

The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast - 2005

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Abstract

From 2 April – 30 August 2005, 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 2005 were to: 1) estimate the size of the adult Snowy Plover population, 2) locate plover nests, 3) erect mini-exlosures (MEs) to protect nests from predators, 4) determine nest success, 5) determine fledgling success, 6) monitor brood movements, 7) collect general observational data about predators, and 8) evaluate the success of predator management.

We observed an estimated 153-158 adult Snowy Plovers; a minimum of 104 individuals was known to have nested. The adult plover population was the highest estimate recorded since monitoring began in 1990, and we found the highest number of nests since monitoring began in 1990 ($n = 146$). Overall Mayfield nest success was 45%. Exclosed nests ($n=83$) had a 70% success rate, and unexclosed nests ($n=63$) had a 27% success rate. Nest failures were attributed to abandonment (34%), corvid depredation (30%), unknown depredation (16%), wind/weather (8%), unknown cause (7%), mammal depredation (3%), and infertility (1%). We monitored 72 broods, including three from unknown nests, and documented a minimum of 77 fledglings, the second highest number of fledglings since monitoring began in 1990. Overall brood success was 69%, and fledgling success was 41%. Since implementation of predator management, hatch rates have not significantly changed (0.48 vs. 0.52; $df = 1$, F -value = 0.37, $P = 0.5448$); fledgling success has improved (0.37 vs. 0.46; $df = 1$, F -value = 3.93, $P = 0.0511$); and fledglings per male has significantly increased (0.89 vs. 1.29; $df=1$, F -value = 9.80, $P = 0.0025$).

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 16th year of monitoring the distribution, abundance, and productivity of Snowy Plovers found 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 direct predator control and by placing predator deterrent exclosures around nests as a means of reducing egg depredation, and management of human related disturbances to nesting plovers. The goal of management is increased annual productivity that will lead to increases in the overall breeding population in Oregon and eventually lead to 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). Our objectives for the Oregon coastal population in 2005 were to: 1) estimate the size of the adult Snowy Plover population, 2) locate plover nests, 3) erect mini-exclosures (MEs) to protect nests from predators, 4) determine nest success, 5) determine fledgling success, 6) monitor brood movements, 7) collect general observational data about predators, and 8) evaluate the success 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, dredge spoil sites, 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 mechanical breach) (Fig. 1). Due to field staff limitations and general lack of plover use, North Siuslaw and Floras Lake were not surveyed. A description of each site occurs in Appendix A.

Methods

In early April 2005, pre-breeding season surveys of historical nesting areas were completed and in late May 2005 breeding season window surveys were completed. State and federal agency personnel and volunteers surveyed sites between the Columbia River south to Euchre Creek. 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, Seal Rock – North Spit Alsea Bay, North and South Siuslaw jetty area, Whiskey Run to the Coquille River, and Euchre Creek.

Breeding season fieldwork was completed from 2 April to 30 August 2005. 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 2005.

All enclosed nests in 2005 were enclosed with mini-exlosures (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*), occurred at certain specific sites. For information regarding the predator management program, see Little 2004b. We continued to delay the placement of exclosures around nests until early to mid-May, when peak raptor migration had passed (Castelein *et al.* 2001, 2002, Lauten *et al.* 2003). We also attempted to leave nests unexclosed when predation pressure was determined to be relatively low. We compared the Mayfield nest success of mini-exlosures and unexclosed nests by Chi-square analysis.

Male Snowy Plovers typically rear their broods until fledging. In order to track the broods we banded the nesting adult male, sometimes the female, and each hatch-year bird with both a USFWS aluminum band and a combination of colored plastic bands. Trapping techniques are described in Lauten *et al.* 2005. We made one slight modification to our trapping technique compared to 2004. In some cases we used the noose carpet in conjunction with the oblong funnel trap. We placed the oblong funnel trap over the nest, and placed the noose carpet in front of the entrance hole of the funnel trap. The advantage of this technique was if the plover crossed the noose carpet without being captured and entered the funnel trap, we were able to capture the plover in the funnel trap. 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 2005 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 the same methods described in Castelein *et al.* 2001, 2002 and Lauten *et al.* 2003.

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 enclosed 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, in particular, the Mayfield calculations. One egg nests and nests found already failed 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 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.

To evaluate the overall productivity of the seven main nesting sites, data was pooled from each main site. Nesting sites with a north and south side include: Siltcoos, Overlook, Tahkenitch, and Tenmile. Nesting sites with multiple nesting areas are CBNS and New River. We did not use data from Sutton Beach or Floras Lake, which have had either very few or no nests over the past three to five years, and have had no predator management activities. We calculated for each site and each year: the number of eggs laid, the number of hatched eggs, the hatch rate (the number of eggs hatched divided by the number of eggs laid), the number of fledged chicks, the fledgling success rate (the number of chicks fledged divided by the number of eggs hatched), a productivity index (the number of fledged chicks divided by the number of eggs laid; this is an index of productivity compared to overall effort) and the number of fledglings per male. For fledglings per male, we only used nests with known males. Broods from undiscovered nests were not included in the analysis. We define predator management as lethal removal of predators from the nesting areas, as all sites have had non-lethal predator management since 1992 (i.e., exclosure use). There have been two years (2004 and 2005) of predator management at Siltcoos, Overlook, Tahkenitch and Tenmile, and four years (2002-2005) of predator management at CBNS, Bandon Beach, and New River. We used ANOVA and Duncan's Multiple Range Test to evaluate whether sites with predator management had the same productivity as sites without predator management. We also compared the hatch rates, fledgling rates, and productivity indices for each site to test whether these parameters changed from before predator management to after predator management. We present these data to give a preliminary assessment of the overall productivity by plovers at each site, and to assess whether predator management may be having any effects on plover productivity.

We evaluated the activity patterns of plovers on four habitat restoration/management areas (HRAs): the 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 and Distribution

Pre-breeding March surveys and the June window survey at sites between the Columbia River and Euchre Creek did not detect any plovers or plover activity outside of known nesting areas.

During the 2005 breeding season, we observed an estimated 153-158 adult Snowy Plovers at breeding sites along the Oregon coast (Table 1). Of 153-158 plovers, 141 were banded. We estimated there was a minimum of 10 unbanded adult plovers based on the numbers of unbanded plovers accounted for during 10-day intervals. Using the daily observation evaluation method of estimating unbanded plovers, a minimum of 12 unbanded plovers and a maximum of 17 unbanded plovers was present during the breeding season. For the breeding season, using the latter method of determining a minimum number of unbanded plovers (12), we observed 72 banded females, 68 banded males, 8 - 12 unbanded females, and 4 - 5 unbanded males.

In 2004 the estimated adult plover population was 136-142, of which 128 were banded. Of these 128 banded adult plovers, 49 (38%) were not recorded in 2005 and therefore are presumed not to have survived winter 2004-2005.

During the 2005 season, we captured and rebanded 31 banded adult plovers - 17 were males and 14 were female; we banded six unbanded adult plovers - four were males and two were females; and we banded 151 chicks during the 2005 season.

The mean number of plovers recorded at each site in 2005 ranged from zero at Sutton Beach to 14.50 at Bandon Beach (Table 2). Plover numbers at Sutton Beach have consistently declined over the past four years from 3.65 in 2002 to zero in 2005. At Siltcoos, plover numbers on the north side remained relatively stable between 2004 (5.45) and 2005 (4.90), while on the south spit plover numbers increased from the first time in four years and more than doubled from 2004 (1.95 in 2004, 4.67 in 2005). At Overlook, plover numbers on the north side remained relatively stable, 4.95 in 2004 compared to 4.24 in 2005, while the south side decreased from 2.67 in 2004 to 1.30 in 2005. At Tahkenitch, for the second consecutive season there was no habitat on the south side. On the north side plover numbers continue to decline: 6.47 in 2003, 4.74 in 2004 and 3.00 in 2005. Plover numbers at Tenmile increased on both spits. The north side increased from 3.46 in 2004 to 4.45 in 2005, and the south side nearly doubled from 4.83 in 2004 to 7.95 in 2005. At CBNS, South Beach survey numbers are the best indicator of plover abundance. Plover numbers remained relatively stable at South Beach: 10.82 in 2004 and 11.27 in 2005. On the nesting areas, the 94HRA declined in plover numbers between 2004 and 2005, but this was offset by improved habitat, and therefore more plover use of the 98EHRA, which has had only limited use and nesting in previous years. Bandon Beach had the largest increase in plover abundance, nearly doubling from 7.65 in 2004 to 14.50 in 2005. Plover numbers at New River remained stable: 11.58 in 2004 and 11.46 in 2005.

Nest Activity

We located 146 nests during the 2005-nesting season (Table 3), the highest number of nests found since monitoring began in 1990. There were three additional broods from nests that we did not locate prior to hatching.

For the second year in a row, there were no known nesting attempts at Sutton Beach.

At Siltcoos, eight nests were found on the north side, and 10 nests were found on the south side. One nest at South Siltcoos was found on the open beach just south of the Waxmyrtle Trail access point; all other nests were within the roped nesting areas of both spits (Figure 2).

At the Dunes Overlook the number of nests remained relatively stable compared to 2004. Eleven nests, the same number found in 2004, were found on the northern section, and five nests, two more than 2004, were found on the southern portion. All nests were on the habitat management areas (Figure 3).

At Tahkenitch, all nest attempts occurred on the north spit for the second year in a row. There was a slight increase in the number of nests in 2005 (11) compared to 2004 (8). All nests were within the roped nesting area (Figure 4).

At Tenmile (Figure 5), 17 nests were found for both spits in 2004 and 2005. On the north side six nests and one brood from an undiscovered nest were found in 2005. Two of the six nests were on the extensive, flat, open spit, south of the roped nesting area. Eleven nests were found on the south side, plus one brood from an undiscovered nest. All nests on the south side were within the roped habitat management area.

At CBNS (Figure 6), 29 nests were found in the 2005-nesting season and there was one brood from undiscovered nest. South Beach had four nests; three were adjacent to the lower portion of the 95HRA, and one was several hundred meters north of the jetty area. All four nests were east of the ropes near the foredune. South Spoil had nine nests, similar to the number of nests found in 2004 and 2003. On the 94HRA, 10 nests were found, a decrease from 15 nests in 2004. The decrease was likely due to improved conditions and plover use on the 98EHRA; five nests were found on the 98EHRA. While there was also improved habitat on the north end of the 95HRA (including the larger portion of the 98WHRA), only one nest was located on the 95HRA.

Bandon Beach (Figure 7) had the largest increase in nesting attempts, nearly doubling from 17 nests in 2004 to 31 nests in 2005. Plovers began nesting mainly on the HRA at the south end of the beach, with one early nest found in the China Creek overwash. After plover nests failed on the HRA due to corvid depredations, some plovers moved north along the beach and began nesting along the foredune; seven nests were found along the foredune between the China Creek overwash and north end of the

HRA. A second nest was found in the China Creek overwash later in the season; the pair of plovers associated with this nest was the same pair associated with the first nest in the China Creek overwash. Twenty-two nests were found on the HRA. Thirty-one nests was the highest number of nests found at any site in one year.

At New River (Figure 8), 23 nests were found this year, similar to 2004 (24). In 2004, six nests were found on or near the Storm Ranch HRA; in 2005, only one nest was found on the HRA. One nest was found on the open beach adjacent to private land, south of the county and state lands but north of BLM lands. Another nest was found in an overwash on private lands. Nine nests were found on Coos County land, the majority in one area west of the Lower Fourmile access area. Eleven nests were found on the open spit, all on state owned land. Eight of the nests were on the open spit south of the mouth of Twomile Creek/New River, and all within the signed restricted area. Three other nests were found late in the season in the area where the mouth of Twomile Creek/New River was located; water levels dropped closing the mouth of the river late winter/early spring 2005, and the river mouth remained plugged throughout the nesting season. Between Bandon Beach and New River, 42 nests were found on state land, 29% of the total number of nests found in 2005.

The latter part of the winter 2004-2005 and the early part of spring 2005 was very dry, sunny, and pleasant. Nest initiation by plovers in the 2005-nesting season was near average in the beginning of April, but by mid to late April the number of active nests was higher than the average and by 1 May was over 20 nests higher than the average (Figure 9). The first nest was initiated 20 March compared to 5 April in 2004. In mid-May weather conditions were very wet. A number of nests failed in early May, and new nest initiation was stalled due to the poor weather conditions; this is reflected by the dip in the number of nests during the 11 May to 30 May time periods (Figure 9). The number of active nests then increased in early June and was nearly 20 nests higher than the average until early July. The maximum number of active nests during 10-day intervals was 50 during 20 June – 29 June time period. This is the highest number of active nests recorded during any time interval since monitoring began in 1990. The last nest initiation occurred on 14 July.

Approximately 67% of the adults (104/153-158) were known to have made a nesting attempt during the 2005-breeding season, lower than the mean for 1993-2004 (79%). Of the nesting adults in 2005, 44 were female (37 banded, 7 unbanded), and 60 were male (58 banded, 2 unbanded).

Nest Success

The overall Mayfield nest success in 2005 was 45%, about equal to the mean (Table 4). Adjusted Mayfield nest success for all enclosed nests in 2005 was 70%, also about equal to the mean and less than the previous two years (both 86% for MEs). Since 2003, there has been an increase in the number of days that nests remained unenclosed. In 2005, the sample of unprotected days nearly doubled from 2003, and was the highest number of unprotected days for any given season. The adjusted Mayfield nest success

rate for unexclosed nests in 2005 was 27%, nearly 10 percentage points higher than the mean. In the past three years, unexclosed nests had a 20% or higher nest success rate, all higher than the mean and all higher than 2000-2002 when the unexclosed nest success rates were very poor. Adjusted Mayfield nest success of unexclosed nests was significantly lower than the adjusted Mayfield nest success of exclosed nests ($\chi^2 = 34.672$, $df = 1$, $P < 0.01$).

In 2005, the overall annual apparent nest success rate was 47%, slightly lower than the 16-year mean of 50% (Table 5 and Figure 10) and lower than 2004 (62%). Apparent nest success for exclosed nests in 2005 was 72%, lower than 2004 (85%). Apparent nest success for unexclosed nests in 2005 was 14%, higher than 2004 (9%). In 2005, few sites had overall nest success rates that deviated much from the average for that site (compare Table 5 to Figure 10). At Siltcoos, overall nest success for the north spit was average and for the south spit nest success was above average. At Overlook, overall nest success was above average for the north side and below average for the south side, however the sample size for South Overlook is very small. At North Tahkenitch, overall nest success was just below average. At Tenmile, overall nest success was average for the north side and below average for the south side. At CBNS, all nests on South Beach were successful and nest success on South Spoil was average, but nest success for the HRAs was below average. The HRAs at CBNS were the only sites with nest success rates below 40%; this was partly due to high failure rates on the 98EHRA where plovers have had only a few previous nest attempts. At Bandon Beach and New River nest success rates were very near the average.

Nest Exclosures

In the 2005 breeding season, of the 146 nests, 83 were exclosed with mini-exclosures (57%). No nests with MEs were depredated. However there were a few MEs that had evidence that some predator had tried to dig under the fencing but none were successful. We suspect that Common Ravens (*Corvus corax*) were responsible for some of these events. In 2004 there was some evidence that ravens may have depredated chicks as they exited exclosures after hatching. We did not note any evidence of chick mortality by ravens near exclosures in 2005. There were a fairly high number of abandoned nests in 2005, but there is little evidence that nests were being abandoned because of ME use.

In 2005, we continued the policy of delaying erection of nest exclosures until approximately mid-May (Lauten *et al.* 2004). On the north sites (Siltcoos to Tenmile), nests were left unexclosed until the second week of May when all nests were then exclosed regardless of predation pressure. On the south sites (CBNS, Bandon Beach and New River), predation pressure was fairly low through mid-May partially due to predator management activities. Evidence of corvid activity appeared minimal and some nests were hatching without exclosures. Nests were left unexclosed through mid-May, and we had hoped to continue to leave nests unexclosed. At that time corvid activity suddenly increased and the unexclosed nests began to experience higher rates of failure due to depredation. We then exclosed nearly all nests found after mid-May.

In previous years we have documented adult depredations in or around exclosures (Castelein *et al.* 2000b, 2001, and 2002, Lauten *et al.* 2003 and 2005). In 2005, we found the remains of one banded male plover within one meter of an exclosed nest on the 94HRA at CBNS. It was unclear what depredated the plover, whether the plover was entering or exiting the exclosure, or whether the plover was captured inside the exclosure. We suspect that it was a mammalian predator, but there were no prints or any evidence to confirm this. We did not document any other adult plover mortalities near any exclosures.

Adult Mortalities

A minimum of seven adult plovers disappeared during the breeding season. Of these seven, six were male and one was a female. The female was last noted at North Overlook on 16 May; no known nest was associated with her but there were several active nests at the time that had no identified female associated with them. This period of time had poor weather conditions and a fairly strong spring storm occurred on 18 May that caused a number of nests to fail or be abandoned. Of the six males, four disappeared in June and two in early July. One male disappeared at CBNS around 8 June; no known nest was associated with this male. Two other males disappeared at CBNS in late June (dates last seen were 24 June and 28 June). The remains of one of these males were found near an exclosure. The nest hatched successfully and the female raised the chicks. The other male was not known to be associated with any nest at the time. A male with a brood at South Tenmile was last noted on 28 June; the brood failed and the male was never seen again. One male at New River disappeared around 5 July; this male may have been associated with an exclosed nest; that nest was abandoned by 16 July (the female remained accounted for). One other male disappeared from Overlook after 7 July. Prior to disappearing, he was associated with a brood that failed. He may have been associated with another nest that eventually was abandoned in mid-July.

Nest Failure

Exclosed nests in 2005 had an overall failure rate of 27% (22 of 83), higher than in 2004 (15%) but comparable to the two previous seasons (23% in 2003 and 34% in 2002). Unexclosed nests continue to experience high rates of nest failure, although in 2005 there was a slight overall improvement: 51 of 61 nests failed compared to 33 of 36 in 2004, 32 of 35 in 2003, 31 of 33 in 2002, 54 of 54 in 2001, and 21 of 21 in 2000. Overall nest failures were attributed to abandonment (34%), corvid depredation (30%), unknown depredation (16%), wind/weather (8%), unknown cause (7%), mammal depredation (3%, one red fox and one unknown mammal), and infertility (1%; Table 6). No exclosed nests failed due to depredation (Table 7). The main cause of nest failure of exclosed nests was abandonment (n=15, 68%) and wind/weather (n=6, 27%). The main cause of failure for unexclosed nests was depredation of eggs (total n=36, 71%; corvids n=22, 61%; unknown predators n=12, 24%; mammals n=2, 4%). Ten unexclosed nests were abandoned (including five one egg nests; 20%) and five nests failed to unknown causes (10%). Corvids continue to be the main cause of nest failures of unexclosed nests.

The number of abandoned nests in 2005 was the highest number of abandoned nests for any season. Of 25 abandoned nests, 10 were not exclosed. Five of these were one egg nests, an average number of one egg nests for any season. Two other unexclosed nests were found with two eggs; one was found already abandoned and one was never clearly active after being found. Two of the 15 exclosed nests that were abandoned were never clearly active despite being exclosed. A total of nine of the abandoned nests were therefore never clearly active. Of the remaining 16, three were unexclosed and 13 were exclosed. All these nests were active for some period of time before being abandoned. None had clear evidence of an adult being depredated in or near the exclosure. It is possible that some adults associated with these nests may have been depredated during the incubation period, but not all the adults were identified and therefore it was not possible to determine if adults were disappearing. Of the abandoned nests, one was abandoned in April (unexclosed), three in May (all unexclosed), five in June (all exclosed), and 11 in July (10 exclosed, 1 unexclosed). Abandoned nests occurred at all sites: N Siltcoos - 3, S Siltcoos - 2, N Overlook - 4, S Overlook - 2, N Tahkenitch - 2, N Tenmile - 1, S Tenmile - 2, CBNS - 3, Bandon Beach - 2, and New River - 4.

Fledgling Success

We monitored 72 broods in 2005 including three broods from undiscovered nests, similar to 2004 when 73 broods were monitored. These are the highest number of broods monitored in any year. A total of 77 fledglings were confirmed, the second highest number of fledglings since monitoring began in 1990 (Table 8). Overall fledgling success was 41%, slightly higher than the average (39%) but lower than the previous two years (2004 - 55%, 2003 - 47%, Table 9). The overall number of fledglings per brood was 1.07 (77/72) compared to 1.46 in 2004, and the overall number of fledglings per male was 1.28 (77/60, Table 10) compared to 1.73 in 2004.

The overall brood success rate was 69% (Table 10) compared to 88% in 2004 and 70% in 2003. At Siltcoos, overall brood success was 75%, however only one of three broods were successful on the north side. At Overlook, overall brood success was 71%. All broods at Tahkenitch were successful. Overall brood success at Tenmile was 60%. At CBNS, overall brood success was 75%. At Bandon Beach, overall brood success was 69%, and at New River, overall brood success was 54%.

Individual site fledgling success rates varied considerably from a high of 70% at South Beach CBNS to a low of 25% at New River (Table 10). North Siltcoos, North Overlook, South Tenmile, Bandon Beach, and New River all had fledgling success rates of 33% or less. South Siltcoos, South Overlook, North Tahkenitch, and CBNS all had fledgling success rates of near 50% or better. At Siltcoos, fledgling success on the north spit was lower than the average for that site while on the south spit fledgling success was higher than the average for that site (compare Table 10 to Figure 11). At Overlook, the north side had a fledgling success rate lower than the average for that site and the south side had a fledgling success rate higher than the average for that site. At North Tahkenitch, the fledgling success rate was higher than the average for that site. North

Tenmile had a fledgling success rate higher than the average for that site while South Tenmile was below the average for that site. At CBNS, where average fledgling success rates are very good, all nesting areas again were productive, however the HRAs fledgling success rate was lower than the average for those sites. At Bandon Beach and New River, fledgling success was average, which in both cases is not very good.

The overall number of fledglings per male was 1.28 in 2005 compared to 1.73 in 2004 and 1.30 in 2003 (Table 10). At Siltcoos, the overall fledglings per male was 1.29 in 2005 compared to 2.40 in 2004 and 0.50 in 2003. North Siltcoos had the lowest fledglings per male of all sites in 2005: 0.66. At Overlook, the overall fledglings per male was 1.20 in 2005 compared to 1.00 in 2004 and 0.75 in 2003. Tahkenitch had the highest fledglings per male ratio: 2.00 in 2005 compared to 1.20 in 2004 and 0.45 in 2003. Overall fledglings per male at Tenmile was 1.22 in 2005 compared to 1.33 in 2004 and 1.25 in 2003. In 2004, North Tenmile was the only site below 1.00 fledglings per male; in 2005 there were 1.50 fledglings per male. South Tenmile declined again in 2005 (1.00) compared to 1.80 in 2004 and 2.25 in 2003. CBNS is the only site where fledglings per male is consistently higher than 1.00. In 2005, CBNS had 1.77 fledglings per male, lower than the previous two years (2004 – 2.16 and 2003 – 2.40). Both Bandon Beach and New River in 2005 had lower fledglings per male compared to 2004 and both were below 1.00. At Bandon Beach, fledglings per male in 2005 was 0.92 compared to 1.50 in 2004 and at New River fledglings per male was 0.90 compared to 1.75 in 2004. Since many of the males at these two sites are the same males, we pooled the data for a combined fledglings per male of 0.91.

Siltcoos had a total of nine fledglings in 2005, the second highest number of fledglings produced from this site. The north side however only produced two fledglings (Table 8). Six fledglings from Overlook was the same number of fledglings as produced in 2004. Tahkenitch produced two more fledglings compared to 2004. At Tenmile, the overall number of fledglings in 2005 was similar to 2004 (11 compared 12), however the north side in 2005 produced twice the number of fledglings compared to 2004 (six compared to three), and 2005 was the highest number of fledglings produced at this site in any year. The south side however declined from nine fledglings in 2004 to five in 2005. The total of 23 fledglings at CBNS was 12 less than in 2004. Bandon Beach produced 11 fledglings in 2005 compared to 16 in 2004, and at New River only nine fledglings were produced in 2005 compared to 21 in 2004.

Productivity

Tables 11 - 17 show the productivity of each of the seven main plover nesting areas on the Oregon coast. Each table shows the productivity for each site by year, then the average productivity for all years prior to predator management activities at that site and the average productivity after predator management was implemented. We eliminated the years 1990 and 1991 from the analysis because of limited data and limited use of exclosures. Data for each site reflects how many years plovers have been known to nest at that site; some sites have had nesting plovers since 1992 while other sites have fewer years of data. The number of years of predator management at each site has also

varied: Siltcoos, Overlook, Tahkenitch, and Tenmile have had two years of predator management activity, while CBNS, Bandon Beach, and New River have had four years of predator management. Table 18 shows the mean fledglings per male for all sites combined for each year.

At Siltcoos, (Table 11) the average hatch rate from 1993 – 2003 was 34%, the average fledgling rate was 30%, the average productivity index was 10%, and plovers produced 0.65 fledglings per male. From 2004-2005 when predator management was implemented, the hatch rate increased to 47%, the fledgling rate was 60%, the productivity index was 28%, and plovers produced 1.75 fledglings per male.

Overlook has the most limited data because it was created before the 1999 nesting season (Table 12). The average hatch rate, fledgling rate, and productivity index was relatively the same before and after predator management. The average number of fledglings per male did increase from 0.71 before predator management to 1.09 after predator management.

At Tahkenitch (Table 13), the average hatch rate, fledgling rate and productivity index after predator management all increased by about 10% above the averages prior to predator management. The average number of fledglings per male increased from 0.89 prior to predator management to 1.56 after predator management.

Tenmile, particularly the south side, has consistently been one of the most productive sites on the coast (see Figure 10 and 11 and Castelein *et al.* 1997, 1998, 2000a, 2000b, 2001, and 2002, and Lauten *et al.* 2003, 2005). The average hatch rate, fledgling rate, productivity index, and fledglings per male have remained about the same from prior to predator management to after predator management (Table 14).

CBNS has been the most productive site on the coast, producing nearly 40% of the total number of fledglings for the Oregon coast (Table 8). CBNS is the only site that has produced at least 1.00 fledglings per male in every year monitoring has occurred (Table 15). The average hatch rate and productivity index have remained stable from prior to predator management to after predator management. While the fledgling success rate and average number of fledglings per male is very high for this site, there were slight increases in both indices since predator management was implemented.

At Bandon Beach (Table 16), productivity prior to predator management was poor. The average hatch rate before predator management was 41% and improved slightly to 49% after predator management. The average fledgling rate and productivity index have improved since predator management was implemented, and the average number of fledglings per male more than doubled and was near 1.00.

At New River (Table 17), the average hatch rate has remained about the same after predator management was implemented. The average fledgling success rate improved considerably and the productivity index also improved. Prior to predator

management, plovers produced about 0.69 fledglings per male, and that increased to 1.17 fledglings per male after predator management was implemented.

The mean hatch rate for all sites prior to predator management was 0.52 and after predator management was 0.48. Hatch rates between nesting sites were not significantly different ($df = 6$, F -value = 1.35, $P = 0.2465$) and there was no change in hatch rates from before predator management and after predator management ($df = 1$, F -value = 0.37, $P = 0.5448$).

There were significant differences in the overall fledgling success between sites ($df = 6$, F -value = 5.83, $P < 0.0001$). CBNS, Tenmile, Tahkenitch, and Overlook had higher mean fledgling success rates than New River, Siltcoos, and Bandon Beach. Overall mean fledgling success increased from 0.37 prior to predator management to 0.46 after predator management, however the model was not significant ($df = 1$, F -value = 3.93, $P = 0.0511$).

The productivity index is the number of fledglings produced compared to the total number of eggs laid, which is a measure of the overall effort of the plovers at each individual site. The model found that there were significant differences in the productivity index between sites ($df=6$, F -value = 3.50, $P = 0.0043$). CBNS and Tenmile, the two most productive sites on the coast, had higher productivity indices compared to the other sites. The overall mean productivity index prior to predator management was 0.20 and after predator management was 0.23. There was no significant difference in the productivity indices before and after predator management was implemented ($df=1$, F -value = 0.82, $P = 0.3677$).

Productivity as measured as fledglings per male was significantly different between sites ($df=6$, F -value = 6.90, $P<0.0001$). CBNS and Tenmile had significantly higher means than Tahkenitch, Overlook, New River, Siltcoos, and Bandon Beach. Productivity was also significantly different from prior to predator management to after implementation of predator management ($df=1$, F -value = 9.80, $P = 0.0025$). The overall mean productivity was 0.89 fledglings per male prior to predator management and 1.29 fledglings per male after predator management.

Brood Movements

Broods movements tend to be unpredictable and variable, and while we may determine a brood is still active by the behavior of the male, the actual location of the brood and the habitat they are using is much more difficult to determine, especially without a focused effort on this aspect of plover ecology.

At Siltcoos, the broods on both spits tended to remain on the spit area, and the roped nesting areas act as a safe refuge from recreational activity on the beach. One brood from the south spit moved south of the spit area and used the beach between South Siltcoos and North Overlook. While some males from either the north or south side were noted on the opposite side of the mouth of the river during the brooding period, there was

no evidence this year that any broods actually crossed the river. Broods from Overlook may also be moving along the open beach to the north and south of the nesting area. Some broods were noted during the brooding period adjacent to or on the HRA, but other broods would disappear and then reappear sometimes more than two weeks after being last recorded. There were limitations to how much of the open beach can be surveyed, partially due to staff levels, so it is likely that broods that moved along the open beach were not detected. At North Tahkenitch, broods were noted active on the large nesting area, but there may have also been movement along the beach to the north as some broods would disappear and then reappear at a later date. In some cases, fledglings were confirmed at a different site than the one they hatched at, again suggesting that broods can and will move fairly considerable distances during the month long brood period. At North Tenmile, the broods tended to stay around the open spit, which was very large in 2005. At South Tenmile, broods were noted using the nesting area and the adjacent beach, and, as in 2004, some brood movement occurred south along the beach and used the area from the motor vehicle closure sign north to the south end of the HRA. There was no evidence that any broods crossed the creek.

At CBNS, most broods hatched on the HRA or spoil remained on these areas for most of the brood rearing period. Some broods, especially late in the brood rearing period, moved to the beach. All broods hatched on the beach remained on the beach. On the beach, broods tended to stay on the south end of the beach, with the majority of use adjacent (west) of the 95HRA, but notably south of the 95HRA where there was a wide section of beach this year. Broods were noted as far south as the jetty area, and at least three broods were noted using the jetty area and the adjacent (east) fill area where vehicles are permitted to drive and park. On one occasion we found at least two active broods on the fill area, and we remained in the area until the broods were safely back on the beach. Only one brood hatched on the 98EHRA, and the brood failed fairly quickly, so use of the area by broods was limited. Once fledged, all chicks moved to the beach.

At Bandon Beach, broods that hatched on the beach from China Creek overwash south along foredune tended to stay along the beach, mostly using the area along the foredune. Some broods that hatched on the HRA moved north along the foredune of the beach. Other broods stayed within or adjacent to the HRA, and at least two broods moved south of the HRA and onto the New River spit. At New River, broods that hatched on the open spit and on county land tended to remain on the open spit or in the overwash areas on county land. Some brood movement occurred to the south of the county land, generally staying along the foredune and into the overwash areas. One brood that hatched on the open beach adjacent to private land stayed in the general area of the nest. This same male also hatched the nest from the Storm Ranch HRA; that brood moved north off the HRA and spent most of the brood rearing period along the foredune and in the overwashes of the open beach adjacent to private land. There appeared to be limited use of the riverside this year, most likely due to high water levels caused by the water that pooled in the river once the breach and the mouth of the river were both plugged.

Activity Patterns on HRAs

Table 19 shows the activity patterns of plovers on four habitat restoration areas: the 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.

2004 Hatch-Year Returns

Due to analysis of hatch year returns, we adjusted the 2004 fledgling total to 108. Forty-three of the 108 hatch-year 2004 plovers returned to Oregon in 2005. The return rate was 40%, below the average return rate of 47% (Table 20). Of the returning 2004 hatch-year birds, 24 (56%) were females and 19 (44%) were males (Table 21). Thirty-three of the hatch year 2004 returning plovers attempted to nest (77%), and they accounted for 30% of the banded adults.

Sightings of Snowy Plovers Banded Elsewhere

Seventeen plovers banded in California were observed in Oregon in 2005. Eleven were females and six were males. Twelve of the plovers, nine females and four males, attempted to nest in Oregon. Three females and one male originally hatched in Oregon and were subsequently rebanded at coastal nest sites in California; two of the females and the male nested in Oregon.

Seven females were originally banded in Humboldt Co., CA, and one other female was originally banded at Salinas SP, Monterey Co., CA. This latter female was first noted in Oregon in 2004 where she was rebanded; she nested in Oregon again in 2005. Two of the females banded in Humboldt Co. were only noted briefly in Oregon and did not attempt to nest. Four males were originally banded in Humboldt Co.; two nested in Oregon and two were noted only briefly in Oregon. One other male was a HY04 plover from Salinas SP, Monterey Co., CA; he nested at New River.

Discussion

For the first time since monitoring began in 1990, the estimated number of plovers present in 2005 was higher than 150 (Table 1). However, despite the highest number of fledglings produced in 2004 (n=108, Table 8), the number of adult plovers present was only about 15 more plovers than in 2004. The hatch year return rate in 2005 was 40% (n=33), the lowest return rate since 1998 and seven percentage points lower than the average (Table 20). Of the banded adult plovers present in 2004, 49 did not return in 2005 and are presumed dead. Overwinter survival of adult plovers was approximately 62%. Colwell et al. (2005) also reported lower numbers of returning adult plovers in 2005, and our estimate of adult survival was near the lowest estimates reported by Colwell et al. (2004). The number of returning hatch year plovers did not replace the number of lost adult plovers, yet the population still increased slightly. This indicates that the increase in population size was partly a result of immigration of plovers into the

area from other breeding locations. Colwell *et al.* (2005) also indicates that the population in Humboldt Co., CA is partially maintained by immigration of plovers into the local breeding population. During winter 2004-2005, Oregon had very mild weather, but California had very wet weather. We believe that plovers wintering in Oregon may have fared well, but plovers that wintered in California, especially southern California, may have had poor survival rates which may have been related to poor climate conditions.

Late winter and early spring 2005 was very dry and warm, resulting in early nest initiations and high numbers of nests by early May (Fig. 9). Depredations of these nests were relatively low and nests were surviving well without being exclosed, and a few nests hatched without the use of exclosures. However, by the second week of May depredations of unexclosed nests increased, and all nests were exclosed after mid-May. During mid-May, the weather was much cooler and wetter, and in combination with depredations of nests, the number of active nests declined. By early June the number of active nests increased and by mid- to late June the number of active nests was the highest number ever recorded on the Oregon coast during any 10-day time interval.

Mayfield nest success of unexclosed nests improved in 2005 (Table 4), indicating that predator management efforts are having a positive effect on reducing predation pressure on nests. However, corvid depredation of nests continues to be the main cause of failure of unexclosed nests (Table 7). In 2005 we documented corvids, particularly ravens, causing high rates of unexclosed nest failures within very short periods of time, sometimes a few hours to several days. We noted areas with little to no corvid activity to have a quick rise in corvid activity over a couple of days. Once corvids find and depredate nests, they continue to hunt and search for more nests and will return to the same area on subsequent days. The ability to respond quickly to the increased corvid activity is essential, but not always applicable due to constraints on staff levels, protocol methodology, and the constraints of techniques used to remove the predators.

MEs were used on all nests at all sites in 2005, which resulted in no egg depredations once exclosures were erected (Table 7). While MEs continue to be successful at maintaining high nest success rates (Table 4), exclosures also may attract predators to nests resulting in harassment of adult and chick plovers, as well as potentially contributing to adult mortality. In 2005 we documented several incidents of predators attempting to get into exclosures by digging under the fencing. This behavior indicates that the predators either smell or see the eggs inside the exclosure. We believe in some cases the predators were ravens; they were not successful in entering any exclosure, nor did any of the incidents result in nest failure. We also documented one adult depredation near an exclosure; it was unclear what caused the depredation, nor was it clear whether the plover was attacked inside the exclosure. Disadvantages of the MEs include permitting predators to get very close to the nests and preventing adult plovers from the ability to flush directly off the nest, potentially increasing their susceptibility to predation.

In 2005, nest abandonment was the highest overall cause of nest failure (Table 6 and 7) and much higher than the average rate of failure due to abandonment (Lauten *et al.* 2004). Abandoned nests occurred at all sites in relatively equal proportions, indicating that there was no site effect for the reasons of abandonment. Interestingly the majority of abandoned nests occurred late in the season. Of the 25 abandoned nests, 64% (n=16) occurred in June and July, and 11 of these (44%) occurred in July. We did not find any evidence that plovers were being depredated around these abandoned nests. There is also no evidence that plovers were abandoning nests due to the use of exclosures. Late season nests and broods often have fairly high success rates (pers. observations), but in 2005 this was not the case. Not only did some late-season nests get abandoned, but also several broods failed late in the season. In May and June ocean temperatures were warm, but in July ocean temperatures dropped to colder than normal, and beaches in July and August were very windy and foggy. We also noted that there was a general lack of seaweed and kelp wash-up during the summer. Seaweed and kelp on the beach are a major source of food, as invertebrates are often concentrated around these decaying masses (Dugan *et al.*, 2003). We have no direct evidence that these conditions influenced nest and brood success, but we speculate that there may have been a relationship between food availability and nest and brood success.

We believe that MEs continue to be an important and useful management tool to increase hatching rates. We continue to work closely with the managing agencies and Wildlife Services to improve our ability to create adequate nesting conditions that result in successful nesting and productivity, and we hope to continue to move towards a self sustaining population that requires less exclosure use with the ultimate goal of minimizing and/or eliminating exclosure use.

Non-lethal predator management (i.e., exclosure use) has been very successful at protecting eggs from depredations and increasing nest success and hatch rates (Table 4). However, exclosure use does not protect chicks once they are hatched and has no impact on fledgling success and productivity rates. Only two sites, CBNS and Tenmile, have consistently been productive sites (Tables 14 and 15), and the Working Team determined in 2000 that some lethal predator management was necessary to improve plover productivity especially at sites with poor overall productivity. Targeted lethal predator management was implemented at CBNS, Bandon Beach, and New River in 2002 and at Siltcoos, Overlook, Tahkenitch, and Tenmile in 2004 to attempt to increase hatching rates of unexclosed nests, increase overall fledgling success, and increase overall productivity of the plovers. The data indicates that lethal predator management has had an overall positive effect on plover productivity (Table 18). While not all sites have improved equally, the overall trend has been an improvement in fledgling success, productivity index, and fledglings per male (Tables 11-17). There also appears to be a positive effect on the hatch rate of unexclosed nests (Table 4). We recommend continued lethal predator management, specifically for corvids and non-native mammals, particularly red fox.

Nearly all current nesting areas continue to have habitat maintenance and restoration which provide plovers with high quality nesting habitat away from the

recreating public. The use of ropes and signs in these areas remains an important aspect of plover management, and the public has been generally respectful of the nesting areas. Plovers continue to respond to these areas, as evidenced by the nesting attempts on the improved habitat on the 98EHRA at CBNS. It continues to be important for plovers that use the newer areas to be successful at nesting because they will return to areas where they have been previously successful. At New River, despite the extensive habitat restoration area adjacent to Storm Ranch, only one nest was found and plover use was minimal. We believe that two factors may have resulted in less plover use of this area: plovers previously breeding on this HRA did not return in 2005, and there was considerable high quality habitat at the north end of New River and at Bandon Beach. We recommend maintaining the habitat area adjacent to Storm Ranch because it is high quality habitat with low recreational impacts, it is available habitat for increasing plover populations, and it helps to reduce available habitat for red fox and other predators. We also recommend that all habitat areas be maintained, as beachgrass will continue to degrade any habitat that is not maintained. We continue to recommend improvement of habitat at North Tenmile. This site is relatively remote, has very low recreational disturbance, and has substantial habitat that can be improved for plovers.

We recommend that agencies continue to be vigilant in monitoring recreational activities at all sites. Violations were approximately at the same level as previous years (agency information) and continue to need monitoring. We believe the presence of seasonal employees and volunteers at nesting beaches as well as law enforcement presence has some of the most positive effect on both reducing violations and educating the public.

Habitat Restoration and Development Projects

The USFS continued habitat restoration projects at Sutton Beach in the winter of 2004-05. Bulldozers have cleared 12 acres north of Berry Creek and 8 acres south of Holman Vista. Both areas are scheduled for further maintenance and improvement in the winter of 2005-06. Spreading woody debris or shell hash on the areas may attract plovers as well as improve nesting potential.

At Siltcoos, maintenance clearing of 10 acres was completed on the south spit in the winter of 2004-05.

At the Overlook, maintenance clearing was completed on 34 acres in the winter of 2004-05.

At Tenmile, maintenance clearing of 15 acres on the south side was completed in the winter of 2004-05.

At CBNS in winter 2004-05, BLM improved the habitat on their portion of the 95 and 98HRA. Of the total 170 acres of habitat, 150 acres were treated with a ripper or with a tractor and disker, and 20 cubic yards of new shell hash was spread on the 98EHRA. The 95HRA west of the 94HRA did not have any maintenance. Grass

continues to fill in this area, degrading the area for nesting. BLM will continue to improve the area in winter 2005-06. BLM in cooperation with other agencies intends to remove some berms and old fencing along the north side of the 94HRA and the south side of the 98EHRA, making the area more contiguous, which will facilitate plover movement. There is limited availability of new shell hash. We recommend that gaps be created in the berm along the west side of the foredune road adjacent to the 94 and 95HRAs to help facilitate plover and brood movement from the nesting areas to the beach.

At Bandon Beach, the HRA north of Twomile Creek/New River estuary was maintained in the winter of 2004-05. No new habitat was created. The total area restored is 50 acres. This area will be maintained in the winter of 2005-06.

At New River, BLM has now created and maintained 160 acres of habitat restoration. Approximately 100 acres of the area will be maintained in the fall of 2005. Modifications to the habitat work are currently being planned due to concerns about sand entering the river from wind and overwashing, and due to concerns about potential flood events. In particular, the east side of the HRA will be built up to capture sand and prevent large overwashes from reaching the river, and the west side of the foredune will not be lowered further and may be built up to prevent large waves from overwashing the entire HRA.

Recommendations

Signing of Restricted Areas

Signing and roping for the 2006-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 in some cases expand habitat restoration areas.
- Continue use of mini-exlosures 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. Continue to erect predator exclosures around nests after 15 May to reduce attacks by migrating falcons. Ultimately move toward elimination of exclosures at all sites.

- Increase and/or maintain predator management at all sites and explore ways of better understanding the activity patterns and population levels of predators, particularly corvids.
- Continue to coordinate with federal agency employees regarding time frames of any habitat management work to be completed to minimize disturbance to nesting activity and broods.
- Coordinate agency activities in restricted/closed areas with plover biologists to minimize disturbance to nesting and brood rearing.
- Continue and explore ideas to document and monitor human disturbance by various recreational users in plover nesting areas.
- Continue to expand and refine volunteer efforts to monitor recreational use.
- Design educational programs to inform and educate the local communities and annual visitors about plover issues.
- Design informative/interactive presentations for schools for children.
- Continue intensive breeding season monitoring until plover numbers have reached the goals to be established in the USFWS Recovery Plan for Snowy Plovers, then monitor plover populations and productivity to ensure recovery goals are maintained.

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Table 1. Population estimates of the Western Snowy Plover on the Oregon Coast, 1990-2005. 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 |

^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

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Table 2. Distribution and abundance of adult Snowy Plovers along the southern Oregon coast during the 2005 breeding season.

| Site Name | Mean (x) | SD | Range | # Surveys (n)^a | Date of Peak Count | Dates of Surveys |
|------------------|-----------------|-----------|--------------|----------------------------------|---------------------------|-------------------------|
| Sutton Beach | 0.00 | 0.00 | - | 4 (4) | - | 13 April - 22 Aug |
| Siltcoos: | | | | | | |
| North Spit | 4.90 | 5.45 | 0-25 | 30 (45) | 29 Aug | 14 April - 29 Aug |
| South Spit | 4.67 | 3.59 | 0-13 | 29 (51) | 14 April, 31 May | 14 April - 23 Aug |
| Overlook: | | | | | | |
| North | 4.24 | 4.07 | 0-14 | 21 (45) | 14 April | 14 April - 15 Aug |
| South | 1.30 | 1.53 | 0-6 | 20 (36) | 14 April | 14 April - 16 Aug |
| Tahkenitch: | | | | | | |
| North | 3.00 | 2.35 | 0-8 | 22 (38) | 21 May | 14 April - 16 Aug |
| Tenmile: | | | | | | |
| North | 4.45 | 3.35 | 0-13 | 31 (42) | 26 Aug | 10 April - 30 Aug |
| South | 7.95 | 3.44 | 0-13 | 22 (31) | 13, 20 July | 10 April - 23 Aug |
| Coos Bay N.S.: | | | | | | |
| South Beach | 11.27 | 3.11 | 0-17 | 23 (32) | 11 April | 11 April - 30 Aug |
| South Spoil | 2.35 | 2.40 | 0-7 | 17 (31) | 8 June | 11 April - 5 Aug |
| HRA '94 | 4.14 | 3.24 | 0-11 | 21 (31) | 31 July | 11 April - 10 Aug |
| HRA '95 | 0.71 | 0.91 | 0-2 | 14 (16) | 12, 24 May, 29 June | 11 April - 22 July |
| HRA '98E | 2.00 | 3.14 | 0-12 | 14 (16) | 24 May | 11 April - 22 July |
| Bandon | 14.50 | 4.73 | 8-24 | 26 (61) | 12 July | 2 April - 25 Aug |
| New River | 11.46 | 4.61 | 3-21 | 24 (57) | 5 July | 2 April - 25 Aug |

^a - first number is total number of complete surveys, number in parenthesis is total number of visits to the site

Table 3. Total number of nests for all sites on the Oregon Coast 1990 – 2005; cells tally nests only and not broods from undiscovered nests. The number of broods from undiscovered nests is totaled for each year and site only.

| Site Name | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Total # nests | Total # broods ^a |
|---------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|-----------|-----------|------------|------------|---------------|-----------------------------|
| Necanicum | | | | | | | | | | | | | 1 | 0 | 0 | 0 | 1 | 1 |
| Sutton Beach | | | | 2 | 1 | 2 | 6 | 14 | 8 | 3 | 7 | 15 | 3 | 1 | 0 | 0 | 62 | 1 |
| North Siuslaw | | | | | | | | | | | | | 1 | 0 | 0 | 0 | 1 | 0 |
| Siltcoos: | | | | | | | | | | | | | | | | | | |
| North Spit | | | | 0 | 2 | 4 | 2 | 0 | 1 | 4 | 8 | 0 | 0 | 0 | 7 | 8 | 36 | 0 |
| South Spit | | | | 1 | 2 | 2 | 1 | 3 | 3 | 17 | 14 | 14 | 10 | 7 | 4 | 10 | 88 | 0 |
| Overlook | | | | | | | | | | | | | | | | | | |
| North | | | | | | | | | | 2 | 8 | 12 | 5 | 8 | 11 | 11 | 57 | 1 |
| South | | | | | | | | | | 0 | 0 | 3 | 3 | 1 | 3 | 5 | 15 | 0 |
| Tahkenitch: | | | | | | | | | | | | | | | | | | |
| North Spit | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 7 | 8 | 13 | 8 | 12 | 52 | 0 |
| South Spit | | | | 0 | 3 | 9 | 18 | 14 | 6 | 3 | 1 | 6 | 7 | 1 | 0 | 0 | 68 | 2 |
| Threemile Creek/ Umpqua River | | | | 0 | 0 | 0 | 1 | 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 | 31 | 2 |
| South Spit | 2 | 0 | 9 | 8 | 5 | 4 | 3 | 2 | 11 | 5 | 5 | 6 | 9 | 11 | 8 | 11 | 99 | 3 |
| CBNS: | | | | | | | | | | | | | | | | | | |
| South Beach | 0 | 4 | 6 | 3 | 4 | 3 | 3 | 6 | 6 | 0 | 1 | 1 | 2 | 3 | 2 | 4 | 48 | 9 |
| South Spoil | 20 | 9 | 4 | 6 | 9 | 12 | 22 | 14 | 5 | 2 | 5 | 3 | 2 | 9 | 8 | 9 | 139 | 13 |
| North Spoil | 5 | 1 | 1 | 0 | 0 | 0 | | | | | | | | | | | 7 | 0 |
| HRAs | | | | | 4 | 3 | 2 | 3 | 7 | 12 | 22 | 13 | 15 | 11 | 16 | 16 | 124 | 12 |
| Anad. Spoil | 0 | | | | | | | | | | | | | | | | 0 | 1 |
| Menasha, N.Bend | 1 | 0 | | | | | | | | | | | | | | | 1 | 0 |
| Bandon | 0 | 14 | 8 | 10 | 5 | 9 | 3 | 4 | 1 | 2 | 2 | 6 | 5 | 5 | 17 | 31 | 122 | 3 |
| New River | 6 | 6 | 2 | 0 | 6 | 20 | 18 | 25 | 26 | 28 | 17 | 23 | 14 | 16 | 24 | 23 | 254 | 6 |
| Floras Lake/ New River Overwash | 2 | 2 | 6 | 11 | 8 | 6 | 9 | 8 | 4 | 0 | 5 | 0 | 1 | 0 | 0 | 0 | 62 | 3 |
| Total nests | 36 | 36 | 36 | 41 | 51 | 76 | 89 | 93 | 78 | 78 | 100 | 111 | 89 | 91 | 117 | 146 | 1268 | |
| Total broods^a | 2 | 1 | 5 | 7 | 4 | 6 | 11 | 5 | 3 | 1 | 2 | 0 | 1 | 4 | 2 | 3 | | 57 |

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

Table 4. Nest Success (Mayfield Method) of Snowy Plovers on the Oregon coast, 1990-2005.

| Year | % Nest Success | | (N) ¹ | (N) ² |
|------|----------------------|-----------------------|------------------|------------------|
| | Overall ¹ | Exclosed 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 | (146) (128) |
| mean | 43.1 ± 15.2 | 69.0 ± 10.7 | 18.4 ± 16.7 | (1268) (1154) |

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

²Does 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.

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

Table 5. Apparent nest success of Snowy Plovers on the Oregon Coast, 2005.

| Site | Total # | Nests Exclosed | | | Nests Not Exclosed | | | Exclosed Nests | Nests Not Exclosed | Overall Nest Success |
|-------------------|---------|----------------|------|---------|--------------------|------|---------|------------------|--------------------|----------------------|
| | | Hatch | Fail | Unknown | Hatch | Fail | Unknown | App Nest Success | App Nest Success | |
| Siltcoos | | | | | | | | | | |
| North | 8 | 3 | 3 | | 0 | 2 | | 50% | 0% | 38% |
| South | 10 | 5 | 2 | | 0 | 3 | | 71% | 0% | 50% |
| Combined | 18 | 8 | 5 | | 0 | 5 | | 62% | 0% | 44% |
| Overlook | | | | | | | | | | |
| North | 11 | 4 | 3 | | 1 | 3 | | 57% | 33% | 45% |
| South | 5 | 2 | 1 | | 0 | 2 | | 67% | 0% | 40% |
| Combined | 16 | 6 | 4 | | 1 | 5 | | 60% | 17% | 44% |
| Tahkenitch | | | | | | | | | | |
| North | 12 | 5 | 3 | | 0 | 4 | | 63% | 0% | 42% |
| South | 0 | - | - | | - | - | | - | - | - |
| Tennile | | | | | | | | | | |
| North | 6 | 3 | 1 | | 0 | 2 | | 75% | 0% | 50% |
| South | 11 | 5 | 2 | 1 | 0 | 3 | | 63% | 0% | 45% |
| Combined | 17 | 8 | 3 | 1 | 0 | 5 | | 67% | 0% | 47% |
| CBNS | | | | | | | | | | |
| South Beach | 4 | 4 | 0 | | 0 | 0 | | 100% | 0% | 100% |
| South Spoil | 9 | 3 | 1 | | 3 | 1 | 1 | 75% | 60% | 67% |
| HRAs | 16 | 4 | 0 | | 1 | 11 | | 100% | 8% | 31% |
| Combined | 29 | 11 | 1 | | 4 | 12 | 1 | 92% | 24% | 52% |
| Bandon | 31 | 12 | 2 | | 1 | 15 | 1 | 86% | 6% | 42% |
| New River | | | | | | | | | | |
| HRA | 1 | 0 | 0 | | 1 | 0 | | 0% | 100% | 100% |
| Other Lands | 22 | 10 | 4 | | 2 | 5 | 1 | 71% | 25% | 59% |
| Combined | 23 | 10 | 4 | | 3 | 5 | 1 | 71% | 33% | 57% |
| Totals | 146 | 60 | 22 | 1 | 9 | 51 | 3 | 72% | 14% | 47% |

Table 6. Causes of Snowy Plover nest failure at survey sites along the Oregon coast, 2005

| Site Name | Total Nests | # Fail | Depredation | | | | Other | | | | |
|--------------------|-------------|-----------|-----------------|-----------|----------|----------|------------------|-----------|----------------------|--------------|--|
| | | | Egg Depredation | | | | Wind/ Weather | Infertile | Abandon ^a | Unk cause | |
| | | | Corvid | Unknown | Mammal | Red Fox | | | | | |
| Siltcoos: | | | | | | | | | | | |
| North | 8 | 5 | | | | | 1 | 1 | 3 | | |
| South | 10 | 5 | | | | | 1 | | 2 | 2 | |
| Overlook | | | | | | | | | | | |
| North | 11 | 6 | | | | | 2 | | 4 | | |
| South | 5 | 3 | 1 | | | | | | 2 | | |
| Tahkenitch | | | | | | | | | | | |
| North | 12 | 7 | | 2 | | | 1 | | 2 | 2 | |
| South | 0 | | | | | | | | | | |
| Tennmile: | | | | | | | | | | | |
| North | 6 | 3 | 1 | 1 | | | | | 1 | | |
| South | 11 | 5 | 1 | 2 | | | | | 2 | | |
| Coos Bay | | | | | | | | | | | |
| North Spit: | | | | | | | | | | | |
| South Beach | 4 | 0 | | | | | | | | | |
| South Spoil | 9 | 2 | | | 1 | | | | 1 | | |
| HRAs | 16 | 11 | 3 | 6 | | | | | 2 | | |
| Bandon | 31 | 17 | 12 | | | 1 | 1 | | 2 | 1 | |
| New River | 23 | 9 | 4 | 1 | | | | | 4 | | |
| TOTALS | 146 | 73 | 22 | 12 | 1 | 1 | 6 | 1 | 25 | 5 | |

^a – includes five one-egg nests that never completed the clutch

Table 7. Cause of failure for Snowy Plover nests protected by predator exclosures and nests unprotected by predator exclosures along the Oregon coast, 2005

| Cause of Failure | | Exclosed | Unexclosed | Totals |
|-------------------------|------------------------------|-----------------|-------------------|---------------|
| Egg Depredation | Corvid | 0 | 22 | 22 |
| | Unknown | 0 | 12 | 12 |
| | Red Fox | 0 | 1 | 1 |
| | Mammal | 0 | 1 | 1 |
| Other | Wind/Weather | 6 | 0 | 6 |
| | Infertile | 1 | 0 | 1 |
| | Abandoned^a | 15 | 10 | 25 |
| | Unknown Cause | 0 | 5 | 5 |
| Totals | | 22 | 51 | 73 |

^a – includes 5 one-egg nests (clutches never completed)

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Table 8. Total number of young fledged for all sites on the Oregon Coast 1990-2005 includes fledglings from broods from undiscovered nests.

| Site Name | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Total |
|--|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------------------|-----------|------------|
| Necanicum | | | | | | | | | | | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Sutton | | | | | | | 0 | 1 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 5 |
| N Siuslaw | | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| Siltcoos: | | | | | | | | | | | | | | | | | |
| North | | | | | 0 | | 0 | 0 | 2 | 4 | 0 | 0 | 0 | 0 | 7 | 2 | 15 |
| South | | | | | 1 | 2 | 0 | 0 | 4 | 2 | 7 | 0 | 0 | 2 | 5 | 7 | 30 |
| Overlook | | | | | | | | | | | | | | | | | |
| North | | | | | | | | | | 3 | 5 | 1 | 2 | 3 | 3 | 4 | 21 |
| South | | | | | | | | | | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 6 |
| Tahkenitch | | | | | | | | | | | | | | | | | |
| North | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 1 | 3 | 6 | 8 | 24 |
| South | | | | | 1 | 12 | 8 | 7 | 1 | 1 | 3 | 4 | 5 | 2 | 0 | 0 | 44 |
| Tenmile: | | | | | | | | | | | | | | | | | |
| North | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 3 | 6 | 14 |
| South | | | 14 | 7 | 3 | 3 | 4 | 4 | 3 | 7 | 5 | 4 | 3 | 9 | 9 | 5 | 80 |
| CBNS: | | | | | | | | | | | | | | | | | |
| S Spoil | 3 | 2 | 4 | 13 | 17 | 17 | 22 | 8 | 6 | 5 | 3 | 4 | 2 | 7 | 13 | 9 | 135 |
| S Beach | | 11 | 9 | 2 | 6 | 2 | 2 | 7 | 2 | 0 | 0 | 1 | 1 | 3 | 0 | 8 | 54 |
| HRAs | | | | | 7 | 2 | 1 | 1 | 1 | 23 | 6 | 6 | 8 | 14 | 22 | 6 | 97 |
| Bandon | | 1 | 1 | 3 | 5 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 4 | 16 | 11 | 45 |
| New River | | | 3 | 0 | 7 | 12 | 8 | 9 | 11 | 8 | 5 | 6 | 6 | 12 | 21 | 9 | 117 |
| Floras Lake/ New River Overwash | 0 | 2 | 2 | 11 | 9 | 6 | 1 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 37 |
| Total | 3 | 16 | 33 | 36 | 56 | 57 | 47 | 40 | 32 | 54 | 43 | 32 | 31 | 60 | 108^a | 77 | 725 |

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

Table 9. Overall Mayfield nest success, fledgling success and total number of fledglings on the Oregon Coast, 1990 – 2005.

| 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 | 41 |
| 1998 | 52 | 26 | 32 |
| 1999 | 54 | 43 | 53 |
| 2000 | 31 | 41 | 43 |
| 2001 | 26 | 34 | 32 |
| 2002 | 38 | 29 | 31 |
| 2003 | 43 | 47 | 60 |
| 2004 | 56 | 55 | 108 |
| 2005 | 45 | 41 | 77 |
| | Mean = 43.1±15.2 | Overall = 39 | Total = 725 |

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

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Table 10. Fledgling success, brood success, and number of fledglings per male for Snowy Plovers on the Oregon Coast, 2005.

| Site Name | Total # Broods* | % Brood Success* | Total # Eggs Hatched | Min. # Fledged | | % Fledgling Success** | # of Breeding Males ^a | # of Fledglings/Male | # of Fledglings/Male - Combined ^c |
|--------------------------------|-----------------|------------------|----------------------|------------------|-------------------------|-----------------------|----------------------------------|----------------------|--|
| | | | | From Known Nests | From Undiscovered Nests | | | | |
| Sutton | - | - | - | - | - | - | - | - | - |
| Siltcoos: | | | | | | | | | |
| North Siltcoos | 3 | 33 | 6 | 2 | 0 | 33 | 3 | 0.66 | 1.29 |
| South Siltcoos | 5 | 100 | 11 | 7 | 0 | 64 | 4 | 1.75 | |
| Overlook | | | | | | | | | |
| North Overlook | 5 | 80 | 12 | 4 | 0 | 33 | 4 | 1.00 | 1.20 |
| South Overlook | 2 | 50 | 4 | 2 | 0 | 50 | 2 | 1.00 | |
| Tahkenitch | | | | | | | | | |
| North Tahkenitch | 5 | 100 | 14 | 8 | 0 | 57 | 4 | 2.00 | 2.00 |
| South Tahkenitch | - | - | - | - | - | - | - | - | - |
| Tenmile: | | | | | | | | | |
| North Spit | 4 | 75 | 8 | 4 | 2 | 50 | 4 | 1.50 | 1.22 |
| South Spit | 6 | 50 | 13 | 4 | 1 | 30 | 5 | 1.00 | |
| Coos Bay N. Spit | | | | | | | | | |
| South Spoil | 6 | 83 | 15 | 9 | 0 | 60 | 5 | 1.80 | |
| South Beach | 5 | 80 | 10 | 7 | 1 | 70 | 5 | 1.60 | 1.77 |
| HRA | 5 | 60 | 13 | 6 | 0 | 46 | 5 | 1.20 | |
| Bandon | 13 | 69 | 37 | 11 | 0 | 30 | 12 | 0.92 | |
| New River | | | | | | | | | 0.91 |
| HRA | 1 | 100 | 2 | 1 | 0 | 50 | 1 | 1.00 | |
| Other lands | 12 | 50 | 34 | 8 | 0 | 24 | 10 | 0.80 | |
| Floras Lake/New River Overwash | - | - | - | - | - | - | - | - | - |
| TOTALS** | 72 | 69 | 176 | 73 | 4 | 41 | 60 | 1.28 | - |
| TOTAL FLEDGED | | | | 77 | | | | | |

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

% Fledgling 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

Table 11. Productivity of Snowy Plovers at Siltcoos, Lane Co., Oregon coast, 1993-2005.

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 |
|---|------------------------------|----------------------------|-------------------|----------------------------|---------------------------------------|---|---|--|--------------------------------------|
| 2005 | 44 | 17 | 39% | 9 | 53% | 20% | 9 | 7 | 1.29 |
| 2004 | 31 | 18 | 58% | 12 | 67% | 39% | 12 | 5 | 2.40 |
| 2003 | 16 | 5 | 31% | 2 | 40% | 13% | 2 | 4 | 0.50 |
| 2002 | 28 | 8 | 29% | 0 | 0% | 0% | 0 | 2 | 0.00 |
| 2001 | 33 | 1 | 3% | 0 | 0% | 0% | 0 | 3 | 0.00 |
| 2000 | 55 | 19 | 35% | 7 | 37% | 13% | 7 | 8 | 0.88 |
| 1999 | 59 | 21 | 36% | 6 | 29% | 10% | 6 | 8 | 0.75 |
| 1998 | 10 | 10 | 100% | 6 | 60% | 60% | 6 | 3 | 2.00 |
| 1997 | 8 | 4 | 50% | 0 | 0% | 0% | 0 | 2 | 0.00 |
| 1996 | 7 | 3 | 43% | 0 | 0% | 0% | 0 | 1 | 0.00 |
| 1995 | 12 | 6 | 50% | 2 | 33% | 17% | 2 | 3 | 0.67 |
| 1994 | 9 | 4 | 44% | 1 | 25% | 11% | 1 | 3 | 0.33 |
| 1993 | 1 | 0 | 0% | 0 | 0% | 0% | 0 | 0 | 0.00 |
| total before predator management (1993-2003) | 238 | 81 | 34% | 24 | 30% | 10% | 24 | 37 | 0.65 |
| total after predator management (2004-2005) | 75 | 35 | 47% | 21 | 60% | 28% | 21 | 12 | 1.75 |

^a - productivity index = number of fledglings/number of eggs laid

Table 12. Productivity of Snowy Plovers at Overlook, Douglas Co., Oregon coast, 1999-2005

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 |
|---|------------------------------|----------------------------|-------------------|----------------------------|---------------------------------------|---|---|--|--------------------------------------|
| 2005 | 42 | 16 | 38% | 6 | 38% | 14% | 6 | 5 | 1.20 |
| 2004 | 39 | 14 | 36% | 6 | 43% | 15% | 6 | 6 | 1.00 |
| 2003 | 17 | 6 | 35% | 3 | 50% | 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 | 43 | 40% | 15 | 35% | 14% | 15 | 21 | 0.71 |
| total after predator management (2004-2005) | 81 | 30 | 37% | 12 | 40% | 15% | 12 | 11 | 1.09 |

^a - productivity index = number of fledglings/number of eggs laid

Table 13. Productivity of Snowy Plovers at Tahkenitch, Douglas Co., Oregon coast, 1993-2005.

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 |
|---|----------------------|--------------------|------------|--------------------|------------------------------|------------------------------------|-------------------------------------|------------------------------------|-----------------------------|
| 2005 | 26 | 14 | 54% | 8 | 57% | 31% | 8 | 4 | 2.00 |
| 2004 | 21 | 14 | 67% | 6 | 43% | 29% | 6 | 5 | 1.20 |
| 2003 | 37 | 17 | 46% | 3 | 18% | 8% | 3 | 10 | 0.30 |
| 2002 | 30 | 16 | 53% | 6 | 38% | 20% | 6 | 5 | 1.20 |
| 2001 | 36 | 22 | 61% | 8 | 36% | 22% | 8 | 8 | 1.00 |
| 2000 | 15 | 6 | 40% | 5 | 83% | 33% | 5 | 2 | 2.50 |
| 1999 | 9 | 1 | 11% | 1 | 100% | 11% | 1 | 2 | 0.50 |
| 1998 | 18 | 11 | 61% | 1 | 9% | 6% | 1 | 4 | 0.25 |
| 1997 | 41 | 10 | 24% | 6 | 60% | 15% | 6 | 7 | 0.86 |
| 1996 | 51 | 21 | 41% | 8 | 38% | 16% | 8 | 9 | 0.89 |
| 1995 | 21 | 16 | 76% | 12 | 75% | 57% | 12 | 7 | 1.71 |
| 1994 | 9 | 8 | 89% | 1 | 13% | 11% | 1 | 3 | 0.33 |
| 1993 | 0 | 0 | 0% | 0 | 0% | 0% | 0 | 0 | 0.00 |
| total before predator management (1993-2003) | 267 | 128 | 48% | 51 | 40% | 19% | 51 | 57 | 0.89 |
| total after predator management (2004-2005) | 47 | 28 | 60% | 14 | 50% | 30% | 14 | 9 | 1.56 |

^a - productivity index = number of fledglings/number of eggs laid

Table14. Productivity of Snowy Plovers at Tenmile, Coos Co., Oregon coast, 1992-2005.

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 |
|---|----------------------|--------------------|------------|--------------------|------------------------------|------------------------------------|----------------------------------|------------------------------------|-----------------------------|
| 2005 | 49 | 21 | 43% | 8 | 38% | 16% | 8 | 8 | 1.00 |
| 2004 | 50 | 29 | 58% | 12 | 41% | 24% | 12 | 9 | 1.33 |
| 2003 | 43 | 20 | 47% | 10 | 50% | 23% | 10 | 8 | 1.25 |
| 2002 | 32 | 14 | 44% | 3 | 21% | 9% | 3 | 8 | 0.38 |
| 2001 | 24 | 10 | 42% | 4 | 40% | 17% | 4 | 4 | 1.00 |
| 2000 | 18 | 14 | 78% | 5 | 36% | 28% | 5 | 4 | 1.25 |
| 1999 | 13 | 8 | 62% | 7 | 88% | 54% | 7 | 3 | 2.33 |
| 1998 | 20 | 8 | 40% | 3 | 38% | 15% | 3 | 4 | 0.75 |
| 1997 | 6 | 6 | 100% | 4 | 67% | 67% | 4 | 2 | 2.00 |
| 1996 | 11 | 6 | 55% | 4 | 67% | 36% | 4 | 4 | 1.00 |
| 1995 | 13 | 11 | 85% | 2 | 18% | 15% | 2 | 4 | 0.50 |
| 1994 | 18 | 3 | 17% | 3 | 100% | 17% | 3 | 2 | 1.50 |
| 1993 | 24 | 15 | 63% | 5 | 33% | 21% | 5 | 5 | 1.00 |
| 1992 | 27 | 19 | 70% | 14 | 74% | 52% | 14 | 7 | 2.00 |
| total before predator management (1992-2003) | 249 | 134 | 54% | 64 | 48% | 26% | 64 | 55 | 1.16 |
| total after predator management (2004-2005) | 99 | 50 | 51% | 20 | 40% | 20% | 20 | 17 | 1.18 |

^a - productivity index = number of fledglings/number of eggs laid

Table 15. Productivity of Snowy Plovers at Coos Bay North Spit, Coos Co., Oregon coast, 1992-2005.

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 |
|---|----------------------|--------------------|------------|--------------------|------------------------------|------------------------------------|----------------------------------|------------------------------------|-----------------------------|
| 2005 | 80 | 38 | 48% | 23 | 61% | 29% | 21 | 12 | 1.75 |
| 2004 | 73 | 42 | 58% | 31 | 74% | 42% | 31 | 15 | 2.06 |
| 2003 | 57 | 29 | 51% | 21 | 72% | 37% | 20 | 9 | 2.22 |
| 2002 | 48 | 21 | 44% | 11 | 52% | 23% | 11 | 10 | 2.22 |
| 2001 | 49 | 21 | 43% | 11 | 52% | 22% | 11 | 8 | 1.38 |
| 2000 | 75 | 23 | 31% | 9 | 39% | 12% | 9 | 6 | 1.50 |
| 1999 | 38 | 35 | 92% | 26 | 74% | 68% | 26 | 10 | 2.60 |
| 1998 | 49 | 18 | 37% | 9 | 50% | 18% | 9 | 8 | 1.13 |
| 1997 | 64 | 32 | 50% | 12 | 38% | 19% | 12 | 11 | 1.09 |
| 1996 | 77 | 48 | 62% | 20 | 42% | 26% | 17 | 14 | 1.21 |
| 1995 | 53 | 35 | 66% | 20 | 57% | 38% | 19 | 11 | 1.72 |
| 1994 | 50 | 44 | 88% | 29 | 66% | 58% | 28 | 12 | 2.33 |
| 1993 | 26 | 18 | 69% | 9 | 50% | 35% | 9 | 7 | 1.29 |
| 1992 | 32 | 21 | 66% | 9 | 43% | 28% | 9 | 7 | 1.29 |
| total before predator management (1992-2001) | 513 | 295 | 58% | 154 | 52% | 30% | 149 | 94 | 1.58 |
| total after predator management (2002-2005) | 258 | 130 | 50% | 86 | 66% | 33% | 83 | 46 | 1.80 |

^a - productivity index = number of fledglings/number of eggs laid

Table 16. Productivity of Snowy Plovers at Bandon Beach, Coos Co., Oregon coast, 1992-2005.

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 |
|---|------------------------------|----------------------------|-------------------|----------------------------|---------------------------------------|---|---|--|--------------------------------------|
| 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 | 7 | 54% | 1 | 14% | 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 | 52 | 41% | 12 | 23% | 9% | 12 | 28 | 0.43 |
| total after predator management (2002-2005) | 156 | 76 | 49% | 28 | 37% | 18% | 27 | 28 | 0.96 |

^a - productivity index = number of fledglings/number of eggs laid

Table 17. Productivity of Snowy Plovers at New River, Coos Co., Oregon coast, 1992-2005.

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 |
|---|------------------------------|----------------------------|-------------------|----------------------------|---------------------------------------|---|---|--|--------------------------------------|
| 2005 | 63 | 36 | 57% | 9 | 26% | 14% | 9 | 10 | 0.90 |
| 2004 | 70 | 37 | 53% | 21 | 57% | 30% | 21 | 12 | 1.75 |
| 2003 | 44 | 25 | 57% | 12 | 48% | 27% | 12 | 10 | 1.20 |
| 2002 | 39 | 17 | 44% | 6 | 35% | 15% | 6 | 9 | 0.67 |
| 2001 | 53 | 22 | 42% | 6 | 27% | 11% | 6 | 8 | 0.75 |
| 2000 | 46 | 14 | 30% | 5 | 36% | 11% | 5 | 8 | 0.63 |
| 1999 | 74 | 42 | 57% | 8 | 19% | 11% | 8 | 14 | 0.57 |
| 1998 | 73 | 60 | 82% | 11 | 18% | 15% | 11 | 16 | 0.69 |
| 1997 | 65 | 41 | 63% | 8 | 20% | 12% | 8 | 12 | 0.67 |
| 1996 | 54 | 41 | 76% | 7 | 17% | 13% | 7 | 12 | 0.58 |
| 1995 | 48 | 12 | 25% | 8 | 67% | 17% | 8 | 8 | 1.00 |
| 1994 | 18 | 14 | 78% | 6 | 43% | 33% | 5 | 5 | 1.00 |
| 1993 | 0 | 0 | 0% | 0 | 0% | 0% | 0 | 0 | 0.00 |
| 1992 | 6 | 6 | 100% | 1 | 17% | 17% | 1 | 2 | 0.50 |
| total before predator management (1992-2001) | 437 | 252 | 58% | 60 | 24% | 14% | 59 | 85 | 0.69 |
| total after predator management (2002-2005) | 216 | 115 | 53% | 48 | 42% | 22% | 48 | 41 | 1.17 |

^a - productivity index = number of fledglings/number of eggs laid

Table 18. Overall productivity of male Snowy Plovers along the Oregon Coast, 1992-2005. Productivity is measured as number of fledglings per male.

| Year | Mean | n | Min | Max | Range | std |
|------|---------|----|-----|-----|-------|---------|
| 1992 | 1.25000 | 20 | 0 | 4 | 4 | 1.16416 |
| 1993 | 1.00000 | 17 | 0 | 3 | 3 | 1.00000 |
| 1994 | 1.48276 | 29 | 0 | 5 | 5 | 1.35279 |
| 1995 | 1.19444 | 36 | 0 | 4 | 4 | 1.16667 |
| 1996 | 0.88095 | 42 | 0 | 3 | 3 | 0.94230 |
| 1997 | 0.83333 | 36 | 0 | 3 | 3 | 0.84515 |
| 1998 | 0.83333 | 36 | 0 | 3 | 3 | 0.97101 |
| 1999 | 1.26829 | 41 | 0 | 5 | 5 | 1.32334 |
| 2000 | 0.97297 | 37 | 0 | 5 | 5 | 1.18992 |
| 2001 | 0.84211 | 38 | 0 | 3 | 3 | 0.85507 |
| 2002 | 0.70000 | 40 | 0 | 3 | 3 | 0.93918 |
| 2003 | 1.06122 | 49 | 0 | 4 | 4 | 1.10695 |
| 2004 | 1.64516 | 62 | 0 | 5 | 5 | 1.16079 |
| 2005 | 1.24138 | 58 | 0 | 3 | 3 | 1.03127 |

Table 19. Activity patterns of Snowy Plovers on Habitat Restoration Areas along the Oregon Coast, 1994-2005. Note that absence of an activity type indicates we have not documented whether the activity is occurring. The Dunes Overlook and the New River HRA were first created in the winter of 1998-99. The 94HRA, 95HRA, 98HRA, and 98EHRA are all located at Coos Bay North Spit, and each was initially created in the winter of the respective year. The Bandon Beach State Park HRA was created in fall 2001 and significantly improved in fall 2002 and 2003.

| | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|------------------------|-------|---------|-------|-------|---------|---------|---------|-----------|-----------|---------|---------|---------|
| 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 |
| 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 |
| 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 |
| 98HRA | | | | | | | N | F?,N,B | R?,F?,N | NA | NA | R |
| 98EHRA | | | | | | | | R?,F?,N,B | R?,F?,N,B | F,B | F,B | R,F,N,B |
| Bandon Beach* | | | | | | | | | NA | 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 |

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

* - there is known winter use of the 94HRA, Dunes Overlook, and Bandon Beach HRA

Table 20. 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 - 2005.

| Year | # of Fledglings | # of HY birds from previous year sighted | | Return Rate (#HY/#Fled) | # that nested on OR coast | % nested on OR coast |
|------|-----------------|--|---------------|-------------------------|---------------------------|----------------------|
| | | # on OR coast | # on OR coast | | | |
| 2005 | 77 | 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 = 47.1%

SD = 11.8%

Average percent of returning HY birds that nest in first season = 65.9%

SD = 19.0%

Table 21. 2004 hatch year Snowy Plovers that returned to the Oregon coast in 2005.

| Chick Combos | New Combo | Sex | 2004 Banding Location | 2005 Location(s) | 2005 Nest |
|--------------|-----------|-----|-----------------------|------------------------------|-----------|
| A/B:Y | | F | 94HRA | NSI, SSI, NOV, SOV, NTA | Yes |
| A/W:Y | RG:YR | M | Bandon Beach | BB,NR | Yes |
| A/Y:Y | BL:GY | M | New River | STM,NTM | Yes |
| A/Y:Y | GR:LY | F | New River | NOV,NSI | Yes |
| B/R/B:Y | | M | N Siltcoos | NSI,SSI,NOV | Yes |
| B/R/B:Y | LB:BG | F | N Siltcoos | NSI,NOV,SSI,STM | Yes |
| B/W/B:Y | | F | New River | BB,NR | Yes |
| B/W/B:Y | | F | New River | BB,NR | Yes |
| B/Y/B:Y | | F | 94HRA | STM | No |
| G:Y | | M | Unknown | SB,BB | No |
| G/B/G:G | BR:GB | F | N Tahkenitch | BB,NR | Yes |
| L:G | | F | Unknown | SSI,NOV,NSI,NTA | Yes |
| L:Y | | M | Unknown | BB | No |
| L/B/L:Y | RY:YW | M | Bandon Beach | SSI,NSI | No |
| L/R/L:Y | BR:YW | M | New River | NR,BB | Yes |
| L/R/L:Y | RL:BW | M | New River | BB,NR | Yes |
| L/W/L:Y | | F | New River | SSI | No |
| L/W/L:Y | | M | New River | NTM | No |
| L/Y/L:Y | LR:GW | F | S Siltcoos | SSI,NSI | Yes |
| R/A/R:G | GR:GY | F | S Spoil | BB | Yes |
| R/B/R:Y | | F | New River | NTM,STM | No |
| R/G/R:G | S:X | M | 94HRA | SB,94HRA | Yes |
| R/G/R:G | | M | 94HRA | 98EHRA,SB | Yes |
| R/G/R:Y | | M | N Tahkenitch | NTM,STM | Yes |
| R/Y/R:Y | | F | S Tenmile | SSI,NOV,NTM | No |
| W:Y | | ? | Unknown | SB,BB,NR | No |
| W/B/W:G | YW:GB | F | 94HRA | NSI | Yes |
| W/L/W:G | | F | Bandon Beach | BB,NR | Yes |
| W/L/W:Y | RL:RY | F | 94HRA | NTM,STM,SB | Yes |
| W/R/W:G | | F | S Siltcoos | STM,NTM,SSI | No |
| W/R/W:Y | YW:BY | F | S Spoil | 94HRA,95HRA,98EHRA,SS,SB | Yes |
| X:S | LR:YG | F | S Overlook | NTM,NOV,SSI,NSI | Yes |
| Y/A/Y:G | | M | N Tenmile | STM,NTM | Yes |
| Y/A/Y:Y | GW:WR | M | 94HRA | SS,94HRA,SB,95HRA,NTM,98EHRA | Yes |
| Y/B/Y:G | RG:GW | M | Bandon Beach | BB,NR | Yes |
| Y/L/Y:Y | YW:WB | F | S Tenmile | SSI,NTM,STM | Yes |

| Chick Combos | New Combo | Sex | 2004 Banding Location | 2005 Location(s) | 2005 Nest |
|-----------------|--------------|-----|--------------------------|---------------------|--------------|
| Y/R/Y:G | GR:LR | M | New River | STM,NTM | Yes |
| Y/R/Y:G | BL:RW | M | New River | BB,NR | Yes |
| Y/R/Y:Y | BR:RW | M | N Tahkenitch | NOV | Yes |
| Y/W/Y:G | | F | S Spoil | STM | No |
| Y/W/Y:G | GW:GR | M | S Spoil | STM,NTM | Yes |
| Y/W/Y:Y | | F | S Spoil | SB,94HRA, 98EHRA | Yes |
| Y/W/Y:Y | GR:YY | M | S Spoil | SB,94HRA | Yes |
| Y/W/Y:Y | YW:WY | F | S Spoil | SOV,NSI | Yes |

Figure 1. Snowy Plover nesting areas surveyed on the Oregon Coast in 2005.

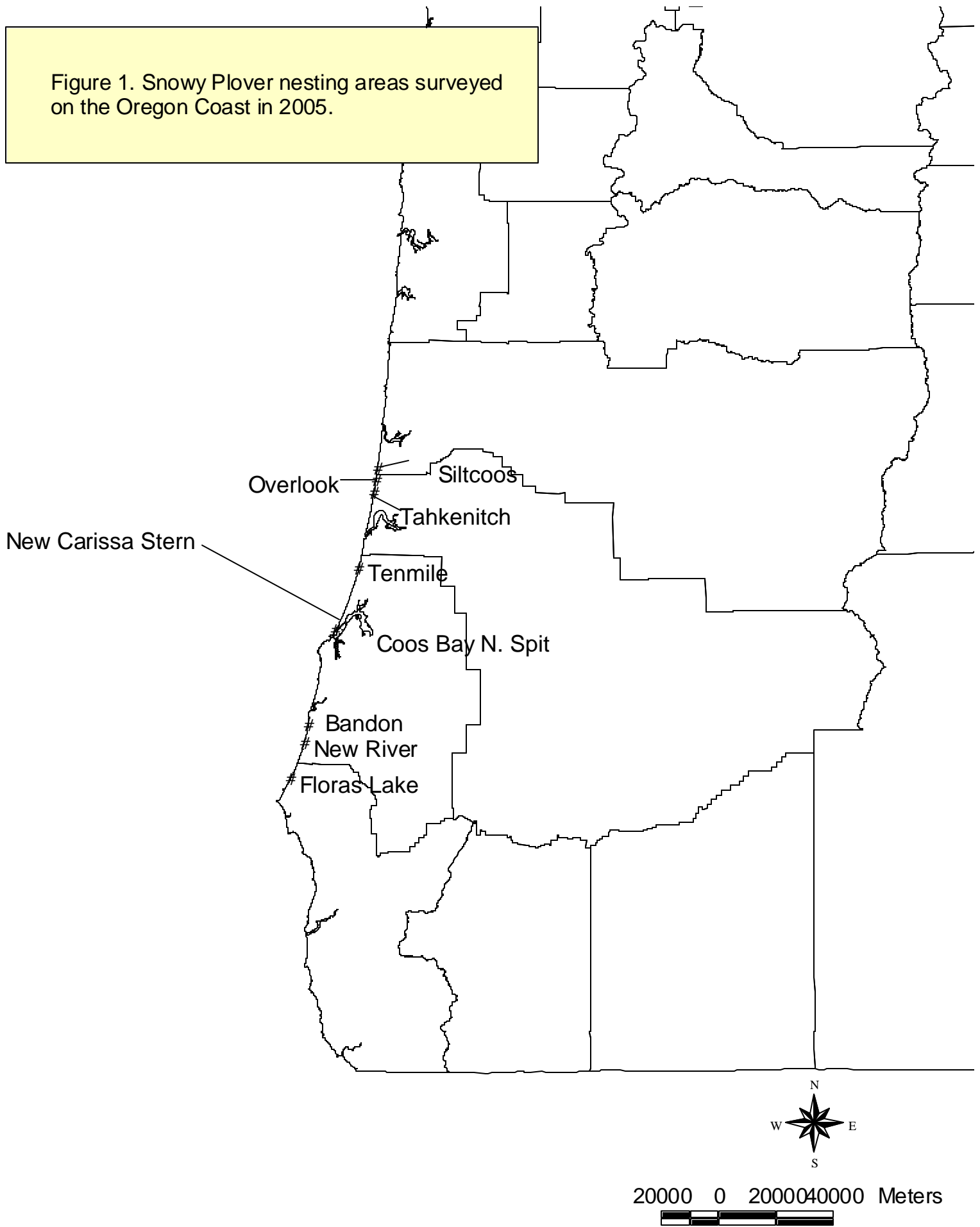


Figure 2. Snowy Plover nest locations at Siltcoos River, Oregon, 2005.

Due to difficulties with the GPS unit, 1 nest point is missing at North Siltcoos, and 4 nest points are missing at South Siltcoos.

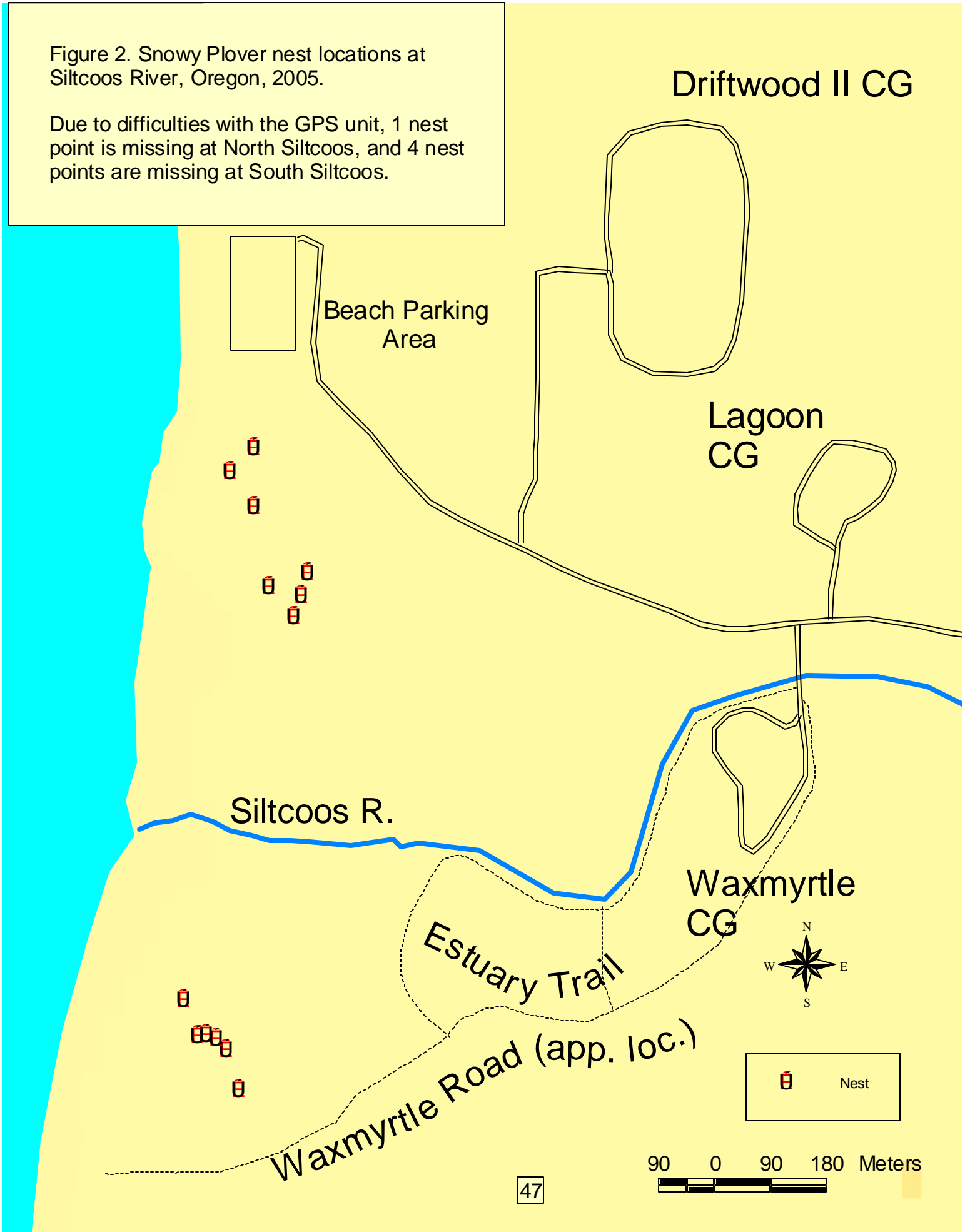


Figure 3. Snowy Plover nest locations at Dunes Overlook Clearing, Oregon, 2005.

Due to difficulties with the GPS unit, 7 nest points are missing from North Overlook and 2 nest points are missing from South Overlook.

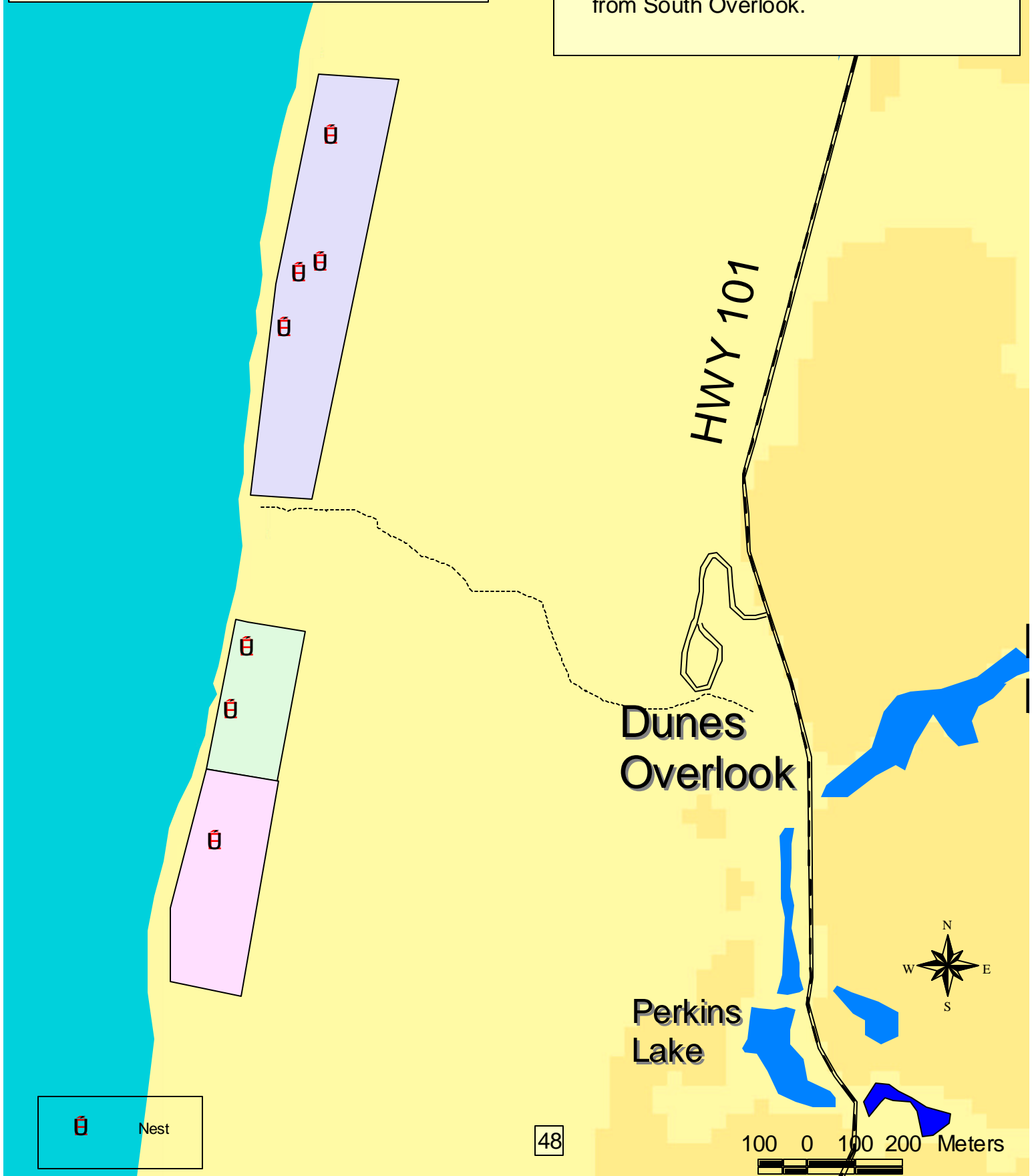


Figure 4. Snowy Plover nest locations at Tahkenitch Creek, Oregon, 2005.

Due to difficulties with the GPS unit, 7 nest points are missing at North Tahkenitch Creek.

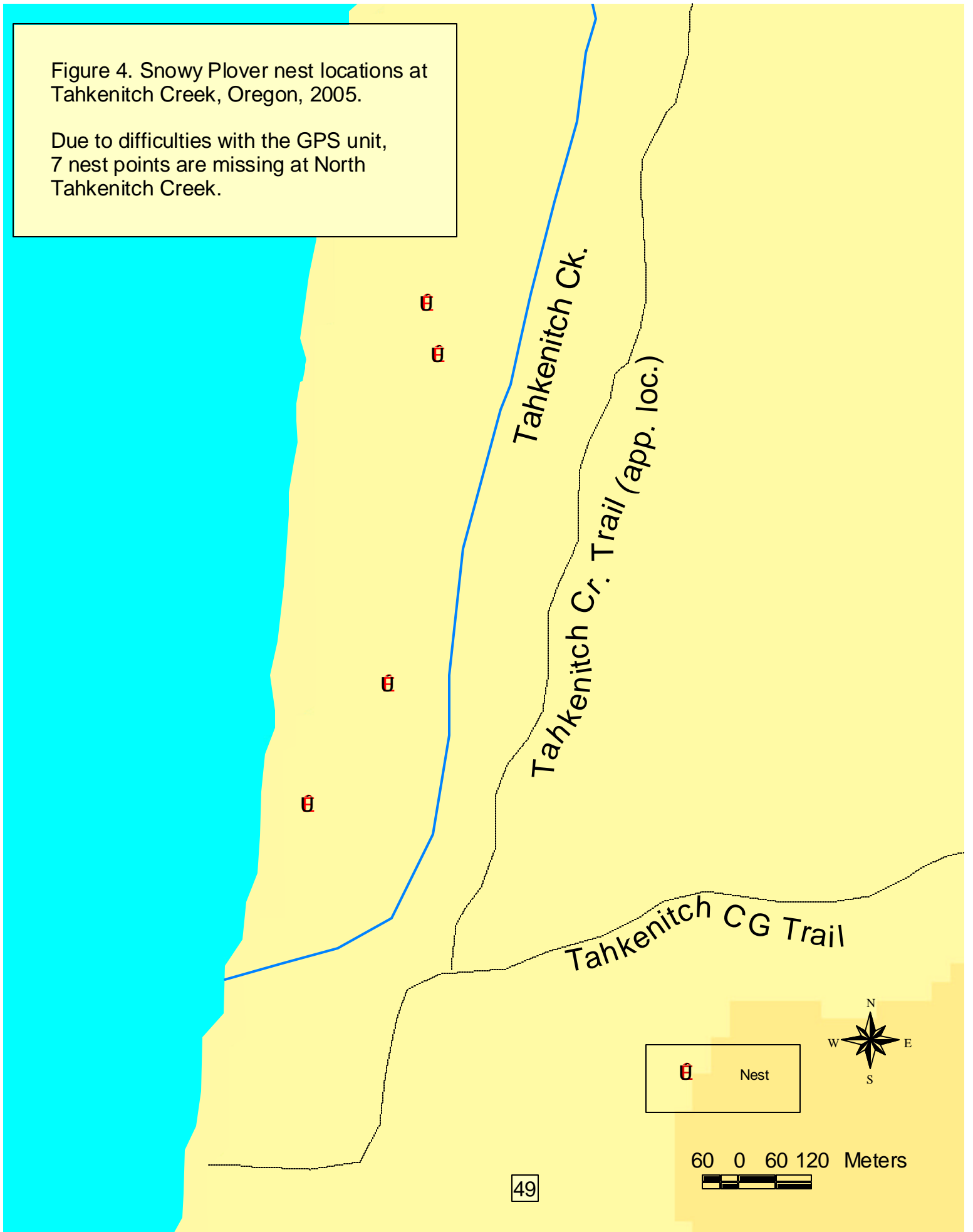


Figure 5. Snowy Plover nest locations at Tenmile Creek, Oregon, 2005.

Due to difficulties with the GPS unit, there is one nest point missing at North Tenmile.

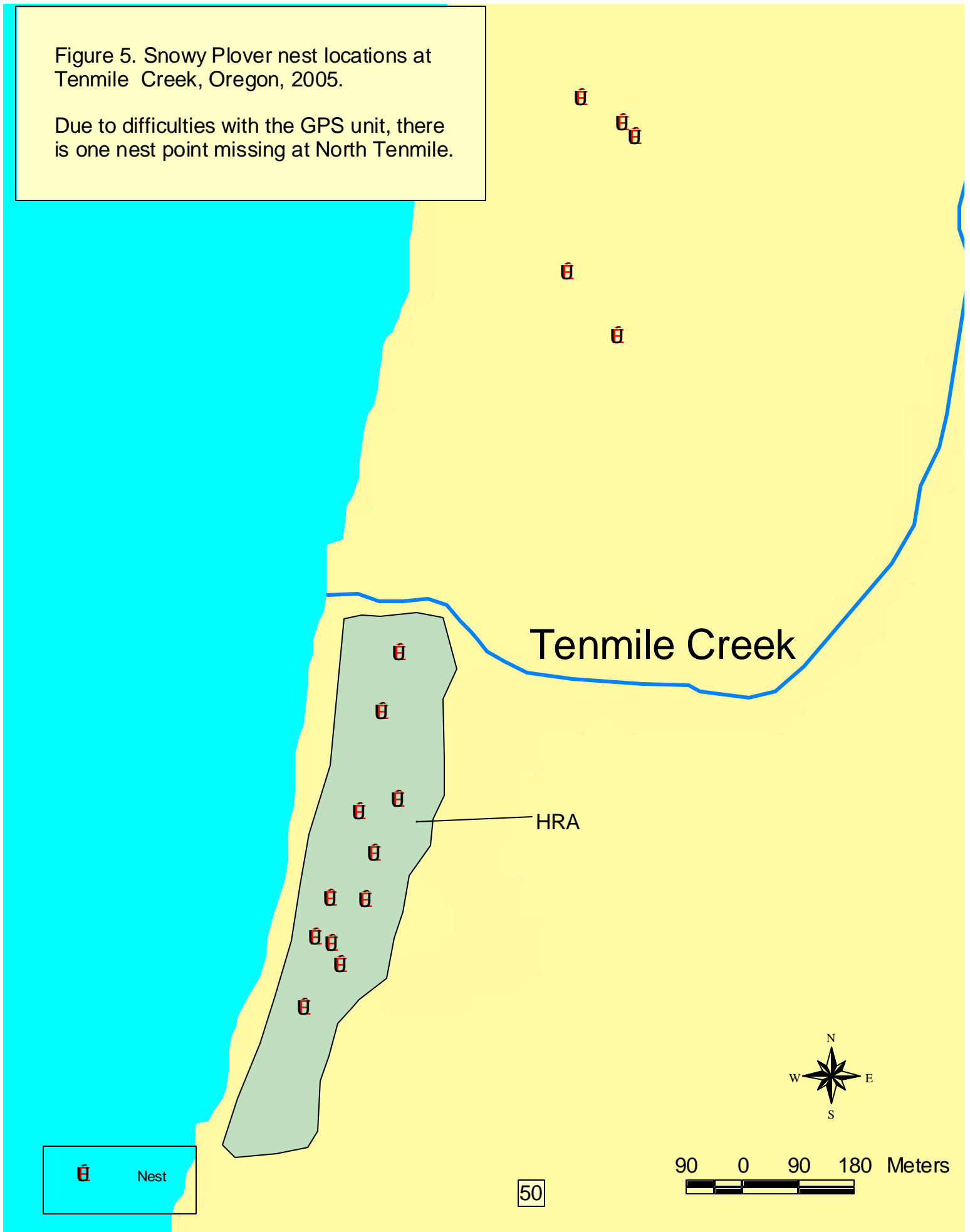
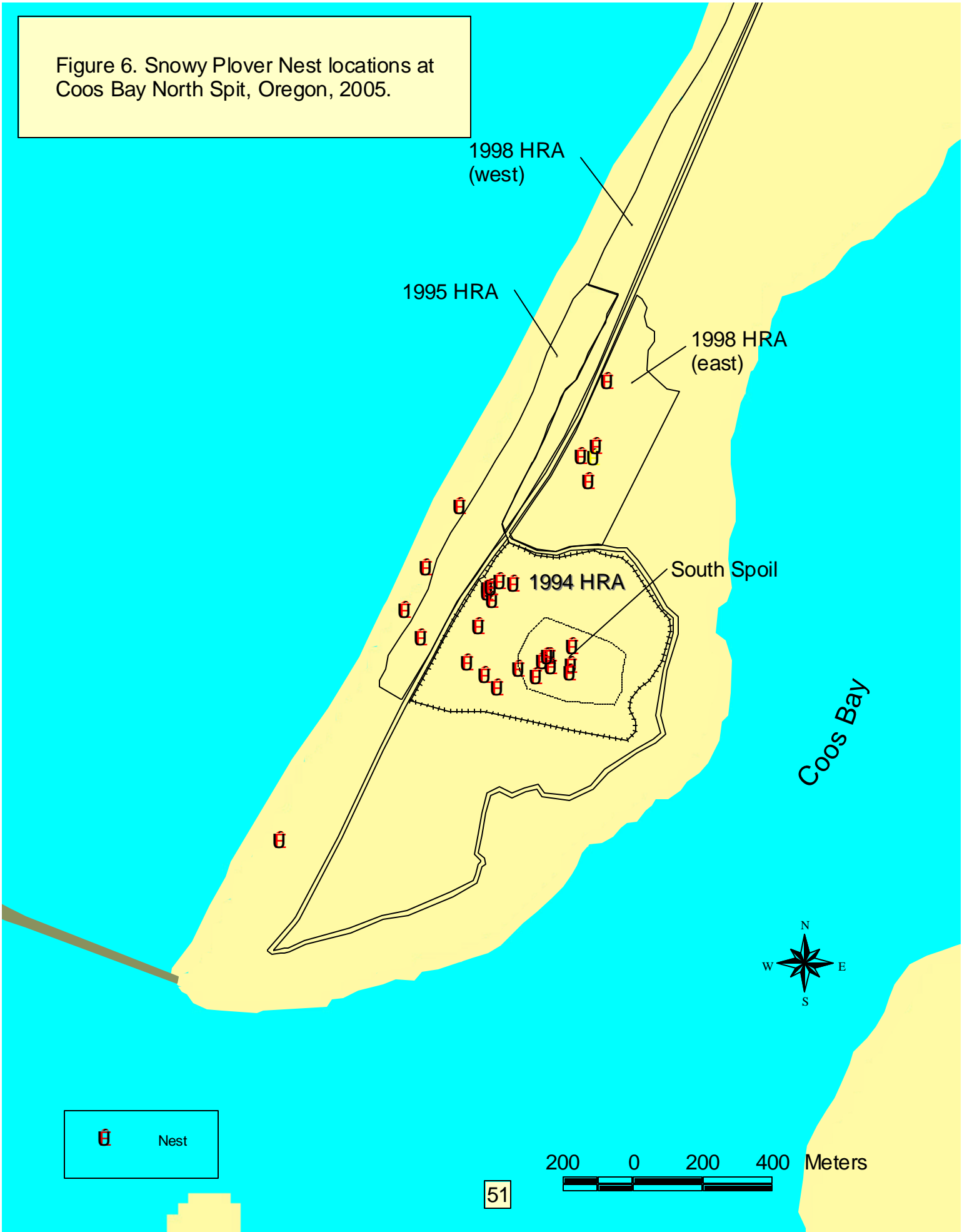


Figure 6. Snowy Plover Nest locations at Coos Bay North Spit, Oregon, 2005.



 Nest

Figure 7. Snowy Plover nest locations at Bandon Beach, Oregon, 2005.

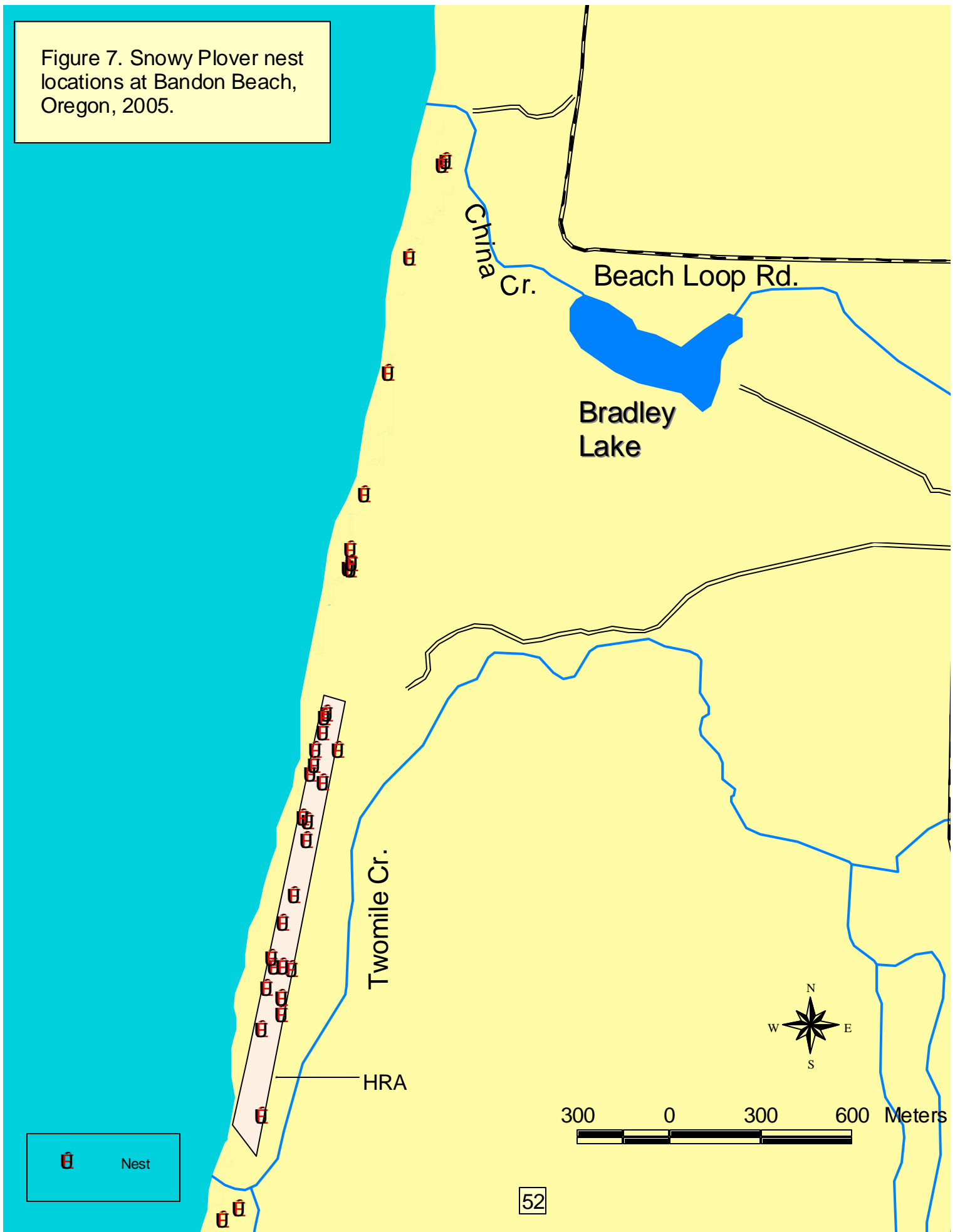


Figure 8. Snowy Plover locations at New River, Oregon, 2005

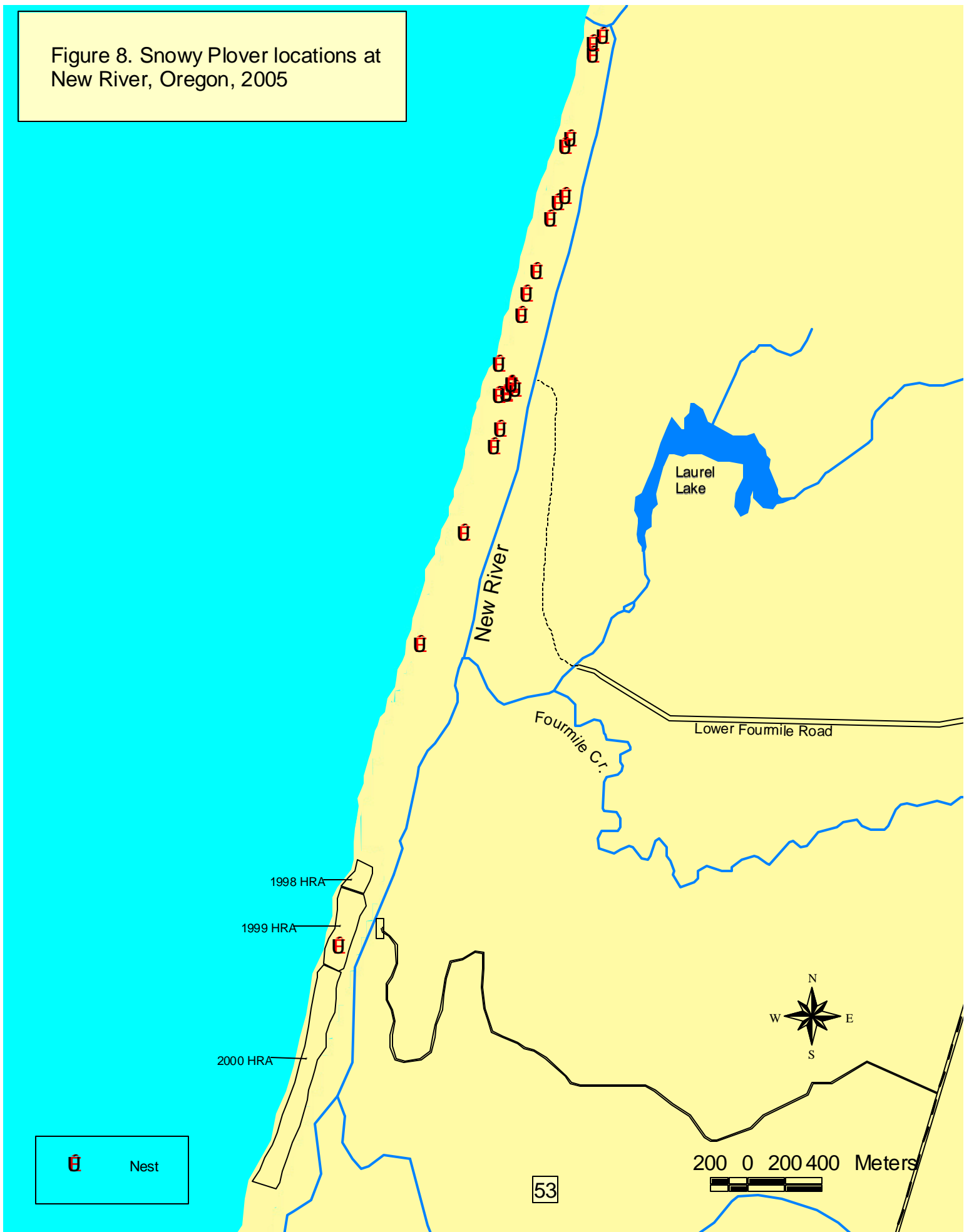


Figure 10. Number of active Snowy Plover nests within 10-day intervals on the Oregon coast, 2005.
Dashed lines represent +/- 2 standard deviations.

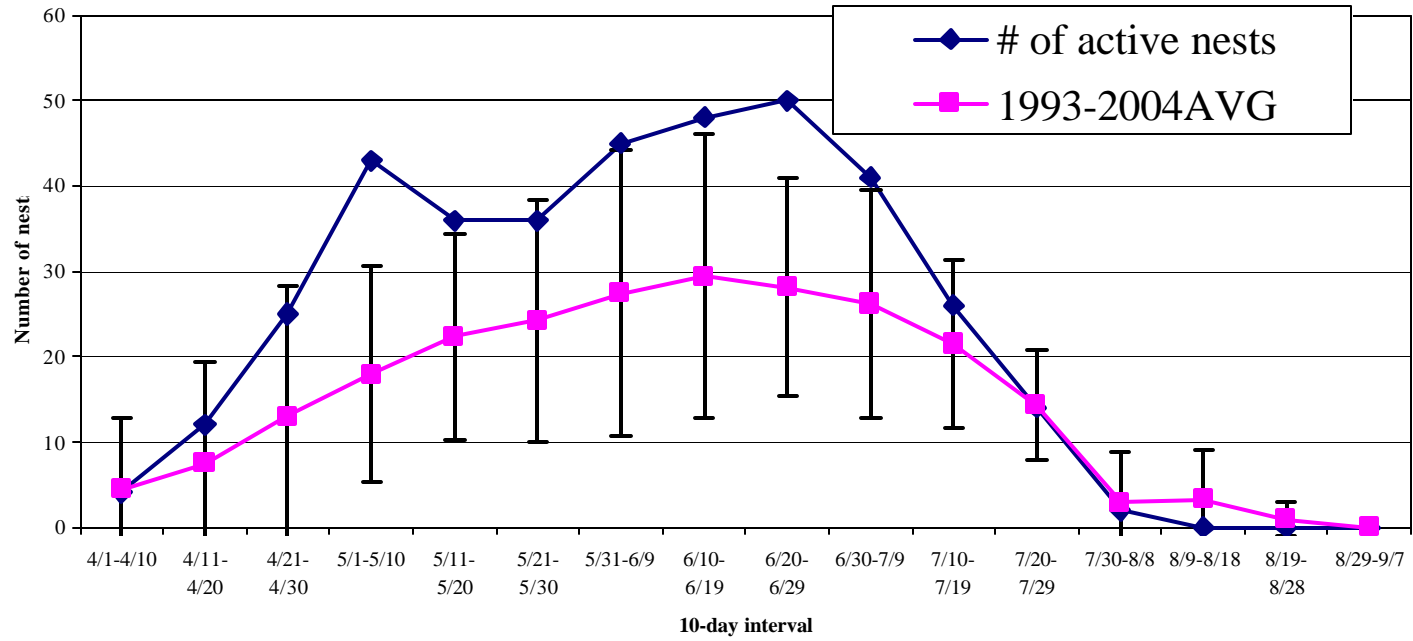


Figure 11. Total percent nest success for Snowy Plovers along the Oregon coast, 1990-2005. Above each bar is the total number of nests that hatched over the total number of nests.

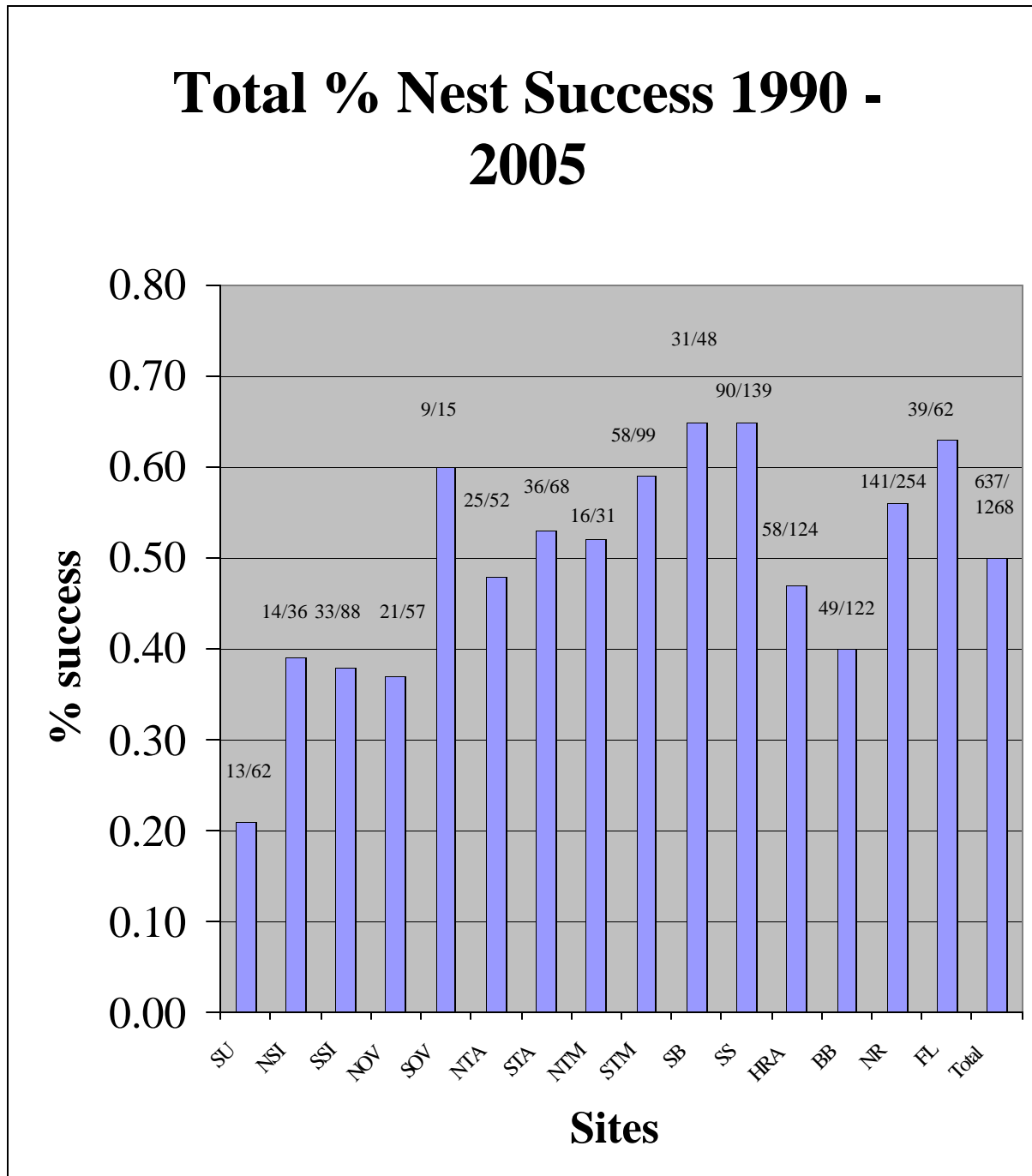
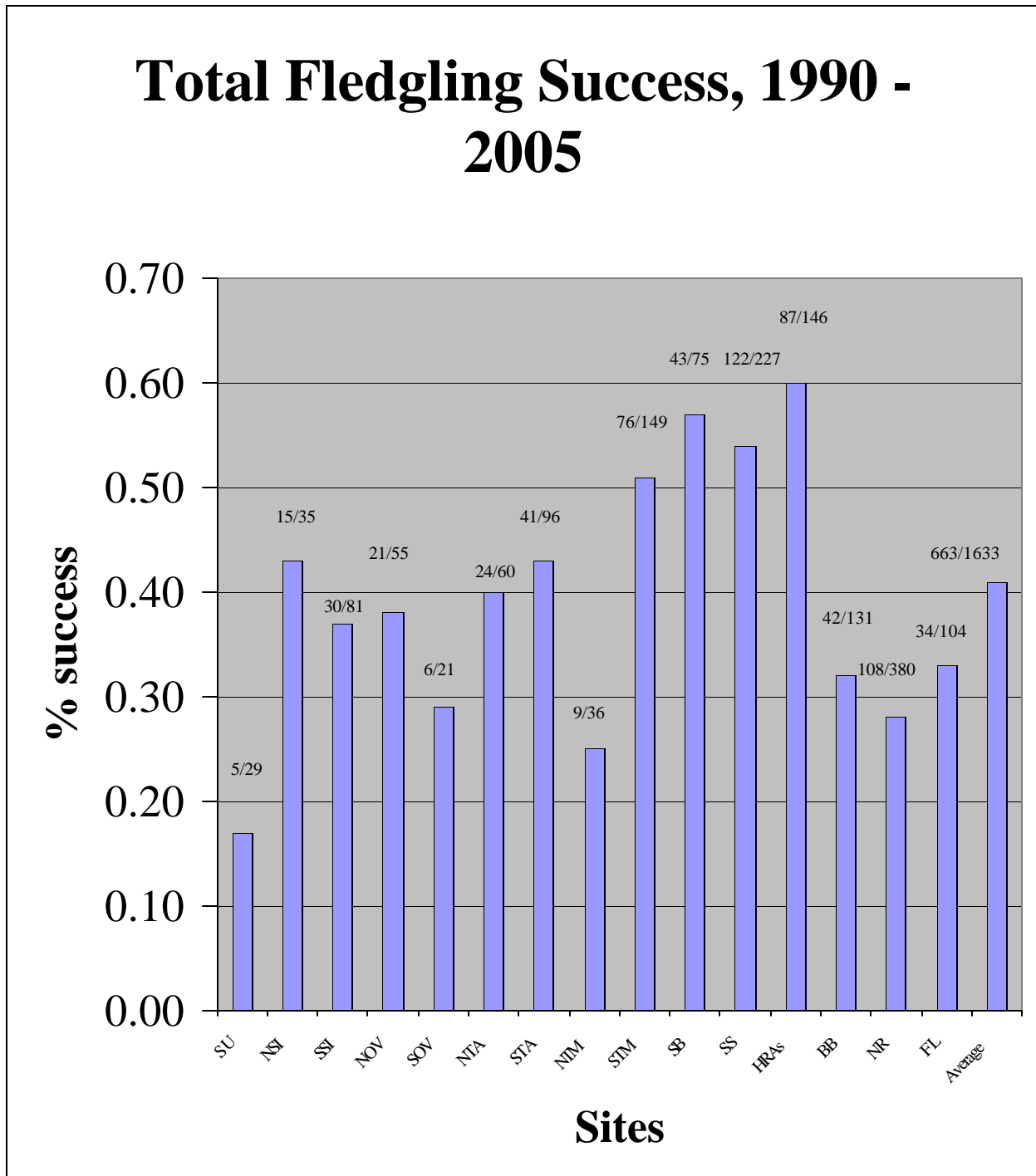


Figure 12. Percent fledgling success of Snowy Plovers at each nesting site along the Oregon coast, 1990-2004. Above each bar is the number of fledglings over the number of hatched eggs.



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 the Waxmyrtle 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/Two-mile Creek mouth, including the large habitat restoration area north of the mouth of Two-mile Creek.

New River Spit, Coos Co. (Figure 8) - the beach and sand spit on the south side of the location of the mouth of New River/Two-mile 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, Seal Rock – North Spit Alsea Bay, North and South Siuslaw jetty area, Whiskey Run to the Coquille River, and Euchre Creek.

APPENDIX B. Recommendations for Management of Recreational Activities and Habitat Restoration for sites with Snowy Plovers along the Oregon Coast - 2005.

Sutton:

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

Overlook:

- Continue predator management to control corvid use of the area.
- 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.

- Additional interpretive signing is recommended at the beginning of the Overlook trailhead (near viewing platforms). This signing is intended to provide more information on the ecology of the Snowy Plover and the reasoning for current management techniques and restricted areas.
- Continue to restrict all dogs to leashes adjacent to the Overlook nesting areas. It should be noted that many hikers with dogs are compliant while on-trail but often unleash their animals upon reaching the beach, therefore additional signing for clarification is highly recommended.

Tahkenitch:

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

Tenmile North and South Spits:

- Continue predator management to control corvid use of the area.
- Continue to maintain and improve the south side for nesting. Consider removal of foredune on the north side to expand nesting area northward.
- 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.
- 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 to the 95HRA and to the beach. Create small vegetation free gaps in the foredune to facilitate brood access to the beach without destabilizing the foredune.
- Continue to rope and sign the beach as early in the nesting season as possible.
- Clearly sign all entrance points on the spit that the beach is street legal vehicles only.
- The seasonal reroute of the foredune road continues to benefit plovers by reducing recreational activity, and thus disturbance, near the nesting area, and permits brood movements between the HRA's without any chance of harm from vehicle use. A permanent reroute of the foredune road would be ideal.

Bandon:

- Continue predator management to control fox and corvid populations.
- Continue to improve and maintain the habitat restoration area north of Twomile Creek.

- Sign and rope the habitat management area near to the mouth of Twomile Creek/New River before the nesting season.
- State Parks should continue to work with the administration of the Christian Camp to help explain the wet and dry sand restrictions to the public.
- All law enforcement agencies should again be informed as to the status of the vehicle regulations on the beach.
- Maintain enforcement of restricted areas and leash laws for dogs. Monitor hiker use from Bandon to Blacklock Point, and check the 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.
- Continue to 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:

- Continue to monitor the site for any plover activity.
- Continue to implement an adaptive management approach between the BLM and Curry Co. Engage local private landowners to cooperate with plover management in the area north of the county land.
- 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.