The Distribution and Reproductive Success of the Western Snowy Plover along the Oregon Coast - 2008

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December 30, 2008

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Abstract

From 1 April – 24 September 2008, 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 2008 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 187-199 adult Snowy Plovers; a minimum of 129 individuals was known to have nested. The adult plover population was the highest estimate recorded since monitoring began in 1990, and we found 196 nests in 2008. Overall Mayfield nest success was 30%. Exclosed nests (n = 51) had a 44% success rate, and unexclosed nests (n = 145) had a 38% success rate. Nest failures were attributed to unknown depredation (28%), one-egg nests (17%), corvid depredation (15%), abandonment (15%), unknown cause (9%), wind (6%), overwashed (6%), adult depredation (2%), infertility (2%), unknown mammal depredation (1%), and weasel depredation (1%). We monitored 70 broods, including three from unknown nests, and documented a minimum of 71 fledglings. Overall brood success was 66%, fledgling success was 47%, and 1.13 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.

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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 19th 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, and 2007). Our objectives for the Oregon coastal population in 2008 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). In addition, early in the season we surveyed Floras Lake but found no evidence of plover usage. A description of each site occurs in Appendix A.

Methods

In early April 2008, pre-breeding season surveys of historical nesting areas were completed and in late May 2008 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 1 April to 26 September 2008. 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 2008.

All exclosed nests in 2008 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*), skunks (*Mephitis sp*.), raccoon (*Procyon lotor*) and coyote (*Canis latrans*), occurred at specific sites. While there was some evidence that adult plovers may have been depredated in association with exclosed nests, other than corvids, no avian predators were targeted or removed in 2008. For information regarding the predator management program, see Little 2008. 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). From mid-May through early August exclosures were used when and where we determined nest predation was high enough to warrant their use. Exclosures were used at all sites except CBNS in 2008. On Forest Service sites predation pressure in May resulted in exclosure use at all sites, but after several adult plovers were likely depredated, most exclosures were removed and exclosure use was discontinued after mid-June. At Bandon Beach and New River, predation pressure was high enough in May that we exclosed nests, and corvid activity remained high throughout the nesting season, resulting in exclosure use on all nests thereafter.

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 2008 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 until the end of the 2008 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 individual site would result in the appearance that more plovers are using the area than actually were present. 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 also eliminated from the adjusted Mayfield calculations all nests that had an exclosure and then had it removed. 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 productivity 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. The productivity index is a measure of overall effort based on how many fledglings the plovers produced compared to how many eggs they laid. If plovers produced high numbers of fledglings compared to eggs laid, then their productivity was high for the amount of effort (eggs laid) and the productivity index would be high. If plovers produced low numbers of fledglings compared to high numbers of eggs laid, then their productivity was low and the productivity index would be low. In general, a site with productivity index higher than 20% is considered good, while a site with productivity index less than 20% is usually not very productive. 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 2008 breeding season, we observed an estimated 187-199 adult Snowy Plovers at breeding sites along the Oregon coast (Table 1). Of 187-199 plovers, 160 (80-86%) were banded. Using the daily observation evaluation method of estimating unbanded plovers, an estimate of 27 to 39 unbanded plovers was present during the breeding season. For the breeding season, we observed 84 banded females, 76 banded males, 16-24 unbanded females, and 11-15 unbanded males.

Of the total estimated population, 129 plovers (65-69%) were known to have nested (Table 1), less than the mean percentage for 1993-2007 (80%). A minimum of 54 banded females and 12 unbanded females nested and 57 banded males and 6 unbanded males nested. An additional 17 banded females and 17 banded males were present during the breeding season but were not confirmed nesting, and an additional nine unbanded plovers were not confirmed nesting but were likely present during the breeding season. The estimated Oregon resident plover population was 172.

In 2007 the estimated adult plover population was 181-184, of which 142 were banded. Of these 142 banded adult plovers, 54 (38%) were not recorded in 2008 and therefore are presumed not to have survived winter 2007-2008. The estimated overwinter survival rate based on returning banded adult plovers was 62%.

During the 2008 season, we captured and rebanded 30 banded adult plovers - 18 were males and 12 were females; we banded 10 unbanded adult plovers - seven were males and three were females; and we banded 128 chicks.

2007 Hatch-Year Returns

Due to analysis of hatch year returns, we adjusted the 2007 fledgling total to 124. Fifty-two of the 124 hatch-year plovers from 2007 returned to Oregon in 2008. The return rate was 42%, nearly the average return rate for 1992-2007 (Table 2, 45%). Of the returning 2007 hatch-year birds, 31 (60%) were females and 21 (40%) were males. Twenty-seven of the hatch year 2007 returning plovers attempted to nest (52%), and they accounted for 17% 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 nesting area along the Oregon coast in 2008. No plovers were recorded at Sutton Beach in 2008. At Siltcoos, 40-44 individual adult plovers were recorded, and 20 adult plovers were known to have nested. At Overlook, 20 individual plovers were recorded during the breeding season with only five confirmed breeders. At Tahkenitch, 16-19 individual adult plovers were recorded but only two were confirmed breeders. At Tenmile, 56-61 individual adult plovers were

recorded and 17 were confirmed breeders. At CBNS, 53 individual adult plovers were recorded and 37 of these nested. At Bandon Beach/New River, 68 individual plovers were recorded and 54 of these were confirmed breeders.

Nest Activity

We located 196 nests during the 2008 nesting season (Table 4), the second highest number of nests found since monitoring began in 1990. In addition we recorded three broods from nests that we did not locate prior to hatching.

There was no nesting activity at Sutton Beach in 2008.

At North Siltcoos (Figure 2), 30 nests were found, double the number found in 2007. The north spit was very large this year and nests were found throughout the main nesting area and south on the open spit area. One nest was found north of the nesting area along the foredune near the public access trail. At South Siltcoos, six nests were found, half the number of the previous two years. The south spit was much reduced this year due to the change in the river course. Thirty-six total nests at Siltcoos is the highest number of nests found at this site since monitoring began in 1993 (Table 4).

At North Overlook 14 nests were found in 2008, one more than in 2007 (Table 4, Figure 3). However, two of these nests were actually found on the open beach north of North Overlook near the Carter Lake trail access. One nest was found at South Overlook in 2008.

At North Tahkenitch, five nests were found in 2008, half the number found in 2007 (Figure 4). One nest was found at the far south end of the spit, and the other nests were within the roped nesting area.

At Tenmile, 28 total nests were found in 2008, down from 41 in 2007 (Table 4). The north spit had 12 nests, 11 within the roped nesting area (Figure 5). One nest was found along the foredune near the Eel Creek trail access. Ropes were erected around this nest. At South Tenmile, 16 nests were found, all within the roped nesting area.

At CBNS (Figure 6), 49 nests were found in 2008, ten more nests than in 2007 which was the previous high for this site. This is the highest number of nests for any given site since monitoring began in 1990 (Table 4). In addition there was one brood from an undiscovered nest. South Spoil had 18 nests and the 94HRA had 13 nests. The 95HRA had eight nests and the 98EHRA had five nests. South Beach had five nests, three along the south end of the beach and two north of the Olson shipwreck. The one brood from an undiscovered nest was found on South Beach but it is not known where the nest originated.

At Bandon Beach (Figure 7), 28 nests were found in 2008, similar to the number of nests found at this site during the previous three years (Table 4). In addition there was one brood from an undiscovered nest. There was no additional acreage improved on the HRA during the winter, and the south end of the HRA has degraded to an unusable nesting condition. Twelve nests were found from China Creek overwash to just south of the old camp trail access, indicating that this area remains an important nesting location for the plovers. The old camp trail was closed relatively early in the season

and remained closed through the remainder of the season. In addition, a new trail was created to replace the old trail, and the old trail has been permanently eliminated. The new trail now brings recreationists to the parking lot instead of directly to the beach, which should reduce plover disturbance along the foredune south of China Creek overwash. Five nests were found along the foredune further south of the old camp trail and north of the HRA. Ten nests were found on the HRA, and one nest was found just south of the ropes at the very south end of the HRA near the mouth of Twomile Creek/New River. The southern end of the HRA had no plover use due to the lack of habitat.

At New River (Figures 7 and 8), 35 nests were found in 2008, the same number found in 2007 (Table 4). In addition one brood from an undiscovered nest was found on state land on the New River spit. Twenty of the 35 nests were found on the BLM HRA. No habitat maintenance was completed on the HRA for the second year in a row, which continues to degrade due to the lack of management. The northern half of the HRA from New Lake breach north had the best habitat, and most of the nests were from Croft Lake breach north. The open breached areas remain some of the best habitat, and seven of the nests were found on or just south of Croft Lake breach. Ten other nests were found in the overwash areas from the north end of the HRA to Croft Lake breach. One nest was found just south of New Lake breach, and for the first time two nests were found on the very large Bono Ditch breach, which has been the active breach for the past two winters. Two nests were found along the beach adjacent to private lands in 2008. Seven nests were found on Coos County land, all in overwashes except one that was along the riverside. On state land, only six nests were found in 2008 compared to 16 nests found in 2007. Habitat remains very good on the open spit mostly on state land, however beachgrass has become well established in several places and large dunes continue to form. Dune formation will eventually lead to degradation of nesting habitat without habitat management. Currently county land has degraded considerably and dune formation is moving further north, thus reducing the available habitat for the plovers. Bandon Beach State Natural Area from China Creek to the south boundary north of Coos County land had a total of 34 nests and two broods from undiscovered nests in 2008.

The first nests were initiated about 3 April (Figure 9). Nest initiation increased throughout April and into early May. The maximum number of active nests during 10-day intervals occurred during two time periods, 11 – 20 May and 10 – 19 June. The 10 – 19 June time period normally has the highest number of active nests. The maximum number of active nests was 57, down from 68 in 2007. Due to increasing plover populations, the past several years have had higher numbers of active nests than the average. The last nest initiation occurred on 19 July.

Nest Success

The overall Mayfield nest success in 2008 was 30%, 11 points below the mean and the lowest success rate since 2001 (Table 5). High numbers of one-egg nests and abandoned nests combined with nests that failed quickly and thus had very few to no exposure days contributed to the low overall success rate. Adjusted Mayfield nest success for all exclosed nests in 2008 was 44%, over 20 points lower than the mean and the lowest rate since monitoring began. This low success rate was partially due to a relatively high number of failed exclosed nests that failed quickly and therefore had very few exposure days. For the second year in a row, the number of days nests were unexclosed was considerably higher than the number of days nests were exclosed (2030 unexclosed days, 898 exclosed days). However, there were more exclosed days and fewer unexclosed days in 2008 than in 2007 (for exclosed, 746 in 2007, for unexclosed, 2267 in 2007), which reflects that exclosures were used on most

nests at Bandon and New River in 2008 compared to 2007 when very few nests at these locations had exclosures (see Lauten et al. 2007). The adjusted Mayfield nest success rate for unexclosed nests in 2007 was 38%, the third year in a row that the success rate was nearly double the mean.

In 2008, the overall annual apparent nest success rate was 35%, lower than in 2007 (42%) and well below the 19-year mean of 47% (Table 6 and Figure 10). The number of exclosed nests in 2008 (n = 51) was higher than in 2007 (n = 38). Apparent nest success for exclosed nests in 2008 was 49%, much lower than in 2007 (71%). The number of unexclosed nests in 2008 (n = 140) was less than in 2007 (n = 164), but was still much higher than in 2006 (n = 79). Apparent nest success for unexclosed nests in 2008 was 30%, slightly less than 2007 (35%) and 2006 (32%). Nest success of unexclosed nests was significantly lower than nest success of exclosed nests ($\chi^2 = 21.590$, df = 1, $P < 0.01$), however the mean nest success of unexclosed nests for 2006-2008 ($x = 32\%$) continues to be much higher than the mean success rates of unexclosed nests for 1995-2005 ($x = 9\%$).

On Forest Service sites, exclosures were used on all sites through mid-June due to repeated failures of unexclosed nests. In mid-June there was evidence that several adult plovers were depredated in association with exclosed nests. Most nests had exclosures removed at that time and exclosure use was discontinued on all nests after mid-June. At Siltcoos, nine total nests were exclosed and four hatched (44%, Table 6), including the only two exclosed nests at South Siltcoos and two of the five nests at North Siltcoos. Twenty-seven total nests at Siltcoos were unexclosed, and only six hatched (22%). Corvid activity declined as the season progressed and five of the six successfully hatched unexclosed nests occurred after mid-June when exclosure use was discontinued. At Overlook, only two nests of fifteen (including two nests found near Carter Lake trailhead) successfully hatched (14%). One successful nest was exclosed and one was unexclosed, and both were on North Overlook. Two exclosed nests, one at North Overlook and one at South Overlook, were in the process of hatching when the adults disappeared, indicating that the adults were depredated. The one unexclosed nest that hatched occurred after exclosure use was discontinued due to the depredation of adult plovers. There were no successful nests at Tahkenitch. At North Tenmile, five of 12 nests were exclosed, but two of these nests had exclosures removed after evidence of Great Horned Owls (*Bubo virginianus*) was found hunting around exclosures. Both of these nests failed after exclosure removal. Two of the other three exclosed nests hatched (67%). Of the seven other unexclosed nests, only one was successful (17%). At South Tenmile, six total nests were exclosed, but two had exclosures removed due to predator activity. One of these nests then failed and the other was successful. Of the four other exclosed nests, one hatched, one failed, and two had unknown outcomes. Of the ten unexclosed nests, five were successful (50%) and all of these nests occurred after exclosure use was discontinued. At Tenmile, overall nest success was 41%, with exclosed nests having a 60% success rate and unexclosed nests having a 35% success rate. Overall nest success for Forest Service sites was generally below average in 2008 (compare Table 6 to Figure 10).

For the second year in a row, no exclosures were used at CBNS in 2008. This is the only site where no exclosures were erected within a given year. Of a total of 49 nests, 27 successfully hatched (55%, Table 6). Nests on the HRAs had a 42% success rate, and nest on South Spoil had a 67% success rate. On South Beach nest success was 80%. Overall, nest success was about average for all sites at CBNS (compare Table 6 to Figure 10).

At Bandon Beach and New River in 2007 only seven nests were exclosed (Lauten et al. 2007). In 2008 at Bandon Beach seven nests of 28 were exclosed. Of the 21 not exclosed, all failed. Many of these nests failed before exclosures could be erected, either due to predation (mostly corvid) or to mostly uncontrollable causes (such as wind, abandonment, overwashing, and one egg nests, Table 7). Of the exclosed nests, three of seven successfully hatched (43%) and overall only 11% of the nests at Bandon were successful. At New River 23 nests were exclosed and 12 nests were unexclosed. Exclosed nests at New River had a 57% nest success rate, however exclosed nests on the HRA had a 73% success rate while on state and county land exclosed nests had only a 25% success rate. Unexclosed nests at New River had an overall 17% success rate, but no unexclosed nests on state, county or private land were successful. On the HRA, 40% of the unexclosed nests hatched. The lack of success of unexclosed nests at these two sites in conjunction with nest failure data and the number of exclosures erected all indicate that predation pressure was higher in 2008 than in 2007. Exclosures were needed throughout the entire season due to persistent corvid activity. Overall nest success at these two sites was below average (compare Table 6 to Figure 10).

Nest Exclosures

During the 2008 season, a total of 56 ME's were erected on the 196 nests (29%) compared to 38 ME's used in 2007. 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). Only at CBNS were no exclosures used during the 2008 season. There was no avian depredation documented at CBNS in 2008 (Table 7). There was a period in mid to late May that an unknown predator depredated 14 nests at CBNS, however we did not exclose nests because evidence did not indicate that exclosures would prevent the depredations. The evidence at the depredated nests did not indicate whether a mammal or avian predator was causing the failures, and we were reluctant to exclose nests especially if the predator was small enough to go through the exclosure fencing, thus potentially endangering adult plovers inside exclosures. The depredations then ceased in early June and most remaining nests successfully hatched.

On Forest Service sites, we began erecting exclosures in mid May because of predation pressures. However in early to mid June there was evidence that some adults associated with exclosed nests were disappearing, suggesting that they were being depredated, possibly around the exclosures. We then removed most exclosures at Overlook and Tenmile. No exclosures were removed at Siltcoos or Tahkenitch, but exclosure use was discontinued during the same time period.

At North Siltcoos, 23 of 30 nests were not exclosed and 19 of the unexclosed nests failed (Table 6), however eight of the nineteen (42%) were one egg nests (Table 7) and therefore did not fail due to depredation. Prior to mid-May exclosure use, one unexclosed nest hatched at North Siltcoos. After exclosure use was discontinued in mid-June, three more unexclosed nests hatched at North Siltcoos. Seven nests were exclosed at North Siltcoos, but only two hatched. The five exclosed nests that failed all failed due to non-predator related causes (wind blown sand, abandonment, and overwashing). For the second year in a row, one exclosed nest at North Siltcoos had greater than one clutch of eggs in the nest bowl (five eggs in 2008, six eggs in 2007). The nest was eventually abandoned. At South Siltcoos there were a total of six nests, two of which were exclosed and both hatched (Table 6). Two of the four unexclosed nests also hatched, both late season nests that occurred after exclosure use was discontinued.

Both unexclosed nests that failed at South Siltcoos were one egg nests. The successful hatching of unexclosed nests after exclosures were discontinued at Siltcoos indicated that predator management of corvid activity at this site was generally successful. Also, while 26 nests failed at Siltcoos, only six (23%) were depredations (Table 7); the remaining failures were due to a variety of factors that were not associated with predator management.

Of the 15 total nests at Overlook, including two near Carter Lake, only five were exclosed and only one of the exclosed nests was successful (Table 6). Another one of these exclosed nests had the exclosure removed due to adult depredation concerns and that nest then failed. Unlike Siltcoos, most of the failures at Overlook were either egg depredations, adult depredations, or suspected to be related to some type of depredation (mostly adult depredations). There continues to be evidence over the past several years that adult plovers are being depredated at Overlook. Two of the exclosed nests, one at North Overlook and one at South Overlook, had hatching chicks abandoned while eggs were pipped, indicating that one or both adults were depredated as the nests hatched. Three other nests that were considered failed due to unknown cause, two with exclosures including one that had the exclosure removed, may have also had adults depredated but the evidence was lacking and we could not be certain. While direct evidence that plovers were depredated has been difficult to document, we believe that there is an ongoing depredation issue at Overlook and exclosure use in the future at this site (and possibly others) is not recommended. We believe that either Northern Harrier (*Circus cyaneus*) or Great Horned Owl may be responsible for these depredations. Harriers continue to be regularly reported hunting the area, and have been noted in the past diving at adult and fledgling plovers. In addition, we continue to observe owl feathers from Great Horned Owls at several sites (CBNS, Tenmile, Siltcoos in 2008). While removal of these predators may be an option, we believe that it would be best if exclosure use was eliminated.

At North Tahkenitch only one of five nests were exclosed (Table 6). The nest had four eggs instead of the normal three egg clutch, and failed to unknown cause. One other unexclosed nest also was abandoned for no apparent reason. There was no evidence of any adult plovers being depredated, but at Tahkenitch nests continue to fail often under somewhat mysterious circumstances. It is possible that this site also may have unidentified avian predators hunting the area, which suggests that exclosure use could be detrimental to nesting plovers.

At Tenmile, 11 of 28 nests were exclosed in 2008 (Table 6), but four exclosures were removed after evidence indicated that exclosed nests were being attacked by some avian predator, likely a Great Horned Owl. Five exclosures were erected on North Tenmile, two of which hatched. Two of the exclosures were removed and both of those nests failed after exclosure removal. The one unexclosed nest that hatched at North Tenmile hatched after exclosure use was discontinued. At South Tenmile, six exclosures were erected, but two were removed. One of those two nests subsequently hatched without an exclosure, but only one other exclosed nest hatched. After exclosures were discontinued, five unexclosed nests at South Tenmile hatched. No owls were targeted and removed in 2008. Either exclosure use at Tenmile should be curtailed if there continues to be Great Horned Owls at Tenmile, or the owls will need to be removed in the future.

At Bandon Beach and New River, we did not exclose nests in the beginning of the season and a number of the nests were being successfully incubated until mid-May when corvid depredation caused the failure of almost all of the active unexclosed nests within a few days. We then began to erect

exclosures on the remaining nests, and on newly found nests thereafter. We had hoped that we could stop erecting exclosures at some point later in the season, but corvid activity remained high at both Bandon Beach and New River for the remainder of the season and we continued to exclose all nests. At Bandon, corvid activity was so consistent that the majority of nests were never exclosed and failed before we even had a chance to return and exclose the nests. Of the 28 nests found at Bandon Beach, 21 were not exclosed and all of them failed (Table 6). Only seven nests were exclosed at Bandon Beach, three of which successfully hatched. One exclosed nest at Bandon Beach was abandoned in mid-July and the resident female was not recorded after the nest failed. The female may have been depredated but there was no evidence near the exclosure. At New River, we exclosed 23 of 35 nests (Table 6), and 13 of the exclosed nests hatched. Of the unexclosed nests (n = 12), 10 failed including all seven on state, county and private land. On the BLM HRA, the two unexclosed nests that were successful hatched in mid-May just before corvid activity depredated most other nests.

Adult Mortalities

During the 2008 nesting season, seven adult plovers disappeared, less than in previous years when as many as 15 plus adult plovers disappeared and may have been depredated. Of the seven adults, only two to four were most likely depredated, and the remaining individuals may have migrated from the area. Three of the plovers were females. One female from South Overlook has a history of nesting at South Overlook, and was likely associated with the only known nest at South Overlook in 2008. The nest failed at hatching, with the chicks abandoned as they attempted to hatch. This indicated that one or both of the adults were depredated at or near the time of hatching. The female was never seen again, and the male was not known. Two other females disappeared, one at Tenmile, and one at Bandon Beach. The female at Tenmile was not associated with any nest and was a HY07 plover, so she had no history of nesting in Oregon and it is not clear if she migrated from the area. The female at Bandon Beach has both wintering and nesting history at Bandon Beach. She was incubating an exclosed nest in mid July when she disappeared and the nest was abandoned. We suspect she was depredated. Four males disappeared during the 2008 season, one at Tahkenitch, one at Tenmile, one at Bandon Beach, and one at New River. The male at Tahkenitch was a HY07 male with no previous history of nesting in Oregon. He may have been associated with an exclosed nest at Tahkenitch, and he disappeared after 21 June. The nest was abandoned shortly after this date. At Tenmile, a male with nesting history at Tenmile disappeared after 2 June. He was not known to be associated with any nest, but this time period was when evidence was gathered that adults might be being depredated around exclosed nests and shortly after we began to pull exclosures. At Bandon Beach a male with history of nesting at Bandon Beach disappeared after 12 May. He was not associated with an exclosed nest at the time, but his disappearance suggests he was depredated. The fourth male was a male with a nesting history at the New River HRA, and he disappeared after raising a brood and was last seen 21 June. He may have migrated from the area.

Nest Failure

Excluding the five nests that had exclosures removed, exclosed nests in 2008 had an overall failure rate of 49% (25 of 51), higher than the previous five years (29% in 2007, 34% in 2006, 27% in 2005, 15% in 2004, and 23% in 2003). While the rate of failure was higher in 2008, there was no specific cause of failure that could be attributed to the higher failure rate (Table 8). In 2007, one exclosed nest failed to egg depredation and one failed due to adult depredation, while in 2008 three

exclosed nests failed to egg depredation and two failed due to adult depredation. The other failed exclosed nests in 2008 were distributed between a variety of environmental and other causes, and while the numbers were higher than in 2007, none were that much greater in 2008 than in 2007 (see Lauten et al. 2007). The number of unexclosed nests that failed in 2008 (n = 102) was very similar to 2007 (n = 104) and the failure rate in 2008 (73%, 104/140) was similar to the previous two years (66% in 2007 and 68% in 2006). The mean failure rate for unexclosed nests for 2006-2008 (69%) is less than the mean failure rate for 2000-2005 (94%), indicating that more unexclosed nests were successful over the past three years. The causes of nest failure for unexclosed nests in 2008 were very similar to the causes of nest failure for unexclosed nests in 2007 (Table 8, Lauten et al. 2007). Overall nest failures were attributed to unknown depredation (28%), one-egg nests (17%), corvid depredation (15%), abandonment (15%), unknown cause (9%), wind (6%), overwashed (6%), adult depredation (2%), infertility (2%), unknown mammal depredation (1%), and weasel depredation (1%, Table 7). The main causes of nest failure of exclosed nests (Table 8) were abandonment (n = 7, 28%) and wind/weather (n = 6, 24%). The main causes of failure for unexclosed nests were unknown depredation (n = 35, 34%), one egg nests (n = 22, 22%), corvid depredation (n = 19, 19%), abandonment (n = 12, 12%), and unknown cause (n = 9, 9%). Corvid and unknown depredations combined were responsible for 43% of the failures and 96% of egg depredations. While there were other predators besides corvids depredating nests, corvids were still likely responsible for the majority of unknown depredations based on data from known nest failures. Corvids were likely responsible for approximately a third of all nest failures and nearly three quarters of egg depredations, and they continue to be the main cause of nest failures, particularly of unexclosed nests. For unexclosed nests, abandoned, one-egg nests, wind blown nests and overwashed nests combined (n=39) were responsible for 38% 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.

As in 2007, there were a high number of one-egg nests (n = 23 for 2007, n = 22 in 2008) and abandoned nests (n = 18 in 2007, n = 19 in 2008). Exclosures were used on seven of these nests in 2008 (17%, 7/41), and in 2007 exclosures were used on five of these nests (13%, 5/40). While disturbance of the plovers by monitors could lead to abandonments, the number of one egg nests and abandonments appears to be increasing with the increasing plover population.

Fledgling Success and Productivity

We monitored 70 broods in 2008 including 3 broods from undiscovered nests, nineteen fewer broods than in 2007 (Lauten et al. 2007). A minimum of 71 fledglings was confirmed, lower than the previous four years but still higher than any year prior to 2004 (Table 9). Overall fledgling success was 47%, the sixth consecutive year that fledgling success was higher than the average (Table 10). The overall number of fledglings per brood was 1.01 (71/70), less than the previous four years (1.38 in 2007, 1.30 in 2006, 1.07 in 2005, and 1.46 in 2004). The overall number of fledglings per male was 1.13 (71/63, Table 11). Using the productivity data from Siltcoos to New River only (Tables 13-19), the mean fledglings per male was lower than the previous four years, but remained above 1.00 for the sixth consecutive year (Table 12).

The overall brood success rate was 66% (Table 11), less than the previous four years (82% in 2007, 76% in 2006, 69% in 2005, and 88% in 2004). At Siltcoos 60% of the broods were successful (n = 6/10). Overlook had only two broods and both were successful. Tahkenitch had no broods in 2008.

At Tenmile, overall brood success was 50% (n = 5/10). CBNS had a 75% overall brood success rate (n = 21/28). Bandon Beach had only four broods, two of which were successful (50%). At New River, all three broods on state and county land were successful, but only six of 13 were successful on the HRA. Overall brood success at New River was 56% (n = 9/16).

Fledgling success rates at Siltcoos were 38% for the north spit and 33% for the south spit, about 10 points lower than in 2007 (Table 11, Lauten et al. 2007). Overlook had a very small sample size (n = 5 eggs hatched). The fledgling success rate was 40%. North Tenmile also had a small sample size (n = 5 eggs hatched); the fledgling success rate was 60%. The sample size at South Tenmile was larger (n = 16 eggs hatched), but fledgling success was low (31%). South Tenmile traditionally has very good productivity. CBNS was the only site with very good fledgling success rates, with all three nesting areas having over 60% fledgling success rates. Bandon Beach also had a small sample size (n = 5 eggs hatched); fledgling success was 40%. At New River, the HRAs had the lowest fledgling success rate of all sites (25%), while the other lands had a 50% fledgling success rate. These fledgling success rates at New River are much lower than in 2007 (Lauten et al. 2007).

While post predator management fledgling success rates and the number of fledglings per male continues to be much improved compared to pre predator management years (Tables 13-19), in 2008 productivity at all sites but CBNS declined and in most cases the decline was quite large. At Siltcoos (Table 13), fledgling success was 36% in 2008, above the average prior to predator management, but well below the post predator management average. Siltcoos had less than 1.00 fledglings per male in 2008, the first time in four years. The productivity index was 12%, indicating that there was poor productivity for the amount of effort. At Overlook, fledgling success in 2008 was 40%, but the sample size was very small (Table 14). The number of fledglings per male was below 1.00 for the first time in four years, and the productivity index was a very poor 6%. Tahkenitch continues to be very erratic, with some years both recently and in the more distant past having good productivity while other years having very poor productivity (Table 15). There was no productivity at this site in 2008. Tenmile was one of only two sites in 2008 that had 1.00 fledglings per male or greater (Table 11 and 16). However, in 2008 productivity at Tenmile was down substantially. In 2007, 27 fledglings were produced at Tenmile, while in 2008 only eight fledglings were produced. Fledgling success was well below the average, and the productivity index was only 10%, indicating that there was poor productivity for the amount of effort. CBNS was the only site that had excellent overall productivity in 2008 (Table 17). CBNS was responsible for 40 of the 71 total fledglings produced in 2008 (56%, Table 11), and had an overall fledgling success rate of 63%, higher than the average for post predator management years. CBNS produced more fledglings in 2008 than in any other individual year, and the number of fledglings per male was 2.00 or higher for the fifth time in seven years. The productivity index for CBNS continues to be very high, indicating that this site is very productive for the amount of effort. After four years of improving productivity, Bandon Beach was very unproductive in 2008 despite a fairly large effort (based on the number of eggs laid, Table 18). While fledgling success was 40%, the sample size was very small. Notably Bandon Beach had only 0.18 fledglings per male in 2008, the lowest since 2002 when predator management began. The productivity index was only 3%, extremely low especially since the effort was fairly large (compare the number of eggs laid in the past five years to years prior to 2004). New River also had very poor productivity in 2008 (Table 19). New River produced 21 fewer fledglings in 2008 compared to 2007, and the fledgling success rate in 2008 (29%) was less than half compared to 2007 (64%) and well below the post predator management average (43.7%). The number of fledglings per male was 0.56, the lowest since 1999. The productivity index declined to 11%, the lowest level

since 2001, and a very poor number especially for the amount of effort based on the number of eggs laid.

Siltcoos produced a total of 8 fledglings in 2008, the first year since 2003 that this site had less than nine fledglings (Table 9). Overlook produced just two fledglings, 10 less than in 2007 and the lowest number of fledglings for this site since 2002. Tahkenitch had no fledglings in 2008, the first time this site produced no fledglings since the initial year of surveying this site (1993). Tenmile had 21 fewer fledglings in 2008 compared to 2007, and the total was the lowest for this site since 2002. CBNS produced 40 fledglings in 2008, the highest number of fledglings produced at any site for any given year. Bandon Beach produced only two fledglings, the first time since 2003 that less than 10 fledglings were produced. New River had a total of 11 fledglings produced in 2008. The BLM HRA produced seven fledglings, half the number produced in 2007, and county/state lands produced four fledglings, 12 fewer fledglings compared to 2007.

Brood Movements

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.

At Siltcoos in 2008 all broods remained on the respective spits where they hatched. We did not note any broods crossing the river nor to our knowledge did any broods travel any distance away from the spits. At Overlook, one brood remained on the north clearing for the entire brood period. The second brood was on the north clearing but may have moved north at some time as it was confirmed fledged at Siltcoos. There was no movement south of Overlook in 2008 and there were no broods at Tahkenitch this year. At Tenmile brood data was very sparse. Broods that were noted remained within and around the main nesting areas, but several broods disappeared for fairly long periods of time and then were confirmed fledged. Either these broods were difficult to identify while in the field, or the broods moved away from the main nesting areas and were not located. No broods were noted crossing the river.

As is typical at CBNS, broods that hatched from South Spoil and the 94HRA tended to stay on these two areas, particularly during the first couple of weeks of brood activity. Broods from the 98EHRA moved around on the 98EHRA but also crossed the foredune road to the 95HRA and went south onto the 94HRA. Broods from the 95HRA mostly stayed on the 95HRA, but due to foredune erosion near the Olson shipwreck these broods had easy access to the beach and frequently would move from the beach to the HRA and back. Any brood from the main nesting areas could move west towards the beach and several did, but some broods would also move back onto the HRAs. Eventually, almost all fledged broods were confirmed on South Beach. Broods from South Beach remained on the beach for the entire brood period. Brood activity on the beach extended from about one quarter mile north of the Olson wreck to the north jetty area, and we even had brood activity on the parking area at the end of the foredune road near the north jetty. The contiguous aspect of the nesting areas, combined with gaps

in the foredune road berms, and areas of relatively grass free foredune along the beach, permit broods to move freely and easily about the nesting areas and to the beach.

There were only four broods at Bandon Beach in 2008. One brood hatched in China Creek and stayed in and around the overwash through early to mid-July before suddenly failing. Shortly before the brood failed, there was high recreational use around the China Creek area and violations of the roped China Creek overwash. A second brood that hatched near the old camp trail access moved south along the foredune and eventually was noted around and on the HRA, and eventually fledged. A third brood that hatched along the foredune also moved south and stayed on and around the HRA and successfully fledged. The fourth brood was from an undiscovered nest, and it too moved south towards the HRA before failing.

There were only three broods on the New River spit in 2008, two from state land and one from county land. The two broods on state land remained at the north end of the spit and successfully fledged. The brood from county land stayed on county land and moved south along the foredune adjacent to private land and successfully fledged. There were 13 broods on the New River HRA in 2008, but only six were successful. The majority of brood activity occurred from the north end of New Lake breach to the north end of the HRA, with a concentration of activity around Croft Lake breach. One brood from a nest on Croft Lake breach moved north to near the north end of the HRA, and then moved south past New Lake breach. Two other broods from the north end of the HRA disappeared after hatching and were later confirmed fledged on the county and state land on the spit. We did not note these broods along the open beach adjacent to private land during the time period, despite searching the area. It is possible that these broods may have been moving north along the river, which we do not check regularly. These three broods are examples that broods can and will move fairly long distances during the brood period, as the distance from the HRA to the spit is nearly two miles. The other successful broods remained on the HRA within fairly close proximity to the nest locations. Most of the failed broods failed quickly and data on the broods was limited.

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

Twelve plovers banded in California were observed in Oregon in 2008. Eight were females and four were males. Eight of the twelve plovers were known to have nested in Oregon in 2008 including all four males and four of the females. Three females and three males originally hatched in Oregon and were subsequently rebanded at coastal nest sites in California; two of the males and two of the females were HY07 birds. Five of these plovers, two females and three males, nested in Oregon in 2008. The other female was only noted twice in June and had no previous history of nesting in Oregon. In addition, two HY07 plovers banded at Leadbetter Point, Pacific Co., Washington were recorded in Oregon in 2008, but neither bird was known to have nested.

The six other plovers were originally banded in California. Two females were banded as chicks in Humboldt Co. One female was a HY07 plover rebanded in Humboldt Co. in April; she later nested at New River HRA. The other female still retains her HY band combo, so we are uncertain what year she originally hatched. She nested at New River. One female was a HY05 bird from Salinas, Monterey Co. She has been in Oregon for three summers, and was confirmed nesting in 2007. We did not confirm a nest for her in 2008. The two other females were a HY06 plover from Salinas, Monterey Co., and a HY07 plover from Pajaro Spit, Santa Cruz Co. The first female attempted to nest at New River HRA, and the other female was only seen at the end of the season and was not known to have nested. One male was originally banded as a chick in 2005 at Salinas SP, Monterey Co.; he nested at New River HRA in 2006, 2007, and 2008.

Discussion

From 2004 to 2006, there was a steady increase in the number of plovers present and the number of plovers breeding along the Oregon coast (Table 1). In 2007, the total number of plovers present was only slightly higher than in 2006. The lack of an increase in plovers present in 2007 despite high productivity in 2006 was attributed to poor overwinter survival (Lauten et al. 2007). In 2008, the number of plovers present did not increase substantially from 2007 despite again having high productivity in 2007, however the overall number of plovers present in 2008 was still the highest since monitoring began in 1990. The number of breeding plovers and the window survey count both decreased from 2007 (Table 1). We suspect the window survey count decline was not attributable to a real decline in plover populations, but was a result of poor survey conditions and other uncontrollable factors (i.e., plover detectability). Washington also reported relatively low window survey numbers due to poor survey conditions in 2008 (S. Pearson, pers. comm.) and Colwell et al. 2008 reported that the percentage of breeding plovers on the window survey counts in Humboldt Co. in 2008 was lower than in previous years. The decline in the number of breeding plovers in 2008 was also not necessarily a real decline in plover numbers, but was partially a result of relatively quick nest failures that led to many unknown adults associated with nests. The number of resident adult plovers was nearly identical in 2007 (174-177) and 2008 (172), suggesting that the number of breeding plovers was undercounted in 2008. The lack of any substantial increase in the plover population from 2007 to 2008 was due to poor overwinter adult survival. Overwinter survival of adults was approximately 62%, nearly identical to 2007 (61%, Lauten et al. 2007), and down from 71% in 2006 (Lauten el al. 2006). The adult overwinter survival rates in 2007 and 2008 were below estimates used in the population viability model in the recovery plan (U.S. Fish and Wildlife Service 2007), but were similar to those reported elsewhere (Sandercock et al. 2005, Stenzel et al. 2007, Colwell et al. 2008). Juvenile overwinter survival rates based on HY07 return rates were much better than in 2007 and near average for Oregon (Table 2). In 2008, 54 banded adult plovers did not return to Oregon, while 52 banded HY07 plovers did return in 2008. The returning HY07 plovers essentially replaced the lost adult plovers, which explains the lack of decline in the plover population. Had adult survival rates been higher, the plover population in 2008 would likely have been higher. The slight increase in the overall number of plovers present suggests that immigration into Oregon from other areas continues to influence the plover population. Colwell et al. (2008) concluded that the Humboldt Co. population is maintained by immigration, and that immigration is an important factor in sustaining some populations. Due to this, Colwell et al. (2008) concludes that the proposed 4(d) rule (U.S. Fish and Wildlife Servive 2006) may be detrimental to the overall west coast population of plovers because source populations are important to maintaining other

coastal populations through immigration. We concur with this conclusion, as the Oregon population is both somewhat maintained by immigration, but is also a source population for Humboldt Co. and Washington populations. Relaxing management activities in Oregon as a result of meeting the criteria of the 4(d) rule may result in population declines in northern California and Washington.

While the overall plover population did not change much from 2007 to 2008, there were some changes in the distribution of plovers. At Sutton Beach, after two years of attempted nesting, there was no plover activity in 2008 (Table 3). At Siltcoos in 2008 the total number of plovers using the area and the number of nesting plovers was slightly higher than in 2007, but has remained relatively stable for the past three years (49/16 in 2006, 36-37/26 in 2007, and 40-44/20 in 2008). While the number of nests increased at Siltcoos in 2008 (Table 4), ten of the nests were one-egg nests, so the actual number of nests with full clutches (n = 26) was similar to 2006 (n = 21) and 2007 (n = 24). Overlook had the largest negative change in the overall number of plovers and the number of breeding plovers using the area from 2007 to 2008. The number of plovers using the area declined by about 10 individuals, and only five plovers were confirmed breeding at Overlook. This number is certainly lower than the actual number of nesting plovers as the number of nests at Overlook was similar in 2007 and 2008. This suggests that many breeding adults were not identified before nests failed. Tahkenitch had a similar number of plovers using the area in 2008 (n = 16-19) as in 2007 (n = 18), however only two plovers were confirmed breeding in 2008 while nine were confirmed breeding in 2007. The decline in the number of breeding plovers may have been partially real as only five nests were found in 2008 compared to 10 in 2007 (Table 4). Tenmile had similar to slightly more numbers of plovers present in 2008 (n = 56-61) compared to 2007 (n = 52), but the number of adults identified as nesting declined from 38 to 17. The number of nests also declined at Tenmile from 41 in 2007 to 28 in 2008. Unfortunately Tenmile was not surveyed as frequently as we would have preferred, and we believe the decline in the number of nests and breeding plovers but not the overall number of adults at Tenmile suggests that some nests may have been missed and identification of some of the breeding adults was not confirmed. Approximately 30% of the total 2008 Oregon coastal population of plovers has been identified at Tenmile, indicating the importance of this site for plovers. Management of habitat at Tenmile as well as predator management is critical to the overall Oregon plover population, especially since this site is historically one of the most productive sites on the coast (Table 16). We continue to recommend that habitat at Tenmile, particularly on the north side, be expanded and improved. CBNS had the largest increase in plover numbers and nesting plovers. There was an increase of 16 plovers and 10 nesting plovers at CBNS in 2008 compared to 2007. This increase was reflected in the number of nests found at CBNS (n = 49), the highest number of nests at any site in any given year (Table 4). The increase in nests from 2007 to 2008 was not just an increase in nest failure, as a similar number of nests failed in 2007 (n = 20) compared to 2008 (n = 22). The total number of plovers and breeding plovers at Bandon and New River in 2008 (68/54) was very similar to 2007 (71/53), as was the number of nests found (Table 4). This represents about 36% of the plovers on the coast and a third or more of the breeding adults. Unfortunately productivity at these sites in 2008 (Table 18 and 19) was very poor and likely due to predation.

The 2008 breeding season had the second highest number of nests since monitoring began in 1990 (Table 4). Since the plover population was also at its highest level since monitoring began in 1990, we expect that the number of nests will continue to remain high. As was the case in 2007, there were high number of one egg nests and abandoned nests. In 2008 there were 22 one-egg nests and 19 abandoned nests, almost identical to 2007 (22 one egg nests and 18 abandoned nests, Lauten et al.

2007). These two years had 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, and in 2007 we speculated that the physical and physiological condition of plovers following a cold winter might have affected the plovers' ability to complete clutches and produce fertile eggs (Lauten et al. 2007). In 2007 we noted a number of early season nests were either infertile, had infertile eggs, or had clutches of less than three eggs. This pattern was not repeated in 2008. Furthermore, 10 of the 22 one-egg nests in 2008 (45%) were found at Siltcoos, while in 2007 the distribution of one egg nests was more widespread (Lauten et al. 2007). The distribution of abandoned nests however was widespread in both 2007 and 2008. While the condition of plovers may affect abandonment and fertility, disturbance likely also plays some role in the outcome of some of these nests. Eight of the one-egg nests and four abandoned nests occurred at North Siltcoos where the nesting area was fairly small and where recreational activity around the nesting area was fairly high. At Bandon Beach, the site with the second highest number of abandoned (n = 5) and one-egg nests (n = 2), four of these nests occurred between China Creek overwash south to near the old camp trail, the area of beach that has the highest recreational activity. In addition to relatively high recreational activity at these sites, monitoring staff and Wildlife Services were also present frequently in these areas. Colwell et al. (2008) ranks human disturbance as the second most important factor limiting plover populations in Humboldt Co. While we cannot be certain that human activities caused any of these failures, it is likely that repeated disturbance by humans, both recreational and permitted activities, may contribute to the failure of some of these nests.

Apparent nest success in 2008 was relatively poor except at CBNS (Table 6). Sutton Beach had no nests and Tahkenitch had 0% nest success, therefore two of eight nesting areas had no productivity at all. Overall nest success at Overlook (14%) and Bandon Beach (11%) was very low, substantially lower than in 2007 (44% and 33% respectively), and would likely have been lower, particularly at Bandon Beach, if exclosures were not used (Table 6). In 2007, only one exclosure was used at Bandon Beach, while in 2008 seven exclosures were used. All unexclosed nests at Bandon Beach failed while in 2007 31% of the unexclosed nests hatched. Siltcoos had a similar overall nest success in 2008 (33%) compared to 2007 (32%). Unexclosed nest success improved from 8% in 2007 to 22% in 2008, and was likely a result of predator management effectively reducing corvid activity at this site as the season progressed. At Tenmile in 2007, unexclosed nest success was 50% on the north side and 14% on the south side, but in 2008 unexclosed nest success was 17% on the north side and 50% on the south side. Most of the unexclosed nests that hatched at Tenmile were on the south side late in the season when corvid activity seemed to decline likely due to predator management. CBNS was the only site in 2008 where no exclosures were used and overall nest success was very good despite another episode of an unknown predator depredating a number of nests. From the evidence at the nest site, it is likely that the same unknown predator was depredating nests on the HRA's at CBNS in both 2007 and 2008 . At New River where in 2007 only seven exclosures were used, 23 exclosures were used in 2008. Only 17% of the unexclosed nests were successful at New River in 2008. Overall nest success would likely have been lower if exclosures were not used. Predation pressure by corvids was consistent throughout much of the season, and predator management in 2008 was not as effective as in 2007.

At Bandon Beach, the China Creek overwash area south to the old camp trail continues to be used by plovers for nesting, roosting and brooding. OPRD has now included this area within the emphasis area of the proposed Habitat Conservation Plan (HCP, Jones and Stokes, 2007). In addition, the camp trail was closed for most of the 2008 nesting season, and a new trail was built to reroute

recreationists to the parking lot. These new management decisions will hopefully result in less human recreational activity along the foredune from China Creek south, and will hopefully result in lessdisturbance to nesting plovers. The HRA at Bandon Beach however was not completely maintained or expanded for the 2008 nesting season and apparently will receive limited treatment in winter 2008/2009 (OPRD, pers. comm.). The south end of the HRA, approximately 16 acres, is now thick with beachgrass and unsuitable for plover use. We recommend that the entire 50 acre HRA at Bandon Beach be restored to usable habitat as required in the HCP, and in addition habitat maintenance completed on the New River spit to ensure high quality nesting habitat before the habitat degrades further and becomes more expensive to restore. These areas harbor a substantial number of plovers and nests on the Oregon coast, and it is critical that these areas are maintained and protected. In addition, these areas are relatively remote and recreational activity in these areas is low compared to other nesting locations. We believe it is very important to maintain these areas as well as encourage plovers to nest and occupy these sites. In 2008 most of the state land on the New River spit was not adequately signed. The HCP requires that OPRD sign and rope the emphasis areas, and we encourage OPRD to sign the entire New River spit at the beginning of the season as has been done in the past.

At New River, the number of nests found in 2008 on the BLM HRA was the highest ever (n = 20). The HRA has not had any maintenance for two years and will not be maintained in winter 2008/2009. Due to the lack of habitat restoration work on the HRA, many areas of the HRA have degraded substantially and large portions are unusable for nesting. Due to the thick grass, plovers tended to nest on the beach, along the foredune edge and on the open breach areas. The degradation of the habitat not only reduces the areas plovers can nest in, but also increases the available habitat for predators. The HRA is the most remote nesting location, and degradation of habitat could result in plovers moving to potentially less productive areas. Nest success on the BLM HRA was relatively good, but exclosures were used much more in 2008 (n = 15) than in 2007 (n = 3). Fledgling success on the HRA was only 25%, and the number of fledglings per male was only 0.58, well below recovery goals of 1.00 (Table 11). Several broods failed within a week of hatching, including two broods at the end of the season, which normally are more successful. Predator management for corvids was not as effective at New River and Bandon Beach as it was in 2007, as corvids were present throughout the entire season and were the main cause of nest failure at both these sites (Table 7). We recommend that habitat maintenance be restarted and maintained every winter, and predator management improve methods to reduce corvid activity at both New River and Bandon Beach.

For the second year in a row, the number of unexclosed days exceeded the number of exclosed days by a substantial amount. While this is very encouraging, the number of unexclosed days declined compared to 2007 while the number of exclosed days increased compared to 2007. The difference is mostly a reflection of the number of exclosures used at Bandon Beach and New River in 2008 compared to 2007. In 2007, only seven exclosures were used at these two sites, while in 2008 30 exclosures were used at these two sites. The increase in exclosure use at these two sites, in addition to the poor nest success of unexclosed nests at these sites (Table 6), reflects the predation pressure by corvids, which was relatively consistent all summer. While exclosure use does increase nest success, we continue to document adult plovers being depredated in and around nest exclosures. In Humboldt Co., due to adult depredations in and around exclosures, exclosure use has been discontinued (Colwell et al. 2008), and at other California breeding sites exclosures are used minimally or only in emergency situations (G. Page, pers. comm.).

We have recommended in past reports that exclosure use be minimized and possibly discontinued partly because the loss of adult plovers is more detrimental to the population than the loss of nests**.** At Siltcoos and Tenmile in 2008, late season unexclosed nests had relatively good nest success (Table 6) once corvid populations were reduced. We believe predator management is essential to reducing or eliminating the use of exclosures. We recommend that Wildlife Services increase its field staff by one so that there is a better distribution of staff in the field and that less time is spent driving between sites and more time is spent on the beach monitoring and managing corvid activity. We also recommend that exclosure use, particularly at certain sites such as Overlook, Tahkenitch and Tenmile, be discontinued due to the consistent depredations of adult plovers at these sites. There has also been documented evidence of Great Horned Owls and Northern Harriers at several of these sites, and we recommend that these owls and harriers be monitored and possibly removed. While we understand that elimination of exclosure use at some or all of the nesting areas is likely to result in greater nest failure, we believe with sufficient predator management, particularly of corvids, hatch rates of unexclosed nests can be at levels that will be productive.

While plover productivity at individual sites continues to be much higher than previous to predator management, for the first time since predator management was implemented most of the nesting sites had poor productivity indices (Tables 13-19). Only two sites, CBNS and Tenmile, reached recovery goals of 1.00 fledglings per male. Furthermore, only one site, CBNS, had a productivity index greater than 20%. Sites with less than 20% productivity index indicate that there was poor productivity for the effort. Many plover populations along the entire west coast reported poor productivity in 2008 (Colwell et al. 2008, G. Page, pers. comm., S. Pearson, pers. comm.), therefore the poor productivity in Oregon was not just a localized phenomenon. However, CBNS did exceptionally well (Table 17). CBNS has some characteristics that likely contribute significantly to its success: a relatively remote, isolated, and large nesting area, controllable populations of corvids, particularly ravens, a lack of nearby campgrounds or ranchlands that attract corvids, and high recreational monitoring and management. The characteristics that contribute to the success of plovers at CBNS should be used as a guideline to enhance and improve other nesting areas both in Oregon and elsewhere. Due to management restrictions, some nesting areas may not be able to repeat all the characteristics that make CBNS a very productive site. However, it is essential that some sites be greatly improved so that overall plover populations have source areas. CBNS was responsible for 40 of 71 fledglings in 2008, and without CBNS the Oregon coastal population would not have met recovery goals of 1.00 fledglings per male (Table 11). Colwell et al. (2008) note that the Humboldt Co. population is maintained by immigration, and it likely that the Washington population is also being sustained by immigration as productivity in Washington is not high enough to sustain the population. Much of the immigration into these populations is coming from Oregon. We believe it is essential to establish other nesting areas that can be as productive as CBNS, thus creating more source populations that would help buffer populations when there are years of poor productivity, and would contribute significantly to current populations that need to increase to reach recovery goals. While we recommend that all nesting areas be improved as much as possible, we specifically believe that Bandon Beach/New River, Tenmile, and Leadbetter Point in Washington could all have improved management that would result in these areas being potentially source populations. These areas are remote, have large areas of habitat or potential habitat, have limited recreational activity, and may have controllable populations of corvids. Improvement of these areas would likely result in better overall plover productivity in RU1.

While the 2008 plover nesting season could be considered generally poor, plover productivity was poor along most of the coastal range indicating that Oregon specific management was not the cause. Populations of wildlife are subject to variations in productivity and numbers. While 2008 could be considered poor, the overall number of fledglings per male was above recovery goals (Table 12) and the number of fledglings produced was still nearly twice the number produced in most years prior to 2003 (Table 9). 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.

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.

We 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 old camp trail, and that they often occur early and late in the day or at night. Bandon Beach continues to have some of the most serious violations, including repeated tampering with exclosures in China Creek overwash. Increased presence by law enforcement and OPRD staff as well as seasonal employees and volunteers at nesting beaches continues to be the most positive recreational management tool to reduce violations and educate the public.

We recommend that Forest Service improve monitoring and patrols at Siltcoos, particularly on the north side. North Siltcoos is the most heavily visited nesting area by recreationists, and there continues to be repeated violations including people walking through the nesting area, off leash dogs, people disembarking from the river, and some vandalism. The number of abandoned and one-egg nests in 2008 may be a reflection of the human activity at this site. North Siltcoos is relatively small, yet overall Siltcoos remains an important nesting area. Plovers have limited room to move around, especially when they have broods. We have repeatedly witnessed broods and nests on the open spit that are impacted by recreationists using the area. While the roped area does offer a protected area for the plovers, the area still is small and repeated disturbance to the plovers likely leads to failed nests and broods. Ideally the area could be completely closed when plover activity is high as it was in 2008, however we realize that this would not be a popular management decision. We believe more intensive recreational monitoring would benefit the plovers.

Habitat Restoration and Development Projects

The USFS bulldozed 15 acres of habitat south of Holman Vista, Sutton Beach in the winter of 2007-08. Three acres of 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, 8 acres on both the north and south side of the estuary were bulldozed in winter 2007-08. Some shell hash was spread at North Siltcoos.

At Overlook 15 acres of habitat was bulldozed in winter 2007-08. Some shell hash was spread at North Overlook.

At Tahkenitch, 10 acres of habitat was bulldozed in winter 2007-08.

At Tenmile, maintenance of 15 acres on the south side and 5 acres on the north side was completed in the winter of 2007-08. Further maintenance and improvement of the north spit should be considered for the future.

At CBNS in winter 2007-08, BLM disked the entire habitat restoration area and parts of the spoil (170 acres). I-beam signs were erected at the south and north end of South Beach that detail the seasonal vehicle closure. Some experimental pesticide treatment was completed and plans are to spray 24 acres in winter 2008-09. An additional 300 cubic yards of shell hash is planned for winter 2008-09.

At Bandon Beach, 11 acres on the HRA was maintained in the winter of 2007-08. 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 2007-08, and will not do any maintenance in winter 2008-09. The area is scheduled for habitat restoration in 2009. Habitat has degraded significantly in many areas. Breach areas and some overwash areas remain free of vegetation.

Recommendations

Signing of Restricted Areas

Signing and roping for the 2009-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.

Acknowledgments

We would like to thank Dylan Little, Michael Roberts, and Mike Burrell of Wildlife Services for their assistance in the field, companionship, and thoughtful insight about predators; Zach Seilo, Americorp Volunteer at ORNHIC, assisted with field work; Robin Sears and Trisha Wymore of OPRD for their hours educating the public and monitoring recreational activity on the beach; Marian Jansen, Corinne Henry, and Kelly Gallagher of OPRD for monitoring recreational activity near New Carissa; Morgan Bell, Rachael Wiese and Theresa Bolch of BLM at CBNS for their hours monitoring recreational activity and nest sitting near the jetty as well as their great companionship and humor in the field; Tim Leonard of BLM at Floras Lake/New River for his monitoring and education with recreationists and campers; Crystal Mullins of Forest Service for her many hours maintaining signs and ropes, monitoring recreational activity and interacting with the public; Randy Henry and staff of NRS, David Parrot, Phil Reed, and the staff of Titan Salvage for all their cooperation with the successful New Carissa removal; volunteers William and Linda Braun and Fran Larsen for OPRD spent numerous hours educating the public at China Creek parking lot, Bandon Beach State Natural Area; special thanks to volunteer Denny Porter and his two pals for ODFW/USFS at Siltcoos who spent their fourth summer educating and monitoring the public – Denny's presence continues to be invaluable due to his knowledge of the plovers, the area, and through the numerous people who now know him and his dogs; volunteer Betty Rabourn for USFS at Siltcoos; Ted Gage and Jake Jakubowski of BLM Law Enforcement, Ray McNeely, Larry Runk, and Ernie Mitchell of Coos County Sheriff's Department, Roger Geeting and Beaver Bowen of the USFS Dunes National Recreation Area, and Bill Harris and Bob Gale of Oregon State Police; Liz Kelly, Madeleine Vander Heyden, and Laura Todd of the US Fish and Wildlife Service; Mark Stern, Ken Popper, and Karen Gleason of The Nature Conservancy; Charlie

Bruce, Stuart Love, Bill Kinyoun, and Bryan Wright of the Oregon Department of Fish and Wildlife; Kip Wright, Steve Langenstein, Kerrie Palermo, Sharon Morse, Megan Harper, and Jim Heaney of the Coos Bay BLM District; Calum Stevenson, Jay Schleier, Ben Fisher, and Jeff Farm of the Oregon Parks and Recreation Department; Cindy Burns and Paul Thomas of the USFS Mapleton Ranger District; Dave Williams of Wildlife Services; Sean McAllister and Ron LeValley of Mad River Biologists in Humboldt Co., CA,; Mark Colwell and students at Humboldt State Univ., Arcata, CA,; Jim Watkins of US Fish and Wildlife Service, Humboldt Co.; Gary Page, Lynne Stenzel, and Doug George, of Point Reyes Bird Observatory; a very special thanks to Frances Bidstrup of Point Reyes Bird Observatory whose knowledge of banded plovers is unparalleled, whose cooperation is essential, and whose friendship is invaluable; everyone provided assistance, input and logistical support without which the program would not be a success.

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Table 1. Population estimates of the Western Snowy Plover on the Oregon Coast, 1990-2008. 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]
2008	98-105	129	187-199

[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 - 2008.

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
2008	71	52	42%	27	52%
2007	124	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 = 45.1%
SD = 11.7%
Average percent of returning HY birds that nest in first season = 66.7%
SD = 18.2%

Table 3. Number of Adult Snowy Plovers at each nesting area on the Oregon Coast, 2008. 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	0/0	23/9	9/2	9/2	31/7	26/14	30/20
# of unbanded females/# nested	0/0	2-5/2	2/0	1-2/0	2-6/1	4/4	5/5
# of banded males/# nested	0/0	15/9	7/3	5/0	23/9	20/16	28/26
# of unbanded males/# nested	0/0	1?/0	2/0	1-3/0	1?/0	3/3	5/3
Total	0/0	40-44/20	20/5	16-19/2	56-61/17	53/37	68/54

Table 4. Total number of nests for all sites on the Oregon Coast 1993 – 2008; 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. Final totals include years 1990 – 1993, which are not included in this table. See Lauten et al. 2007 for years 1990 – 1993.

Site Name	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	Tot nst	Totbrd[a]
Necanicum										1	0	0	0	0	0	0	1	1
Sutton Beach	2	1	2	6	14	8	3	7	15	3	1	0	0	4	3	0	69	1
North Siuslaw										1	0	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	30	93	0
South Spit	1	2	2	1	3	3	17	14	14	10	7	4	9	13	13	6	119	2
Overlook																		
North							2	8	12	5	7	11	11	9	13	14	92	2
South							0	0	3	3	1	3	5	1	3	1	20	0
Tahkenitch:																		
North Spit	0	0	0	0	0	0	0	4	7	8	13	8	11	4	10	5	70	1
South Spit	0	3	9	18	14	6	3	1	6	7	1	0	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	0	1	0
Tenmile:																		
North Spit		2	2	1	0	0	0	1	2	3	5	9	6	10	20	12	73	3
South Spit	8	5	4	3	2	11	5	5	6	9	12	8	11	12	21	16	149	4
CBNS:																		
South Beach	3	4	3	3	6	6	0	1	1	2	3	2	4	0	8	5	61	12
South Spoil	6	9	12	22	14	5	2	5	3	2	9	8	9	14	12	18	183	13
North Spoil	0	0	0														7	0
HRAs		4	3	2	3	7	12	22	13	15	11	16	16	18	19	26	187	17
Anad. Spoil																	0	1
Menasha, N.Bend																	1	0
Bandon	10	5	9	3	4	1	2	2	6	5	5	17	31	23	30	28	203	6
New River	0	6	20	18	25	26	28	17	23	14	16	24	23	27	35	35	351	11
Floras Lake/ New River Overwash	11	8	6	9	8	4	0	5	0	1	0	0	0	0	0	0	62	3
Total nests	**41**	**51**	**76**	**89**	**93**	**78**	**78**	**100**	**111**	**89**	**91**	**117**	**144**	**147**	**202**	**196**	**1811**	
Total broods[a]	**7**	**4**	**6**	**11**	**5**	**3**	**1**	**2**	**0**	**1**	**4**	**2**	**3**	**15**	**4**	**3**		**79**

[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, 1990-2008.

	% 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)
2008	30	45	38	(196)	(159)
mean	41.6 ± 14.3	67.0 ± 11.3	21.8 ± 17.2	(1811)	(1596)

[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, 2008.

		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	0	0	0	0	0	0	0	-	-	-
Siltcoos										
North	30	2	5		4	19		29%	17%	20%
South	6	2	0		2	2		100%	50%	67%
Combined	36	4	5		6	21		44%	22%	33%
Overlook										
North	14 [a]	1	2		1	9		33%	11%	15%
South	1	0	1		0	0		0%	-	0%
Combined	15	1	3		1	9		25%	11%	14%
N Tahkenitch	5	0	1		0	4		0%	0%	0%
Tenmile										
North	12 [b]	2	1		1	6		67%	17%	30%
South	16 [c]	1	1	2	5	5		50%	50%	50%
Combined	28	3	2	2	6	11		60%	35%	41%
CBNS										
South Beach	5	0	0		4	1		-	80%	80%
South Spoil	18	0	0		12	6		-	67%	67%
HRAs	26	0	0		11	15		-	42%	42%
Combined	49	0	0		27	22		-	55%	55%
Bandon	28	3	4		0	21		43%	0%	11%
New River										
HRA	20	11	4		2	3		73%	40%	65%
Other Lands	15	2	6		0	7		25%	0%	13%
Combined	35	13	10		2	10		57%	17%	43%
Totals	196	24	25	2	42	98		49%	30%	35%

[a] – 1 of 14 nests was exclosed, then exclosure was removed, and the nest failed. Did not include in calculations.
[b]- 2 of 12 nests were exclosed, then exclosures removed, and both nests failed. Did not include in calculations.
[c] – 2 of 16 nests were exclosed, then exclosures removed; one nest hatched and one nest failed. Did not include in calculations.

Table 7. Causes of Snowy Plover nest failure at survey sites along the Oregon coast, 2008.

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	Weasel							
Sutton	0	0											
Siltcoos:													
North	30	24	1	5				3	4	8	2		1
South	6	2								2			
Overlook													
North	14	12	2	2			1			1	1		5
South	1	1					1						
N Tahkenitch	5	5		1					1	1	1		1
Tenmile:													
North	12	9		7					1	1			
South	16	7		3					2	1			1
Coos Bay													
North Spit:										1			
South Beach	5	1											
South Spoil	18	6		4					1				1
HRAs	25	15		10					2	3			
Bandon	28	25	10	4				2	5	2	1		1
New River	35	20	6		1	1		2	3	2	2	1/1[a]	1
TOTALS	**196**	**127**	19	36	1	1	2	7	19	22	7	1/1[a]	11

[a] – one nest had partially developed embryos

Table 8. Cause of failure for Snowy Plover nests protected by predator exclosures and nests unprotected by predator exclosures along the Oregon coast, 2008.

Cause of Failure		Exclosed	Unexclosed	Totals
Egg Depredation	**Corvid**	0	19	19
	Unknown	1	35[a]	36
	Unknown Mammal	1	0	1
	Weasel	1	0	1
Other	**Adult Depredated**	2	0	2
	Wind/Weather	6	1	7
	Overwashed	3	4	7
	Infertile	2	0	2
	One Egg Nests	0	22	22
	Abandoned	7	12	19
	Unknown Cause	2	9[b]	11
Totals		25	102	127

[a] – includes three nests that had exclosures, then exclosures were removed, and then the nests were depredated.
[b] – includes one nest that had an exclosure, then the exclosure was removed, and then the nest failed to unknown cause.

Table 9. Total number of young fledged for all sites on the Oregon Coast 1990-2008 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	08	Tot
Necanicum											1	0	0	0	0	0	0	0	0	1
Sutton				0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	5
N Siuslaw													0	0	0	0	0	0	0	0
Siltcoos:																				
North					0	0	0	0	2	4	0	0	0	0	7	2	11	7	5	38
South				0	1	2	0	0	4	2	7	0	0	2	5	7	7	4	3	44
Overlook																				
North										3	5	1	2	3	3	5	8	12	2	44
South										0	0	1	0	0	3	2	0	1	0	7
Tahkenitch																				
North				0	0	0	0	0	0	0	2	4	1	3	6	8	5	2	0	31
South				0	1	12	8	7	1	1	3	4	5	2	0	0	0	0	0	44
Tenmile:																				
North					0	1	0	0	0	0	0	0	3	1	3	6	12	13	3	42
South	0	0	14	7	3	3	4	4	3	7	5	4	3	9	9	5	7	14	5	106
CBNS:																				
S Spoil	3	2	4	13	17	17	22	8	6	5	3	4	2	7	13	9	11	7	17	170
S Beach	0	11	9	2	6	2	2	7	2	0	0	1	1	3	0	8	1	10	7	72
HRAs					7	2	1	1	1	23	6	6	8	14	22	6	19	9	16	141
Bandon	0	1	1	3	5	1	1	0	1	1	0	1	0	4	16	11	12	13	2	73
New River	0	0	4	0	7	12	8	9	11	8	5	6	6	12	21	9	17	32	11	178
Floras Lake/ New River Overwash	0	2	2	11	9	6	1	4	0	0	3	0	0	0	0	0	0	0	0	38
Total	**3**	**16**	**34**	**36**	**56**	**58**	**47**	**41**	**32**	**54**	**43**	**32**	**31**	**60**	**108**	**78**	**110**	**124**	**71**	**1034**

Table 10. Overall Mayfield nest success, fledgling success and total number of fledglings on the Oregon Coast, 1990 – 2008.

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
2008	30	47	71
	Mean = 41.6 ± 14.3	Overall = 40.3 ± 11.0	Total = 1034

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. Fledgling success, brood success, and number of fledglings per male for Snowy Plovers on the Oregon Coast, 2008.

Site Name	Total # Broods*	% Brood Success*	Total # Eggs Hatched	Min. # Fledged: From Known Nests	Min. # Fledged: From Undiscovered Nests	% Fledgling Success**	# of Breeding Males[a]	# of Fledglings/ Male	# of Fledglings/Male – Combined[c]
Sutton	0	-	0	0	0	-	0	-	-
Siltcoos:									
North Siltcoos	6	67	13	5	0	38	5	1.00	0.89 (9)
South Siltcoos	4	50	9	3	0	33	4	0.75	
Overlook									
North Overlook	2	100	5	2	0	40	2	1.00	0.67 (3)
South Overlook	0	-	0	0	0	-	1	0.00	
North Tahkenitch	0	-	0	0	0	-	0	0.00	0.00 (0)
Tenmile:									
North Spit	3	67	5	3	0	60	2	1.50	1.00 (8)
South Spit	7	43	16	5	0	31	6	0.83	
Coos Bay N. Spit									
South Spoil	12	75	25	16	0	64	8	1.75[d]	
South Beach	5	80	11	7	0	64	5	1.40	2.00 (19)[d]
HRA	11	82	27	17	0	63	10	1.70	
Bandon	4	50	5	2	0	40	10	0.20	0.20 (10)
New River									
HRA	13	46	28	7	0	25	12	0.58	0.61 (18)
Other lands	3	100	6	3	1	50	7	0.57	
TOTALS**	**70**	**66**	**150**	**70**	**1**	**47**	**63**[b]	**1.13**	
TOTAL FLEDGED				**71**					

% 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] – calculations do not include one brood with two fledglings because female raised brood and male was unknown; for South Spoil 14 fled/8 males, and for all areas combined 38 fled/19 males

Table 12. Overall productivity of male Snowy Plovers along the Oregon coast, 1992-2008. 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
2008	1.030	67	0	4	1.029

Table 13. Productivity of Snowy Plovers at Siltcoos, Lane Co., Oregon coast, 1993-2008.
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
2008	68	22	32%	8	36%	12%	8	9	0.88
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	38.3+/-26.5	24	20.4+/-21.4	11.3+/-17.5	24	37	0.47+/-0.61
total after predator management (2004-2008)	270	103	40.4+/-10.2	53	52.4+/-12.1	21.8+/-10.4	53	36	1.57+/-0.68

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

Table 14. Productivity of Snowy Plovers at Overlook, Douglas Co., Oregon coast, 1999-2008

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
2008	34	5	18%	2	40%	6%	2	3	0.67
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	53.8+/-28.4	15	36.2+/-20.2	20.8+/-17.9	15	21	0.79+/-0.41
total after predator management (2004-2008)	189	72	39.4+/-16.4	34	45.8+/-7.0	18.2+/-8.8	34	27	1.26+/-0.50

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

Table 15. Productivity of Snowy Plovers at Tahkenitch, Douglas Co., Oregon coast, 1993-2008.
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
2008	14	0	0%	0	0%	0%	0	1	0.00
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	45.6+/-26.7	51	42.7+/-32.8	18.1+/-15.6	51	57	0.87+/-0.73
total after predator management (2004-2008)	96	43	44.4+/-31.0	20	35.4+/-21.5	20.4+/-14.9	20	17	1.00+/-0.77

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

Table 16. Productivity of Snowy Plovers at Tenmile, Coos Co., Oregon coast, 1992-2008.
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
2008	77	21	27%	8	38%	10%	8	8	1.00
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	58.6+/-22.7	64	52.7+/-26.3	29.5+/-18.6	64	55	1.25+/-0.61
total after predator management (2004-2008)	324	142	44.6+/-11.3	71	47.4+/-11.8	21.4+/-8.2	71	55	1.25+/-0.30

[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, 1992-2008.
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
2008	125	63	50%	40	63%	32%	38	19	2.00
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	60.4+/-20.3	154	51.1+/-11.8	32.4+/-18.1	149	94	1.55+/-0.52
total after predator management (2002-2008)	577	292	50.9+/-7.44	174	60.1+/-11.4	30.4+/-7.0	169	92	2.00+/-0.25

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

Table 18. Productivity of Snowy Plovers at Bandon Beach, Coos Co., Oregon coast, 1992-2008.
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
2008	68	5	7%	2	40%	3%	2	11	0.18
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	38.4+/-35.0	12	14.4+/-14.1	9.5+/-11.6	12	28	0.34+/-0.40
total after predator management (2002-2007)	350	124	33.4+/-23.1	51	34.9+/-17.3	13.4+/-9.9	49	53	0.83+/-0.62

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

Table 19. Productivity of Snowy Plovers at New River, Coos Co., Oregon coast, 1992-2008.
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
2008	92	34	40%	10	29%	11%	10	18	0.56
2007	96	47	49%	30	64%	31%	29	17	1.70
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	55.3+/-30.8	60	26.4+/-18.4	14+/-8.2	59	85	0.64+/-0.28
total after predator management (2002-2008)	473	230	49.9+/-6.4	104	43.7+/-14.3	21.6+/-8.2	103	88	1.16+/-0.47

[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, 1994-2008. 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. All areas have been maintained to varying degrees through 2008.

	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
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	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	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	R,F,N,B
98HRA							N	F?,N,B	R?,F?,N	NA	NA	R	F,B	F,B	F,N,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	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	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	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 along the Oregon coast, 2008.

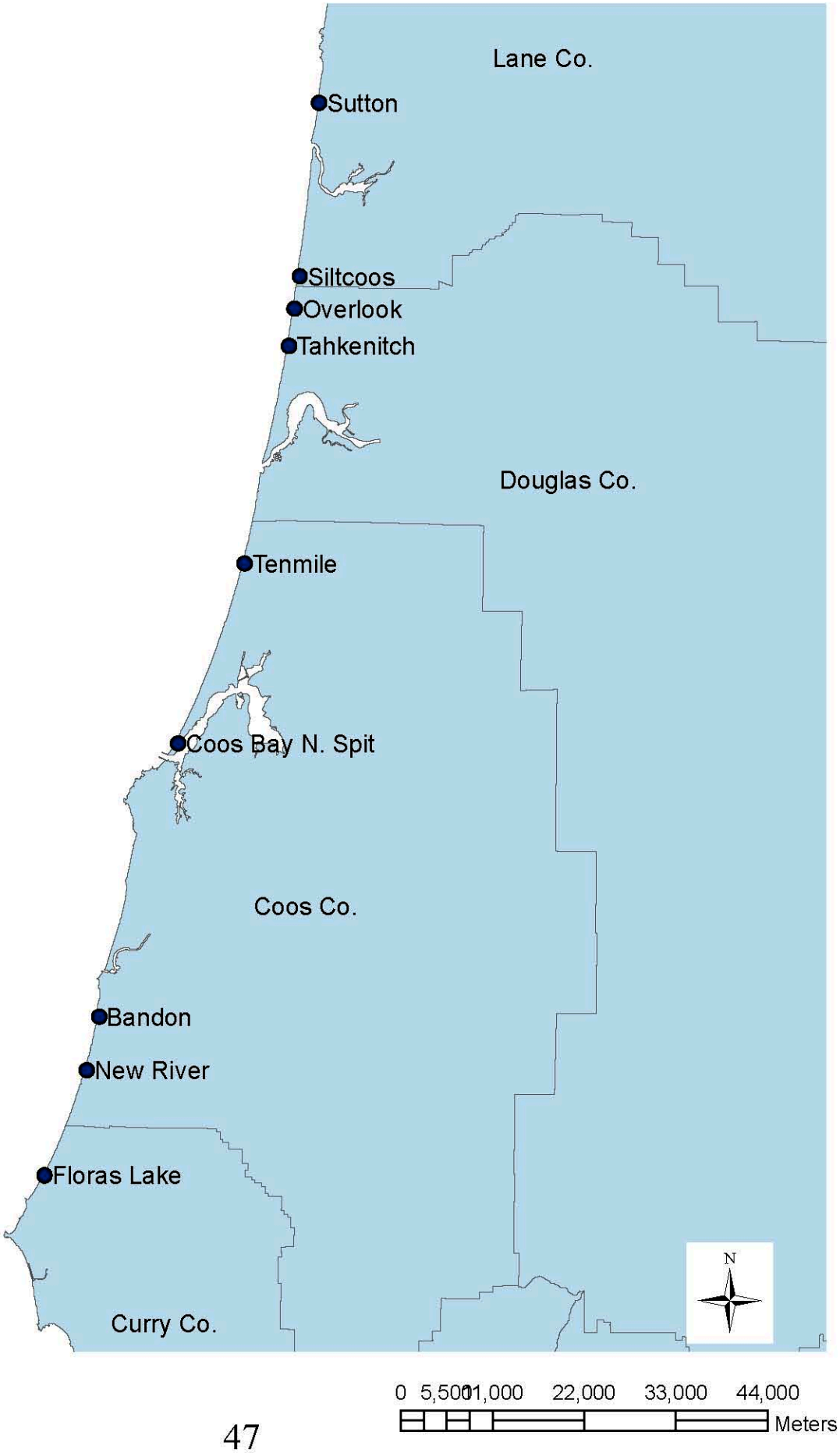

Figure 2: Snowy Plover nest locations at Siltcoos River, Oregon, 2008.

Legend

- 2008 Nests

0 62.5 125 250 375 500 Meters

Orthophoto circa 2005 - does not represent location of river bed during 2008 nesting season. No nests occured in the river bed during 2008.

Figure 3: Snowy Plover nest locations at Dunes Overlook, Oregon, 2008.

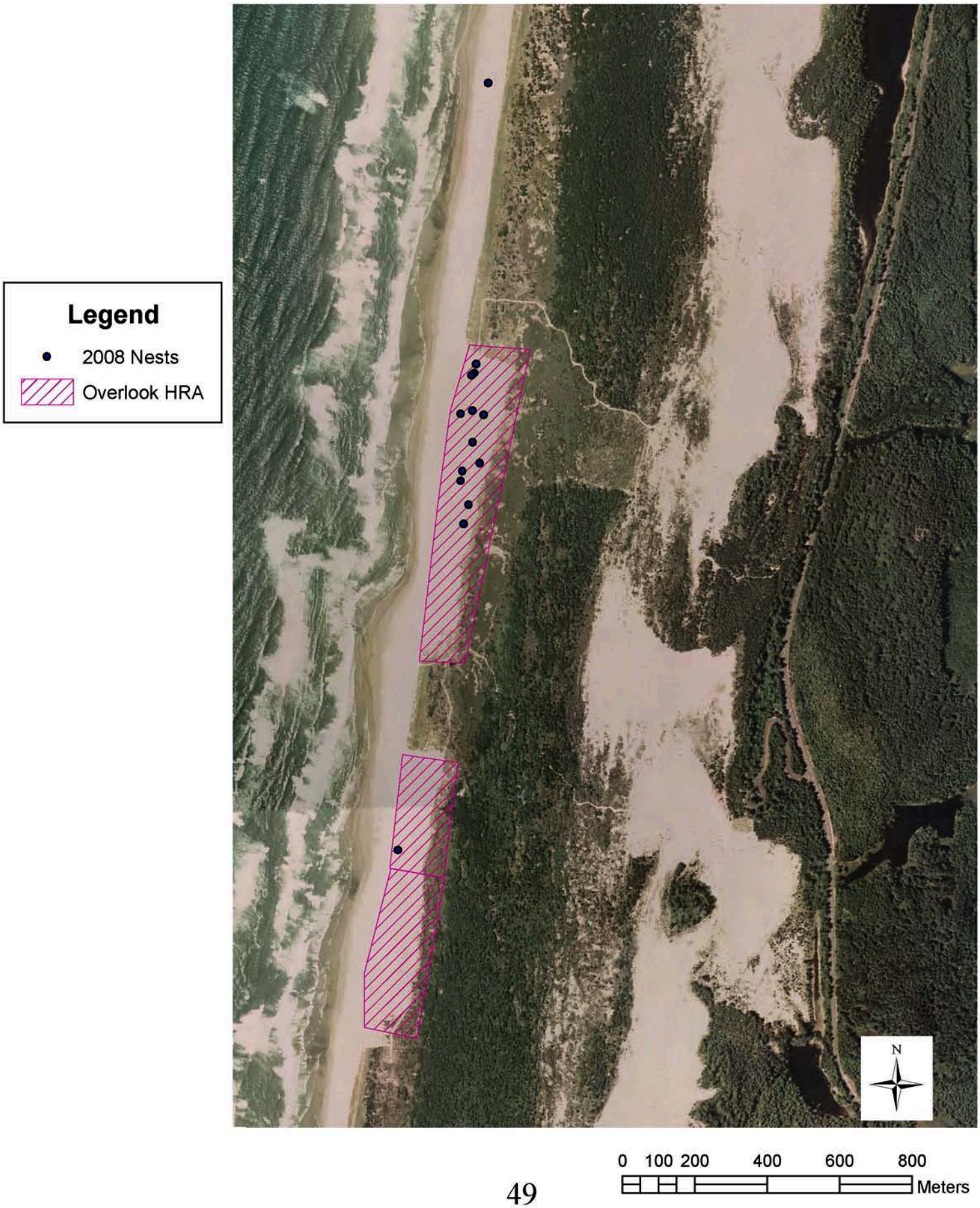

Figure 4: Snowy Plover nest locations at Tahkenitch Creek, Oregon, 2008.

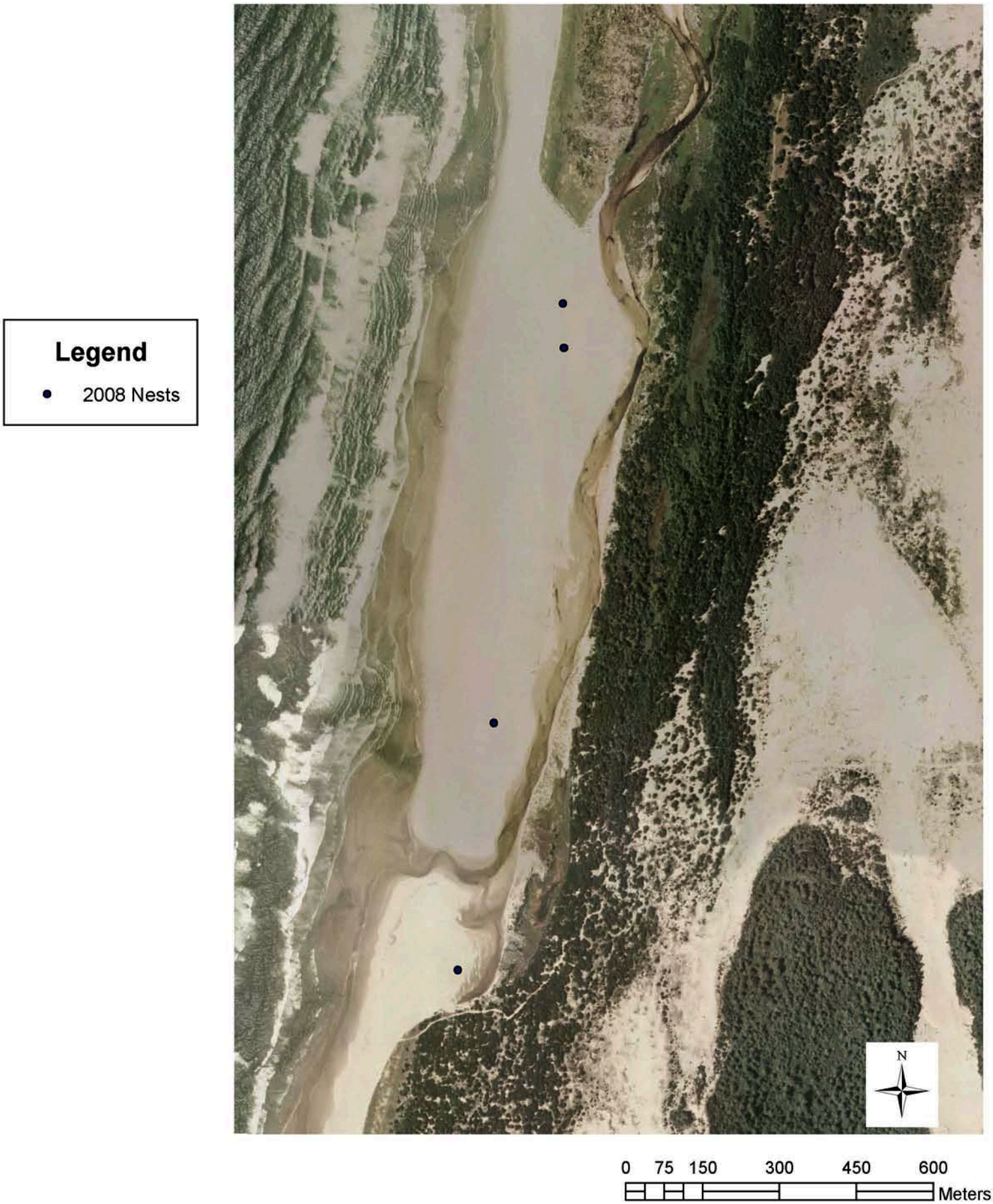

Figure 5: Snowy Plover nest locations at Tenmile Creek, Oregon, 2008.

Figure 6. Snowy Plover nest locations at Coos Bay North Spit, Oregon, 2008.

Figure 7: Snowy Plover nest locations at Bandon/New River, Oregon, 2008.

Figure 8 Snowy Plover nest locations at New River, Oregon, 2008.

Figure 10. Number of active Snowy Plover nests within 10-day intervals on the Oregon coast, 2008. Dashed lines represent +/- 2 standard deviations.

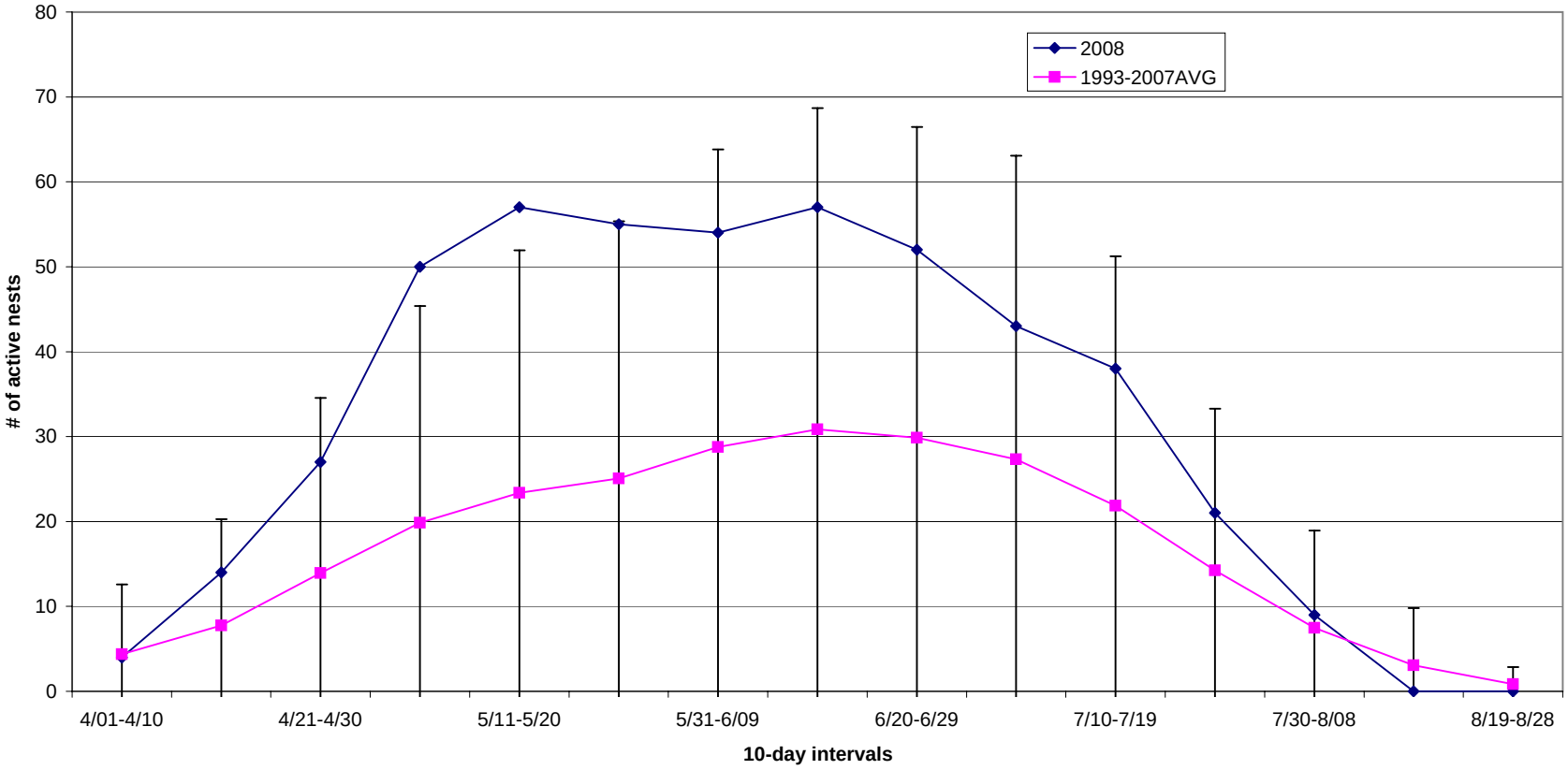

Figure 10. Total percent nest success for Snowy Plovers along the Oregon coast, 1990-2008. Above each bar is the total number of nests that hatched over the total number of nests.

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. - the beach north of Berry Creek south to the mouth of Sutton Creek.

Siltcoos: North Siltcoos, Lane Co. (Figure 2). - 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 3). - 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 4) - 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 5) - 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 6): 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 7): 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. (Figures 7 and 8) - 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 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 and Great Horned Owl use of the area and consider removal if harriers and owls 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. Identify if Great Horned Owls or other avian predators are hunting the area. Remove if necessary.
- 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. Monitor and remove Great Horned Owls if necessary.
- 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. Maintain 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.
- 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.