

The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast - 2002

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Abstract

From 26 March – 24 September 2002, 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, North Siuslaw, Siltcoos River estuary to the Dunes Overlook and south to Tahkenitch Creek, Tenmile Creek, Coos Bay North Spit, Bandon Beach, and south from the mouth of New River to Floras Lake. Volunteers monitored Necanicum for plover activity where a nest successfully hatched this year but the brood failed. During the annual winter survey in 2002 a group of plovers was found at a new location, north of the north jetty of the Siuslaw River. Surveys were conducted in spring 2002 at this location and plovers were found using the area early in the nesting season; a nest was located but was unsuccessful. Our objectives were to: 1) estimate the population size of the adult Snowy Plovers, 2) locate plover nests, 3) erect predator exclosures around nests, 4) determine nest success, 5) determine fledgling success, 6) monitor and document brood movements and 7) collect general observational data regarding predators.

We observed an estimated 99-102 adult Snowy Plovers; a minimum of 80 individuals was known to have nested. Indices of abundance indicated that the coastal population of Snowy Plovers in 2002 was the same or slightly lower compared to 2001. Mayfield nest success was 38% (n=89). Exclosed nests (n=56) experienced 67% success while unexclosed nests (n=33) had a 14% success rate. Nest success in 2002 was the same as in 2001 for exclosed nests and was consistent with the 10-year mean of 66.8%. Nest success for unexclosed nests in 2002 was slightly lower compared to the 10-year mean of 17.3%. Nest failures were attributed to unknown depredation (22%), wind and weather (18%), abandonment (18%), corvid depredation (14%), predation of an adult plover (10%), unknown cause (10%), infertile eggs (4%), and Red Fox (*Vulpes vulpes*) and avian depredation (2% each). We monitored 40 broods, including one from an unknown nest, and documented 31 fledglings. Fledgling success was 32%, slightly lower than the average success rate for 1990-2001 (38%). A single egg within 24 hours of hatching was removed from an abandoned nest at New River. It hatched in captivity and was reared by the Newport Aquarium staff. When the chick reached appropriate weight and was capable of flight it was released at New River.

The plover population on the Oregon coast will require a doubling of the population to reach recovery goals and have sustained annual productivity for at least five years. To achieve recovery, continued management actions should include increased predator control efforts, habitat improvement and maintenance, and management of recreational activities to increase nesting and fledgling success rates.

TABLE OF CONTENTS

ABSTRACT	i
INTRODUCTION	1
STUDY AREA	1
METHODS	1
RESULTS	4
Abundance and Distribution	4
Nest Activity	5
Nest Success.....	7
Nest Exclosures.....	7
Nest Failure	8
Fledging Success.....	10
Captive Reared Chick	10
Brood Movements.....	11
Activity Patterns on HRA's	11
2001 Hatch-Year Returns	11
Sightings of Snowy Plovers Banded Elsewhere	11
Corvid Observations	12
DISCUSSION	12
Captive Reared Chick	14
Habitat Restoration and Development Projects	15
RECOMMENDATIONS	16
Signing of Restricted Areas	16
General Recommendations	16
ACKNOWLEDGMENTS	18
LITERATURE CITED	18
TABLES 1-14	21-34
FIGURES 1-14.....	35-48
APPENDIX A. Study Area.....	49
APPENDIX B. Site Specific Recommendations	50
APPENDIX C. Summary of Corvid Observations	53

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, disturbance, and predation pressures 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 13th year of monitoring the distribution, abundance, and productivity of Snowy Plovers found along the Oregon coast during the breeding season. We continue to focus our efforts on placing predator deterrent exclosures around nests as a means of reducing egg depredation with the expectation that increased annual productivity will lead to increases in the overall breeding population in Oregon. Over the past five years we have begun to gather observational data related to the predator populations at each site to recommend where predator management will have the most effective positive impact for the plovers. Based on observations and data gathered since the inception of the project, we continually evaluate, and when necessary, modify our methods. Previous work and results have been summarized in annual reports (Stern et al. 1990, 1991, 2000, Craig et al. 1992, Casler et al. 1993, Hallett et al. 1994, 1995, Estelle et al. 1997, and Castelein et al. 1997, 1998, 2000a, 2000b, and 2001). We continued with these efforts in 2002; our objectives for the Oregon coastal population this year were to: 1) estimate the size of the adult Snowy Plover population, 2) locate plover nests, 3) erect predator exclosures around nests, 4) determine nest success, 5) determine fledgling success, 6) monitor and record brood movements, and 7) collect general observational data about predators. These results 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, North Siuslaw, Siltcoos River estuary to the Dunes Overlook and south to Tahkenitch Creek, Tenmile Creek, Coos Bay North Spit, Bandon Beach, and south from the mouth of New River to Floras Lake (Fig. 1-10). A description of each site occurs in Appendix A. We also visited Bayocean Spit early in the season and the Necanicum Spit was monitored by volunteers.

Methods

In March 2002, pre-breeding season surveys of historical nesting areas were completed. State and Federal agency personnel and various other individuals surveyed sites between Bayocean Spit south to Pistol River. The surveys were implemented in an attempt to locate any prospecting plovers at locations not known as currently active nesting sites.

Breeding season fieldwork was completed from 26 March to 24 September 2002. Surveys were completed on foot or from an all-terrain vehicle (ATV). For each survey we recorded the combination of any banded individual. The amount of time to complete the survey and weather conditions was also noted. We surveyed each site weekly or biweekly, and additional visits were made to check nests, band chicks, or monitor broods.

We located nests using methods described by Page et al. (1985) and Stern et al. (1990). We defined a nest as a nest bowl or scrape with eggs or tangible evidence of eggs in the bowl, i.e. egg shells. We predicted hatching dates by floating eggs (Westerkov 1950) using a floatation schedule developed by staff at Point Reyes Bird Observatory (pers. comm. Gary Page). We defined a successful nest as one that hatched at least one egg. A failed nest was one where we found buried or abandoned eggs, infertile eggs, signs of depredation (e.g. mammalian or avian tracks, eggshell remains not typical of hatched eggs, or nest cup disturbance) or where eggs had disappeared prior to the expected hatch date. In a few instances we found nests with only one egg; often there was no indication of incubation or nest defense and it was uncertain whether the nest was abandoned, or simply had a “dropped” egg. Because it was difficult to make this determination, we considered all one egg clutches as nest attempts, and classified them as abandoned when there was no indication of incubation or nest defense.

Evidence indicates that predators, particularly American Crows (*Corvus brachyrhynchos*), are occasionally able to enter exclosures and depredate the eggs. We have also documented depredation of adult plovers in and around exclosures (Castelein et al. 2000b and Castelein et al. 2001). We continue to refine management methods in an attempt to reduce risks to both the adults and the eggs associated with exclosed nests. As in 2001 and in accordance with the procedures used in California, to avoid depredation of nesting plovers around exclosures by migrating raptors, specifically Merlins (*Falco columbarius*), exclosures are not set up until 15 May, when peak raptor migration has passed. In the past few nesting seasons various materials have been added to the standard exclosure design in attempts to prevent predators from entering exclosures (Castelein et al. 2000b, Castelein et al. 2001). Two minor alterations were made to the exclosures during the 2002 nesting season compared to previous years. Slight modifications were made to the “hot-wire” system (Castelein et al. 2001). The wire that leads from the field charger inside the buried plastic container was changed to a fully insulated wire to reduce arcing problems and the plastic clips used to hold the wire on the wooden post was changed from yellow to black to make them less conspicuous. Two by four fencing was used for some exclosures for the first time instead of 2x2 fencing. A potential advantage of 2x4 fencing is to allow the plovers a quicker opportunity to enter or exit an exclosure. We continued to use the PVC pipe/cord lock and string method based on a design developed by Doug George (Point Reyes Bird Observatory) and our traditional hand strung method.

In order to better understand the behaviors of avian predators we had field staff observe from a hidden location in the foredune corvid activity at and around nest sites. Base line data was recorded including what predators were observed, what they did, how much time they spent doing an individual behavior, and how plovers responded to their

presence. The amount of time the observer spent in a particular location was also recorded, as was the date, weather, and any other pertinent information.

Male Snowy Plovers typically rear their broods until fledging. In order to track the broods we banded the nesting adult male and each hatch-year bird with both a USFWS aluminum band and a combination of colored plastic bands. We used an oblong walk-in funnel-trap placed over the nest or chicks to catch adult birds for banding. We monitored broods and recorded brood activity or males exhibiting broody behavior at each site. We attempted to note brood locations approximately two times per week 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 2002 by determining the number of uniquely color-banded adult Snowy Plovers observed during the breeding season, and added to that number our estimate of the number of unbanded Snowy Plovers that were also present. We estimated the number of unbanded Snowy Plovers by determining the number of unbanded plovers observed at each site within ten-day intervals during May, June and the first week of July. These time periods, as determined in past years, represent the periods of maximum nesting effort, maximum breeding population, and are also when there are relatively few movements of plovers between nesting sites. For each 10-day interval we then subtracted the number of adults that were subsequently banded during the breeding season and then selected the 10-day interval that had the highest remaining count of unbanded plovers. This provided us with an estimate of the number of unbanded plovers found at these sites during the breeding season. There are several potential flaws in this method, such as underestimating the number of unbanded plovers because not all plovers are recorded on every survey. Conversely there is potential to overestimate the number of unbanded plovers because plovers can and will move between sites within a 10-day period of time. To assess our estimate we also analyzed our daily observations of all unbanded plovers at each site. We tracked all the dates of unbanded plovers during the breeding season, which permitted us to observe where each unbanded plover was over time, if they had a nest, when they potentially moved from a particular site, and if and when they were subsequently banded. We determined a minimum and maximum number of unbanded plovers using this method and compared it to the previous method.

We calculated nest success using apparent nest success (number of successful nests divided by the total number of nests) and the Mayfield method of nest success (Mayfield 1961, Mayfield 1975). The Mayfield method is used because it describes the probability of nest success on a per day basis, thus eliminating any bias associated with the age of the nest when found; e.g. a nest found on day two of incubation has a different likelihood of hatching than one found on day 27. The strength of the Mayfield method is that the probability of nest success is calculated on a per day basis, and when mortality is assumed to be constant during the incubation period, nest success can be calculated for the entire period.

We evaluated the activity patterns of plovers on the three main habitat restoration/management areas: the Overlook, the HRA's at CBNS, 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

During the 2002 breeding season, we observed an estimated 99-102 adult Snowy Plovers at breeding sites along the Oregon coast in 2002 (Table 1). Of 99-102 plovers, 95 were banded. We estimated there were 6 unbanded adult plovers based on the number of unbanded plovers accounted for during the 10-day interval. The alternative evaluation of estimating unbanded plovers determined a minimum of 4 unbanded plovers and a maximum of 7 unbanded plovers were present. Using the latter method of estimating unbanded plovers, we observed 47 banded females, 45 banded males, 3 banded but uncertain sex, 3-5 unbanded females, and 1-2 unbanded males.

The mean number of plovers recorded at each site this nesting season ranged from zero at Bay Beach-CBNS to 9.79 at New River (Table 2). Other sites with high mean number of plovers were 94HRA at Coos Bay North Spit (7.28) and North Tahkenitch (7.22). Compared to the 2001-nesting season, noteworthy increases were observed at North Tenmile and the 94HRA at Coos Bay North Spit. North Tenmile had 0.48 plovers per survey in 2001 compared to 2.50 in 2002. At Coos Bay North Spit the 94HRA had 4.48 plovers per survey in 2001 compared to 7.28 in 2002. Three sites had slight increases: South Siltcoos had a mean of 4.59 plovers per survey compared to 5.37 in 2002. South Tenmile had a mean of 4.25 plovers per survey in 2001 compared to 5.96 in 2002. Floras Lake had a mean of 0.33 plovers per survey in 2001 compared to 1.06 in 2002.

Several of the study sites had notable decreases including Sutton, North Siltcoos, Overlook, 95/98WHRA and 98EHRA at Coos Bay North Spit and Bandon Beach. Sutton had a mean of 11.37 in 2001 compared to 3.65 in 2002. North Siltcoos in 2001 had a mean of 3.69 plovers per survey compared to 1.24 in 2002. We divided Overlook into a north and south area for the 2002-nesting season compared to the previous nesting seasons; in 2001 the mean was 4.33 compared to 2002 when the north area had a mean of 1.90 and the south area had a mean of 0.96. At Coos Bay North Spit the 95/98WHRA had a mean of 2.50 plovers per survey in 2001 compared to 0.36 in 2002; the 98EHRA had a mean of 1.55 in 2001 compared to 0.25 in 2002. Bandon Beach had a mean of 3.70 in 2001 compared to 2.19 in 2002.

Nest Activity

We located 89 nests during the 2002-nesting season (Table 3). This total includes a nest found at Necanicum and a nest found at North Siuslaw. All historical nesting locations for Snowy Plovers on the Oregon coast were surveyed during the March pre-breeding season census. The only location where plovers were observed other than currently known nesting areas was at the beach on the north side of the Siuslaw jetty. Previously, nine plovers had been noted here during the winter survey in January 2002. We monitored this site and found a nest here in early May, the first known nest for this area; the nest was depredated the following day. In early May volunteers for USFWS found an active nest at Necanicum and monitored the unexclosed nest through May. The nest hatched, but the brood failed quickly. The unbanded male was never observed with chicks, nor was a male seen at the beach once the nest hatched. Subsequently no plovers were observed here for the remainder of the season but the banded female was observed with an unbanded male at Leadbetter Point within two weeks of the hatch date (pers. comm. from USFWS personnel in WA).

The number of nests found at Sutton decreased substantially between 2001 (15) and 2002 (3). Two of the nests were on the north spit of Sutton Creek and one nest was by Berry Creek. No nests were located in the areas between the Baker Beach and Holman Vista access points.

A total of 10 nests were found at Siltcoos in the 2002 nesting season, all on the south side of the estuary. The number of nests located during the 2002 nesting season was less than 2001 (14) and continues to decline from the peak numbers of 2000 (22) and 1999 (21). No nests were found on the North Spit of the Siltcoos River for the second consecutive year. Nest locations were similar to the 2001-nesting season with nests on the open spit and south in the partially open sandy areas with clumps of scattered vegetation closer to the foredune.

At the Dunes Overlook we found eight nests compared to 15 nests in 2001. Five of the nests were found on the northern section and three of the nests were found on the southern portion. Ropes needed to be moved when one nest on the north side was found west of the roped area and another nest on the south side was found very close to the ropes.

Nesting attempts at Tahkenitch increased for the second consecutive year: 15 nests were found in 2002 compared to 13 nests in 2001 and five nests in 2000. Eight nests were found on the north side and seven nests were found on the south side. This is the second highest year since data collection began.

Twelve nests, the most ever, were found at Tenmile during the 2002-nesting season. Three nests were found on the north side along the foredune edge or on the open spit and nine nests were found on the south side of the creek, scattered throughout the management area. One of the nests was found at the extreme south end of the nesting habitat near the southern most opening in the foredune.

At the Coos Bay North Spit 19 nests were found in the 2002-nesting season compared to 17 in the 2001-nesting season. On the 94HRA in 2002 we found 10 nests compared to five nests in 2001. In the 2001 nesting season plovers initially used the 94HRA for nesting, but after corvid depredation caused nests to fail, the plovers spread out onto the adjacent HRA's. In 2002 the plovers did not have excessive early failures and the plovers remained on the 94HRA throughout the nesting period. Two nests were located on the 95HRA and three nests were located on the 98EHRA. Two nests were found on the South Spoil and two on South Beach.

Five nests were found in the 2002 nesting season at Bandon Beach compared to six nests in 2001. Two nests were found in the 2002-nesting season in the China Creek overwash, the same as in 2001. The three other nests found were between the Christian Camp access point and the motorized vehicle closure sign. Most of the plover activity was at the northern half of the beach, and no nests were found at the south end of the beach including the habitat cleared in the winter near the Twomile Creek/New River estuary.

Fourteen nests were found at New River this year compared to 23 nests in 2001. Early in the nesting season the nesting activity was on the BLM managed habitat adjacent to Storm Ranch. Later nests were mostly on the spit and county land at the north end of the overwashes. Seven of the nests were found on the BLM managed habitat, one nest was found in an overwash on private land, three nests were on the riverside east of the dunes on county land and three nests were on the spit on both county and state lands. The overwashes on private land are filling in with European beachgrass, reducing the available nesting habitat and thus reducing nesting attempts.

One nest was found at Floras Lake in the 2002-nesting season in the closed section of beach near the southern boundary. The pair that nested there made two nest attempts at New River that failed then moved south to Floras Lake. The male of this nest is a thirteen-year-old male that was initially banded at Floras Lake and has a history of nesting at Floras Lake. The nest hatched, but the brood failed within the first week. The male moved back to New River for a final nest attempt. No nests were located at the Floras Creek/New River Overwash area.

The first known nest initiation in the 2002-nesting season began on 26 March, earlier than in 2001 which began on 5 April. The last nest initiation occurred on 26 July, 12 days later than 2001. The last successful nest hatched on 23 August, also 12 days later than 2001. The maximum number of active nests during 10-day intervals was 10 June-29 June (Fig. 10).

Approximately 80% of the adults (80/99-102) were known to have made a nesting attempt during the 2002 breeding season. This is slightly higher than the mean for 1995-2000 (76%). Of the nesting adults in 2002, 42 were female (39 banded, 3 unbanded), and 38 were male (37 banded, 1 unbanded).

Nest Success

The overall Mayfield nest success in 2002 was 38%, which is slightly below the 13 year mean of 42% (Table 4). The estimated Mayfield nest success for exclosed nests in 2002 was the same as 2001, 67%, equal to the 12-year mean. Unexclosed nests continue to have a much lower Mayfield nest success, 14% in 2002, slightly lower than the 12-year mean (17%).

Figure 11 shows the 2002 nest success and Figure 12 shows the 1990 – 2002 average nest success. Annual nest success rates continue to be low at some sites. At Sutton and Bandon Beach no nests hatched in the 2002-nesting season (3 and 5 nests respectively). At North Tenmile the three nests discovered did not hatch but one undiscovered nest did hatch. South Siltcoos also continues to have low nest success; three of 10 (30%) nests hatched in 2002. At Tahkenitch in 2002, seven of 15 (47%) nests hatched. At Coos Bay North Spit, the habitat restoration areas, where most of the nesting occurs, had six of 15 (40%) nests hatch in 2002 and five of 13 (38%) nests hatched in 2001. At New River eight of 14 nests hatched (57%) compared to only nine of 23 in 2001 (39%). Nest success at Overlook improved in 2002 (63%, 4/15, compared to 27%, 5/8, in 2001, both sites combined), and remains relatively high at South Tenmile (67%, 6/9).

Nest Exclosures

We used the same 48-foot perimeter square exclosure design as we have in previous nesting seasons. Forty-two of the nests had 2x2 fencing and 14 of the nests had 2x4 fencing. The PVC/cord lock design we began to use in the 2000-nesting season was again used this season. Hot wires were used on 18 of 20 nests at Siltcoos, Overlook and Tahkenitch (Table 14). Various stringing methods were used on a nest-by-nest basis, similar to the concepts for the 2001-nesting season (Castelein et al. 2001).

Exclosures were placed around 56 of the 89 nests found in 2002 (Table 5). With the continued use of exclosures we annually evaluate and explore ideas to deter predators from entering the exclosures. Three exclosures were entered during the 2002-nesting season by predators at two different sites. Eggs were depredated at an exclosed nest at North Tenmile by an unknown predator. At Coos Bay North Spit one adult was killed inside an exclosure and at another exclosed nest the chicks or hatching eggs were depredated. In both cases it appeared to be the same type of predator by the evidence of the predator tracks inside each exclosure.

Thirty-four of the 56-exclosures had the PVC pipe/cord lock design used on top. The remaining 22-exclosures had the traditional hand strung/tied knots set up on top of the exclosure. Eighteen of the 34 exclosures with the PVC design had hot wires on top; of these nests 13 had 2x2 fencing and three had 2x4 fencing. Of the 18 hot-wired nests, 15 hatched (83%, Table 14). The three nests that were hot-wired but were unsuccessful failed due to abandonment (1) and wind blown sand (2). Eighteen of the exclosures that had the traditional tied string method on were single strung; of those 12

had 2x2 fencing and six had 2x4 fencing. The four remaining hand strung exclosures were double strung and all four had 2x4 fencing. Some of the exclosures had perpendicular string added on top and some did not. Depending on the site and the particular location at that site we determined what would be the most effective exclosure set up.

Nest Failure

Our population estimate of 99-102 adult Snowy Plovers includes six banded adult plovers that were initially present and nesting but were apparently depredated by predators during the breeding season. At Coos Bay North Spit an avian predator entered two exclosures. One exclosure had evidence that an adult was killed. The nest still had all three eggs inside the exclosure with adult plover body and wing feathers. Body feathers were found with a small amount of blood and sand stuck on the top edge of the exclosure fence. It appeared the avian predator perched on the exclosure with the dead plover. Avian foot tracks were inside the exclosure, in and around the nest bowl, and next to a clump of sand stuck together with dried blood. We believe these were not crow depredations due to the size of the footprint inside the exclosure and the nature of the depredation. The day we found evidence indicating this adult had been depredated inside the exclosure we also found the remains of a skunk depredated on the South Spoil. Avian predator tracks were around the remains of the skunk that were within 30 meters of an active exclosed nest. The skunk remains led us to question if it was possibly a Great Horned Owl (*Bubo virginianus*). In previous nesting seasons Great Horned Owls have been occasionally observed on Coos Bay North Spit around the Snowy Plover nesting sites. The avian predator tracks inside the exclosure and by the skunk remains looked very similar. The evidence around the exclosure looked very similar to the depredation of an adult in the 2001-nesting season on the 98EHRA (Castelein et al. 2001).

The second exclosure entered in the 2002-nesting season by an avian predator appeared to have had the eggs or chicks depredated, but not the adults. We had checked the nest in the evening and found all three eggs with large pip holes and the chicks were cheeping. The following morning the male was near the exclosure but did not exhibit any brood like behavior. We found avian predator tracks inside the exclosure, similar to the tracks observed in the exclosure in which the adult was killed. It was possible the chicks may have been vocal at night, attracting attention to the nest. We were unsure if the eggs were eaten or some of the eggs hatched. When this second exclosure was entered a breast feather of what we believed to be an owl was found on the fence of the 94HRA. It was sent to the USFWS forensic lab in Ashland, OR and confirmed to be from a Great Horned Owl.

Five other adult plovers associated with nests disappeared during their nesting process and were not observed again for the remainder of the nesting season. All but one of the nests failed and the evidence suggests the adults were depredated. The one nest that did hatch had a longer incubation period than normal and the female reared the young. The male was not observed during the banding process nor was he observed for the remainder of the nesting season. Four other adult plovers disappeared during the

breeding season and were not observed for the remainder year. All these plovers had some history of nesting in previous seasons in Oregon and none were noted outside of Oregon at other breeding locations in 2002. We believe these plovers were depredated. None of these plovers were associated with exclosed nests and therefore we believe that the depredations were natural mortalities.

Exclosed nests in 2002 had a 34% (19 of 56) failure rate, compared to 32% (18 of 57) in 2001, 52% (41 of 79) in 2000, and 36% (25 of 69) in 1999. Unexclosed nests continue to experience a very high rate of nest failure: 31 of 33 in 2002, 54 of 54 in 2001, and 21 of 21 in 2000. Overall nest failures were attributed to unknown depredation (22%), wind/weather (18%), abandonment (18%), corvid depredation (14%), depredation of an adult plover by an unknown predator (10%), unknown cause (10%), infertile (4%), and Red Fox and avian depredation (2% each) (Tables 6 and 7). No nests were lost this season due to overwashing. The main cause of nest failure of exclosed nests was wind blown sand (32%) and depredation of an adult plover (26%). Other causes of exclosed nest failure were unknown cause and infertility (11% in both cases), and abandonment, avian depredation, unknown depredation and weather (5%). The main cause of failure for unexclosed nests was depredation of eggs by predators (61%); unknown predators(32%); corvids (23%); fox(3%); avian predator (3%).

Unknown depredation accounted for the highest loss of nests (22%) in the 2002-nesting season. One of the 11 nests was exclosed. The remaining 10 nests had no evidence around the nests bowl or tracks were so faded it was not possible to determine what depredated the eggs. Wind/weather and abandonment each accounted for 18% of the failed nests in 2002. In the case of the abandoned nests eight of the nine were one-egg nests that never had a second egg laid.

Corvid depredation accounted for 14% of the nests failing. All seven nests were unexclosed; four of these nests were depredated before mid May when exclosure use was implemented.

Five nests failed due to adult plover depredation by an unknown predator (10% of the nests), three of these occurring at Coos Bay North Spit. Unknown cause also accounted for 10% of the nests failing.

Infertility caused the failure of two nests (4%). In each case at least one adult of the pair has a history of infertile eggs. These two adults, one female and one male, are related; the female is the granddaughter of the male.

Red Fox and avian depredation caused the failure of one nest each in the 2002-nesting season (2%). The fox depredation occurred at New River at an unexclosed nest. The avian depredation was at Coos Bay North Spit of an exclosed nest on the day of hatching.

Fledgling Success

Forty broods were monitored in 2002. One of the broods was from an undiscovered nest; the chicks were observed when they were at the fledgling stage. Forty broods are similar to the previous two nesting seasons: 39 broods were monitored in 2001 and 40 broods in 2000. The total number of fledglings confirmed in 2002 was 31 compared to 32 in 2001, 43 in 2000 and 53 in 1999 (Table 8). Fledgling success was lower than the previous three nesting seasons: 29% in 2002, 34% in 2001, 41% in 2000 and 43% in 1999 (Table 9). Less than one chick (0.78) fledged per brood during the 2002-nesting season. North Tenmile had a 100% fledgling success rate from an undiscovered nest; one male fledged three young. South Tahkenitch had a fledgling success rate of 56% from three broods. At Coos Bay North Spit, the South Spoil had a success rate of 67% and the success rate for both South Beach and the Habitat Restoration Areas was 50%. All other sites had fledgling success rate of less than 36% (Table 10).

South Siltcoos had eight chicks hatch from ten nests but no chicks fledged. Two chicks fledged at Overlook from a total of five broods from the north and south sides combined. North Tahkenitch had four broods but only one known fledgling, while the south side had one less brood yet produced five fledglings. South Tenmile had 14 eggs hatch and only three fledged. Coos Bay North Spit continues to produce the highest number of fledglings: 11 fledglings total. Bandon had five nests; no chicks hatched and therefore no fledglings were produced. New River had the same number of broods as Coos Bay North Spit but only produced six fledglings.

Captive Reared Chick

On 15 July we visited a nest on the HRA at New River and banded two hatched chicks. Both adults were present. The third egg was pipped and the chick was cheeping inside. We left the area after banding the chicks. On 16 July we returned during a routine survey and found the third egg still present with the chick still alive inside. Both banded chicks and adults were gone and were not noted anywhere in the vicinity of the nest. This particular nest enclosure had many predator tracks around it including Common Raven (*Corvus corax*), Red Fox, and weasel (*Mustela sp.*). We were reluctant to leave the egg behind, and knowing we had potential other nests that were imminently hatching, we made the decision to take the egg with the idea of placing it into another nest. Unfortunately none of the other nests that were potentially hatching were ready, and the chick hatched in captivity. A call was made to USFWS to seek input as to what should become of the chick, and it was decided upon consultation with the Newport Aquarium that an attempt would be made to raise the chick in captivity. The chick was transferred to USFWS personnel and brought to the Aquarium.

The Newport Aquarium staff consulted with Monterey Aquarium (CA) staff who had experience raising captive plover chicks. The chick did well in captivity, gained normal weight, and developed feathers normally. When the chick reached about 40 days old, the weight was normal for that age, and the chick exhibited normal flight behavior,

the Aquarium staff and USFWS personnel brought the chick back to the New River area. With ONHP personnel, the chick was released near the mouth of New River in the vicinity of a large post breeding flock of plovers. The chick was banded with a unique color combination. The chick was then noted on several surveys through early September. The chick was noted feeding normally and appeared to exhibit normal behavior, including roosting within vicinity of other plovers.

Brood Movements

Overall patterns of brood movements along coastal Oregon beaches are similar to what we have observed in past years. Males (or rarely females) with broods remained close to their nest location or moved to mouths of estuaries or traveled long distances north or south on the beach. At Coos Bay North Spit males moved their chicks around on the different habitat management areas but mainly used the 94HRA. Many completed their entire rearing process on the management areas, and would eventually bring their fledglings west onto the beach. Multiple broods were observed on the beach at a single time this nesting season. In some cases they moved east to west from the management areas to the beach several times in the brooding process. At New River where some overwashes are still open males with broods moved between the beach, the overwashes and east to the riverside. North site broods were seen in nesting areas as well as feeding on the beach adjacent to nesting areas. At South Tahkenitch broods also moved south of the nesting area along the beach. Once fledged, some chicks were noted at various other nesting locations.

Activity Patterns on HRA's

Table 11 shows the activity patterns of plovers on the three main habitat restoration areas: the Overlook, the HRA's at CBNS, 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.

2001 Hatch-Year Returns

Eighteen of the 32 hatch-year 2001 plovers returned to Oregon this year. The return rate was 58%, comparable to the 53% return rate of 2001 and higher than the average return rate of 48.5% (Table 13). Of the returning 2001 hatch-year birds, nine were female and nine were male (Table 12). Eighty-three percent of the returning '01HY birds nested, and they accounted for 19% of the banded adults.

Sightings of Snowy Plovers Banded Elsewhere

Eight plovers banded in California were observed in Oregon in 2002. Six were females and two were males. Four of the females originally hatched in Oregon and were subsequently rebanded at nest sites in California. Five of the plovers, one male and four females, attempted to nest in Oregon; two of the females were originally hatched in

Oregon. Each of these five individuals made one or two nest attempts; of the eight nest attempts three hatched and one fledgling was produced.

Two females and two males were Humboldt Co., CA hatch year birds. One of the two females made two nest attempts and the other nested once. One of the two males made two nest attempts. The second male was only observed on two separate occasions on two different beaches and was not observed for more than one survey.

Corvid Observations

The results of the corvid observational work are summarized in Appendix C. We were only able to gather data on a limited number of days and generally from mid-morning to mid-afternoon. Corvids provide one of the most challenging aspects of predator management, and a better understanding of their behaviors and patterns of usage will result in better success of predator management techniques.

Discussion

The population of adult plovers along the Oregon coast continues to remain relatively static for the past five years (Table 1). Hatch year return rates are relatively high, but since overall numbers of fledglings are not very high, the actual number of surviving hatch year plovers is not substantial (Table 13). The increase in the population from surviving hatch year plovers is being offset by adult mortalities in both winter and the breeding season.

Initial numbers of nests were below average until late April (Fig. 10). Early season nest attempts have high rates of failure because they are not exclosed and unexclosed nests have very poor nest success rates (Table 4). Fewer early season nest attempts and failures helped contribute to higher overall nest success than in 2001.

Exclosed nests continue to enhance nest success (Table 4). Hot-wired exclosures had a very high nest success rate (83%) and none failed to depredation by corvids. However, there was no true control at these sites (of the three nests without hot wires, all failed quickly due to wind blown sand or abandonment) and we did not witness any corvids attempting to perch on or enter an exclosure. At New River where corvids have entered exclosures in past years, no hot-wires were used and corvids did not enter any exclosures in 2002. The data suggests that the hot-wire system may be working, however it is unclear if corvids were actually deterred by the hot-wire system or whether corvids made no attempts to enter exclosures this year. The use of the hot wire system requires more time spent around an individual exclosure and should be considered a temporary solution to deter avian predators. We can improve hatch success rates through the use of exclosures and hot wires but not fledgling success rates. Predator control measures will ultimately be the best solution, as they will not only help to improve nest success but also fledgling success.

Evidence indicates that depredation of adult plovers continues around exclosed nests but also is occurring away from exclosures or at unexclosed nests. Some mortalities may be associated with migrating raptors such as Merlins. Great Horned Owls apparently caused mortality of adult plovers around exclosures at Coos Bay North Spit. In California, at some sites where nocturnal avian predators are believed to be a problem exclosures are no longer erected around nests (G. Page, pers. comm.). We recommend that Wildlife Services make a concerted effort to remove the owls from CBNS before the nesting season starts. If the owls are not captured and removed, we recommend that the risks associated with the use of exclosures at CBNS be carefully considered prior to continued use of exclosures at this site. Coos Bay continues to be the most productive site on the coast but also continues to have the highest adult mortality associated with exclosures. In the long term, we believe the best scenario would be implementation of an effective predator control program so that use of exclosures would be unnecessary. Overall exclosure use should be reduced to a minimum or eliminated at sites with adequate predator control measures. Reduction of predator populations around nesting areas should result in higher nesting success and brood success.

Overall fledgling success in 2002 was below the 12-year mean (Table 9) and the number of fledglings produced per male was less than one, which is below recovery plan goals. The reasons for poor fledgling success remain elusive due to the difficulty in determining why broods fail, but we suspect the main cause is depredation. More remote sites (Coos Bay North Spit, Tenmile, Tahkenitch) tend to have better productivity while some sites that have poor success rates (Siltcoos, Bandon, Floras Lake) often have higher recreational activities and may have high predator numbers associated with recreational facilities. To reach a sustainable population fledgling success needs to improve. Additional predator control at all sites would hopefully result in higher fledgling success rates.

Habitat rehabilitation and maintenance continues to be a very important aspect of plover management. Plovers continue to extensively use the habitat restoration areas (Table 11). An advantage of HRA's is it gives the plovers an area to nest and brood away from the open beach where recreational activities occur. It also gives them places to nest away from areas that accrete sand and potentially bury nests. However, it is important to maintain openings in the foredune to permit broods access to the beach where food tends to be highest in quantity and quality (Tucker and Powell 1999). Since recreational activity and wind is lowest in the morning, openings in the foredune permit broods to access the beach at this time and then retreat onto the HRA's later in the morning.

Habitat management work proposed at Sutton by the USFS is scheduled to begin during the winter of 2002/2003. This work will hopefully alleviate some of the problems the plovers have with steady and strong sustained winds at this site by creating a nesting area behind the foredune where wind should be less severe. Improved habitat at Overlook and Tahkenitch may attract plovers to nest at these sites which tend to have less recreational disturbance than Siltcoos and are further away from campgrounds which tend to have high numbers of corvids and other predators (such as cats). Continued

habitat management at Tenmile and New River will also hopefully attract plovers to areas that are more remote and tend to have less disturbance. However, predator control at these sites will be very important to help increase nest and fledgling success rates.

Disturbance of plovers caused by recreational activities on the beach continues to be a concern, particularly at certain sites. Management agencies continue to improve efforts to limit disturbance, such as the closure of the Estuary Trail at Siltcoos, improvements and maintenance of ropes and signs at many sites, and overall educational efforts. Disturbance from recreational activities continues to need annual adjustments and adaptive approaches, and management of disturbance requires support from law enforcement.

At New River, recreational activities from the Coos County access point from Lower Fourmile Road continued to be a management challenge. OHV access from the county land continues to be a problem but it did not appear to be as regular as it has been in the past. Due to discussions with State Parks, county parks manager and law enforcement, ATV and motorcycle activity declined after the gate was locked near the entrance of the county land at the end of Lower Fourmile Road. More education of non-motorized vehicle users is needed at this site as we had several problems with people walking up to exclosures and removing signs and ropes that were erected to help keep recreational activities away from nesting plovers. We recommend continued cooperation with county officials to further manage recreational activities in this area. In addition, more development is occurring on the east side of the river at Roaring Surf Estates with property being cleared and development occurring. In order for the landowners to understand what our objectives are they need to be informed of plover and management activity.

Captive Reared Chick

It was encouraging that the Newport Aquarium staff was able to make the time to raise the chick brought into captivity especially under short notice and with limited resources. In addition it was also encouraging to see the plover apparently behaving normally after its release. Captive rearing programs can potentially increase the number of chicks raised to adulthood and help to increase the population over a short period of time. However, captive rearing programs do nothing to address the problems plovers face in the wild. Chicks raised in captivity will still face the same predator pressure, loss of habitat, and recreational pressures that wild plovers face. While they may increase the number of plovers on the landscape, there is no guarantee that they will successfully breed and contribute to an overall increase in plover numbers. Captive rearing programs are also costly and time consuming and may not be the best management tool to spend limited funding on.

Habitat Restoration and Development Projects

The USFS mechanically treated five acres of European beachgrass at South Siltcoos in the winter of 2001-2002. An additional 10 acres were treated with herbicide in September of 2002.

At the Overlook, the USFS mechanically treated 40 acres of habitat on both the north and south clearing. No new habitat was cleared.

The USFS mechanically treated 25 acres at South Tenmile that was severely overgrown with beachgrass. Openings were created where the remnants of overwash mouths were beginning to fill in.

At CBNS the BLM continued the annual disking of the 94,95/98W and 98E habitat restoration areas. The 94HRA and the 95/98W HRA were disked twice. The 98E HRA was disked once in winter 2001. Beachgrass and sand was removed from the west and north sides of the fence around the 94 HRA where grass growth was causing the accretion and build up of sand. Several small patches of vegetation were taken out of the vegetated wall growing on the west side of the foredune road. One small opening was also created on the south side of the 98 E HRA vegetation wall.

Five acres of habitat were opened up and cleared at the south end of Bandon Beach by the Twomile Creek/New River estuary in/and north of the overwashes.

The habitat restoration project continued during the fall of 2001 at New River along the stretch of beach adjacent to the Storm Ranch boat launch and south. The original northern overwashes where the management work began were hand picked and scalped slightly. The difference was visible between overwashes that had several years of restoration work completed on them compared to an area with one year of work. Less beachgrass was sprouting and less root material was visible in the overwashes with three years of work. The habitat being restored for the first time was south of the area adjacent to the BLM boat launch. The area was cleared of vegetation and woody debris with a bulldozer. An additional 64 acres of habitat was added to the already existing habitat. The vegetation was removed but the existing rolling dunes were not flattened and the hilly topography was left in place. The mouths of overwashes were lowered to allow ocean water from winter storms and high tides to enter the overwashes. It was a mild winter therefore we did not have much winter storm activity. Some of the overwashes experienced a minimal amount of overwashing. Additional restoration work is being completed again this fall. The objectives are again to clear the habitat and lower the beach height in the overwashes to allow for natural storm activity to clear out debris and vegetation.

Recommendations

Signing of Restricted Areas

Signing and roping for the 2003-nesting season should again be implemented to inform the public of plover nesting habitat. Each season signs and symbolic fencing are erected to direct the public away from the nesting areas. Signing proves to be a challenging issue. It appears from public comment that some of the signing remains confusing. Continued refinement and alternative ideas may help alleviate some of the problems. To maximize the effectiveness of signs and ropes each site should continue to be evaluated at the end of each nesting season and ways to improve the signing and ropes for the next season should be considered. 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. Plover monitors can inform the different land agencies managing sites of any obvious maintenance needs at a particular site if problems arise. It is important that the signs are maintained to keep violations to a minimum.

General Recommendations

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

- Maintain, enhance and expand habitat management areas.
- Consider additional field staff to compensate for the continual annual expansion of habitat management areas.
- Continue the use of predator exclosures around nests after 15 May as a temporary solution; but ultimately move toward elimination of exclosures at all sites.
- Increase predator control at all sites; including sites where hot-wired exclosures are used as a predator control tool.
- 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.
- 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; including a video about plover biology and management to be used in schools and summer programs.
- Design informative/interactive presentations for school children.
- Consider a comprehensive study of both the mammalian and avian predators effecting plovers. The managing agencies should consider research projects of both American Crows and Common Ravens associated with plover coastal habitat to gain a better understanding of their behavior and movements relative to plover activities.
- Continue intensive breeding season monitoring, at least until plover numbers have reached the goals to be established in the USFWS Recovery Plan for Snowy Plovers.

- Consider employing a coastal regional coordinator for plover management to facilitate communication between all federal and state agencies.
- Consider allocation of funding to support further analysis and write up of 13-year data set (1990-2002).

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APPENDIX A. Study Area

The study area encompassed known nesting areas along the Oregon coast including Necanicum Spit, Clatsop Co., Bayocean Spit, Tillamook Co., and all sites between Berry Creek, Lane Co., and Floras Lake, Curry Co. (Fig. 1). Survey effort was concentrated at the following sites, listed from north to south:

Necanicum Spit, Clatsop Co.: the spit north of the mouth of the Necanicum River.

Bayocean Spit, Tillamook Co.: the beach from the south jetty of Tillamook Bay, south approximately three miles to the south end of the woods.

Sutton Beach, Lane Co.: the beach north of Berry Creek south to the mouth of Sutton Creek.

North Siuslaw, Lane Co.: the beach north of the north jetty of the Siuslaw River north to the mouth of Sutton Creek.

Siltcoos: North Siltcoos, Lane Co. - 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. : the area 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. : Tahkenitch North Spit - the small spit and beach on the north side of Tahkenitch Creek; Tahkenitch South Spit - the spit, beach and sand openings between Tahkenitch Creek and the south end of the vehicle closure; North of Threemile Creek. - the beach from the south end of the vehicle closure to Threemile Creek; and South of Threemile Creek. - the beach between Threemile Creek and the Umpqua River.

Tenmile: North Tenmile, Coos and Douglas Cos. - 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: South Beach - the beach between the north jetty and the first set of F.A.A. towers; South Spoil/HRA - the south dredge spoil and adjacent habitat restoration areas (HRA) that were recently cleared of vegetation; and Bayside - the bay south of the South Spoil.

Bandon Beach, Coos Co: the beach between China Creek and New River mouth, the sand spits and overwash areas near the mouth of Twomile Creek.

New River Spit, Coos and Curry Cos.: the beach and sand spit on the south side of the mouth of New River, and the oceanside beach, overwashes and riverside deltas extending to approximately one mile south of Fourmile Creek and the habitat restoration area (HRA) adjacent to the BLM boat launch at the Storm Ranch ACEC.

Floras Lake/New River Overwash, Curry Co.: the beach west of Floras Lake north to the two overwash areas near the confluence of Floras Creek and Floras Lake outflow.

In addition, the beach between the overwash areas of Floras Lake/New River Overwash and New River Spit, the beach between the FAA towers and the Tenmile Estuary closure (North Beach) were surveyed periodically. Suitable plover habitat at Sixes River, Elk River, Euchre Creek, and Pistol River in Curry Co. was also surveyed at least once this season.

APPENDIX B. Recommendations for Management of Recreational Activities and Habitat Restoration for sites with Snowy Plovers along the Oregon Coast - 2002.

Necanicum:

- Continue to monitor this site early in the nesting season as plovers have now nested here in two of the last three years.
- Consider signs and ropes if plovers are noted at the site early in the season.
- Work with the local community to manage recreational activities, especially off leash dogs.
- Evaluate the level of predator activity to determine whether predator management tools are necessary if nesting continues.

Sutton:

- Create, improve and manage a large nesting area behind the foredune.
- Continue roping and signing of dry sand from Sutton Creek to north of Berry Creek.
- Have the necessary materials in place at the initiation of the nesting season to reduce confusion to the public and achieve greater compliance.
- 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 to close the Estuary Trail, which benefits nesting Snowy Plovers on both spits. Noncompliance with the closed areas continues to be a problem every year due to high recreational use at this site; the Siltcoos Canoe Trail continues to encourage disturbance in the closed estuary. Most people did not know the estuary was closed. This includes both people on foot and people boating in the river that disembark on the estuary riverbanks.

- 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.
- If the closed area during the 2003 nesting season is similar to the closed area during the 2000, 2001, and 2002 nesting season, we recommend the ropes and signs be set up prior to 15 March, to be as effective as possible.
- 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.
- To address the number of crows using the estuary and nesting closures at Siltcoos, we recommend exploration of various management techniques.
- Continue to extend appropriate signing to both riverbanks, to prevent hikers from walking up the closed estuary.

Overlook:

- Continue to rope and sign both north and south closures for Snowy Plover nesting habitat by 15 March, which is the onset of the nesting season.
- Continue to improve and enlarge the restoration area, especially to the south towards Tahkenitch. Restoration work should be scheduled after the Snowy Plover nesting season is completed, acknowledging in advance that broods may remain in the area as late as mid-September.
- 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 restoration area, and create more habitat to the north of the north spit towards the South Overlook restoration area.
- Continue to rope and sign all suitable habitat including the north end of the south spit and the north spit.
- Block off the old trail that people use to access the south spit from the Tahkenitch Creek Trail, and put up new trail signs.
- Continue to restrict dogs to leashes adjacent to closure areas.
- Continue to extend appropriate signing on both riverbanks, to prevent hikers from walking up the closed estuary.

Tenmile North and South Spits:

- Continue to maintain and improve the south side for nesting; create and maintain a large habitat restoration area on the north side.
- Continue to rope and sign plover nesting habitat on both north and south spits.
- Enforce vehicle closure to prevent violators from driving in the habitat restoration areas.

Coos Bay North Spit:

- Continue to improve and maintain the habitat restoration areas. Continue to spread shell hash to improve nesting substrate. Continue to maintain the fence, and remove accumulated sand and grass.
- 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, and inform all law enforcement agencies of the regulations on the beach.
- Permanently reroute the foredune road around the '94HRA and '98 HRA's to reduce disturbance to the plovers, especially during the nesting season. The seasonal reroute of the road in 2002 once again allowed a minimum amount of disturbance to occur. The plovers appeared to respond by continuing to nest near the edge of the fence and spreading further out and along the edge of the 95HRA and the 98HRA compared to what has been observed in previous years. If the foredune road is permanently rerouted, eliminate the berms that border the HRA's.

Bandon:

- Continue to improve and maintain the habitat restoration area north of Twomile Creek.
- Sign and rope around the China Creek overwash, the entrance point to the Christian Camp, and south of the trailhead early in the season.
- Sign 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 and hire a recreational monitor 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. We have seen an increase in hikers going from Bandon to Blacklock Point.
- State Parks should work with the Bandon Chamber of Commerce to develop a new map of the town coastline to explain what type of recreational activities are allowed.

New River:

- 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.

- We continue to have problems with people approaching active nests that were on the open spit. The employment of an interpretive specialist to explain the goals of the work done there may help to reduce the problems.
- Work with the county to reduce the ATV riding on the open spit. Although violations were reduced compared to the 2001-nesting season they remain a problem. Cooperation between county, state and federal law enforcement officers and the landowners of Roaring Surf Estates may help to reduce violations.
- Rope and sign a trail through the open spit to permit people to access the beach without disturbing nesting plovers.
- The open spit should be posted as a dogs-on-leash area only. People with dogs off leash, including horseback riders, continue to be a problem at New River.
- Coordinate between county, state and federal agencies to adequately post the area.
- Continue to close the gate at the Storm Ranch for 15 April- 15 September.

Floras Lake:

- Continue to discuss an adaptive management approach between the BLM and Curry Co. to best address the management approach for the plovers at Floras Lake.
- Continue the seasonal restrictions and use of ropes and signs as determined any cooperative management agreement. It is important to have all the ropes, signs and fences in place early in the nesting season.
- Prompt replacement of signs, rope and posts should continue to notify people that the area is being monitored. Signs need to clearly state that dogs must be on leashes at all times on the beach regardless of whether or not they are outside of the restricted zone.
- Continue to hire an on-site interpretive specialist, to contact the public, monitor the beach, and present slide shows.
- Continue strict law enforcement at Floras Lake to improve compliance by the public. It is important for the BLM to maintain a high profile at Floras Lake to notify the public the site is being monitored, especially since the new bridge was constructed.

Appendix C

Summary of corvid behavior near Snowy Plover breeding sites in the Siuslaw National Forest during 2002

American Crows (*Corvus brachyrhynchos*) and Common Ravens (*Corvus corax*) (corvids hereafter) are documented nest predators of Federally Threatened Western Snowy Plovers (*Charadrius alexandrinus nivosus*) at breeding sites within the Siuslaw National Forest. Therefore, corvids have been given special management attention in prior years. Plover nest depredations by corvids have lead to the hotwire method of adding an electrified perch and line around the top of the typical plover nest enclosure. While this has been met with some success in reducing nest depredation by corvids, it remains pertinent to understand behavioral factors that could allow corvids to key into vulnerable aspects of the hotwired enclosure system.

In order to start to get at this information, we conducted preliminary observations on corvids at plover breeding locations within the Siuslaw National Forest (Table 1). Our goal was to get a feel for what type of observational work would be possible for corvids under given field conditions and to get some preliminary ideas of how corvids are behaving and what habitats they are using on the beach. We conducted six observation stints, which ranged from one to four hours. Sites were chosen in coordination with the standard monitoring work in order to reduce disturbance. Observations were conducted from a location where active plover nests would be visible while not flushing the incubating adult. The foredune and European beachgrass (*Ammophila arenaria*) were usually used as cover.

At the time of these observations, we observed no corvids interested in any of the active nests. When foraging, corvids did so usually in the wrack line on the beach or within an estuary (Table 1.2). All corvids observed inside Snowy Plover nesting closures remained at least 50 meters from any active nest. Also, the overall number of corvids observed appeared to be low when compared to the number of tracks seen with the closures during routine plover surveys.

This information allows us to make the following recommendations.

- Obtain a portable cloth blind to hide the observer from the view of any corvids
- Begin observations in April before Snowy Plovers begin to nest and hotwires are implemented. It is our contention that by mid-June, corvids could already be conditioned to avoid hot perches and exclosures and that the increased use of campgrounds at this time could provide suitable forage for corvids.
- Observe for at least 20 hours per week with stints no less than four hours each.
- Form detailed question/hypotheses and collect data in a manner that can address these issues.

Table 1. Distribution of time spent observing corvids at Snowy Plover nesting areas in the Siuslaw National Forest.

Stint	Date	Start Time	Duration	Site	Species
1	18 June	10:40	2 hr	S Siltcoos	Unknown
2	20 June	8:15	2 hr	N Overlook	Raven
3	24 June	8:00	2 hr	N Overlook	Raven
4	10 July	12:30	2 hr	S Siltcoos	Unknown
5	15 July	9:30	4 hr	N Tahkenitch	Crow
6	24 July	10:50	1 hr	N Overlook	Crow

Table 2. Corvid use of different habitats in and adjacent to Snowy Plover nesting areas in the Siuslaw National Forest.

Site	Species	Habitats Used	Behaviors Exhibited
S Siltcoos	Unknown	Open Sand	Briefly Landed/Flyover
N Overlook	Crow and Raven	Intertidal Zone/Wrack/ Upland Shrub	Foraging/Resting/Flyover
N Tahkenitch	Crow	Wet Sand of Estuary	Foraging

Figure 2. Number of active Snowy Plover nests within 10 day intervals on the Oregon coast, 2002. Dashed lines represent ± 2 standard deviations.

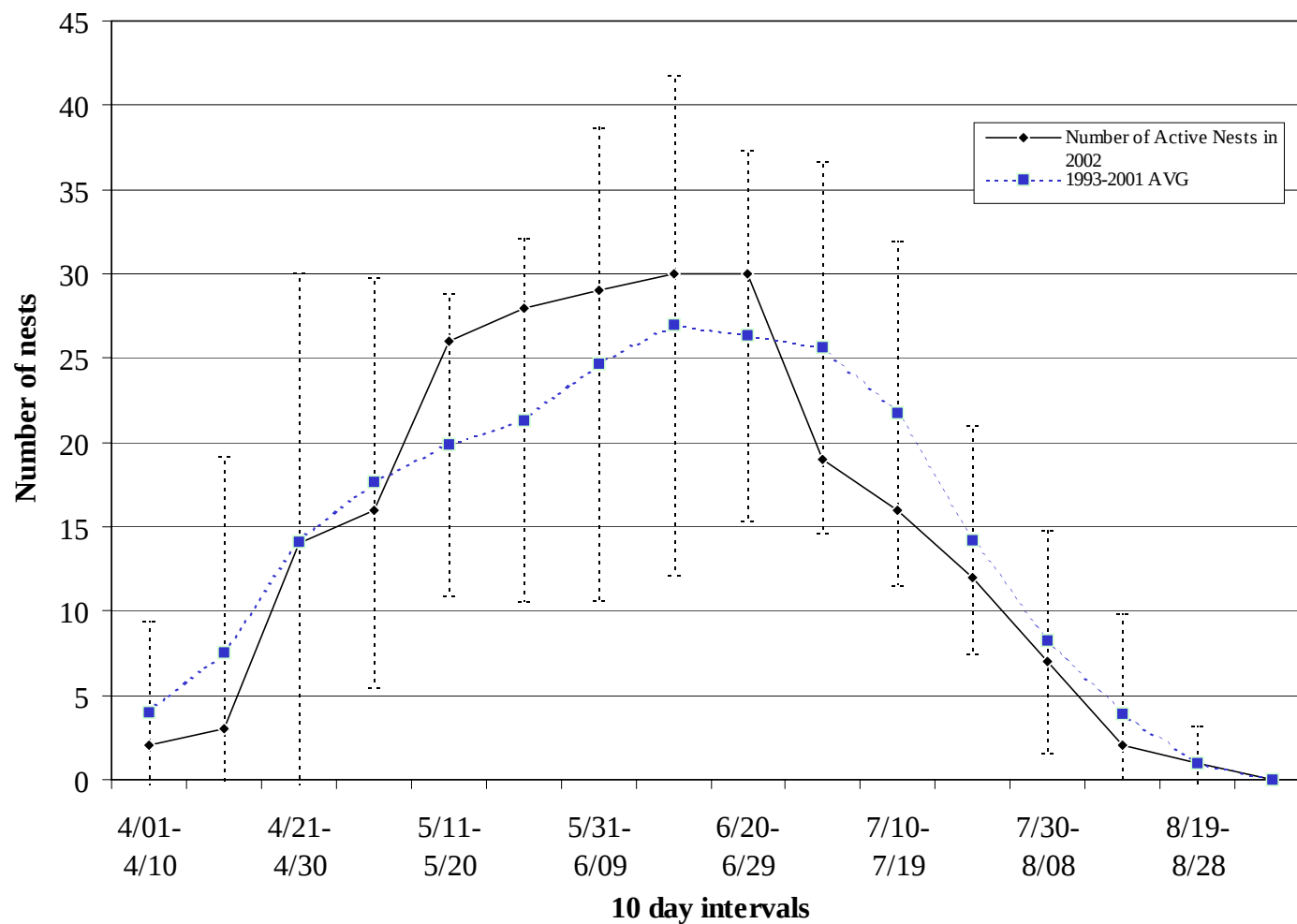


Figure 11. Number of active Snowy Plover nests within 10 day intervals on the Oregon coast, 2002. Dashed lines represent ± 2 standard deviations.

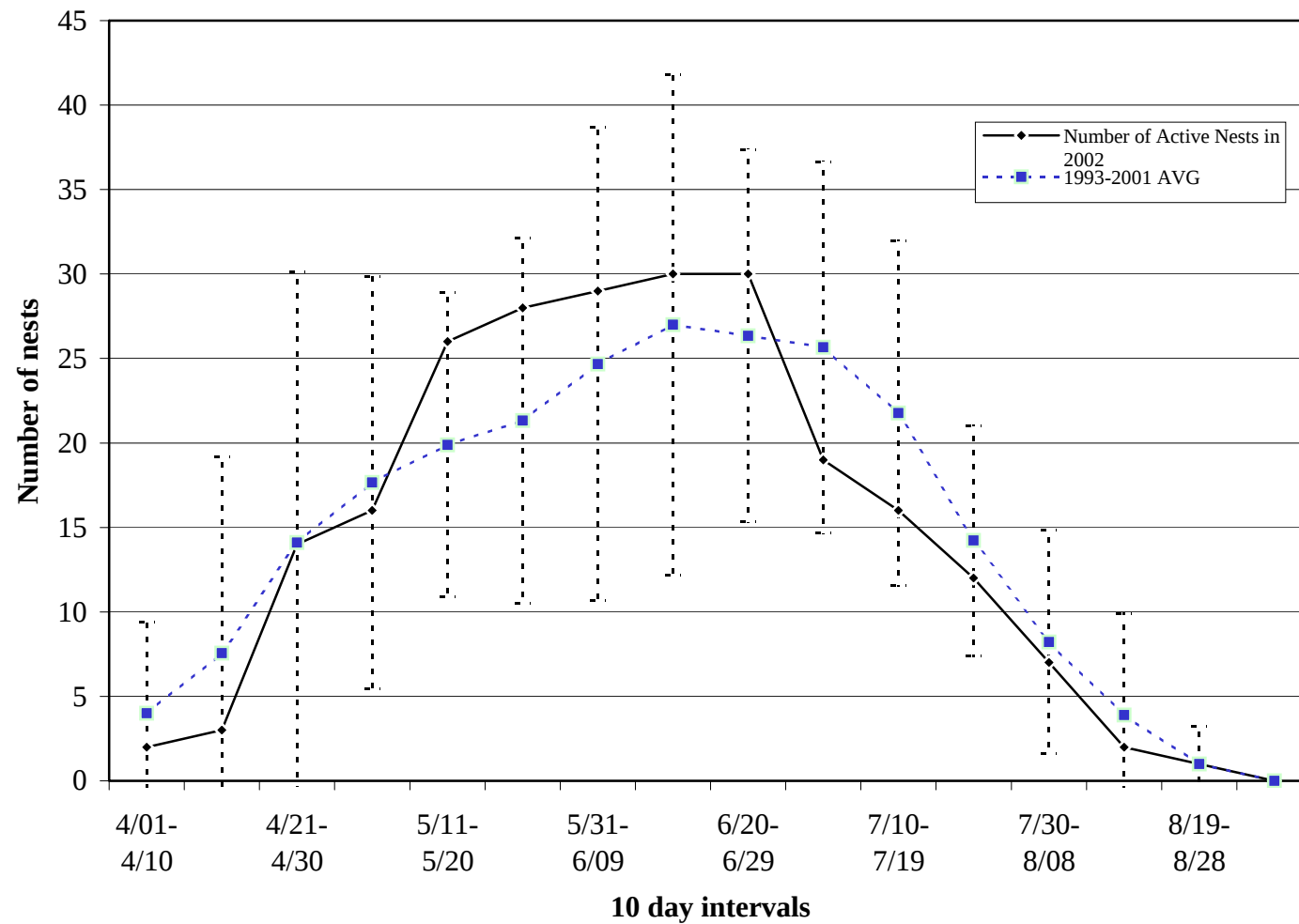
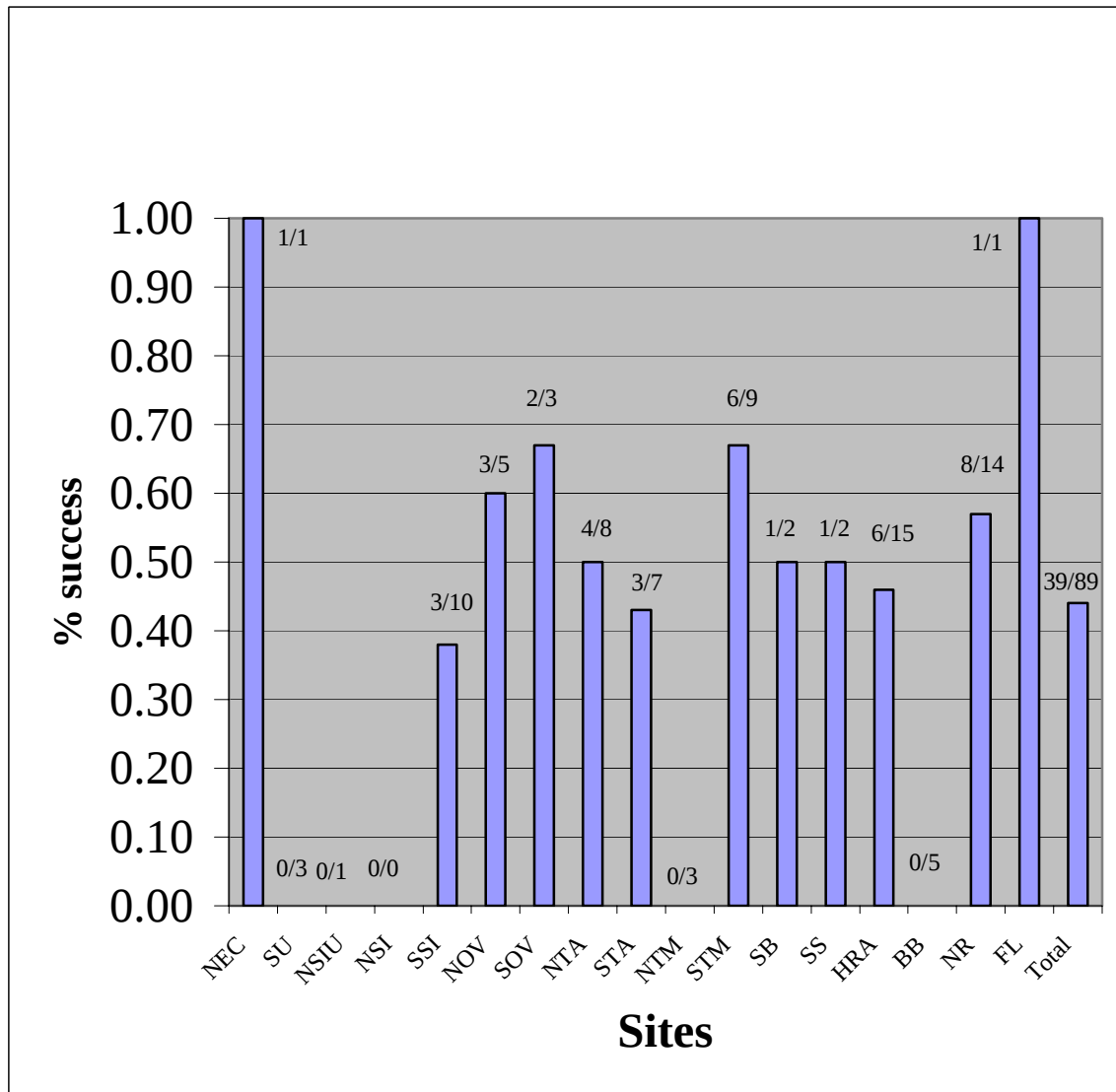
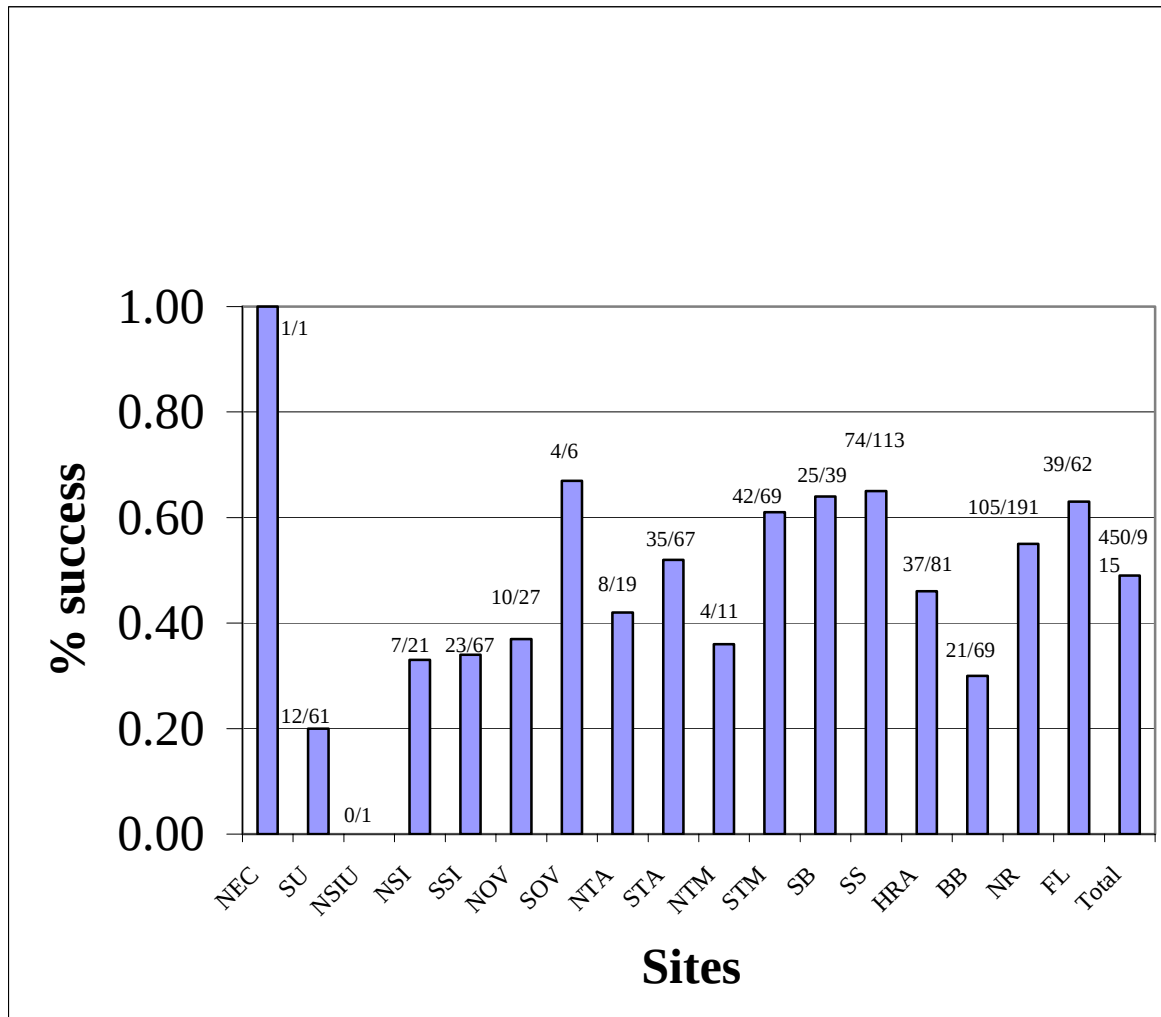


Figure 12. Percent nest success for Snowy Plovers along the Oregon coast for the 2002 nesting season. Above each bar is the total number of nests that hatched over the total number of nests.



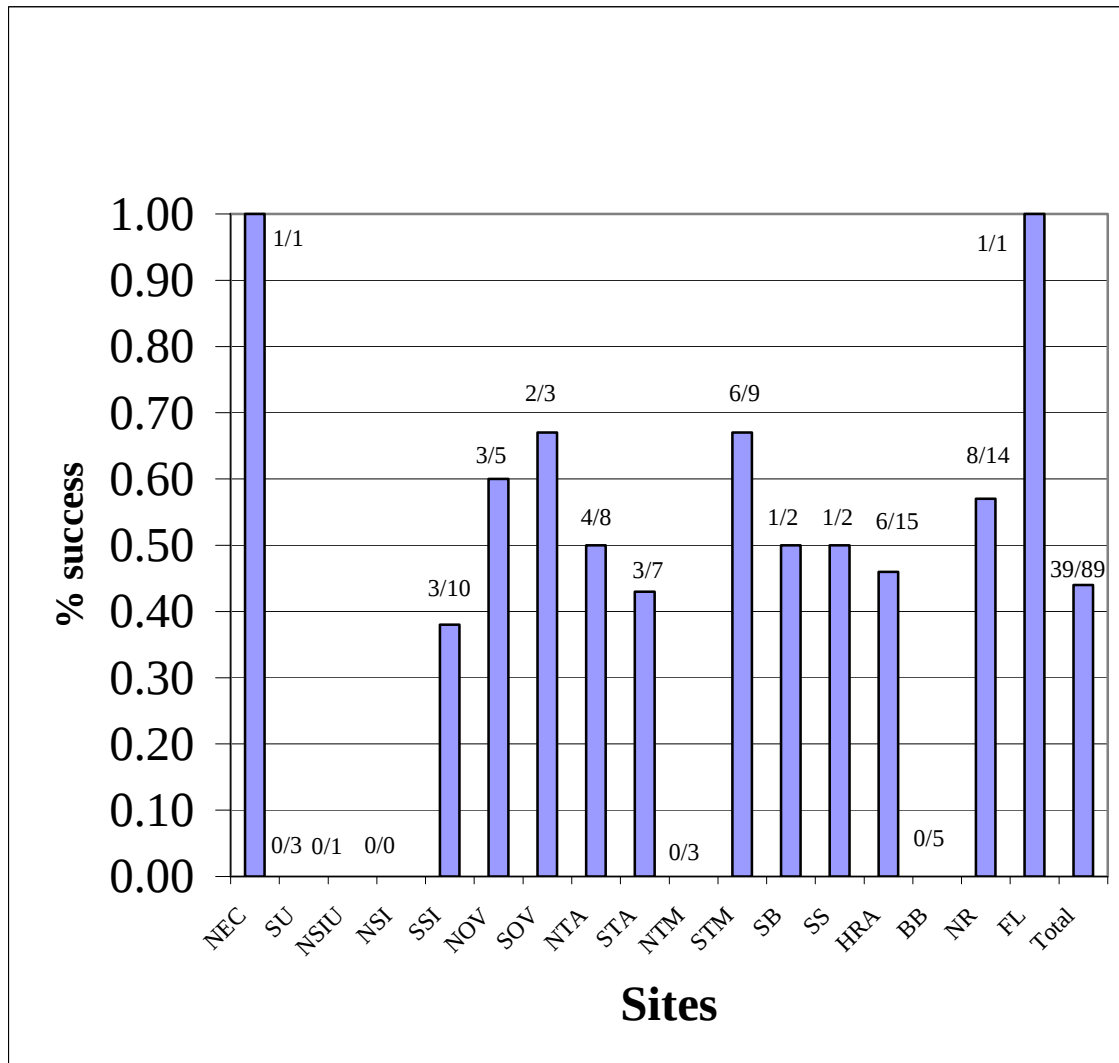
NEC = Necanicum; SU = Sutton; NSIU = North Siuslaw; NSI = North Siltcoos; SSI = South Siltcoos; NOV = North Overlook; SOV = South Overlook; NTA = North Tahkentich; STA = South Tahkentich; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

Figure 13. Total percent nest success for Snowy Plovers along the Oregon coast, 1990 – 2002. Above each bar is the total number of nests that hatched over the total number of nests.



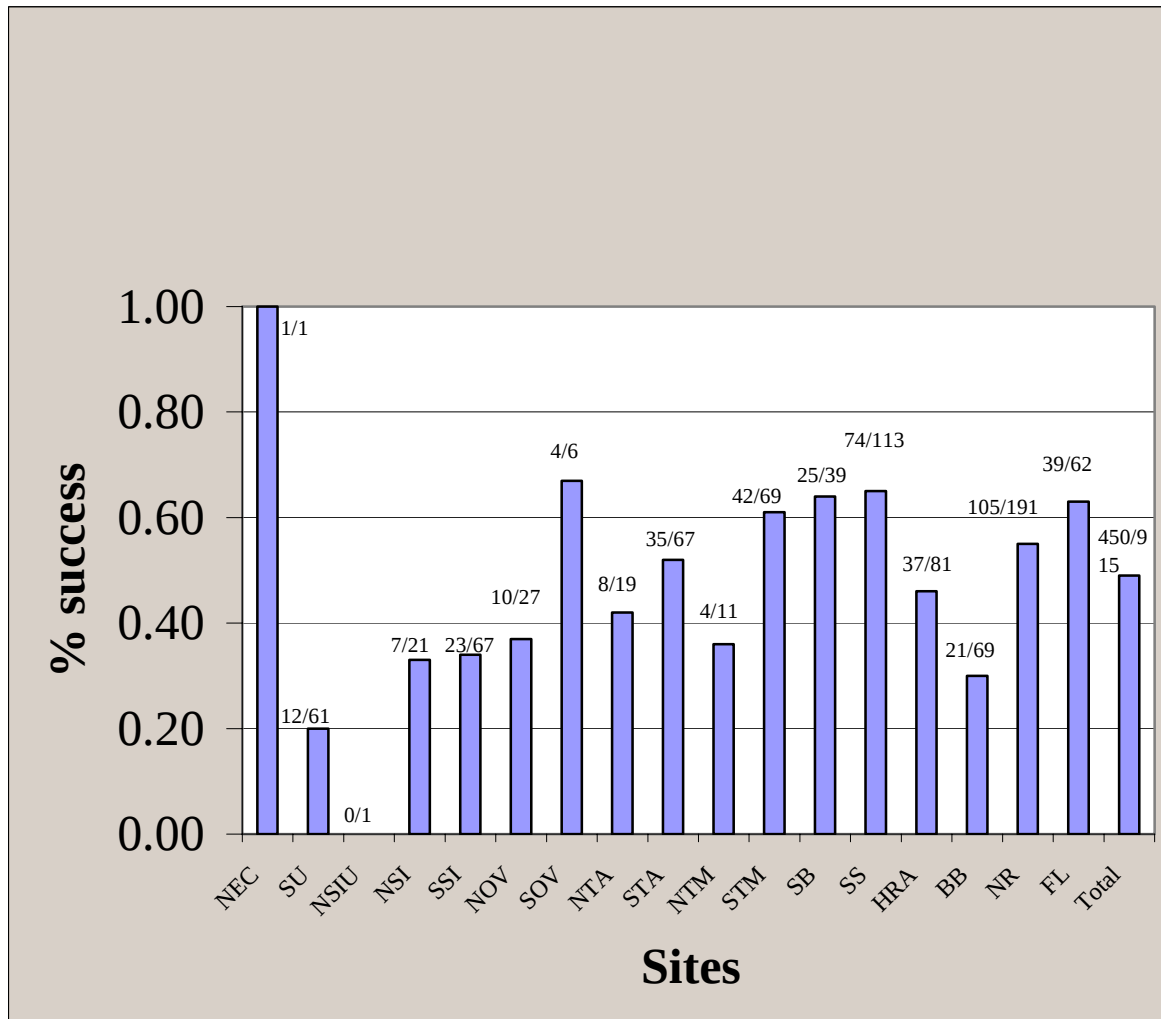
NEC = Necanicum; SU = Sutton; NSIU = North Siuslaw; NSI = North Siltcoos; SSI = South Siltcoos; NOV = North Overlook; SOV = South Overlook; NTA = North Tahkentich; STA = South Tahkentich; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

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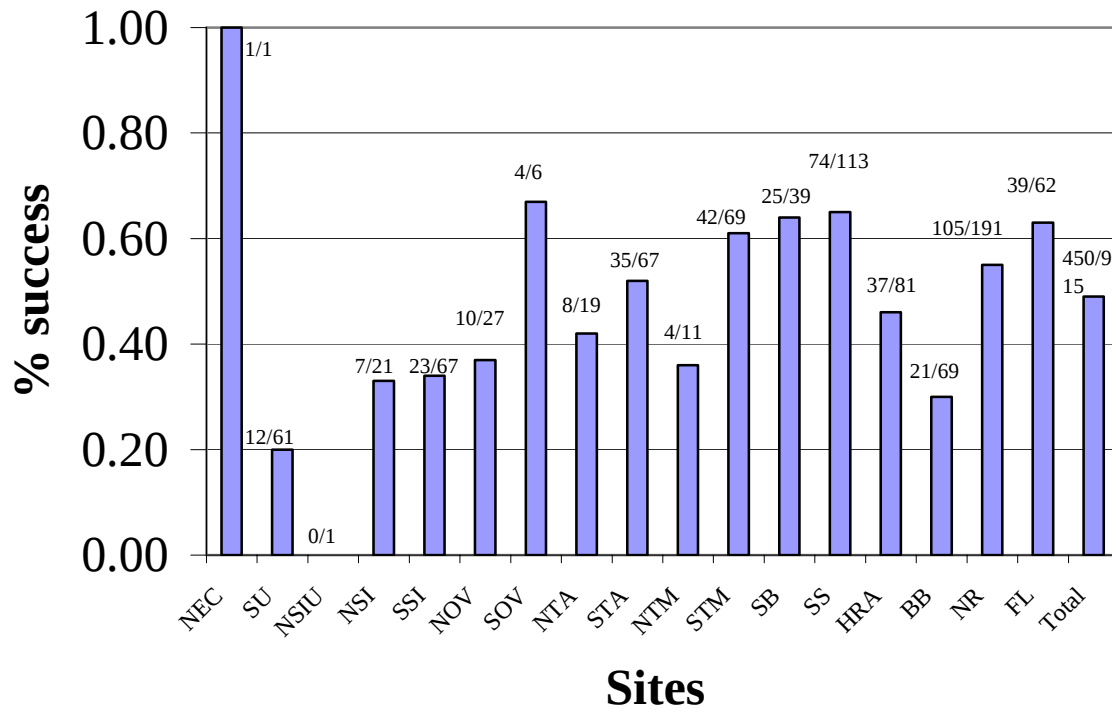
NEC = Necanicum; SU = Sutton; NSIU = North Siuslaw; NSI = North Siltcoos; SSI = South Siltcoos; NOV = North Overlook; SOV = South Overlook; NTA = North Tahkentich; STA = South Tahkentich; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

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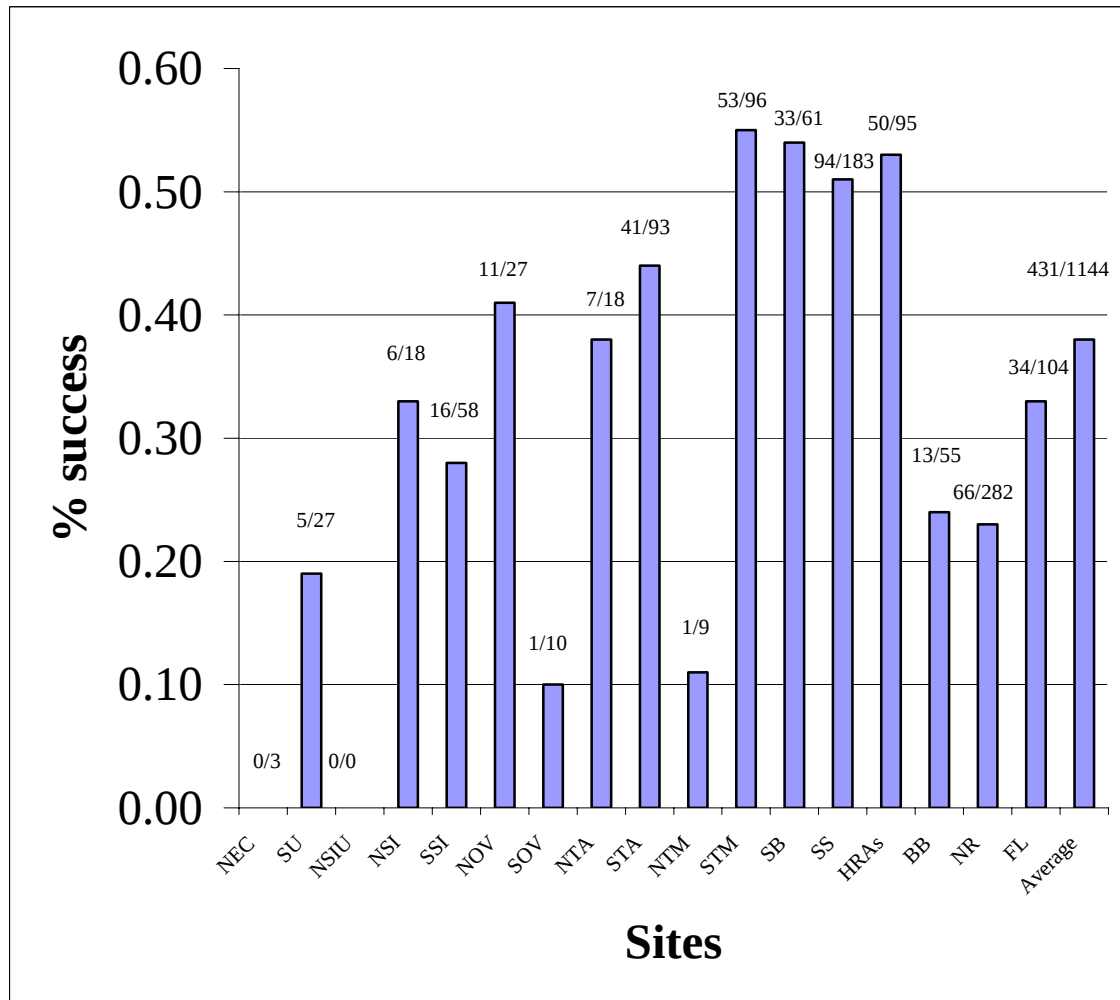
NEC = Necanicum; SU = Sutton; NSIU = North Siuslaw; NSI = North Siltcoos; SSI = South Siltcoos; NOV = North Overlook; SOV = South Overlook; NTA = North Tahkentich; STA = South Tahkentich; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

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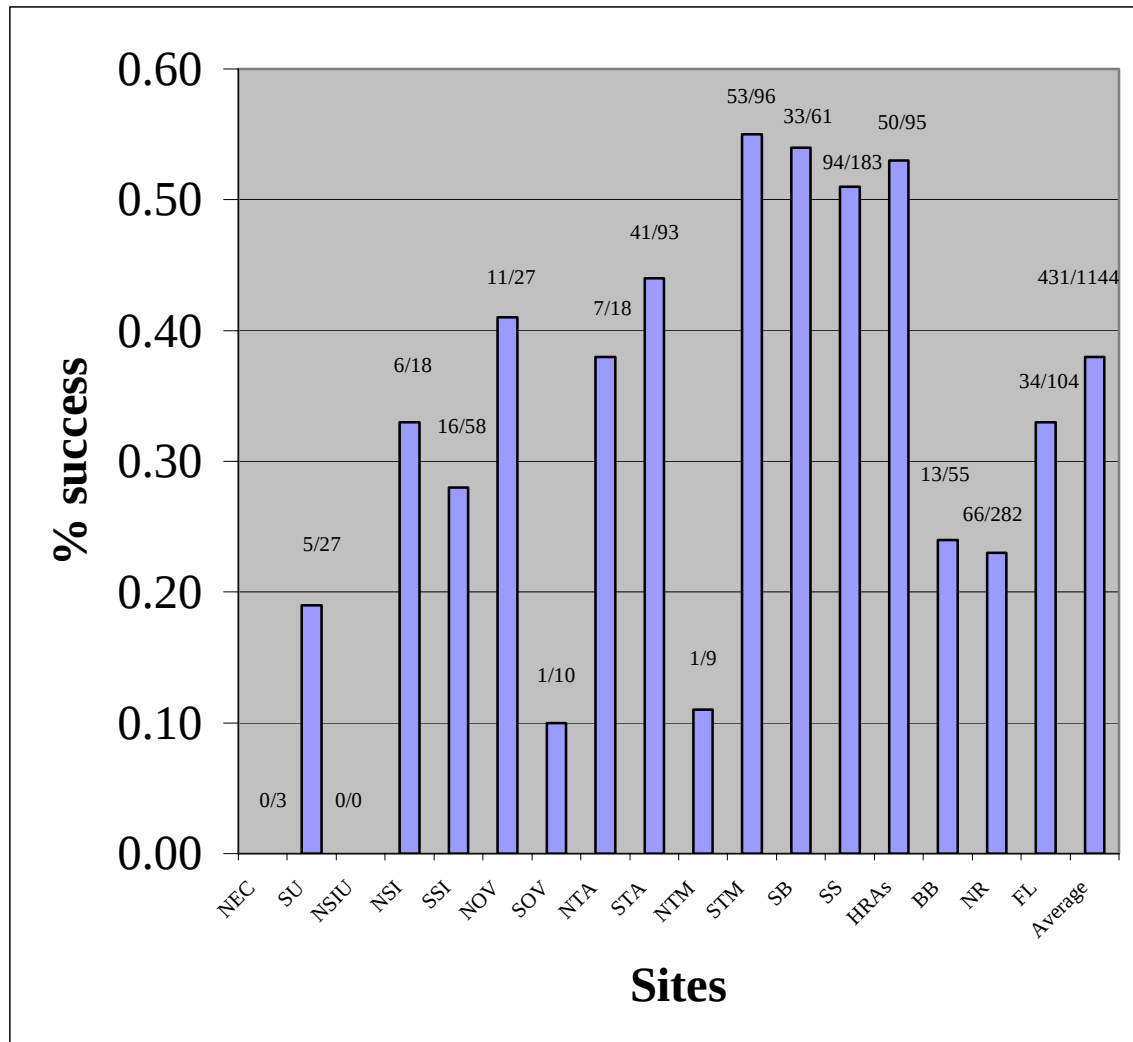
NEC = Necanicum; SU = Sutton; NSIU = North Siuslaw; NSI = North Siltcoos; SSI = South Siltcoos; NOV = North Overlook; SOV = South Overlook; NTA = North Tahkentich; STA = South Tahkentich; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

Figure 14. Percent fledgling success of Snowy Plovers at each nesting site along the Oregon coast, 1990 – 2002. Above each bar is the number of fledglings over the number of hatched eggs.



NEC = Necanicum; SU = Sutton; NSIU = North Siuslaw; NSI = North Siltcoos; SSI = South Siltcoos; NOV = North Overlook; SOV = South Overlook; NTA = North Tahkentich; STA = South Tahkentich; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

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Table 1. Population estimates of the Western Snowy Plover on the Oregon Coast, 1990-2002.

YEAR	WINDOW SURVEY	# SNPL BREEDING	# SNPL PRESENT
1990	59	-	-
1991	35	-	-
1992	30	-	-
1993	45	55-61	72
1994	51	67	83
1995	72	94	120
1996	86	110-113	134-137
1997	85	106-110	141
1998	63	75	97
1999	52	77	95-96
2000	NC	89	109 ^a
2001	81	79-80	111-113 ^b
2002	81	80	99-102 ^c

^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

Table 2. Distribution and abundance of adult Snowy Plovers along the southern Oregon coast during the 2002 breeding season.

Site Name	Mean ($\bar{x}$)	SD	Range	# Surveys (n)^a	Date of Peak Count	Dates of Surveys
Sutton Beach	3.65	3.65	0-11	20(36)	25 April	3 April- 28 Aug
North Siuslaw	0.46	1.13	0-3	13(14)	2, 9 May	4 April-7 Aug
Siltcoos:						
North Spit	1.24	4.44	0-20	21(21)	24 Sept	2 April-24 Sept
South Spit	5.37	3.16	0-11	30(73)	15 Aug, 5 Sept	2 April-24 Sept
Overlook:						
North	1.90	1.82	0-8	29(59)	9 July	7 April-9 Sept
South	0.96	1.67	0-7	28(46)	30 April	7 April-3 Sept
Tahkenitch:						
North	7.22	2.33	0-11	36(60)	5 April, 31 May, 22 Aug, 3 Sept	5 April-9 Sept
South	2.26	2.38	0-9	27(50)	17 July	5 April-3 Sept
Tenmile:						
North	2.50	2.15	0-7	28(30)	17 Aug	4 April-30 Aug
South	5.96	3.16	1-11	28(41)	29 June, 15 July, 1 Aug	4 April-14 Sept
Coos Bay N.S.:						
South Beach	6.03	3.26	0-16	31(34)	2 May	7 April-5 Sept
South Spoil	1.22	1.59	0-5	18(26)	5 July	7 April-1 Aug
HRA '94	7.28	3.78	0-13	21(44)	10 July	7 April-1 Aug
HRA '95/'98W	0.36	0.84	0-3	14(22)	23 June	7 April-15 July
HRA '98E	0.25	0.45	0-2	12(22)	6,7 July	7 April-7 July
Bay Beach	0.00	0.00	0	4(4)	NA	7 April-22 May
Bandon	2.19	2.76	0-9	26(39)	4 April	27 March-4 Sept
New River	9.79	4.02	0-17	24(53)	4 Sept	6 April-4 Sept
Floras Lake/New River Breach	1.06	1.30	0-4	17(21)	3 June	26 March-16 July

^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 – 2002; 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	Total # nests	Total # broods ^a
Necanicum													1	1	1
Sutton Beach				2	1	2	6	14	8	3	7	15	3	61	1
North Siuslaw													1	1	0
Siltcoos:															
North Spit				0	2	4	2	0	1	4	8	0	0	21	0
South Spit				1	2	2	1	3	3	17	14	14	10	67	0
Overlook															
North										2	8	12	5	27	0
South										0	0	3	3	6	0
Tahkenitch:															
North Spit				0	0	0	0	0	0	0	4	7	8	19	0
South Spit				0	3	9	18	14	6	3	1	6	7	67	1
Threemile Creek/ Umpqua River				0	0	0	1	0	0	0	0	0	0	1	0
Tenmile:															
North Spit					2	2	1	0	0	0	1	2	3	11	1
South Spit	2	0	9	8	5	4	3	2	11	5	5	6	9	69	2
Coos Bay North Spit:															
South Beach	0	4	6	3	4	3	3	6	6	0	1	1	2	39	9
South Spoil	20	9	4	6	9	12	22	14	5	2	5	3	2	113	13
North Spoil	5	1	1	0	0	0								7	0
Habitat Rest. Areas					4	3	2	3	7	12	22	13	15	81	8
Anad. Spoil	0													0	1
Menaha, N.Bend	1	0												1	0
Bandon	0	14	8	10	5	9	3	4	1	2	2	6	5	69	2
New River	6	6	2	0	6	20	18	25	26	28	17	23	14	191	6
Floras Lake/ New River Overwash	2	2	6	11	8	6	9	8	4	0	5	0	1	62	3
Total nests	36	36	36	41	51	76	89	93	78	78	100	111	89	914	
Total broods^a	2	1	5	7	4	6	11	5	3	1	2	0	1		48

^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, 1990-2002.

Year	% Nest Success				
	Overall ¹	Exclosed ²	Unexclosed ²	(N) ¹	(N) ²
1990	12	- ³	13	(36)	(29)
1991	23	77	5	(36)	(33)
1992	54	80	9	(36)	(34)
1993	55	77	16	(41)	(39)
1994	74	75	68	(51)	(47)
1995	43	62	7	(76)	(70)
1996	48	66	7	(89)	(87)
1997	43	52	26	(93)	(87)
1998	50	70	15	(78)	(70)
1999	51	62	40	(78)	(72)
2000	32	46	2	(100)	(91)
2001	26	67	4	(111)	(101)
2002	38	67	13	(89)	(76)
mean	42.2 ± 16.2	66.8 ± 10.3	17.3 ± 18.4	(914)	(838)

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

²Does not include infertile nests or nests with one egg that were subsequently abandoned 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. Nest Success of Snowy Plovers on the Oregon Coast, 2002.

		NESTS EXCLOSED		NESTS NOT EXCLOSED	
SITE NAME	Total #	Hatch	Fail	Hatch	Fail
Necanicum	1	0	0	1	0
Sutton	3	0	2	0	1
North Siuslaw	1	0	0	0	1
Siltcoos					
North	0	0	0	0	0
South	10	3	3	0	4
Overlook					
North	5	3	1	0	1
South	3	2	0	0	1
Tahkenitch:					
North	8	4	0	0	4
South	7	3	1	0	3
3mi. Ck. - Umpqua R.	0	0	0	0	0
Tenmile:					
North ^a	3	0	1	0	2
South	9	6	1	0	2
Coos Bay North Spit:					
South Beach	2	1	1	0	0
South Spoil	2	1	0	0	1
Habitat Restoration Areas	15	5	5	1	4
Bandon	5	0	2	0	3
New River					
Habitat Restoration Area	7	3	0	0	4
Other lands	7	5	2	0	0
Floras Lake	1	1	0	0	0
TOTALS	89	37	19	2	31
% Success of known fate nests:		Nests Exclosed		Nests Not Exclosed	
Apparent		66%		6%	

^a – does not include one brood from an undiscovered nest

Table 6. Causes of Snowy Plover nest failure at survey sites along the Oregon coast, 2002.

Site Name	Total Nests	# Fail	Depredation					Other			
			Egg Depredation				Adult Depredation				
			Corvid	Unk	Red Fox	Avian	Unknown Predator	Wind/ Weather	Infertile	Abandon ^a	Unk cause
Necanicum	1	0									
Sutton	3	3						3			
North Siuslaw	1	1		1							
Siltcoos:											
North	0	0									
South	10	7	2	2				3			
Overlook											
North	5	2		1						1	
South	3	1		1							
Tahkenitch											
North	8	4						1		1	2
South	7	4		2						1	1
Tenmile:											
North	3	3	1	1						1	
South	9	3	1	1							1
Coos Bay											
North Spit:											
South Beach	2	1						1			
South Spoil	2	1								1	
HRAs	15	9	2			1	3		1	2	
Bandon	5	5	1				1	1		1	1
New River	14	6		2	1		1		1	1	
Floras Lake	1	0									
TOTALS	89	50	7	11	1	1	5	9	2	9	5

^a – includes 8 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, 2002.

Cause of Failure		Exclosed	Unexclosed	Totals
Egg Depredation	Corvid Predation	0	7	7
	Unknown Predation	1	10	11
	Red Fox Predation	0	1	1
	Avian	1	0	1
Adult Depredation	Unknown Predation	5	0	5
Other	Wind/Weather	7	2	9
	Infertility	2	0	2
	Abandoned^a	1	8	9
	Unknown Cause	2	3	5
Totals		19	31	50

^a – includes 8 one-egg nests (clutches never completed)

Table 8. Total number of young fledged for all sites on the Oregon Coast 1990-02; includes fledglings from broods from undiscovered nests.

Site Name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	TOTALS
Necanicum											1	0	0	1
Sutton							0	1	1	0	3	0	0	5
North Siuslaw													0	0
Siltcoos:														
North Spit					0		0	0	2	4	0	0	0	6
South Spit					1	2	0	0	4	2	7	0	0	16
Overlook														
North										3	5	1	2	11
South										0	0	1	0	1
Tahkenitch														
North					0	0	0	0	0	0	2	4	1	7
South					1	12	8	7	1	1	3	4	5	42
Tenmile:														
North Spit					0	1	0	0	0	0	0	0	3	4
South Spit			14	7	3	3	4	4	3	7	5	4	3	57
Coos Bay North Spit:														
South Spoil	3	2	4	13	17	17	22	8	6	5	3	4	2	106
South Beach		11	9	2	6	2	2	7	2	0	0	1	1	43
Habitat Rest. Areas					7	2	1	1	1	22	6	6	8	54
Bandon		1	1	3	5	0	1	0	1	1	0	1	0	14
New River Spit			3	0	7	12	8	9	11	8	5	6	6	75
Floras Lake/ New River Overwash	0	2	2	11	9	6	1	3	0	0	3	0	0	37
TOTALS	3	16	33	36	56	57	47	40	32	53	43	32^a	31	479

^a – increased total fledglings based on breeding season 2002 sitings

Table 9. Overall Mayfield nest success, fledgling success and total number of fledglings on the Oregon Coast, 1990 – 2001.

Year	% Nest Success ^a	% Fledgling Success ^b	# Fledglings ^c
1990	12	11	3
1991	23	45	16
1992	54	41	33
1993	55	42	36
1994	74	50	56
1995	43	50	57
1996	48	32	47
1997	43	30	41
1998	50	26	32
1999	51	43	53
2000	32	41	43
2001 ^d	26	34	32
2002	38	29	31
	Mean = 42.2±16.2	Overall = 37	Total = 480

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

d – number of fledglings and % fledgling success slightly modified based on 2002 sightings

Table 10. Fledging and Brood Success of Snowy Plovers on the Oregon Coast, 2002.

Site Name	Total # Broods*	% Brood Success*	Total # Eggs Hatched	Min. # Fledged		% Fledging Success**
				From Known Nests	From Undiscovered Nests	
Necanicum	1	0	3	0	0	0
Sutton	0	0	0	0	0	0
Siltcoos:						
North Siltcoos	0	0	0	0	0	0
South Siltcoos	3	0	8	0	0	0
Overlook						
North Overlook	3	67	8	2	0	25
South Overlook	2	0	5	0	0	0
Tahkenitch						
North Tahkenitch	4	25	7	1	0	14
South Tahkenitch	3	67	9	5	0	56
Tenmile:						
North Spit	1	100	3***	0	3	100***
South Spit	6	33	14	3	0	21
Coos Bay N. Spit						
South Spoil	1	100	3	2	0	67
South Beach	1	100	2	1	0	50
HRA	6	83	16	8	0	50
Bandon	0	0	0	0	0	0
New River						
HRA	3	67	8 ^a	3	0	36
Other lands	5	40	9	3	0	33
Floras Lake/New River Overwash	1	0	3	0	0	0
TOTALS**	39	46	95	28	-	29
TOTALS***	40	48	98	28	3	32
TOTAL FLEDGED				31		

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

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

* Includes broods from undiscovered nests:

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

***In this case we did calculate fledgling success from the undiscovered nest because all three chicks fledged and nests do not contain more than three eggs, therefore we can safely assume that all eggs from this nest successfully hatched.

^a – Does not include the one egg that was taken into captivity, raised and released; this egg/chick is not included in any totals.

Table 11. Activity patterns of Snowy Plovers on Habitat Restoration Areas along the Oregon Coast, 1994-2002. 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.

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Dunes Overlook						F?,N,B	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
95HRA		R,F,N,B	F,B	N,B	F,N,B	F,B	F,N,B	F?,N,B	R,F?,N,B
98HRA							N	F?,N,B	R?,F?,N
98EHRA								R?,F?,N,B	R?,F?,N,B
New River						N	F,N,B	F,N,B	F,N,B

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

* - there is known winter use of the 94HRA; this is the only area with documented winter use

Table 12. 2001 hatch year Snowy Plovers that returned to the Oregon coast in 2002.

Chick Combos	New Combo	Sex	2001 Banding Location	2002 Location(s)	2002 Nest
B/G/B:W		M	South Beach	SS/5,SB/6,HRA/6	Yes
GB:W		F	S Overlook	SU/8	No
GW:W		M	South Spoil	SB/4,HRA/5	Yes
L:W		F	Unknown	SB/5,HRA/5,SS/7	Yes
L:W		M	Unknown	NR/4	Yes
L/G/L:W		F	New River	TM/4,SU/5,OV/5,TA/5,HRA/5	Yes
L/Y/L:W	RG:GG	F	South Spoil	TA/5,OV/5,SI/9	Yes
R/G/R:W		M	95HRA	NR/5,BB/7	Yes
R/G/R:W	RG:WW	F	95HRA	TA/5,HRA/5,SB/5,SS/6	Yes
R/Y/R:G	RG:BB	M	N Tahkenitch	TM/4	Yes
R/Y/R:G		F	N Tahkenitch	OV/5,TA/6,SI/8	Yes
S:W		F?	Unknown	OV/4	No
W/B/W:W	BL:RR	M	S Tahkenitch	TA/4,OV/5	Yes
W/G/W:W		M	94HRA	TM/4,SB/5,HRA/5,SS/6	Yes
W/G/W:W		M	94HRA	TA/4,FL/7,TM/7	No
W/Y/W:W	RG:YY	M	New River	TM/5	Yes
WB:W		F	S Tenmile	BB/3,TM/4,FL/6, NR/6	Yes
Y/W/Y:W	RL:WW	F	N Overlook	TM/5	Yes

Table 13. 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 - 2002.

# of HY birds from previous year sighted on OR coast					
Year	# of Fledglings	# of HY birds from previous year sighted on OR coast	Return Rate (#HY/#Fled)	# that nested on OR coast	% nested on OR coast
2002	31	18	58%	15	83%
2001	31	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 = 48.45%

SD = 13.26%

Average percent of returning HY birds that nest in first season = 60%

SD = 17%

Table 14. Summary of sites with exclosed Snowy Plover nests that were hot wired on the Oregon coast, 2002.

Site	Number of exclosed nests	Number of hot wired nests	Percent of hot wired nests that hatched	Cause of	
				failures of hot wire nests	Outcome of non-hot wired nest
S Siltcoos	6	5	60	2 overblown	overblown
Overlook	6	6	83	1 abandoned	
Tahkenitch	8	7	100		unknown cause
Overall	20	18	83		