that there was a concentration of brood activity from west of the 95HRA to the jetty, but also much further north and west of the 98WHRA. Broods did not travel as far north as the FAA towers.

Brood activity at Bandon Beach was stretched along the entire beach from China Creek to the south end of the HRA. As in 2006, the brood from an early season nest in China Creek overwash spent all of the brood rearing period in and around the China Creek overwash. One brood that hatched just south of the Christian Camp trail just prior to the 4th of July holiday moved south, but then quickly failed. Recreational activity was fairly heavy at that time and not far from the area where the nest hatched. Other broods that hatched along the foredune tended to stay along the foredune, but also used the north end of the HRA. Broods that hatched on the HRA tended to stay around the HRA, but

some movement north along the foredune occurred. Broods did use the southern heavily vegetated section of the HRA, but mostly along the periphery (notably at the north end of the vegetated area and along the foredune south to Twomile Creek). One brood from the New River spit moved north, crossed Twomile Creek, and was reared on the Bandon HRA. No broods moved south to the New River side of the creek. At New River, broods hatched on state and county land tended to stay on the open spit, mostly using the area from Lower Fourmile access north to the Twomile Creek mouth. One female with a brood of one chick that hatched on county land did move south onto lands privately owned. This female is particularly sneaky, and it was unclear if she spent much time on the riverside or within the old overwashes on private land. No broods from the spit area moved south to the BLM HRA, nor did any broods from the BLM HRA move north along the beach adjacent to private land. All broods on the BLM HRA stayed on the HRA and adjacent beach. Brood activity was noted from the very north end of the HRA to just south of the New Lake breach, although the majority of brood use occurred north of the New Lake breach to the north end of the HRA. Broods seem to prefer the areas of the HRA that are not breached, even though several nests were on the Croft Lake breach. The breach areas tend to be very open with little cover for chicks, so broods tended not be found on the open breach areas, but moved onto the adjacent more vegetated HRA. While vegetated cover is important for brood protection, too much vegetation is detrimental due to the inability of the plovers to see predators and difficulty moving around through thick vegetation.

Activity Patterns on HRAs

Table 20 shows the activity patterns of plovers on four habitat restoration areas: Overlook, the HRAs at CBNS, Bandon Beach HRA, and the New River HRA. We were unable to confirm all types of activity on each site for each year, therefore a missing activity does not necessarily indicate that that behavior is not occurring, rather we have not confidently identified that behavior for that given site and year.

Sightings of Snowy Plovers Banded Elsewhere

Eleven plovers banded in California were observed in Oregon in 2007. Nine were females and two were males. Ten of the eleven plovers attempted to nest in Oregon; only one female did not nest. Three females and one male originally hatched in Oregon and were subsequently rebanded at coastal nest sites in California; all of these plovers have been established Oregon breeders except one female that did not attempt to nest in Oregon. This female was only noted for about one week in late June to early July and has not had a previous history of nesting in Oregon. Two hatch year plovers banded at Leadbetter Point, Pacific Co., Washington in 2007 were recorded in Oregon at the end of the season.

Of the six females originally banded in California, three were banded as chicks in Humboldt Co., and one was banded as an adult in Humboldt Co. None of these females were known HY06 chicks, however one female retained her hatch year band combo (X:Y) and therefore we are uncertain which year she hatched. Except for the latter bird,

all these females have previous nesting history in Oregon. Two other females were originally banded in 2005 as chicks at Salinas SP, Monterey Co. One of these females previously nested in Oregon in 2006, but the other female had not been previously recorded in Oregon. One male was originally banded as a chick in 2005 at Salinas SP, Monterey Co.; he nested at New River in 2006 and 2007.

Discussion

From 1995 to 2003, the number of plovers recorded along the Oregon coast remained fairly stable, fluctuating around 100 to 120 total plovers present and 80 to approximately 100 breeding plovers (Table 1). From 2004 to 2006, there was a steady increase in the number of plovers present and the number of plovers breeding. In 2007, the total number of plovers present was the highest ever, but did not increase substantially from 2006. However, the number of breeding plovers did increase and the window survey count was the highest recorded since monitoring began in 1990 (Table 1). The window survey count is important because the recovery plan for plovers uses this index to determine the number of breeding plovers needed to reach recovery goals (U.S. Fish and Wildlife Service 2007). The total number of plovers present did not increase much from 2006 likely because winter 2006-2007 was cold and wet, and overwinter survival of adult and juvenile plovers was generally poor. Overwinter survival of adults was approximately 61%, down from 71% in the previous winter (Lauten el al. 2006) and below estimates used in the population viability model in the recovery plan (U.S. Fish and Wildlife Service 2007). The hatch year return rate in 2007 was the lowest ever (29%, n=32) and well below the average (Table 2). Colwell et al. (2007) reports similar adult and juvenile survival rates for Humboldt Co. plovers, indicating that poor survival of overwintering plovers was not solely a local phenomenon. Both juvenile and adult survival rates were low compared to other estimates reported in the literature (Sandercock et al. 2005, Stenzel et al. 2007, U.S. Fish and Wildlife Service 2007). The reasons for increases in the window survey count and the number of breeding plovers but not in the overall number of plovers present may be partly a result of differences in field monitoring between 2006 and 2007. Surveying throughout the summer results in almost full detection of all plovers, so for both years the total number of plovers was similar. However, in 2007, all field monitors were on full time from 1 April, while in 2006 one field monitor of four was part time until early June. In 2006, because of the short staff, field crews spent fewer days at each individual site, which may have resulted in fewer individual plovers being identified as confirmed breeders. The number of breeding adults in 2006 may have been more than were actually tallied because some breeding plovers may have gone unconfirmed. In 2007, we were able to divide the workload more equally between field crews, which resulted in more time spent at each individual site. This resulted in better confirmation of breeding adults, which is reflected in the increase in the number of breeding adults in 2007, but not a similar increase in the total number of plovers. .

Colwell *et al.* (2007) states that the population in Humboldt Co., CA is maintained by immigration of plovers into the local breeding population. This is also true for Oregon, as the number of returning hatch year plovers has not replaced the

number of lost adult plovers. From 2006 to 2007, 59 banded adult plovers did not return to the Oregon coast. Only 32 of 110 hatch year 2006 plovers returned to the Oregon coast, showing that hatch year returns did not replace the number of lost adult plovers, yet the overall population remained about the same size (Table 1). This indicates that the population continues to be bolstered by immigration of plovers into the area from other breeding locations. Interestingly, however, there were fewer California banded plovers in Oregon in 2007 than in 2006 (Lauten et al. 2006), and all but possibly one have been recorded in Oregon previous to 2007. This suggests that unbanded plovers from populations that are not being banded are immigrating into the area. Where these plovers originate is unknown. It is important to note that the increased productivity of Oregon plovers over the last five years has helped to maintain the overall increased population size. Prior to 2003, the number of fledged chicks was about 30-50 individuals. With poor overwinter survival such as in 2006-2007, the number of returning plovers in years prior to 2003 would have been very small, and thus the contribution to the overall population would have been small. With increasing productivity, even in years with poor overwinter survival, there is a better chance of good numbers of hatch year returns, thus helping to replace lost adult plovers.

There were some changes in the distribution of plovers during the 2007 season. At Sutton Beach, for the second consecutive year a minimum of four plovers attempted to nest at Sutton (Table 3). For the two years previous to 2006, Sutton had no nesting activity and few plovers used the area during the breeding season (Table 4). Nesting attempts at Sutton occurred early in the season, and after the nests failed plovers essentially abandoned the site. At Siltcoos the total number of plovers using the area in 2007 was down from 2006 (49 in 2006, 36-37 in 2007). However, the number of plovers that nested at Siltcoos increased from 16 in 2006 to 26 in 2007. There were similar numbers of nests at Siltcoos in 2006 and 2007 (Table 4), so the increase in breeding plovers is likely a result of better identification of nesting adults. At Overlook, the overall number of plovers using the area was very similar from 2006 to 2007 (32 compared to 28-30), however the number of nesting adults increased from eight in 2006 to 20-21 in 2007. The number of nests at Overlook was also similar in 2006 and 2007, again suggesting that the increase in breeding adults was due to better identification of those adults. Tahkenitch had more overall use by plovers in 2007 (eight in 2006 compared to 18 in 2007), and the number of breeding adults was also slightly higher (six compared to nine). The number of nest attempts also increased in 2007 (Table 4), however most nests were not successful (Table 6). Tenmile had the largest overall increases in plover activity. Nearly 20 more plovers were recorded using the Tenmile estuary in 2007 compared to 2006 (34-35 in 2006 compared to 52 in 2007), and the number of breeding adults nearly doubled (23 in 2006 compared to 38 in 2007). This increase is not likely due to better identification of breeding adults, as the number of nests at Tenmile nearly doubled in 2007 compared to 2006 (Table 4). Tenmile is one of the most remote breeding areas, particularly on Forest Service property, and continues to be one of the most productive areas on the coast (Table 16). The increase of plover activity, particularly on the north spit, is very encouraging and should be fostered. Tenmile remains one of the best areas for habitat improvement, as the area already is far from recreational activity and there are available dunes, particularly north of the north spit that

could be restored. Furthermore, encouraging plovers to nest in areas that have proven to be productive should be priority over sites that have poor productivity and act as sinks. There was a slight decline in plover numbers at CBNS from 2006, one of the only sites that recorded both a decline in the total number of plovers and the number of breeding plovers (45 total plovers in 2006 compared to 37 in 2007, and 33 breeding plovers in 2006 compared to 27 in 2007). Plovers do not winter in large numbers at CBNS, so the decline at this site is not related to overwinter survival of plovers at this site. Despite the slight decline in plover numbers, the number of nest attempts increased slightly (Table 4), however this is likely due to depredation of nests at this site resulting is more nest attempts. Bandon and New River combined continue to have the largest number of plovers and breeding adults (Table 3, nearly 40% of the plovers on the coast and 33% of the breeding adults). The number of plovers using this area increased slightly from 2006 (66-67 compared to 71 in 2007) as did the number of breeding adults (47 in 2006 compared to 53 in 2007), despite the fact that up to eight breeding adults were depredated at Bandon in 2006 (Lauten et al 2006).

Despite the small increase in the total plover population, the 2007 breeding season had the highest number of nests since monitoring began in 1990, over 50 more than the previous high in 2006 (Table 4). The total includes 23 one egg nests and an additional 18 abandoned nests, double the number of one egg and abandoned nests found in 2006 (Lauten et al. 2006), and considerably more one egg nests and abandoned nests than any year from 2000 to present (Castelein et al. 2000, 2001, 2002, Lauten et al. 2003, 2004, 2005, 2006). The reasons for the high number of one egg and abandoned nests are difficult to assess, however a couple of factors may have contributed to both the high number of nests found and the high number of one egg and abandoned nests. One reason may be related to the condition of plovers following a cold winter that apparently resulted in poor overwinter survival. In 2007 we noted a number of early season nests either were infertile, had infertile eggs, or had clutches of less than three eggs. This may suggest that the physical and physiological condition of female plovers may have been poorer than normal due to stresses related to cold and wet weather conditions in winter. This may have resulted in a higher than normal rate of inviable eggs. It may have also resulted in females laying eggs but either being unable to finish clutches, or not being ready to begin the incubation process and thus abandoning the nest attempt. Females then may have renested when they were more prepared to attempt a full clutch and incubation period, thus resulting in more nest attempts then in a typical year. However, another potential reason for the high number of one egg and abandoned nests may have been related to monitor effort. Due to the strong monitoring crew this season, we may have found more nests early in the egg laying process than we have in previous years. It is possible that if we do not find these nest attempts early and they are abandoned quickly, the tracks leading to the nests and the eggs themselves may get buried quickly in windy conditions, and therefore we do not find the nests or eggs and the nest attempt is never recorded.

It is encouraging that for the second season in a row plovers attempted to nest at Sutton Beach after no nests were found for the previous two seasons (Table 4). Some of the nest attempts were within the relatively newly created Holman Vista habitat restoration area. Despite the nest attempts none were successful. Tahkenitch also saw an

encouraging increase in nest attempts in 2007, however, most of those nest attempts failed quickly. Plover use of north spits at Siltcoos and Tenmile continued to increase even though both locations did not restore any additional habitat, although existing habitat was improved at both sites. At CBNS, South Beach had the highest number of nests ever, plus one brood from an undiscovered nest was found on the beach and likely originated there. The relatively high number of nests on South Beach was a result of nests failing on the HRAs and spoil from an unknown small mammal. After the small mammal depredated most active nests on the HRA and spoil, plovers moved to the beach in an attempt to find a different location where predation pressure was less. It is important that as much habitat as possible is maintained for plovers throughout the breeding range even if that habitat is not occupied at the beginning of each season so that plovers have a place to attempt to renest when nesting attempts fail at other locations.

At Bandon Beach, plovers nested in the China Creek overwash throughout the summer, and plovers continue to occupy the entire beach from China Creek overwash, south along the foredune, and on the HRA to the south end. While China Creek is not considered within the emphasis area of the proposed Habitat Conservation Plan (HCP, Jones and Stokes, 2007), nesting has occurred within the overwash since 1990, and nest attempts have been consistent over the past three years. According to the HCP, if an area has nesting attempts outside a Snowy Plover Management Area (SPMA) consistently and predictably (three years in a row), and there is successful nesting at least two of the three years, OPRD will consult with USFWS to consider adding the site to the list of SPMAs in exchange for one of the unoccupied SPMAs. It can be expected that plovers will nest at China Creek in the coming years. Therefore China Creek south to the Christian Camp trail should be considered part of an SPMA based on the nesting history of this area. At New River, the number of nests found in 2007 was the highest ever, and plovers occupied the state and county spit lands and the BLM HRA from the north end to the far south end from the beginning of the season. On the BLM HRA, plover nests were found in the beginning of the season from the north end to the south end, but due to raven activity at the south end, most of the plover activity for the remainder of the nesting season was concentrated from the north end to the south end of the New Lake breach. Due to the lack of habitat restoration work on the HRA, many areas of the HRA are being detrimentally degraded by beachgrass. Due to the thick grass, plovers tended to nest on the beach and along the foredune edge and on the open breach areas more than they have in the past. BLM does not have plans to continue restoration in the winter of 2007-2008, which will certainly result in further degradation of habitat as well as a reduction in the amount of critical habitat in the area.

One of the most encouraging aspects of the 2007 nesting season was the reduction in the number of days exclosed, the increase in the number of days unexclosed, and the reduction in the number of exclosed nests. For the first time ever, the number of unexclosed days exceeded the number of exclosed days, and the difference was substantial. While overall Mayfield nest success was down, Mayfield nest success for exclosed nests was near average and for unexclosed nests was double the average (Table 5). Since the number of days unexclosed was very high, the Mayfield nest success for unexclosed nests was quite good. We believe that the average nest success of exclosed

nests is quite high, and quite probably higher than a naturally nesting population, which is likely between 40 to 50%. Therefore it is very acceptable that unexclosed nest success was 41% in 2007, and we believe that an average of between 40 to 50% nest success would produce enough chicks for a growing and sustainable population as long as fledgling success and fledgling per male also remained at sustainable levels. As an example, at CBNS and New River in 2007, overall apparent unexclosed nest success at these sites was 42% and 48% (Table 6). All nests at CBNS were unexclosed, and the majority of nests at New River were unexclosed. The nest success rates of these unexclosed nests were considerably below the average nest success of exclosed nests (Table 5). Yet CBNS and New River produced excellent fledgling success rates, fledglings per male, and total number of fledglings (Table 12).

The lack of exclosure use at CBNS, and the minimal exclosure use at Bandon Beach and New River was also very encouraging. This is further evidence (besides productivity numbers since predator management was initiated) that predator management activities are having a positive effect on plover nesting and productivity. At Forest Service sites, unexclosed nests did not fare as well as south sites (Table 6). Corvids continue to be the main cause of depredated unexclosed nests (Table 7 and Table 8). It appears that corvid numbers on Forest Service sites are higher than on southern nesting areas (Little 2007), but some other factors may also be involved. Most of the Forest Service sites are considerably smaller than southern nesting areas, thus it is easier for predators to search the areas and find plover nests. Another factor may be the proximity of several campgrounds to the Siltcoos nesting areas. It is also more difficult for Wildlife Services to be consistently present on Forest Service sites. On southern nesting areas, CBNS has little corvid activity, freeing Wildlife Service staff of the need to consistently visit this area and permitting them to work nearly daily in the Bandon/New River area. On Forest Service sites, the one Wildlife Services staff member has more areas to cover and greater driving distances between sites, thus his job is more complicated and he cannot be present on each nesting area every day as is likely needed. To further reduce exclosure use on Forest Service sites, it would be best to fund and hire an additional Wildlife Service staff member who would help alleviate the workload, better distribute the time and effort on site, and be present more frequently on each nesting area. Exclosure use will continue to be needed in the future, but we intend to continue to work towards reducing the number of exclosures used and the number of days exclosed. Adult mortalities continue to occur in association with exclosed nests, thus any reduction in their use is beneficial to plover survival. Furthermore, while exclosure use has proven to help restore plover populations, maintaining a recovered population would preferably occur without exclosure use. Predator management is essential to the success of the plovers, and we continue to refine and modify our techniques to best respond to predation issues and improve plover productivity.

Plover productivity continues to be greatly improved since the implementation of predator management in 2002. Overall productivity in 2007 was excellent, with the highest number of fledglings ever produced (Table 9) and one of the highest fledgling success rates ever (Table 10). Productivity at individual sites continues to be much higher than previous to predator management (Tables 13-19). All sites with the

exception of Bandon Beach have post-predator management fledgling success rates over 40%, productivity indices greater than 20%, and more than 1.00 fledglings per male. Even at Bandon Beach post-predator management fledgling success is close to 40%, the productivity index is much improved and nearing 20%, and fledglings per male is greater than 1.00 (Table 18). One Forest Service site in 2007 had less than 1.00 fledgling per male (Table 12), and Forest Service sites in general were less productive in 2007 than in 2006 (Lauten et al. 2006), but southern sites were more productive in 2007 than in 2006. This annual variation in the productivity of individual sites should be expected.

Overall the data continues to support that predator management, habitat restoration, and recreational management are having a positive effect on the plover population and productivity. We continue to recommend that these management actions be supported at current or higher levels. Wildlife Services notes that some predator levels are down from six years ago (Little, pers. comm.), but the number of predators removed, the level of nest predation, and the continual changing aspect of predator populations, continues to justify the careful management of predators.

While there continues to be maintenance and improvement of some of the nesting areas, further improvements are needed and in some cases there may be some loss of habitat. Some Forest Service sites remain relatively small (i.e., Siltcoos), which concentrates plover nesting and permits predators, particularly corvids, to hunt quickly and efficiently. Tenmile, which had an increase in plover numbers and activity, can and should be improved particularly on the north side. Tenmile is remote and has very good productivity, but increasing plover numbers without increasing habitat may result in a concentration of prey that could result in a concentration of predator activity. At Bandon, sufficient funding has not been spent to maintain and improve the entire habitat restoration area. This has resulted in a loss of quality nesting habitat. Furthermore, no habitat management has been done on state owned land on the New River spit. Beachgrass continues to establish dunes on the spit, which have grown with each year that there has been no grass removal. These dunes with associated grass should be removed before they grow much bigger and become more difficult to remove. With each year the dunes grow, there is a reduction is available nesting habitat, potentially forcing plovers to nest in substandard habitat. The BLM HRA at New River will go through a second winter with no habitat maintenance, which has resulted in a serious degradation of available nesting habitat. If habitat continues to degrade at both ends of New River, and plover numbers continue to increase then plovers will have to search and find other locations to attempt to nest, locations that may not exist. With the success of the current management programs, it makes little sense to reduce the available nesting habitat or let the habitat degrade. Furthermore, it seems more cost effective for agencies to maintain and expand existing HRAs at known nesting areas than to spend limited resources attempting to establish new nesting areas at sites that plovers have not used in years. It is essential that existing quality nesting areas continue to be maintained, improved, and expanded to provide the increasing plover population with adequate and high quality nesting habitat.

We recommend the continued use at all sites of ropes and signs along nesting beaches and habitat restoration areas. Ropes and signs should be installed as early in the season as practical so that the closed sections of beach are adequately protected throughout the season and the public understands which sections of beach are closed and the message is consistent throughout the nesting season and from year to year. Installing ropes and signs at the beginning of the season also reduces the need to respond to individual nests that are within closed beach sections but not roped and signed. This reduces the disturbance to those nests when ropes and signs have to be installed after a nest is found. Because there has been nesting at China Creek for the past three years, we recommend that China Creek overwash at Bandon Beach be considered a nesting area, and roped and signed at the beginning of each nesting season. We also recommend that OPRD continue to maximize signage and volunteer time at Bandon Beach, including erecting signs for hikers explaining the length of beach they are hiking and where they are permitted to camp. Hiking and camping continues to increase in the Bandon/New River area, and signage is important to inform the public of the current camping restrictions. We also believe that some type of gate at China Creek parking area that can be open and closed each morning and evening would reduce the number of violations in this area. We have repeatedly noted that most violations occur near the parking lot to the Christian Camp trail, and that they often occur early and late in the day or at night. We further believe that rerouting or closing the Christian Camp trail would reduce the number of violations in this area. Bandon Beach continues to have some of the most serious violations. Increased presence especially by law enforcement and OPRD staff could help reduce violations. The presence of seasonal employees and volunteers at nesting beaches as well as law enforcement presence continues to be the most positive recreational management tool to reduce violations and educate the public.

Habitat Restoration and Development Projects

The USFS bulldozed 12 acres of habitat south of Holman Vista, Sutton Beach in the winter of 2006-07. No habitat restoration was completed at Berry Creek. Spreading woody debris or shell hash on the areas may attract plovers as well as improve nesting potential.

At Siltcoos, eight acres on both the north and south side of the estuary were bulldozed in winter 2006-07.

At Overlook 15 acres of habitat was bulldozed in winter 2006-07. All habitat on the north side was improved, but the south side did not have any habitat improved.

At Tenmile, maintenance of 15 acres on the south side and five acres on the north side was completed in the winter of 2006-07. Further maintenance and improvement of the north spit should be considered for the future.

At CBNS in winter 2006-07, BLM disked the entire habitat restoration area and parts of the spoil (170 acres).

At Bandon Beach, the HRA north of Twomile Creek/New River estuary was partially maintained in the winter of 2006-07. From the north end of the HRA, about 9-10 acres was bulldozed. The south end did not get treated due to limitations of time, equipment and funding. The south end has become fairly heavily vegetated and will need to be totally cleared in the future.

At New River, BLM did not do any habitat management in winter 2006-07, and there is no plan to maintain any habitat in winter 2007-08. Some areas of the HRA have become or are becoming heavily vegetated with beachgrass. Breach areas and some overwash areas remain free of vegetation but the habitat is degrading quickly.

Recommendations

Signing of Restricted Areas

Signing and roping for the 2008-nesting season should again be implemented to inform the public of plover nesting habitat and direct the public away from the nesting areas. High tides early in the season often make posting areas a challenge, but it is important to have signs in place beginning on 15 March. Maintenance of signs is important to keep violations to a minimum. To maximize the effectiveness of signs and ropes each site should continue to be evaluated and ways to improve the signing and ropes should be considered.

General Recommendations

Below are general recommendations. We also provide additional site-specific comments and management recommendations in Appendix B.

- Maintain, enhance and expand habitat restoration areas.
- Reduce use of mini-exclosures in conjunction with predator management to reduce the risks to adult plovers, decrease the time monitors spend around individual nests, and decrease disturbance to plovers. Determine exclosure use dependent on predation pressure, density of plover nests, and nest locations. Continue to move toward elimination of exclosures at all sites.
- Increase and/or maintain predator management at all sites and explore ways of better understanding the activity patterns and population levels of predators, particularly corvids.
- Continue to coordinate with federal agency employees regarding time frames of any habitat management work to be completed to minimize disturbance to nesting activity and broods.
- Coordinate agency activities in restricted/closed areas with plover biologists to minimize disturbance to nesting and brood rearing.
- Continue and explore ideas to document and monitor human disturbance by various recreational users in plover nesting areas.
- Continue to expand and refine volunteer efforts to monitor recreational use.

- Design educational programs to inform and educate the local communities and annual visitors about plover issues.
- Design informative/interactive presentations for schools for children.
- Continue intensive breeding season monitoring until plover numbers have reached the goals to be established in the USFWS Recovery Plan for Snowy Plovers, then monitor plover populations and productivity to ensure recovery goals are maintained.

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Table 1. Population estimates of the Western Snowy Plover on the Oregon Coast, 1990-2007. For Window Survey, first number is counted plovers minus duplicate band combos and unidentified plovers, number in parenthesis is total head count without considering duplicate combos or unknown plovers.

YEAR	WINDOW SURVEY	# SNPL BREEDING	# SNPL PRESENT
1990	59	-	-
1991	35	-	-
1992	28	-	-
1993	45	55-61	72
1994	51	67	83
1995	64 (67)	94	120
1996	85	110-113	134-137
1997	73 (77)	106-110	141
1998	57 (59)	75	97
1999	49 (51)	77	95-96
2000	NC	89	109[a]
2001	71 (85)	79-80	111-113[b]
2002	71 (76)	80	99-102[c]
2003	63	93	102-107[d]
2004	82 (83)	120	136-142[e]
2005	100	104	153-158[f]
2006	91	135	177-179[g]
2007	125	162	181-184[h]

[a] - includes 13-15 adult plovers that were depredated during the breeding season

[b] - includes at least two adult male plovers that were depredated and 1M and 1F thought to have been depredated during the breeding season

[c] - includes at minimum of 6 adult plovers that were depredated and another 4 that possibly were depredated during the breeding season

[d] - includes 2 adult female plovers that were probably depredated during the breeding season

[e] - includes 2-3 males and 1-2 females believed to have depredated during the breeding season

[f] - includes 1 female and 6 males that may have been depredated during the breeding season

[g]- includes a minimum of 16 resident breeding plovers that probably were depredated during the breeding season

[h] – includes 4 plovers known to have died and an additional 8 other plovers that were likely depredated

Table 2. Number of Snowy Plover fledglings, number of previous year fledglings returning, return rate, number nesting, and percent nesting in first year of return along the Oregon coast, 1990 - 2007.

Year	# of Fledglings	# of HY birds from previous year sighted on OR coast	Return Rate (#HY/#Fled)	# that nested on OR coast	% nested on OR coast
2007	123	32	29%	26	81%
2006	110	29	37%	23	79%
2005	78	43	40%	33	77%
2004	108	26	43%	21	81%
2003	60	14	45%	14	100%
2002	31	18	56%	15	83%
2001	32	23	53%	14	61%
2000	43	31	58%	25	81%
1999	53	18	56%	12	67%
1998	32	14	34%	11	79%
1997	41	30	64%	18	60%
1996	47	18	32%	10	55%
1995	57	37	66%	13	35%
1994	56	16	44%	8	50%
1993	36	10	30%	6	60%
1992	33	6*	38%	2	33%
1991	16	No chicks banded in 1990			
1990	3	x	x		

* - minimum number sighted

Average return rate = 45.3%
SD = 12.1%
Average percent of returning HY birds that nest in first season = 67.6%
SD = 18.4%

Table 3. Number of Adult Snowy Plovers at each nesting area on the Oregon Coast, 2007. First number is number of adults recorded at each site, and the second number is the number of breeding adults recorded at each site.

	Sutton	**Siltcoos Total**	**Overlook Total**	**N Tahkenitch**	**Tenmile Total**	**CBNS**	**New River/Bandon Total**
# of banded females/# nested	4/2	21/13	15/9	10/3	25/14	18/11	31/17
# of unbanded females/# nested	1/1	2-3/2	2-4/2-3	2/2	5/5	4/4	9/9
# of banded males/# nested	1/0	11/9	9/7	5/3	18/15	13/10	25/21
# of unbanded males/# nested	1/1	2/2	2/2	1/1	4/4	2/2	6/6
Total	7/4	36-37/26	28-30/20-21	18/9	52/38	37/27	71/53

Table 4. Total number of nests for all sites on the Oregon Coast 1990 – 2007; cells tally nests only and not broods from undiscovered nests. The number of broods from undiscovered nests is totaled for each year and site only.

Site Name	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	Total # nests	Total # broods[a]
Necanicum													1	0	0	0	0	0	1	1
Sutton Beach				2	1	2	6	14	8	3	7	15	3	1	0	0	4	3	69	1
North Siuslaw													1	0	0	0	0	0	1	0
Siltcoos:																				
North Spit				0	2	4	2	0	1	4	8	0	0	0	7	8	12	15	63	0
South Spit				1	2	2	1	3	3	17	14	14	10	7	4	9	13	13	113	2
Overlook																				
North										2	8	12	5	7	11	11	9	13	78	2
South										0	0	3	3	1	3	5	1	3	19	0
Tahkenitch:																				
North Spit				0	0	0	0	0	0	0	4	7	8	13	8	11	4	10	65	1
South Spit				0	3	9	18	14	6	3	1	6	7	1	0	0	0	0	68	2
Threemile Creek/ Umpqua River				0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Tenmile:																				
North Spit					2	2	1	0	0	0	1	2	3	5	9	6	10	20	61	3
South Spit	2	0	9	8	5	4	3	2	11	5	5	6	9	12	8	11	12	21	133	4
CBNS:																				
South Beach	0	4	6	3	4	3	3	6	6	0	1	1	2	3	2	4	0	8	56	11
South Spoil	20	9	4	6	9	12	22	14	5	2	5	3	2	9	8	9	14	12	165	13
North Spoil	5	1	1	0	0	0													7	0
HRAs					4	3	2	3	7	12	22	13	15	11	16	16	18	19	161	17
Anad. Spoil	0																		0	1
Menasha, N.Bend	1	0																	1	0
Bandon	0	14	8	10	5	9	3	4	1	2	2	6	5	5	17	31	23	30	175	5
New River	6	6	2	0	6	20	18	25	26	28	17	23	14	16	24	23	27	35	316	10
Floras Lake/ New River Overwash	2	2	6	11	8	6	9	8	4	0	5	0	1	0	0	0	0	0	62	3
Total nests	**36**	**36**	**36**	**41**	**51**	**76**	**89**	**93**	**78**	**78**	**100**	**111**	**89**	**91**	**117**	**144**	**147**	**202**	**1615**	
Total broods[a]	**2**	**1**	**5**	**7**	**4**	**6**	**11**	**5**	**3**	**1**	**2**	**0**	**1**	**4**	**2**	**3**	**15**	**4**		**76**

[a] – broods from undiscovered nests only; these broods are not tallied in the total number of nests

Table 5. Nest Success (Mayfield Method) of Snowy Plovers on the Oregon coast, 1990-2007.

	% Nest Success				
Year	Overall[1]	Exclosed[2]	Unexclosed[2]	(N)[1]	(N)[2]
1990	13	-[3]	13	(36)	(29)
1991	20	77	5	(36)	(33)
1992	55	79	9	(36)	(34)
1993	56	77	16	(41)	(39)
1994	72	75	68	(51)	(47)
1995	41	62	7	(76)	(70)
1996	47	66	7	(89)	(87)
1997	40	52	26	(93)	(87)
1998	52	70	15	(78)	(70)
1999	54	62	40	(78)	(72)
2000	31	46	2	(100)	(91)
2001	26	67	4	(111)	(101)
2002	38	67	13	(89)	(76)
2003	43	79	23	(91)	(79)
2004	56	86	20	(117)	(109)
2005	45	70	27	(144)	(128)
2006	38	60	40	(147)	(126)
2007	33	66	41	(202)	(159)
mean	42.2 ± 14.5	68.3 ± 10.2	20.9 ± 17.2	(1615)	(1437)

[1]Overall includes exclosed nests, unexclosed nests, infertile nests, and nests with one egg that were subsequently abandoned.

[2]Does not include infertile nests, nests with one egg that were subsequently abandoned, or nest found failed because the outcome of these nests was not affected by the presence or absence of an exclosure.

[3]Exclosed nests not included as multiple experimental designs were employed.

Table 6. Apparent nest success of Snowy Plovers on the Oregon Coast, 2007.

		Nests Exclosed			Nests Not Exclosed			Exclosed Nests	Nests Not Exclosed	
Site	**Total #**	**Hatch**	**Fail**	**Unknown**	**Hatch**	**Fail**	**Unknown**	**App Nest Success**	**App Nest Success**	**Overall Nest Success**
Sutton	3				0	3			0%	0%
Siltcoos										
North	15	5	4		0	6		56%	0%	33%
South	13	3	2		1	7		60%	14%	31%
Combined	28	8	6		1	13		57%	8%	32%
Overlook										
North	13	4	1		2	5	1	80%	25%	46%
South	3	1	1		0	1		50%	0%	33%
Combined	16	5	2		2	6	1	71%	25%	44%
N Tahkenitch	10	0	1		2	7		0%	22%	20%
Tenmile										
North	20	1	1		9[a]	9[b]		50%	50%	50%
South	21	6[e]	1		2[c]	12[d]		86%	14%	38%
Combined	41	7	2		11	21		78%	34%	44%
CBNS										
South Beach	8				6	2			75%	75%
South Spoil	12				5	7			42%	42%
HRAs	19				8	11			42%	42%
Combined	39				19	20			49%	49%
Bandon	30	1	0		9	20		100%	31%	33%
New River										
HRA	14	3	0		7	4		100%	64%	71%
Other Lands	21	3	0		7	11		100%	39%	48%
Combined	35	6	0		14	15		100%	48%	57%
Totals	202	27	11		58	105	1	71%	35%	42%

[a] – 5 of 9 nests were exclosed, then exclosures removed, and 5 hatched.
[b]- 1 of 9 nests was exclosed, then exclosure removed, and nest failed.
[c] – 2 nests were exclosed, then exclosures removed, and nests hatched.
[d] – 1 of 12 nests was exclosed, then exclosure removed, and nest failed.
[e] – 1 of 6 nests was exclosed, then exclosure removed, then exclosure was replaced again, and nest hatched.

Table 7. Causes of Snowy Plover nest failure at survey sites along the Oregon coast, 2007.

Site Name	Tot Nsts	# Fail	Depredations					Other					
			Egg Depredations				Adult Depred	Wind	Abandon	One Egg Nest	Over-wash	Infer	Unk cause
			Corvid	Unk	Unk Mam	Coyote/ Raccoon*							
Sutton	3	3		1					1	1			
Siltcoos:													
North	15	10	2	2					2	1	2	1	
South	13	9		1		1		1	1	3	1		1
Overlook													
North	13	6	2	2			1	1					
South	3	2		1									1
N Tahkenitch	10	8	3	2					1	2			
Tenmile:													
North	20	10	2	3					1	3			1
South	21	13	3	6					1	3			
Coos Bay North Spit:													
South Beach	8	2		1					1				
South Spoil	12	7		1	4	1						1	
HRAs	19	11		2	3	1			3	1		1	
Bandon	30	20	4	1	1	1*			4	5			4
New River	35	15	4					1	3	4	1	1	1
TOTALS	**202**	**116**	20	23	8	3/1*	1	3	18	23	4	4	8

Table 8. Cause of failure for Snowy Plover nests protected by predator exclosures and nests unprotected by predator exclosures along the Oregon coast, 2007.

Cause of Failure		Exclosed	Unexclosed	Totals
Egg Depredation	**Corvid**	1	19	20
	Unknown		23	23
	Unknown Mammal		8	8
	Coyote		3	3
	Raccoon		1	1
Other	**Adult Depredated**	1		1
	Wind/Weather	1	2	3
	Overwashed	3	1	4
	Infertile		4	4
	One Egg Nests		23	23
	Abandoned	5	13	18
	Unknown Cause	1	7	8
Totals		12	104	116

Table 9. Total number of young fledged for all sites on the Oregon Coast 1990-2007 includes fledglings from broods from undiscovered nests.

Site Name	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	Tot
Necanicum											1	0	0	0	0	0	0	0	1
Sutton				0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	5
N Siuslaw													0	0	0	0	0	0	0
Siltcoos:																			
North					0	0	0	0	2	4	0	0	0	0	7	2	11[c]	7	33
South				0	1	2	0	0	4	2	7	0	0	2	5	7	7	4	41
Overlook																			
North										3	5	1	2	3	3	5	8	12	42
South										0	0	1	0	0	3	2	0	1	7
Tahkenitch																			
North				0	0	0	0	0	0	0	2	4	1	3	6	8	5	2	31
South				0	1	12	8	7	1	1	3	4	5	2	0	0	0	0	44
Tenmile:																			
North					0	1	0	0	0	0	0	0	3	1	3	6	12	13	39
South	0	0	14	7	3	3	4	4	3	7	5	4	3	9	9	5	7	14	101
CBNS:																			
S Spoil	3	2	4	13	17	17	22	8	6	5	3	4	2	7	13	9	11	7	153
S Beach	0	11	9	2	6	2	2	7	2	0	0	1	1	3	0	8	1	10	65
HRAs					7	2	1	1	1	23	6	6	8	14	22	6	19	9	125
Bandon	0	1	1	3	5	1	1	0	1	1	0	1	0	4	16	11	12	13	71
New River	0	0	4	0	7	12	8	9	11	8	5	6	6	12	21	9	17	31	166
Floras Lake/ New River Overwash	0	2	2	11	9	6	1	4	0	0	3	0	0	0	0	0	0	0	38
Total	**3**	**16**	**34**	**36**	**56**	**58**	**47**	**41**	**32**	**54**	**43**	**32**	**31**	**60**	**108[a]**	**78[b]**	**110[c]**	**123**	**962**

[a] –total modified based on siting of an additional banded HY04 plover in 2005.

[b] – total modified based on sitings of 2 fledglings from B1190 in Jan 2006; thought only one fledged [b]

[c]- total modified based on sitings of an additional banded HY06 in 2007; not included in this total is one fledgling raised in captivity at Newport Aquarium and successfully released; total fledglings = 111

Table 10. Overall Mayfield nest success, fledgling success and total number of fledglings on the Oregon Coast, 1990 – 2007.

Year	% Nest Success[a]	% Fledgling Success[b]	# Fledglings[c]
1990	13	11	3
1991	20	45	16
1992	55	41	33
1993	56	42	36
1994	72	50	56
1995	41	50	57
1996	47	32	47
1997	40	30	40
1998	52	26	32
1999	54	43	54
2000	31	41	43
2001	26	34	32
2002	38	29	31
2003	43	47	60
2004	56	55	108
2005	45	41	78
2006	38	48	110
2007	33	54	123
	Mean = 42.2 $\pm$ 14.5	Overall = 40	Total = 962

a – Overall Mayfield Success from Table 4

b – does not include fledglings from broods from undiscovered nests

c – total number of fledglings including from broods from undiscovered nests

Table 11. Overall productivity of male Snowy Plovers along the Oregon coast, 1992-2007. Productivity is measured as number of fledglings per male.

Year	Mean	n	Min	Max	std
1992	1.250	20	0	4	1.164
1993	1.000	17	0	3	1.000
1994	1.483	29	0	5	1.353
1995	1.194	36	0	4	1.167
1996	0.881	42	0	3	0.942
1997	0.833	36	0	3	0.845
1998	0.833	36	0	3	0.971
1999	1.268	41	0	5	1.323
2000	0.973	37	0	5	1.190
2001	0.842	38	0	3	0.855
2002	0.700	40	0	3	0.939
2003	1.061	49	0	4	1.107
2004	1.645	62	0	5	1.161
2005	1.259	58	0	3	1.036
2006	1.559	68	0	4	0.983
2007	1.481	77	0	4	1.108

Table 12. Fledgling success, brood success, and number of fledglings per male for Snowy Plovers on the Oregon Coast, 2007.

Site Name	Total # Broods*	% Brood Success*	Total # Eggs Hatched	Min. # Fledged		% Fledgling Success**	# of Breeding Males[a]	# of Fledglings/ Male	# of Fledglings/Male – Combined[c]
				From Known Nests	From Undiscovered Nests				
Sutton	0	0	0	0	0	0	1	0	0.00 (1)
Siltcoos:									
North Siltcoos	5	100	15	7	0	47	7	1.00	1.10 (10)
South Siltcoos	4	50	9	4	0	44	4	1.00	
Overlook									
North Overlook	7	71	18	10	2	56	7	1.71	1.44 (9)
South Overlook	1	100	3	1	0	33	2	0.50	
North Tahkenitch	2	50	6	2	0	33	4	0.50	0.50 (4)
Tenmile:									
North Spit	10	90	23	13	0	57	8	1.63	1.50 (18)
South Spit	8	88	20	14	0	70	10	1.40	
Coos Bay N. Spit									
South Spoil	5	80	14	7	0	50	4	1.75	
South Beach	7[d]	71	18	8	2	44	7	1.43	2.16 (12)
HRA	8	63	18	9	0	50	7	1.29	
Bandon	10	80	24	13	0	54	8	1.63	1.63 (8)
New River									
HRA	11	91	27	14	1	52	9	1.67	1.63 (19)
Other lands	11	100	20	15	1	75	11	1.45	
TOTALS**	**89**	**82**	**215**	**117**	**6**	**54**	**77[b]**	**1.60**	
TOTAL FLEDGED				**123**					

% Brood success = # broods with at least 1 chick fledged / total # of broods

% Fledging Success = # of young fledged / # of eggs hatched

* Includes broods from undiscovered nests:

** Does not include fledglings from undiscovered nests because we do not know how many eggs hatched from those nests.

[a] – number of known individual breeding males for each site

[b] – number of known breeding males in entire population; this is not a tally of known males from each site as some males may have nested at more than one location

[c] – number of fledglings for both sites combined and number of known individual breeding males for both sites combined

[d] – 2 broods had unknown outcome, included in calculations but not considered successful

Table 13. Productivity of Snowy Plovers at Siltcoos, Lane Co., Oregon coast, 1993-2007.
Number of eggs laid, number hatched, hatch rate, # fledged, fledgling success rate, and productivity index based on all known nests. Number of fledglings per male based on nests with known adult males only, therefore number of fledglings may vary from total number of fledglings.

Siltcoos	total # eggs laid	total # hatched	hatch rate	total # fledged	fledgling success rate	productivity index[a]	# fledged from known males	# of known breeding males	# of fledglings /male
2007	67	24	36%	11	46%	16%	11	10	1.10
2006	60	22	37%	13	60%	22%	11	5	2.20
2005	44	17	39%	9	53%	20%	9	7	1.29
2004	31	18	58%	12	67%	39%	12	5	2.40
2003	16	5	31%	2	40%	13%	2	4	0.50
2002	28	8	29%	0	0%	0%	0	2	0.00
2001	33	1	3%	0	0%	0%	0	3	0.00
2000	55	19	35%	7	37%	13%	7	8	0.88
1999	59	21	36%	6	29%	10%	6	8	0.75
1998	10	10	100%	6	60%	60%	6	3	2.00
1997	8	4	50%	0	0%	0%	0	2	0.00
1996	7	3	43%	0	0%	0%	0	1	0.00
1995	12	6	50%	2	33%	17%	2	3	0.67
1994	9	4	44%	1	25%	11%	1	3	0.33
1993	1	0	0%	0	0%	0%	0	0	0.00
total before predator management (1993-2003)	238	81	34%	24	30%	10%	24	37	0.65
total after predator management (2004-2007)	202	81	40%	45	56%	22%	45	27	1.67

[a] - productivity index = number of fledglings/number of eggs laid

Table 14. Productivity of Snowy Plovers at Overlook, Douglas Co., Oregon coast, 1999-2007

Number of eggs laid, number hatched, hatch rate, # fledged, fledgling success rate, and productivity index based on all known nests. Number of fledglings per male based on nests with known adult males only, therefore number of fledglings may vary from total number of fledglings.

Overlook	total # eggs laid	total # hatched	hatch rate	total # fledged	fledgling success rate	productivity index[a]	# fledged from known males	# of known breeding males	# of fledglings /male
2007	46	19	41%	11	58%	24%	11	9	1.22
2006	28	18	64%	8	44%	29%	8	4	2.00
2005	42	16	38%	7	44%	17%	7	5	1.40
2004	39	14	36%	6	43%	15%	6	6	1.00
2003	17	9	53%	3	33%	18%	3	4	0.75
2002	24	13	54%	2	15%	8%	2	4	0.50
2001	39	10	26%	2	20%	5%	2	4	0.50
2000	22	8	36%	5	63%	23%	5	7	0.71
1999	6	6	100%	3	50%	50%	3	2	1.50
total before predator management (1999-2003)	108	46	43%	15	33%	14%	15	21	0.71
total after predator management (2004-2007)	155	67	43%	31	46%	20%	31	24	1.29

[a] - productivity index = number of fledglings/number of eggs laid

Table 15. Productivity of Snowy Plovers at Tahkenitch, Douglas Co., Oregon coast, 1993-2007.
Number of eggs laid, number hatched, hatch rate, # fledged, fledgling success rate, and productivity index based on all known nests. Number of fledglings per male based on nests with known adult males only, therefore number of fledglings may vary from total number of fledglings.

Tahkenitch	total # eggs laid	total # hatched	hatch rate	total # fledged	fledgling success rate	productivity index[a]	# fledged from known males	# of known breeding males	# of fledglings /male
2007	23	6	26%	2	33%	9%	2	4	0.50
2006	12	9	75%	4	44%	33%	4	3	1.33
2005	26	14	54%	8	57%	31%	8	4	2.00
2004	21	14	67%	6	43%	29%	6	5	1.20
2003	37	17	46%	3	18%	8%	3	10	0.30
2002	30	16	53%	6	38%	20%	6	5	1.20
2001	36	22	61%	8	36%	22%	8	8	1.00
2000	15	6	40%	5	83%	33%	5	2	2.50
1999	9	1	11%	1	100%	11%	1	2	0.50
1998	18	11	61%	1	9%	6%	1	4	0.25
1997	41	10	24%	6	60%	15%	6	7	0.86
1996	51	21	41%	8	38%	16%	8	9	0.89
1995	21	16	76%	12	75%	57%	12	7	1.71
1994	9	8	89%	1	13%	11%	1	3	0.33
1993	0	0	0%	0	0%	0%	0	0	0.00
total before predator management (1993-2003)	267	128	48%	51	40%	19%	51	57	0.89
total after predator management (2004-2007)	82	43	52%	20	47%	24%	20	16	1.25

[a] - productivity index = number of fledglings/number of eggs laid

Table 16. Productivity of Snowy Plovers at Tenmile, Coos Co., Oregon coast, 1992-2007.

Number of eggs laid, number hatched, hatch rate, # fledged, fledgling success rate, and productivity index based on all known nests. Number of fledglings per male based on nests with known adult males only, therefore number of fledglings may vary from total number of fledglings.

Tenmile	total # eggs laid	total # hatched	hatch rate	total # fledged	fledgling success rate	productivity index[a]	# fledged from known males	# of known breeding males	# of fledglings /male
2007	89	43	48%	27	63%	30%	27	19	1.42
2006	59	28	47%	16	57%	27%	16	10	1.60
2005	49	21	43%	8	38%	16%	8	8	1.00
2004	50	29	58%	12	41%	24%	12	9	1.33
2003	43	20	47%	10	50%	23%	10	8	1.25
2002	32	14	44%	3	21%	9%	3	8	0.38
2001	24	10	42%	4	40%	17%	4	4	1.00
2000	18	14	78%	5	36%	28%	5	4	1.25
1999	13	8	62%	7	88%	54%	7	3	2.33
1998	20	8	40%	3	38%	15%	3	4	0.75
1997	6	6	100%	4	67%	67%	4	2	2.00
1996	11	6	55%	4	67%	36%	4	4	1.00
1995	13	11	85%	2	18%	15%	2	4	0.50
1994	18	3	17%	3	100%	17%	3	2	1.50
1993	24	15	63%	5	33%	21%	5	5	1.00
1992	27	19	70%	14	74%	52%	14	7	2.00
total before predator management (1992-2003)	249	134	54%	64	48%	26%	64	55	1.16
total after predator management (2004-2007)	247	121	49%	63	52%	26%	63	46	1.37

[a] - productivity index = number of fledglings/number of eggs laid

Table 17. Productivity of Snowy Plovers at Coos Bay North Spit, Coos Co., Oregon coast, 1992-2007.
Number of eggs laid, number hatched, hatch rate, # fledged, fledgling success rate, and productivity index based on all known nests. Number of fledglings per male based on nests with known adult males only, therefore number of fledglings may vary from total number of fledglings.

CBNS	total # eggs laid	total # hatched	hatch rate	total # fledged	fledgling success rate	productivity index[a]	# fledged from known males	# of known breeding males	# of fledglings /male
2007	108	45	42%	26	58%	24%	26	12	2.17
2006	86	54	63%	22	41%	26%	22	14	1.57
2005	80	38	48%	23	61%	29%	21	12	1.75
2004	73	42	58%	31	74%	42%	31	15	2.06
2003	57	29	51%	21	72%	37%	20	9	2.22
2002	48	21	44%	11	52%	23%	11	10	2.22
2001	49	21	43%	11	52%	22%	11	8	1.38
2000	75	23	31%	9	39%	12%	9	6	1.50
1999	38	35	92%	26	74%	68%	26	10	2.60
1998	49	18	37%	9	50%	18%	9	8	1.13
1997	64	32	50%	12	38%	19%	12	11	1.09
1996	77	48	62%	20	42%	26%	17	14	1.21
1995	53	35	66%	20	57%	38%	19	11	1.72
1994	50	44	88%	29	66%	58%	28	12	2.33
1993	26	18	69%	9	50%	35%	9	7	1.29
1992	32	21	66%	9	43%	28%	9	7	1.29
total before predator management (1992-2001)	513	295	58%	154	52%	30%	149	94	1.58
total after predator management (2002-2007)	452	229	51%	134	59%	30%	131	72	1.82

[a] - productivity index = number of fledglings/number of eggs laid

Table 18. Productivity of Snowy Plovers at Bandon Beach, Coos Co., Oregon coast, 1992-2007.
Number of eggs laid, number hatched, hatch rate, # fledged, fledgling success rate, and productivity index based on all known nests. Number of fledglings per male based on nests with known adult males only, therefore number of fledglings may vary from total number of fledglings.

Bandon Beach	total # eggs laid	total # hatched	hatch rate	total # fledged	fledgling success rate	productivity index[a]	# fledged from known males	# of known breeding males	# of fledglings /male
2007	73	24	33%	13	54%	18%	13	8	1.63
2006	53	19	36%	8	42%	15%	7	6	1.16
2005	83	37	46%	11	30%	13%	11	12	0.92
2004	50	33	66%	15	45%	30%	14	10	1.40
2003	13	6	46%	2	33%	15%	2	4	0.50
2002	10	0	0%	0	0%	0%	0	2	0.00
2001	13	6	46%	1	17%	8%	1	3	0.33
2000	6	0	0%	0	0%	0%	0	2	0.00
1999	4	3	75%	1	33%	25%	1	2	0.50
1998	3	0	0%	0	0%	0%	0	1	0.00
1997	12	0	0%	0	0%	0%	0	2	0.00
1996	9	6	67%	1	17%	11%	1	2	0.50
1995	22	4	18%	0	0%	0%	0	3	0.00
1994	15	15	100%	5	33%	33%	5	4	1.25
1993	21	10	48%	3	30%	14%	3	5	0.60
1992	23	7	30%	1	14%	4%	1	4	0.25
total before predator management (1992-2001)	128	51	40%	12	24%	9%	12	28	0.43
total after predator management (2002-2007)	282	119	42%	49	38%	17%	47	42	1.12

[a] - productivity index = number of fledglings/number of eggs laid

Table 19. Productivity of Snowy Plovers at New River, Coos Co., Oregon coast, 1992-2007.

Number of eggs laid, number hatched, hatch rate, # fledged, fledgling success rate, and productivity index based on all known nests. Number of fledglings per male based on nests with known adult males only, therefore number of fledglings may vary from total number of fledglings.

New River	total # eggs laid	total # hatched	hatch rate	total # fledged	fledgling success rate	productivity index[a]	# fledged from known males	# of known breeding males	# of fledglings /male
2007	96	47	49%	30	64%	31%	29	17	1.7
2006	69	34	49%	16	47%	23%	16	12	1.33
2005	63	36	57%	9	26%	14%	9	10	0.90
2004	70	37	53%	21	57%	30%	21	12	1.75
2003	44	25	57%	12	48%	27%	12	10	1.20
2002	39	17	44%	6	35%	15%	6	9	0.67
2001	53	22	42%	6	27%	11%	6	8	0.75
2000	46	14	30%	5	36%	11%	5	8	0.63
1999	74	42	57%	8	19%	11%	8	14	0.57
1998	73	60	82%	11	18%	15%	11	16	0.69
1997	65	41	63%	8	20%	12%	8	12	0.67
1996	54	41	76%	7	17%	13%	7	12	0.58
1995	48	12	25%	8	67%	17%	8	8	1.00
1994	18	14	78%	6	43%	33%	5	5	1.00
1993	0	0	0%	0	0%	0%	0	0	0.00
1992	6	6	100%	1	17%	17%	1	2	0.50
total before predator management (1992-2001)	437	252	58%	60	24%	14%	59	85	0.69
total after predator management (2002-2007)	381	196	51%	94	48%	25%	93	70	1.33

[a] - productivity index = number of fledglings/number of eggs laid

Table 20. Activity patterns of Snowy Plovers on Habitat Restoration Areas along the Oregon Coast, 1994-2007. Note that absence of an activity type indicates we have not documented whether the activity is occurring. The Dunes Overlook and the New River HRA were first created in the winter of 1998-99. The 94HRA, 95HRA, 98HRA, and 98EHRA are all located at Coos Bay North Spit, and each was initially created in the winter of the respective year. The Bandon Beach State Park HRA was created in fall 2001 and significantly improved in fall 2002 and 2003. All areas have been maintain through 2007.

	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Dunes Overlook						F?,N,B	F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B
94HRA	F,N,B	F,B	F,N,B	F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B
95HRA		R,F,N,B	F,B	N,B	F,N,B	F,B	F,N,B	F?,N,B	R,F?,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B
98HRA							N	F?,N,B	R?,F?,N	NA	NA	R	F,B	F,B
98EHRA								R?,F?,N,B	R?,F?,N,B	F,B	F,B	R,F,N,B	R,F,N,B	R,F,N,B
Bandon Beach									NA	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B
New River						N	F,N,B	F,N,B	F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B	R,F,N,B

Type of activity: **R** = roosting, **F** = foraging, **N** = nesting, **B** = brooding, **?** = uncertain, no direct evidence, but activity possibly occurring, **NA** = no activity.

Figure 1. Snowy Plover nesting areas surveyed on the Oregon Coast in 2007.

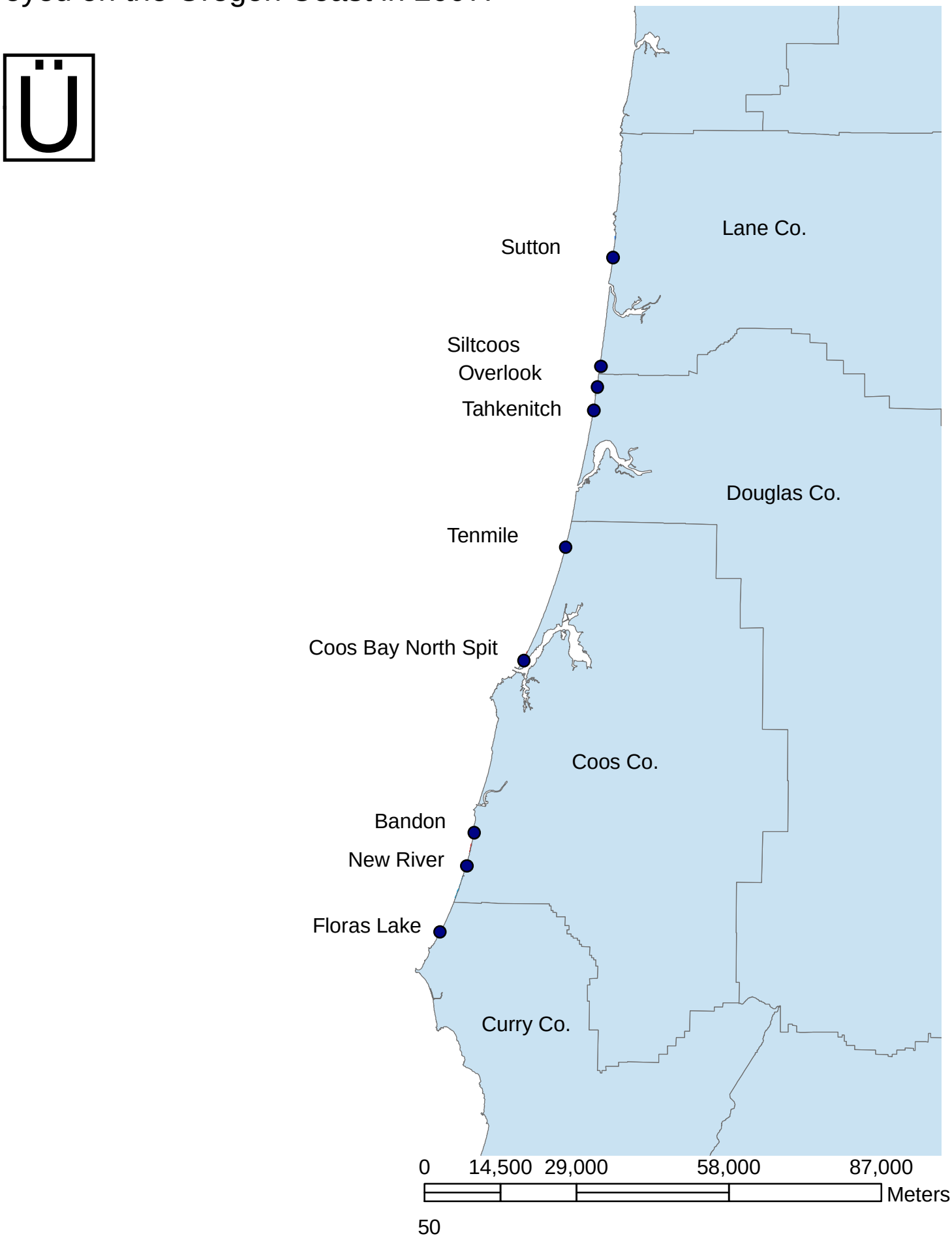


Figure 2. Snowy Plover nest locations at Sutton Creek, Oregon, 2007.

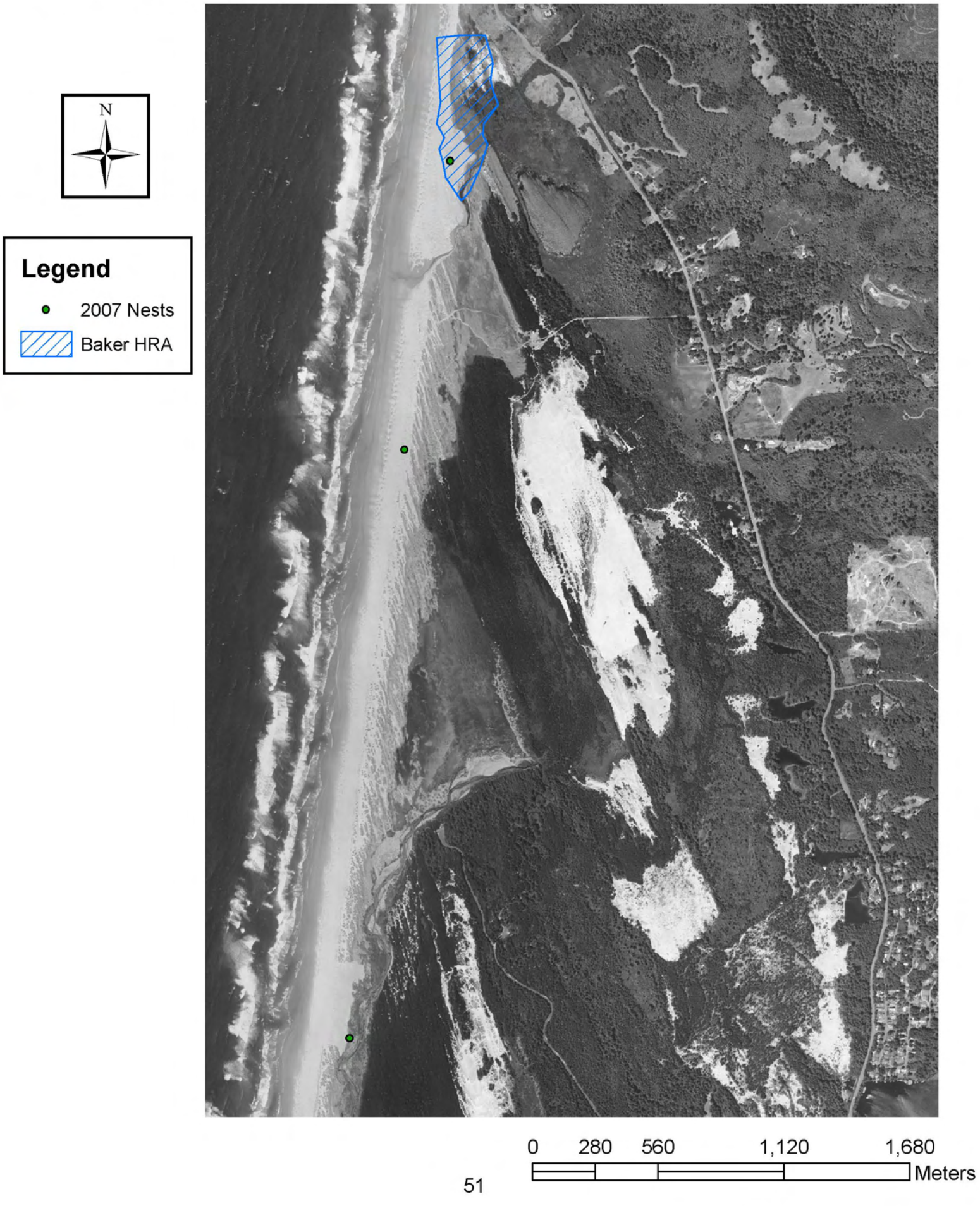
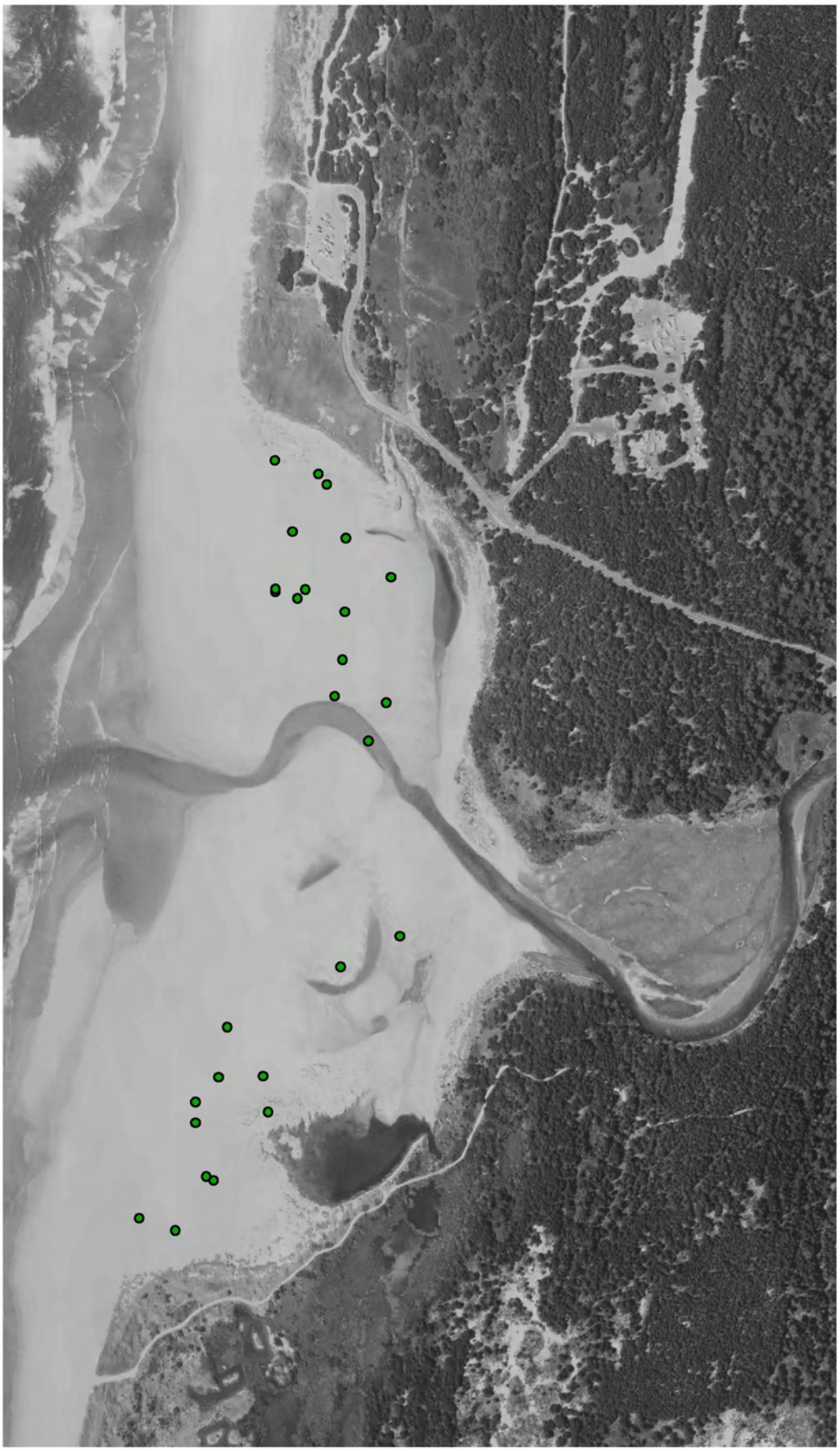


Figure 3. Snowy Plover nest locations at Siltcoos River, Oregon, 2007.



Note: This orthophoto image was taken in 2005. Since then the rivermouth has moved. Current nest locations are not in the river. Their placement is correct.

Figure 4. Snowy Plover nest locations at Dunes Overlook, Oregon, 2007.

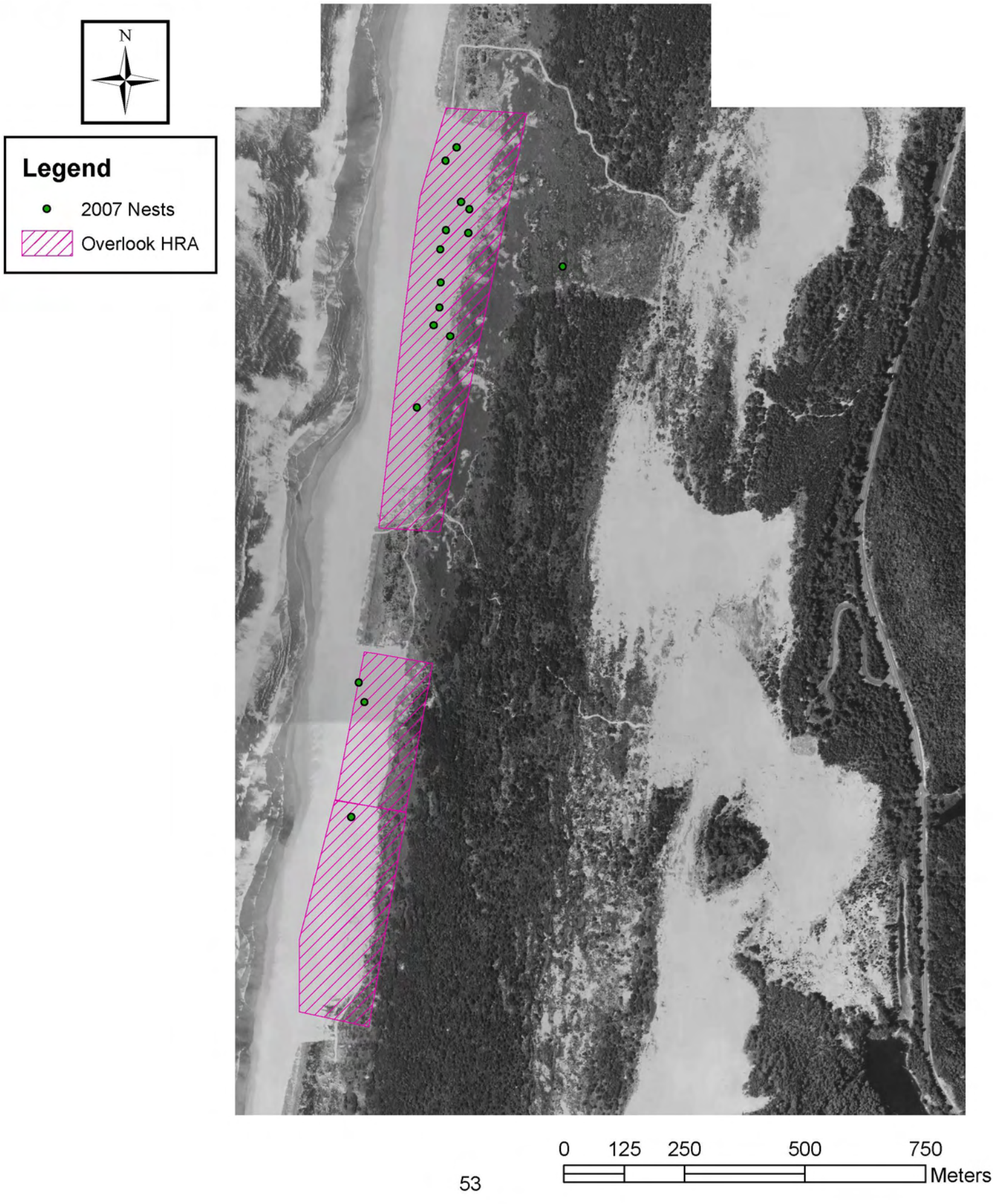
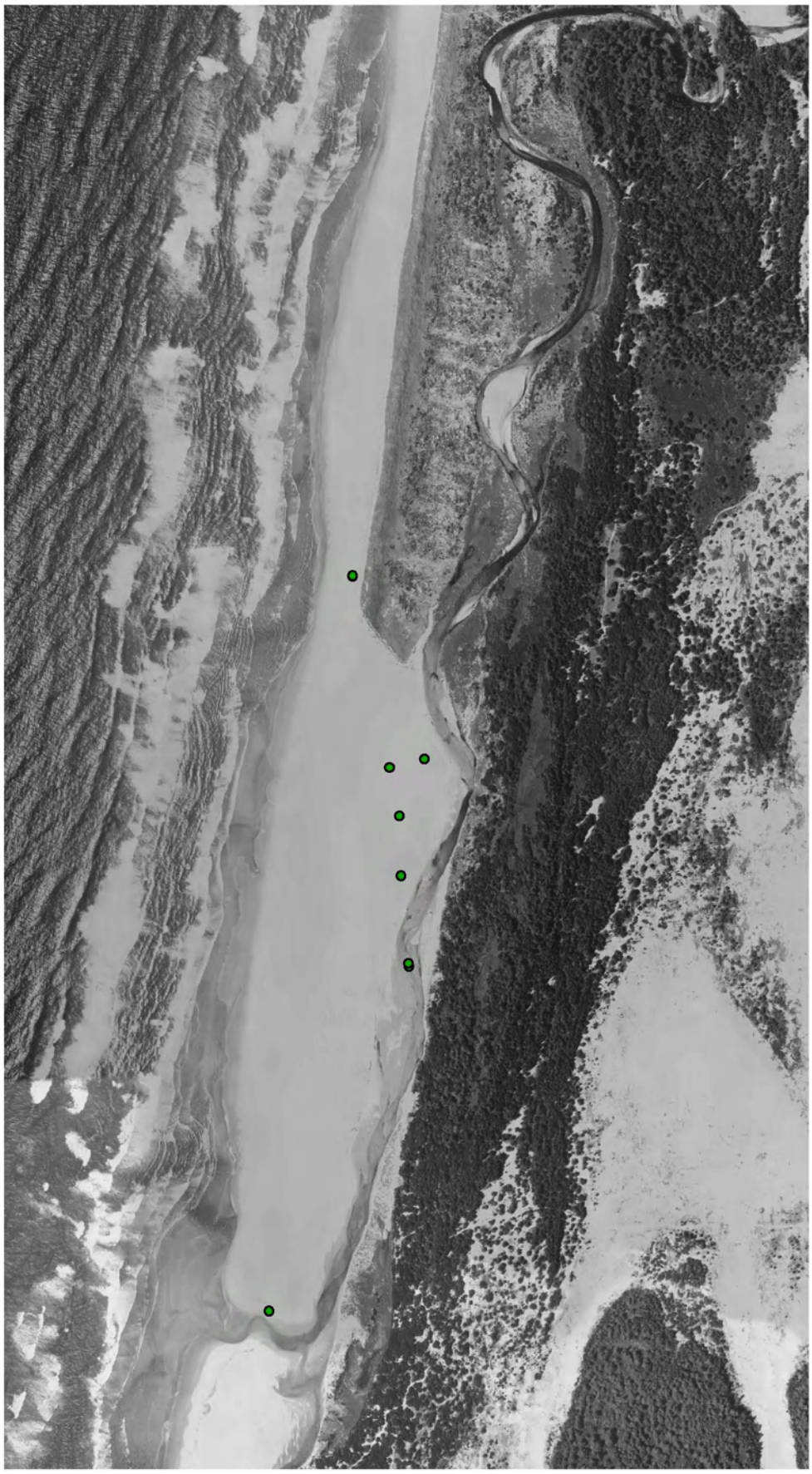


Figure 5 Snowy Plover nest locations at Tahkenitch Creek, Oregon, 2007.



Note: This orthophoto image was taken in 2005. Since then the rivermouth has moved. Current nest locations are not in the river. Their placement is correct.

Figure 6 Snowy Plover nest locations at Tenmile Creek, Oregon, 2007.

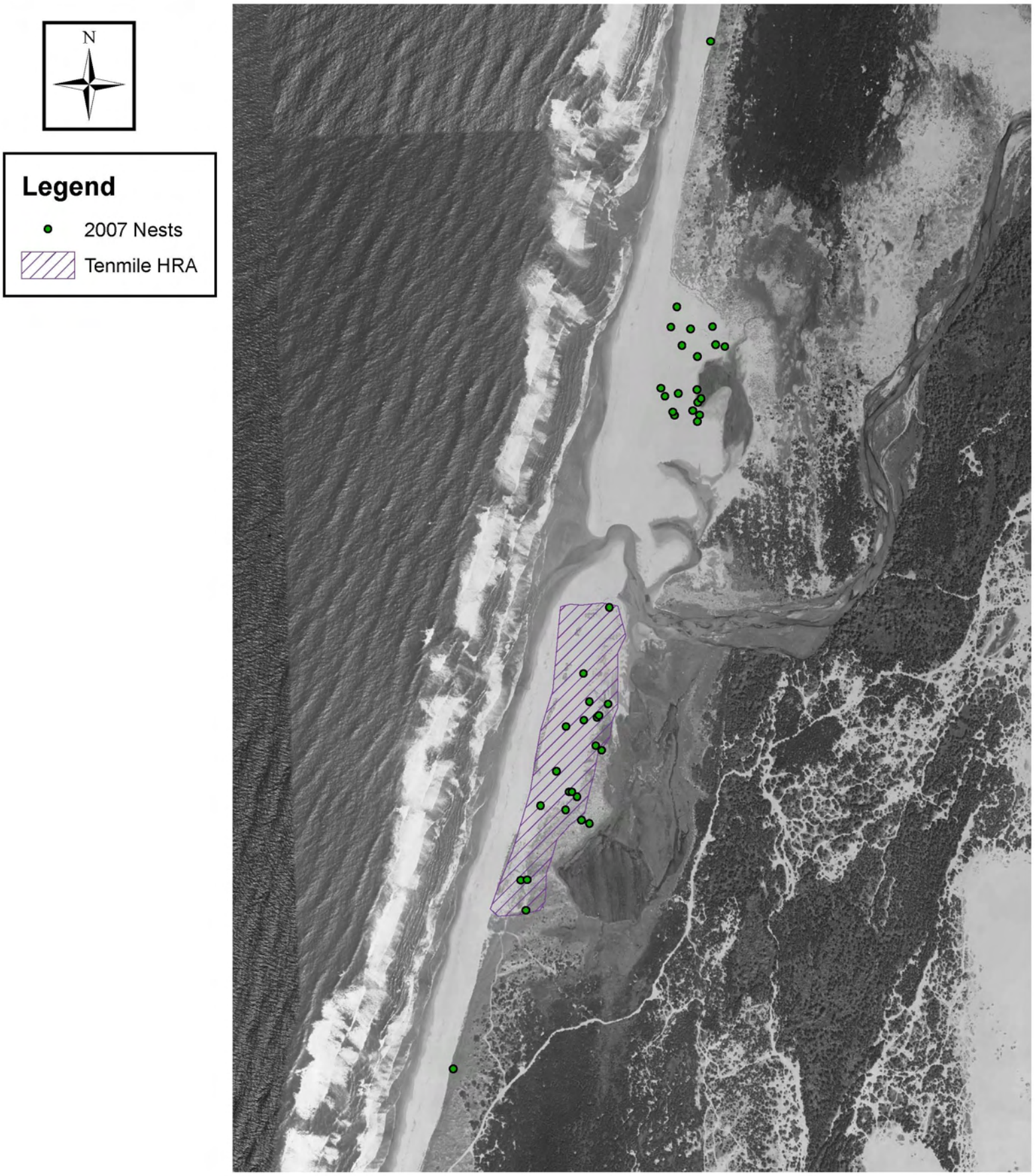


Figure 7. Snowy Plover nest locations at Coos Bay North Spit, Oregon, 2007.

Figure 8. Snowy Plover nest locations at Bandon/New River, Oregon, 2007.

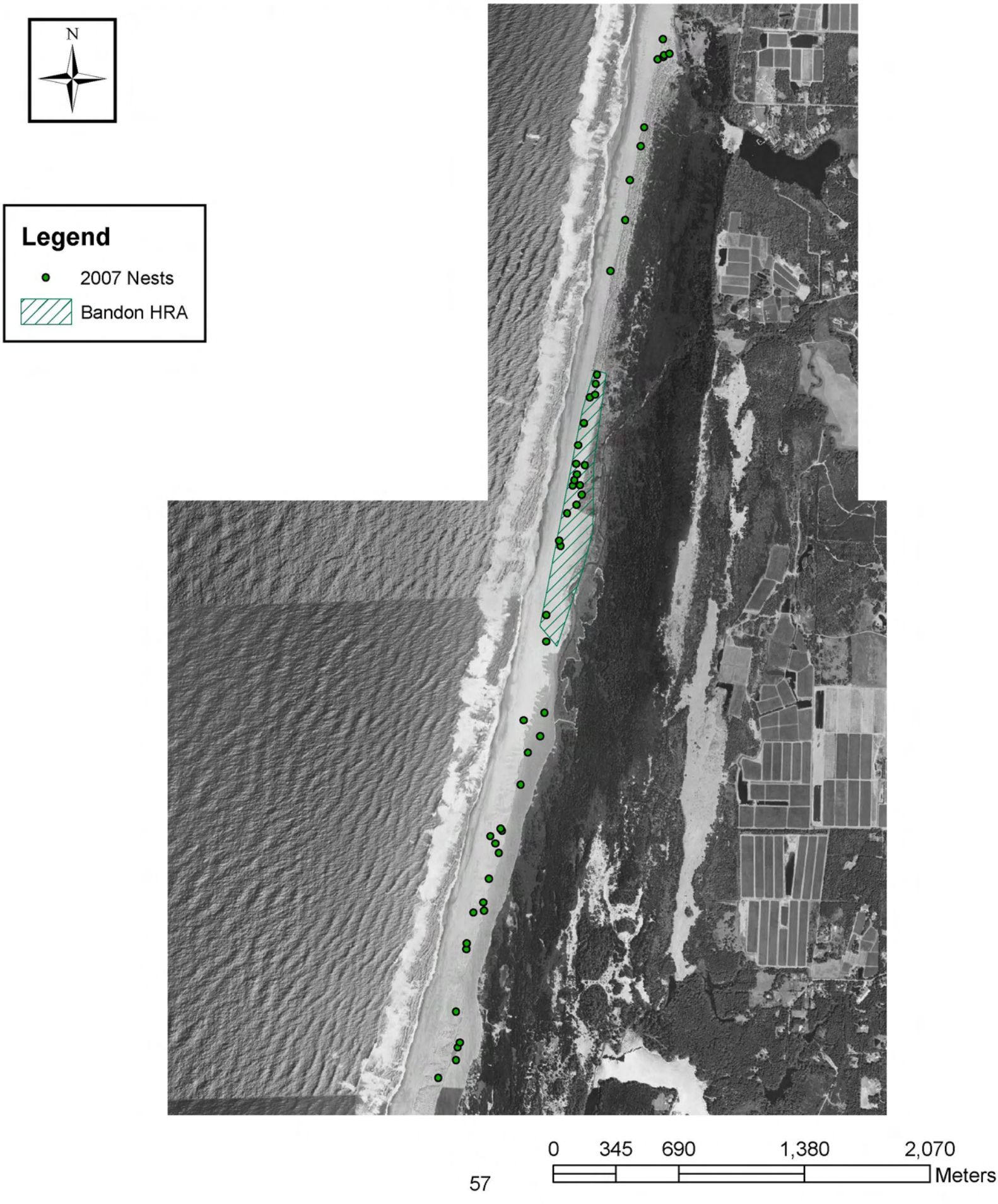


Figure 9. Snowy Plover nest locations at New River, Oregon, 2007.

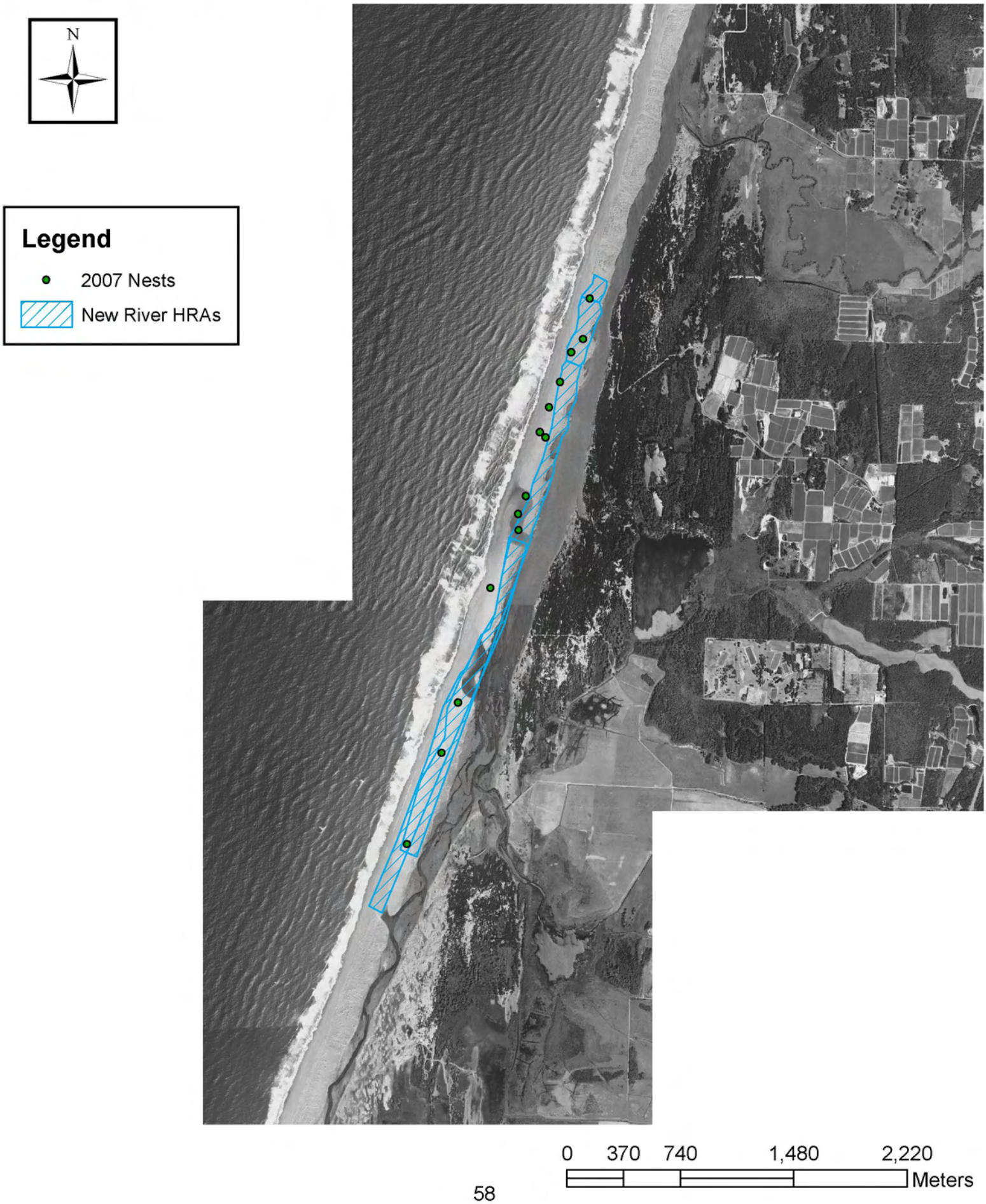


Figure 10. Number of active Snowy Plover nests within 10-day intervals on the Oregon coast, 2007. Dashed lines represent +/- 2 standard deviations.

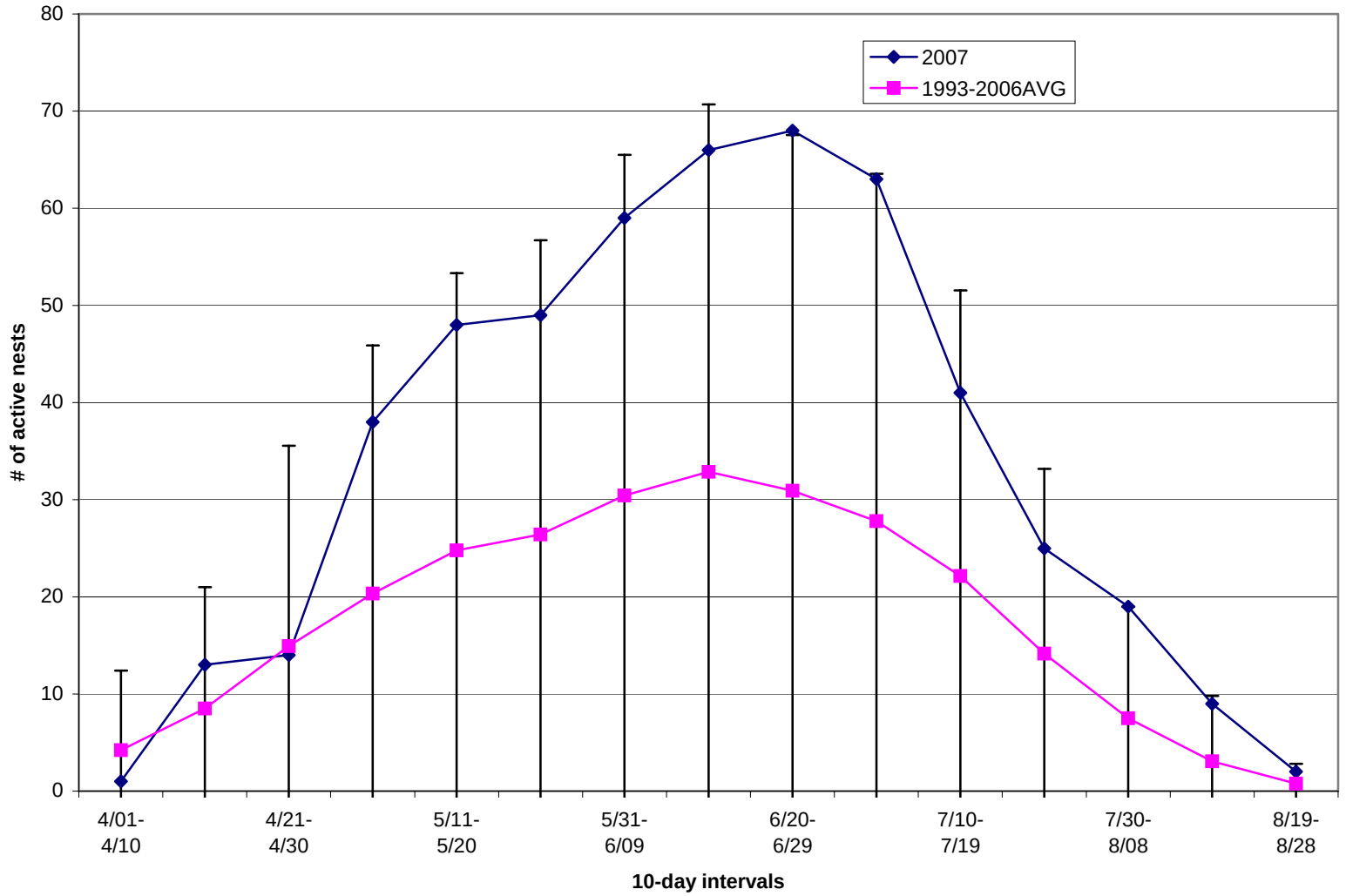
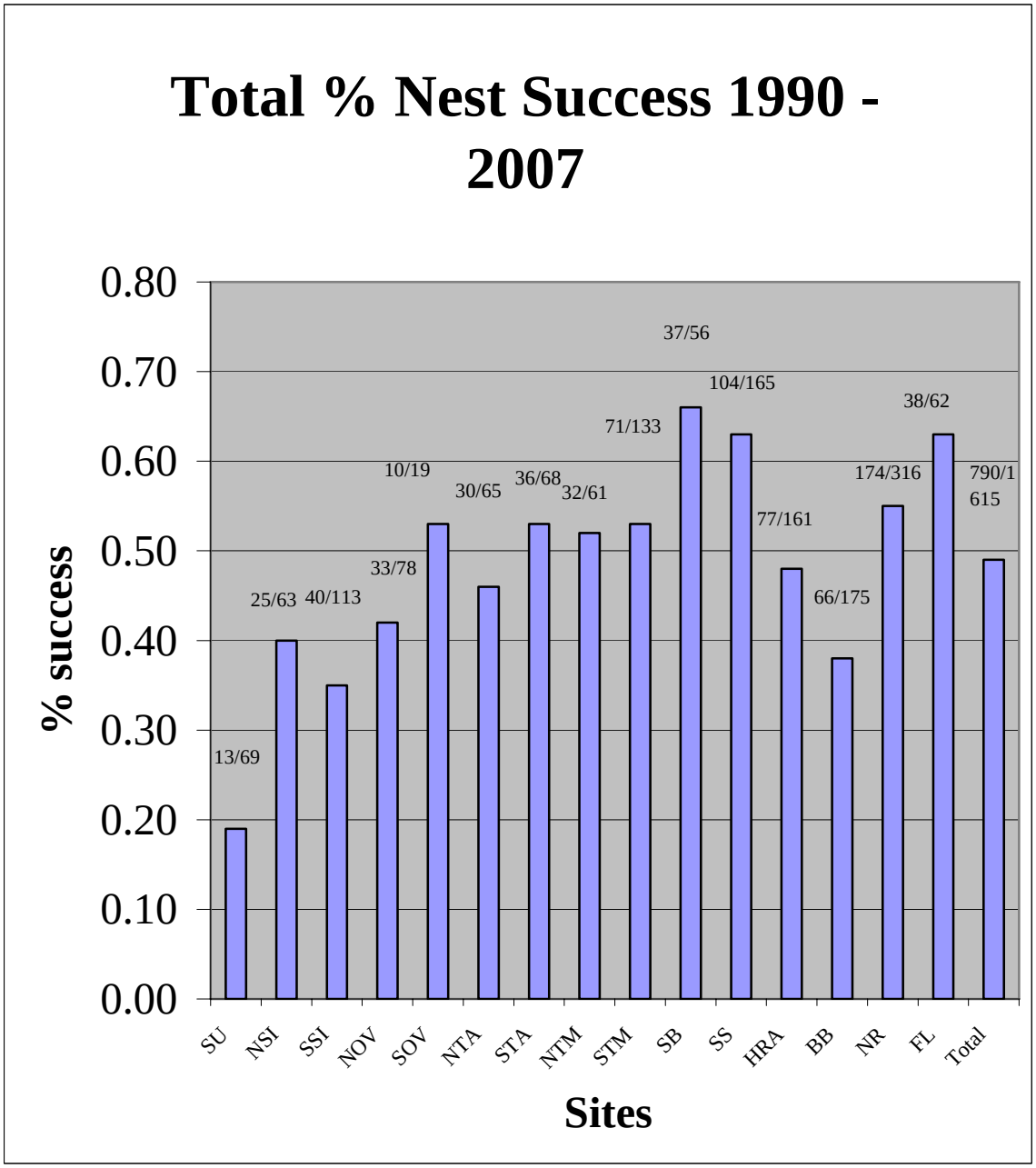


Figure 11. Total percent nest success for Snowy Plovers along the Oregon coast, 1990-2007. Above each bar is the total number of nests that hatched over the total number of nests.



APPENDIX A. Study Area

The study area encompassed known nesting areas along the Oregon coast including all sites between Berry Creek, Lane Co., and New River, Coos Co. (Fig. 1). Survey effort was concentrated at the following sites, listed from north to south:

Sutton Beach, Lane Co. (Figure 2). - the beach north of Berry Creek south to the mouth of Sutton Creek.

Siltcoos: North Siltcoos, Lane Co. (Figure 3). - the north spit, beach, and open sand areas between Siltcoos River mouth and the parking lot entrance at the end of the paved road on the north side of the Siltcoos River; and South Siltcoos, Lane Co. - the south spit, beach, and open sand areas between Siltcoos River mouth and south to Carter Lake trail beach entrance.

Dunes Overlook Clearing, Douglas Co. (Figure 4). - the north and south areas cleared of beachgrass, beginning in 1998, directly west of the Oregon Dunes Overlook off of Hwy 101.

Tahkenitch Creek to the Umpqua River, Douglas Co. (Figure 5) - Tahkenitch North Spit - the spit and beach on the north side of Tahkenitch Creek; there was no habitat on the south side of Tahkenitch Creek due to erosion and the movement of the mouth of the creek.

Tenmile: North Tenmile, Coos and Douglas Cos. (Figure 6) - the spit and ocean beach north of Tenmile Creek, north to the Umpqua River jetty; and South Tenmile, Coos Co. - the south spit, beach, and estuary areas within the Tenmile Estuary vehicle closure, and continuing south of the closure for approximately 1/2 mile.

Coos Bay North Spit (CBNS), Coos Co. (Figure 7): South Beach - the beach between the north jetty and the F.A.A. towers; and South Spoil/HRAs - the south dredge spoil and adjacent habitat restoration areas (94HRA, 95HRA, 98HRA);

Bandon Beach, Coos Co. (Figure 8): the beach between China Creek and the location of the New River/Twomile Creek mouth, including the large habitat restoration area north of the mouth of Twomile Creek.

New River Spit, Coos Co. (Figure 9) - the beach and sand spit on the south side of the location of the mouth of New River/Twomile Creek, and the oceanside beach, overwashes and riverside deltas between the open spit and south to BLM lands, and the habitat restoration area (HRA) adjacent to the BLM boat launch at the Storm Ranch ACEC.

The following additional areas were either surveyed in early spring or the breeding window survey: Fort Stevens, Necanicum Spit, Nehalem Spit, Bayocean Spit,

Netarts Spit, Sand Lake Spit, Nestucca River Spit, Whiskey Run to the Coquille River, Elk River, Euchre Creek, and Pistol River.

APPENDIX B. Recommendations for Management of Recreational Activities and Habitat Restoration for sites with Snowy Plovers along the Oregon Coast - 2007.

Sutton:

- Continue to manage the nesting areas behind the foredune; consider spreading shell hash or woody debris to improve the nesting substrate.
- Continue predator management when and if plovers are nesting to reduce predation pressure on broods, particularly corvids.
- Continue roping and signing of dry sand from Sutton Creek to north of Berry Creek.
- Continue to sign the backside of the foredune in order to minimize pedestrian crossing of dry sand.
- Place signs on the south side of Sutton Creek notifying people that if they cross the creek dogs must be on leash at all times.

Siltcoos North and South Spits:

- Continue predator management to reduce the number of corvids using the nesting area. Continue to reduce the feral cat population in the area. Continue to monitor and possibly remove coyotes that are using and possibly denning near the nesting area.
- Continue to close the Estuary Trail. Continue signage along river, especially east of nesting area and on any "islands" that may develop to alert kayak/canoe users about plover management activities.
- Continue to post the area with updated maps of the estuary and beach at several locations. These areas include the Stagecoach Trailhead, the north parking lot, and both ends of the Waxmyrtle Trail.
- Erect ropes and signs prior to 15 March, to be as effective as possible. Place signs and ropes on east and south side of the north spit nesting area as well as continued signage to the west and north.
- Continue to prohibit dogs on the spits and near the estuary during nesting season.
- Continue the use of campground plover hosts/volunteers to educate people and keep them out of closed areas. Use hosts/volunteers, especially during peak periods on weekends, and stagger their hours to cover evenings. Have hosts/volunteers in contact with Law Enforcement Officers to improve enforcement of the closures, and have them engage people on the beach before violations occur.
- Continue to extend appropriate signing to both riverbanks, to prevent hikers from walking up the closed estuary.

Overlook:

- Continue predator management to control corvid use of the area. Monitor Northern Harrier use of the area and consider removal if harriers continue to pose problems to breeding plovers.

- Continue to rope and sign both north and south closures for Snowy Plover nesting habitat by 15 March.
- Continue to improve and enlarge the restoration area, especially to the south towards Tahkenitch.
- Erect and maintain interpretive signing at the beginning of the Overlook trailhead (near viewing platforms). This signing is intended to provide more information on the ecology of the Snowy Plover and the reasoning for current management techniques and restricted areas.
- Continue to restrict all dogs to leashes adjacent to the Overlook nesting areas. It should be noted that many hikers with dogs are compliant while on-trail but often unleash their animals upon reaching the beach, therefore additional signing for clarification is highly recommended.

Tahkenitch:

- Continue to maintain and improve the habitat.
- Continue predator management to control corvid use of the area.
- Continue to rope and sign all suitable habitat. Place signs along east and south edge outside of the roped area to prevent hiking and camping near nesting area.
- Continue to restrict dogs to leashes adjacent to closure areas.

Tenmile North and South Spits:

- Continue predator management to control corvid use of the area; continue to monitor coyote use and possibly remove coyotes if warranted.
- Continue to maintain and improve the south side for nesting. Consider expanding and improving habitat on the north side.
- Continue to rope and sign plover nesting habitat on both north and south spits.
- Enforce vehicle closure to prevent violators from driving in the habitat restoration areas.

Coos Bay North Spit:

- Continue predator management of the area for corvids, feral cats, and skunks; monitor the coyote population and remove coyotes if warranted.
- Continue to improve and maintain the habitat restoration areas. Continue to spread shell hash to improve nesting substrate.
- Maintain gaps in the berm along the 95HRA to facilitate brood movement from the 94HRA and 98WHRA to the 95HRA and to the beach. Create small vegetation free gaps in the foredune to facilitate brood access to the beach without destabilizing the foredune.
- Continue to rope and sign the beach as early in the nesting season as possible.
- Clearly sign all entrance points on the spit that the beach is street legal vehicles only.

The seasonal reroute of the foredune road continues to benefit plovers by reducing recreational activity, and thus disturbance, near the nesting area, and permits brood movements between the HRA's without any chance of harm from vehicle use. A permanent reroute of the foredune road would be ideal.

Bandon:

- Continue predator management to control fox and corvid populations.
- Continue to improve and maintain the habitat restoration area north of Twomile Creek.
- Sign and rope the entire beach from China Creek overwash to the habitat management area near to the mouth of Twomile Creek/New River before the nesting season.
- State Parks should continue to work with the administration of the Christian Camp to help explain the wet and dry sand restrictions to the public.
- All law enforcement agencies should again be informed as to the status of the vehicle regulations on the beach.
- Maintain enforcement of restricted areas and leash laws for dogs. Monitor hiker use from Bandon to Blacklock Point, and check the beach and HRA on weekends for illegal camping activity.

New River:

- Continue predator management to control fox and corvid populations.
- Continue to improve and maintain the habitat restoration area.
- Place interpretive signs on the east side of the river on the county land at the end of Lower Fourmile Road to inform the public of plover activity.
- Sign State Parks lands on the open spit south of the mouth of New River. Enforce dogs on leash rules. Consider use of an interpretive specialist to help monitor recreational activities in the area and explain the management efforts in the area.
- Work with the county to reduce disturbance of plovers from recreationists accessing from Lower Fourmile Road. Encourage continuing cooperation of county, state and federal law enforcement officers to monitor vehicle use of the area.
- Continue to close the gate at the Storm Ranch for 15 April- 15 September.

Floras Lake:

- Monitor the site for any plover activity.
- Enforce dogs on leash rules at all times.
- Continue to hire an on-site interpretive specialist, to contact the public, monitor the beach, and present slide shows.