

The Distribution and Reproductive Success of the Western Snowy Plover Along the Oregon Coast - 2001

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Abstract

From 3 April – 7 September 2001, we monitored the distribution, abundance and productivity of the Federally Threatened Western Snowy Plover (*Charadrius alexandrinus nivosus*) along the Oregon coast during the breeding season. From north to south, we surveyed and monitored plover activity at Sutton Beach, Siltcoos River mouth, the Dunes Overlook, Tahkenitch Creek, Tenmile Creek, Coos Bay North Spit, Bandon Beach, and south from the mouth of New River to Floras Lake. We also visited Bayocean Spit and a volunteer monitored Necanicum for plover activity. 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, and 6) monitor and document brood movements.

We observed an estimated 111-113 adult Snowy Plovers; a minimum of 79-80 were known to have nested. Indices of abundance indicated that the coastal population of Snowy Plovers in 2001 was the same or slightly higher compared to 2000. We located 111 nests, more nests than any previous nesting season; however, the high number of nests was a result of frequent nest failure and repeated efforts to renest. Mayfield nest success was 26%. Exclosed nests (n=57) experienced 67% success while unexclosed nests (n=54) were essentially a complete failure at 4% success. Nest success for exclosed nests was consistent with the 10-year mean of 66.8%, however nest success for unexclosed nests in the 2001-nesting season was substantially lower compared to the 10-year mean of 17.3%. Nest failures were attributed to corvid depredation (28%), unknown depredation of eggs (19%), abandonment (14%), unknown cause (13%), wind (10%), Red Fox (*Vulpes vulpes*) depredation (7%), overwash (4%), infertile eggs (3%), and depredation of adults (3%). We monitored 39 broods in 2001, all from known nests and documented 31 confirmed fledglings. Fledgling success was 33%, slightly lower than the overall success rate for 1990-2000 (38%).

The draft recovery plan for the Western Snowy Plover Pacific Coast Population was released to management agencies and the public in August 2001. To reach the recovery goals for plovers along the Oregon coast there will need to be continued monitoring and use of exclosures, intensive efforts to restore habitat, manage predator populations, and manage recreational activities to increase nesting and fledgling success rates.

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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, 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 12th year of monitoring the distribution, abundance, and productivity of Snowy Plovers found along the Oregon coast during the breeding season. We have focused our efforts on placing predator proof exclosures around nests as a means of reducing egg predation, with the expectation that increased annual productivity will lead to increases in the overall breeding population in Oregon. Based on observations and data gathered since the inception of the project, we continually evaluated and when necessary modified 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, and 2000b). We continued with these efforts in 2001; 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, and 6) monitor and record brood movements. 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 sites. From north to south, we surveyed and monitored plover activity at Sutton Beach, Siltcoos River mouth, the Dunes Overlook, Tahkenitch Creek, Tenmile Creek, Coos Bay North Spit, Bandon Beach, and south from the mouth of New River to Floras Lake (Fig. 1). 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 a volunteer. Cooperators from the Corps of Engineers also surveyed Bayocean Spit in late March and early April.

Methods

Pre-breeding season surveys of many historical nesting areas were completed in March 2001 for the first time on the Oregon coast. The surveys were implemented to attempt to locate any prospecting plovers at locations not known to have currently active nesting sites. State and Federal agency personnel and various other individuals surveyed sites between Bayocean Spit south to Pistol River.

Breeding season fieldwork was completed between 3 April - 7 September 2001. 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 were 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 to what extent the nest was abandoned, or simply 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.

We continued to refine the design of the nest exclosures used to protect nests from egg predators, specifically corvids. American Crows (*Corvus brachyrhynchos*) continue to enter exclosures and depredate eggs (see Castelein et al. 2000a, 2000b). In 2001 at the Dunes Overlook, crows depredated three exclosed nests within a five-day period. In previous breeding seasons we have added extra string or blueberry netting on the top of the exclosure, spiked-cut chicken wire on the top edge of the exclosure and/or electrified “hot wire” along the top perimeter of each exclosure (Castelein et al. 2000b). In some instances, multiple methods were used. During the 2001 nesting season we used the extra string method, a modified “hot-wire” method, and on some exclosures we altered the traditional method of tying string across the top from side to side. Instead we used a PVC pipe/cord lock and string method based on a design developed by Doug George, Point Reyes Bird Observatory. The modified “hot-wire” system and the PVC pipe/cord lock system are described below.

- The “hot wire” method was modified in the 2001 nesting season to reduce the amount of wire used on the top of the exclosure and to increase the efficiency of the hot wire system. One line of electrical twine was placed parallel to the top of the fence material. The fence itself acted as the “ground” eliminating the need for a second parallel wire. This method follows the same concept as the original idea, which is to discourage or prevent corvids from perching on the top of the exclosure and forcing their way between the rows of twine. The positive wire was charged by a battery-operated field charger and the negative wire was attached to a ground pole buried in the sand and the fence. Extra string was used in conjunction with this method.

- The use of PVC pipe with string and cord locks was incorporated into the methods we used in the 2001 nesting season to improve the string concept used to deter predators from entering the enclosure from the top of the enclosure. Materials used in this method are four pieces of PVC pipe cut into six foot sections, PVC adapters, twine cut into 14 foot lengths, cord locks and small pieces of electrical wire. Holes were drilled into the PVC pipes at two inch intervals on the outer foot of the pipe and four inch intervals on the remaining five feet of pipe. Two pieces of the PVC pipe had twine laced through the holes then knotted onto the PVC pipe. These two pieces of pipe were then connected together by a small PVC pipe adapter, creating one 12 foot long piece with the two-inch spacing on the outside edges. The two remaining pieces of PVC pipe were attached together by a small PVC pipe adapter and laid parallel 12 feet apart. The twine was stretched out and laced through the holes on the second set of pipe. A cord lock was then cinched onto the end of the twine to keep it in place. To attach them to the top of an enclosure several small pieces of wire were wrapped around the PVC pipe, then twisted and knotted onto the fencing for a tight fit. The twine was then cinched taut with the cord locks.

In previous years we erected enclosures around nests as soon as nests were discovered beginning in April of each season. However, we have documented predation of adult plovers in and around enclosures, particularly in the beginning of the season (see Castelein et.al. 2000b). In California, to avoid depredation of nesting plovers around enclosures by raptors, enclosures are not set up until 15 May, when peak raptor migration has passed (G.Page pers. comm.). For the 2001 nesting season, we elected to modify our methods and delayed deployment of enclosures until the second week of May hoping to minimize predation of adult plovers around enclosures.

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. 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 2000 summer by determining the number of individually color-banded adult Snowy Plovers recorded during the breeding season, and adding 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 a minimum estimate of the number of unbanded plovers found at these sites during the breeding season. This method may underestimate the number of unbanded plovers because not all plovers are recorded on every survey. To check 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 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 creating a relative scale upon which nests found at different times during the nesting cycle can be compared; 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 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. We did not GPS brood locations this year as we have in the previous three seasons due to the lack of funding.

We evaluated 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 defined four main usage types: roosting, foraging, nesting, and brooding. We reviewed previous years reports and data and summarized the activity patterns in a table. Our intent was to show in a simple manner the response of plovers to restored habitats, and therefore, the benefits to plovers of habitat restoration projects.

Results

Abundance and Distribution

During the March 2001 pre-breeding surveys, no plovers were discovered at any historical nesting location other than those currently active.

During the 2001 breeding season, we observed an estimated 111-113 adult Snowy Plovers at breeding sites along the Oregon coast in 2001 (Table 1). Of 111-113 plovers, 104 were banded. We estimated there were eight 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 seven unbanded plovers and a maximum of nine unbanded plovers were present. Using the latter method of estimating unbanded plovers, we observed 49 banded females, 51 banded males, 4 banded but uncertain sex, six to seven unbanded females, and one to two unbanded males.

Our population estimate of 111-113 adult Snowy Plovers includes four banded adult plovers that were initially present and nesting but were apparently killed by predators during the breeding season. At South Siltcoos we believe two breeding plovers, one male and one female, were depredated while nesting. Both of these adults were three years old and nested at Siltcoos in 1999, 2000 and 2001. The banded male disappeared within the first week of incubation. The female disappeared sometime during the last week of incubation of her nest. Both nests were abandoned and failed. Both of these adults are Oregon residents, spending their entire year at Siltcoos. Neither adult was recorded at any site along the Oregon coast for the remainder of the nesting season.

One adult male at the Dunes Overlook was killed at the nest site. His body was found in the exclosure, while the female incubated the eggs. The body was removed and given to USFWS to be necropsied. The cause of the mortality is not yet known. The female completed incubation and the nest hatched. One chick was confirmed to have fledged. At the Coos Bay North Spit (CBNS) one adult male was depredated at the nest site on the day of hatching. Wing and body feathers of an adult Snowy Plover were found inside and outside the exclosure. The two chicks that hatched were banded the evening before the depredation event and were missing and presumed depredated. The remaining egg was infertile; it was found cracked, just outside the exclosure. Tracks from an avian predator were found inside the exclosure. The predator appears to have perched in two different places on the exclosure. The male was a four-year-old male who has nested at CBNS the past three nesting seasons.

The mean number of plovers recorded at each site this nesting season ranged from zero at Bay Beach-CBNS to 11.37 at Sutton (Table 2). Other sites with high mean number of plovers were New River (9.68) and North Tahkenitch (6.91). Compared to the 2000-nesting season, noteworthy increases were observed at Sutton Beach, North and South Tahkenitch, and the 95/98W HRA at Coos Bay North Spit. Sutton Beach had 6.95 plovers per survey in 2000 compared to 11.37 in 2001. North Tahkenitch had 2.57 plovers per survey in 2000 compared to 6.91 in 2001; South Tahkenitch had 0.33 plovers per survey in 2000 compared to 2.77. The 95/98W HRA at CBNS had 0.33 plovers per survey in 2000 compared 2.50 in 2001. Three sites had slight increases: Coos Bay North Spit had an overall increase in the number of birds observed per survey except for the South Spoil which dropped in use minimally, likely due to increased use of other restoration areas adjacent to the Spoil. South Beach had a mean of 4.50 plovers per survey in 2000 compared to 5.63 in 2001. The 94HRA had a mean of 3.84 plovers per survey in 2000 compared to 4.48 in 2001. Bandon Beach had a mean of 2.33 plovers per survey in 2000 compared to 3.70 in 2001 and New River in 2000 had a mean of 8.32 plovers per survey compared to 9.68 in 2001. At Coos Bay North Spit during the winter of 2000-01 the 98E HRA had most of the large vegetation piles burned and the habitat was disked for the first time. The plovers used the improved habitat for the first time in the 2001 nesting season; the mean number of plovers per survey was 1.55.

Several of the study sites had decreases including North and South Siltcoos, North and South Tenmile, and Floras Lake. North Siltcoos in 2000 had a mean of 9.57 plovers

per survey compared to 3.69 in 2001. South Siltcoos had a mean of 7.82 plovers per survey in 2000 compared to 4.59 in 2001. North Tenmile had a mean of 1.81 in 2000 compared to 0.48 in 2001. South Tenmile had a mean of 5.82 in 2000 compared to 4.25 in 2001. Floras Lake had a mean of 1.13 in 2000 plovers per survey compared to 0.33 in 2001.

Nest Activity

We located 111 nests during the 2001 nesting season (Table 3). The number of nests found at Sutton increased by 100% for the second consecutive year; 15 nests were found in 2001 compared to seven nests in 2000 and three nests in 1999. Eleven of the 15 nests found at Sutton in 2001 were north of the Holman Vista trailhead. Six of those nests were north of Berry Creek. Three nests were found on or near the spit of Sutton Creek and one nest was between the Holman Vista trailhead and Sutton Creek.

Fourteen nests were found at Siltcoos in the 2001 nesting season compared to 22 nests in 2000 and 21 nests in 1999. No nests were found on the North Spit of the Siltcoos River in 2001 despite restoration work being completed. This is the first time since 1997 that no nests were located on the North Spit. All 14 nests on the south side of the estuary were spread out in the more open sandy areas with clumps of scattered vegetation. No nests were found near the entrance of the Waxmyrtle Trail beach access point where three nests were located in 2000.

The number of nests located at the Dunes Overlook substantially increased for the second consecutive year: 15 nests were found in 2001 compared to eight nests in 2000 and two nests in 1999. Three nests were found in the south portion of the restoration area where nesting had not been previously documented. One nest was found west of the roped area on the north end of the restoration area. Previous to the 2001 nesting season all the nests were located on the northern restoration area.

Both sides of the Tahkenitch estuary showed an increase in nesting activity: 13 nests were found in 2001 compared to five nests in 2000. This is the first time since 1997 that more than 6 nest attempts have been made at Tahkenitch. Seven nests were found on the north side and six nests were found on the south side.

Two nests were found at North Tenmile during the 2001 nesting season; one was located at the north end of the open spit and the other nest was on the east side of the river on open sand but in an area with much scattered vegetation. South Tenmile had six nests in 2001.

We found 17 nests at the Coos Bay North Spit this year compared to 28 nests found in 2000. Of the 17 nests found this season at CBNS, 13 were on the habitat restoration areas and all four of the HRA's were used for nesting for the first time. Plovers initially used the 94HRA for nesting, but after corvid depredation caused these nests to fail, the plovers spread out onto the adjacent HRA's. Five nests were located on the 94HRA and six nests were located on the 95/98W HRA. Two nests were found on

the 98E HRA where no known nesting records exists prior to restoration work. Only three nests were found on the South Spoil and one on South Beach.

Six nests were found in the 2001 nesting season at Bandon Beach compared to two nests in 2000. Two nests were found in the China Creek overwash, one nest was along the foredune about one mile south of China Creek and three nests were in the overwashes at the south end of the beach at the Twomile/New River estuary.

At New River we found 23 nests this year compared to 17 nests found in 2000. The nests were spread out along the entire stretch of beach between the mouth of New River/Twomile Creek south to the HRA adjacent to Storm Ranch. Three of the nests were found on Coos Co. lands on the open spit, north of the overwash area on private lands. Nine nests were found in the overwashes mostly on private land. Ten of the nests were located on the BLM HRA, compared to four nests in 2000.

No nests were found at Floras Lake in the 2001-nesting season, only the second time since 1990 that no nests were located at this site. One brood from the HRA at New River moved south and was discovered using the Floras Creek/New River Overwash area.

Known nest initiation in the 2001-nesting season began on 5 April, seven days later than 2000 and ended on 14 July, three days earlier than 2000. The last successful nest of the 2001 season hatched on 11 August, three days earlier than 2000. The maximum number of active nests during 10-day intervals was 37 during 10-19 June (Fig. 10). The high number of nests in June is a reflection of repeated failure of unexclosed nests followed by increased success once exclosures were set up after 15 May.

Approximately 71% of the adults (n=79-80/111-113) were known to have made a nesting attempt during the 2001 breeding season. This is slightly lower than the mean for 1995-2000 (76%). Of the nesting adults in 2001, 39-40 were female (36 banded, 6 unbanded), and 40 were male (39 banded, 1 unbanded).

Nest Success

In 2001, overall Mayfield nest success was 26%, the lowest overall nest success since 1991 (Table 4). This is 17% lower than the 12-year mean. The estimated Mayfield nest success in 2001 for exclosed nests was 67%, equal to the 12-year mean. Unexclosed nests however had a much lower Mayfield nest success of only four percent, while the 12-year mean is 17%.

Nest success was extremely poor at Sutton (n = 15) and Siltcoos (n = 14), where only one nest at each site hatched. At Siltcoos had just one egg hatch, and at Sutton only two eggs hatch. Both broods failed. At Overlook 27% of the nests hatched (4/15). At Coos Bay North Spit, early in the season the plovers attempted to nest on the 94HRA and then the 95HRA, but Common Ravens (*Corvus corax*) were very successful at finding all the nests, thus contributing to the relatively poor nest success rates on all the HRA's

(38%). At Bandon and New River, early season nests also failed quickly due to corvid and Red Fox (*Vulpes vulpes*) depredation, also resulting in poor nest success rates (33% and 39% respectively).

Between 3 April and 15 May unexclosed nests consistently failed. Subsequently we exclosed nests, plovers dispersed and were more widely distributed, and nest success improved. This is particularly noticeable at Tahkenitch where eight of 13 nests were successful (62%). Early in the season there was little to no nest activity at Tahkenitch, but after plovers repeatedly failed at Sutton, Siltcoos, and Overlook, some moved to Tahkenitch where their success improved. At Coos Bay North Spit, the plovers moved onto the South Spoil, the 98HRA's and South Beach. South Spoil, 98EHRA and South Beach all had 100% nest success. Nest success at Tenmile was good in general (63%).

Figure 11 shows the 2001 % nest success and Figure 12 shows the 1990 – 2001 average % nest success. The low nest success rates at Sutton, Siltcoos, and Bandon in 2001 are consistent with overall low nest success at these sites. Tahkenitch, Tenmile, and Coos Bay North Spit have consistently had high nest success rates, and 2001 showed a similar pattern. New River had a much lower nest success rate compared to the average at this site.

Nest Exclosures

We placed exclosures around 57 of the 111 nests found in 2001 (Table 5). We used a combination of methods to deter predators from entering the exclosures. Five times during the 2001 nesting season predators entered a nest exclosure. Three of the exclosures at Dunes Overlook had an American Crow enter the exclosure and depredate the eggs causing nest failure. One nest at South Siltcoos had evidence that a crow entered it (tracks in the sand inside the exclosure), but only one of three eggs was depredated and the nest did not fail. At Coos Bay North Spit an adult male was killed inside the exclosure shortly after the chicks hatched; evidence of an avian predator walking around the inside of the exclosure was observed.

Thirty-four of the 57 exclosed nests had the PVC pipe/cord lock design used on top. Twenty-five of the 34 PVC type exclosures also had perpendicular string added along the perimeter of the other two sides. Six of the PVC type exclosures had perpendicular string added on two sides and were hot-wired. Three of the PVC type exclosures had no extra string added.

Nineteen other exclosed nests had the normal stringing across the top. Eleven of these nests were “double” strung, which means that extra string was placed every two inches near the two sides of the exclosure (as opposed to normal four inch spacing). Six of these eleven double strung nests had no perpendicular strings added to the other two sides of the exclosure, three had perpendicular string added on the two sides, and two had perpendicular string added on the two sides and were hot-wired. The other eight exclosed nests were single strung (four inch spacing); five of the eight single strung nests

had no extra string. Three of the eight single strung nests had perpendicular string added on two sides.

Four exclosures followed the square design but were modified in size and design slightly. A 42' exclosure was used around a nest where large driftwood logs made using a normal size exclosure not possible. The exclosure was more diamond shaped than square. Single stringing was used on the top of that exclosure with no extra stringing. That exclosure was used on another nest after the first nest hatched. The second nest had the fence material more square again using the single string method. One exclosure we have used for two years is a 50' exclosure and has hooks on the top of the fence material to hold the string. This exclosure was used on two nests that successfully hatched this season.

Nest Failure

Exclosed nests in 2001 had a 46% (18 of 39) failure rate, compared to 52% (41 of 79) in 2000, 36% (25 of 69) in 1999 and 30% (18 of 61) in 1998. Unexclosed nests continue to experience a very high rate of nest failure, and for the third consecutive season were a complete loss: 54 of 54 in 2001, 21 of 21 in 2000, and 9 of 9 in 1999. Nest failures were attributed to corvid depredation of the eggs (28%), unknown depredation (19%), abandonment (14%), unknown cause (13%), wind (10%), Red Fox (7%), overwash (4%), depredation of an adult plover by an unknown predator (3%), and infertile eggs (3%) (Tables 6 and 7).

Corvid depredation accounted for 28% of the nests failing in 2001: 20 nests failed due to corvids, three exclosed and 17 unexclosed. Unknown depredation accounted for 20% of the nests failing, all 14 unexclosed nests.

Abandonment accounted for 14% of the nest failures this season. A total of 10 nests were abandoned, including five one-egg nests that the adults never completed clutches or attended the nest. Three of the abandoned nests were exclosed.

Nine nests failed due to unknown causes (13% of the nests). Wind caused the failure of seven nests between Sutton Beach and Tahkenitch (10% of the nests).

Red Fox depredated five nests this year (7% of the nests). This is an increase compared to the 2000 nesting season when one nest was depredated by Red Fox. All Red Fox depredation has occurred at New River, although they have been observed at Bandon Beach and Floras Lake also.

Overwashing accounted for 4% ($n = 3$) of the failed nests in the 2001 nesting season. Infertile nests and depredation of an adult plover by an unknown predator each caused 3% of the nests to fail (2 nests each).

Fledgling Success

We monitored 39 broods in 2001. We did not confirm any broods from undiscovered nests this season although an unbanded brood was reported in the Siltcoos area during the nesting season but could not be relocated after the initial siting. Thirty-nine broods is slightly lower than the number of broods monitored the past few nesting seasons: 40 broods were monitored in 2000 and 45 broods in 1999. We confirmed 31 fledglings in 2001 compared to 43 in 2000 and 53 in 1999 (Table 8). Fledgling success was 33% in 2001 compared to 41% in 2000 and 43% in 1999 (Table 9). Less than one chick (0.80) fledged per brood during the 2001 nesting season. The South Spoil at Coos Bay North Spit had a fledgling success rate of 57%, the only site to have a fledgling success rate over 50% for the 2001 nesting season. At CBNS all the HRA's combined had fledgling success rate of 45% and at South Tenmile the fledgling success rate was 44%. The remaining sites had fledgling success rates ranging from 0-36% (Table 10).

At Sutton and Siltcoos only three eggs hatched and no fledglings were produced from these sites. Overlook produced just two fledglings from 15 nests. Tahkenitch produced eight fledglings, the highest number produced since 1996. All four fledglings from Tenmile were hatched on the south side. Coos Bay North Spit produced 10 fledglings, the highest number of fledglings of all sites. Bandon Beach produced one fledgling this season. New River continues to have low numbers of fledglings with just six fledglings confirmed from nine broods.

Brood Movements

In general we observed the same patterns of brood movement we have seen in previous seasons. Some broods stayed close to their nest location while other broods traveled relatively large distances to the mouths of estuaries or onto the beach if they were east of the foredune on an HRA. One male that nests at Bandon Beach/New River moved a brood that hatched on the New River HRA several miles north and crossed the mouth of New River/Two-mile Creek. The brood was located five days after hatching along the northern portion of Bandon Beach, a minimum of four miles north of the nest site. Another brood from New River hatched on the HRA west of the Storm Ranch boat launch. For the first two weeks the brood moved south on the HRA, and then disappeared. We were unable to relocate the brood for over a week, but finally found the male with two fledglings on the Floras Lake/New River Overwash area, ca. 6-8 miles south of the hatching location. We are not certain whether the brood walked the entire distance because on the day we relocated the brood they were able to fly, but had only recently fledged. At Coos Bay North Spit, most of the broods that hatched on the South Spoil, 94HRA and 98EHRA remained on the HRA's during the brood period. Two broods from the 95HRA as well as the one brood from South Beach spent all their time on South Beach. Tenmile and Tahkenitch broods tended to stay around the estuaries, but broods from Overlook moved both north and south. One brood was located north along the beach between Siltcoos and Overlook, and two broods moved south to the Tahkenitch estuary.

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. In general, plovers have responded quickly to habitat restoration areas, often nesting on the sites within a year or two of the creation of the habitat.

2000 Hatch-Year Returns

Twenty-three of the 43 hatch-year 2000 plovers returned to Oregon this year. The return rate is 53%, comparable to the 58% return rate of 2000. The return rate for 1999 was 56% (18 of 32). Of the returning 2000 hatch-year birds, 12 were female, 10 were male, and one was of uncertain sex (Table 12). Sixty-one percent of the returning '00HY birds nested, and they accounted for 13% (14 of 104) of the banded adults.

Sightings of Snowy Plovers Banded Elsewhere

Eight plovers banded in California were observed in Oregon in 2001. Seven were females and one was a male. Five of the plovers attempted to nest in Oregon, the single male and four females. Each of these five individuals made one nest attempt; two of the five nests hatched and one fledgling was produced. The male made at least one nest attempt at Sutton Beach at the end of May, which failed. He remained at Sutton until the end of June but no other nests associated with him were found. An individual with the same combination was seen one day in September at Bandon Beach but the sex was not determined; it may have been the same individual.

Two of the females were banded as hatch year plovers in Humboldt Co., CA. Both females were rebanded with adult combinations at their respective nest in Oregon. One female was first observed at Sutton Beach on 23 April. She was observed at Sutton for slightly more than a month, then she moved south to Tahkenitch where she successfully nested. The brood subsequently failed. The second female was first observed at Bandon Beach on 16 April. She was rebanded and successfully nested at the south end of Bandon Beach. The brood failed soon after hatching. The female moved north and was observed for several weeks at Coos Bay North Spit for several weeks after the nest hatched. Then she moved south to New River and was observed there through September.

Five of the females were banded as adults in California, including two that were Oregon hatch year birds and were rebanded in California. One of the females nested at Dunes Overlook. She was first observed at Tenmile on 11 April. She moved north to the Dunes Overlook in June and was first recorded there on 19 June. She successfully nested there. The male of the nest was found dead inside the enclosure close to the expected hatch date. She completed the incubation period and hatched the chicks. She reared the

brood and fledged one chick. The remaining four females were seen on either one or multiple days at a site but did not remain for any period of time and no nests for those individuals were found. One of them is a 1998 hatch-year bird from Tenmile who winters in Oregon but does not spend the summer in Oregon. Another was a 1999 hatch-year bird from Bandon; this was the first time she was recorded in Oregon since fledging.

Discussion

For the second consecutive winter it was mild on the Oregon coast and we experienced few winter storms. The precipitation level was below normal for the winter of 2000-2001. However, there was no evidence that nest initiation was earlier than the 1999-2000 average (Fig. 10).

Abundance

The estimated population of adult plovers in 2001 was slightly higher than in 2000, despite the loss of 13-15 adult plovers during the 2000 breeding season.

Nesting Activity

The 111 nests found during the 2001 nesting season is the most nests found in one year (Table 3). However, the high numbers of nests reflects poor nest success and frequent renesting attempts.

Sutton Beach continues to have an increase of use by the plovers during the nesting season, in part due to the use of Sutton by hatch year returns and in part due to the availability of suitable nesting habitat. However, nest success was extremely poor at Sutton, with only one nest hatching. In addition, this brood failed immediately apparently due to a dog which extensively circled the enclosure just after hatching and crushed one chick and may have lead to the other chick's death. There is no one cause of nest failure at Sutton that predominates, however wind and overwashing were responsible for six of the known nest failures. Habitat restoration work proposed at Sutton by the USFS will hopefully benefit the plovers by giving them an area out of the wind and wave action, in addition to helping keep some distance between recreating public and nesting activity.

Nesting activity at Siltcoos remains high although success was very low with only one egg from one nest hatching. Recreational use remains high making management of this site a challenging issue. The Estuary Trail was temporarily closed for a few weeks in July to minimize disturbance of a nest close to the trail, which subsequently was abandoned. A variety of causes of failure occurred at Siltcoos. Depredation continues to be a problem, and an apparent Coyote (*Canis latrans*) den near the nesting area may have contributed to some of the nest and adult mortalities. Five of the nests failed due to abandonment and unknown cause; the exact cause of these failures is not known.

Plover use of the Overlook increased in May and June as plovers dispersed following failed nest attempts at Sutton and Siltcoos. Unfortunately three exclosed nests were entered by American Crows and destroyed, and a fourth nest may have been disturbed by these same crows and was abandoned. As restoration work continues each year at the Overlook the amount and quality of habitat available to the plovers improves, and it is encouraging that nesting was documented for the first time on the south clearing.

Plover use at Tahkenitch was low in the beginning of the season, but increased as plovers dispersed after failed nest attempts at Sutton, Siltcoos, and Overlook. The plovers used both sides of the creek this year for nesting and brood rearing compared to the 2000 nesting season when most of the activity was on the north side. Habitat restoration work was completed on the existing plover habitat in winter 2000 on the south side of the creek. Increased plover use and an increase in fledgling production is encouraging.

There was a slight increase in nesting at Tenmile this season, but that did not equate to more fledglings. The habitat continues to degrade at South Tenmile as the beach grass fills in the overwashes and closes up the mouths. Tenmile continues to be one of the most consistent and productive sites on Forest Service land (Table 8 and Fig. 12).

At CBNS, the plovers responded to early season nesting failure mostly on the 94HRA by renesting on all the other restoration areas as well as the beach and the spoil. The BLM has increased available nesting habitat, which apparently enabled the plovers to disperse when failure rates are high. Several nests were located close to the foredune road this season; we believe it is beneficial that minimal disturbance occurs along the foredune road and therefore it is important to maintain the reroute road for public access. Three nests were found on the South Spoil continuing the declining pattern of use observed over the past few years. Although only three nests were found four fledglings were produced. The one nest found on South Beach this year was adjacent to the south end of the 95 HRA, farther south than where the plovers have nested on the beach in recent years. Coos Bay North Spit continues to be the most productive site on the coast.

Nesting activity increased at Bandon Beach, especially at the south end of the beach near the Twomile Creek/New River estuary. Overwashes are important nesting habitat for plovers at Bandon Beach with five of the six nests found this season in overwashes.

At New River, the BLM continues to increase the acreage of the habitat restoration area adjacent to Storm Ranch. As the habitat is improved and expanded the plovers increase their use of the area. The mean number of plovers observed at this site per survey was up slightly this year, in contrast to the downward trend noted the past few years. The increase in the number of nests can be in part attributed to the high rate of nest failure early in the season. The plovers continue to increase their use of the HRA, especially as the habitat is degrading in some of the overwashes on private land.

While New River is relatively remote compared to most sites and sees less recreational disturbance, protecting nests and broods is still a challenge. One of the nests on the county land was due west of the Lower Fourmile beach access point. An exclosure was set up around the nest and signs and ropes were set up to minimize disturbance to the birds. Due to low water levels, people crossed the river and repeatedly walked passed the signs and ropes and up to the exclosure. After the nest hatched one egg remained inside the exclosure and someone threw an aerosol can inside the exclosure not far from the egg. ATV access from the county land continues to be a problem. On one occasion two ATV riders rode extensively on the dry sand and wrack line while the last broods of the season were active on the spit. Both broods failed due to unknown cause, but one was active the day before all the ATV riding.

The plovers again nested farther south at New River than what has been observed in previous nesting seasons. New River produced 21% of the nests and 19% of the fledglings along the Oregon coast this year indicating the importance of this site for Snowy Plover recovery. Despite the highest total number of nests found and years of relatively high nest success at New River (Fig.12), fledgling success is consistently very low (Fig. 13). We believe fledgling rates are low at New River due to predation by Red Fox, and that removal of the Red Fox at this site has the potential to increase fledgling success rates. Due to the typically high numbers of nests and chicks at New River, any improvement in fledgling success rates should significantly increase the overall fledgling numbers on the Oregon coast.

At Floras Lake, the extreme south end of the BLM managed land has one large flat area where a nest scrape was found and plovers were observed for several surveys but no nest was located. Much of the beach habitat along the foredune at this site remains narrow and steep. At the north end of the beach at the confluence of Floras Creek/New River the habitat looked similar to last season when five nests were located. Plover use of this area was low except for one brood that moved south from the New River HRA. A decrease in plover use at this site may be in part due to an increase of use at New River. The plovers at south end of the population, Bandon, New River, and Floras Lake, move between sites during the nesting season.

Nest Success and Failure

High rates of nest failure continued during the 2001 nesting season, similar to what was observed in 2000. The overall Mayfield nest success was the lowest since 1991. The very high rates of nest failure and overall poor nesting success resulted from our decision not to exclose early season nests. All 54 unexclosed nests failed, or 49% of the total number of nests found. Early season nests failed mostly due to corvid and fox depredation because they were not protected with exclosures. Once we began exclosing nests, nest success rates improved (see Table 5 for a comparison of exclosed and unexclosed nests). In previous nesting seasons a higher percentage of nests were exclosed. In 2001, many females had three and often six eggs destroyed before 15 May. If nests are successful, most females do not lay more than six to nine eggs in a season. It is not known whether the increase in egg production by females due to high rates of early

season nest failure has a negative impact on their physiological condition and thus their survival, particularly in the following winter season. We also do not know whether increased egg production due to high rates of early season nest failure may lead to increased numbers of infertile eggs or chicks in poor condition at hatching. These potential impacts of high nest failure are a concern and need to be monitored. Predators continue to pose a threat around the exclosures. The need to reduce the number of predators around the nesting area to reduce depredation of both the eggs and breeding adults is important. Survival of the adult plovers is imperative to maintain genetic diversity in the population.

As in previous years, corvids are the primary cause of nest depredation. Research and management of both American Crows and Common Raven may help to increase both nest and fledgling success.

Five of 10 abandoned nests had just one egg, and it remains unclear whether these nests were abandoned due to disturbance or if they were laid by a female that needs to “drop an egg”. Some evidence suggesting the need to “drop an egg” occurred at New River. More females were present at New River than males. During June, all of the males were either incubating a nest or had a brood. One female who was not paired nor associated with an active nest was repeatedly observed in or near by a specific overwash where an individual egg was laid on two occasions in two separate nest bowls. One egg was abandoned and the second appeared to be abandoned until a Red Fox depredated the egg. This female was not able to pair with a male plover and probably needed to expel her developing eggs. There was no evidence in either case that the female was disturbed.

Red Fox were the cause of failure of five nests at New River this year; two in overwashes on private land and three on the HRA. Red Fox were observed occasionally and their tracks were documented regularly from Bandon Beach south to Floras Lake. We recorded a Red Fox on videotape at New River and the documentation was given to BLM personnel. The fox was on the eastside of the river around the Lower Fourmile access point on county land. One fox den was found this year at Bandon Beach on the eastside of the foredune. It was found by following what appeared to be a pup from this year. We saw this particular pup in the morning just before 9:00 AM, then again several hours later at 11:35 AM in the same general location digging in the wet sand. We followed the fox east toward the foredune and found the den. We believe this apparent increase in the Red Fox population from Bandon to Floras Lake has had a negative impact on the plover population.

We used the same basic exclosure design as we have in previous nesting seasons with some modifications to deter predation. There was little evidence that the PVC/cord lock method worked better than the typical stringing method, but it did alleviate some problems with setting up exclosures, which in turn is helpful for the monitoring crews. We did not experience any problems with the PVC/cord lock method, and we anticipate using this method in the future.

The site and the particular circumstances associated with each site determined what type of enclosure was assembled. The addition of more string or hot wires helped to deter predation in some cases. The modified hot wire system worked more efficiently than the original design and required less time to set up the enclosure, but it still entails more time than a regular enclosure. Seven of eight “hot wired” enclosures hatched, suggesting that this system is effective. The one nest that did fail appears to have failed because an unknown predator depredated the adult male, but there was no evidence the depredation occurred inside the hot-wired enclosure. At a different hot-wired enclosure, an adult male was found dead inside, but there was no evidence a predator entered the enclosure, at least not an avian predator. The female completed the incubation period alone and the nest hatched.

Each year we have modified and refined minor aspects of how we set up enclosures, hoping to improve the efficiency of keeping predators away from nests. Although nest success is clearly improved through the use of enclosures, the modification and refinement of various techniques overtime has made it difficult to make a rigorous comparison among the various enclosure techniques.

Fledgling Success

The total of 31 chicks fledged in 2001 is the lowest number of fledglings since 1991, although in 1992 and 1998, 33 and 32 fledglings were produced. Poor nest success resulted in fewer possible chicks, and therefore fewer potential fledglings. Fledgling success in the 2001 nesting season was slightly lower than the overall 12-year mean (33% compared to 37%, Table 9). Fledgling success rates for each site in 2001 were generally less than the 12-year means (compare Table 10 to Fig.13). Sutton, Siltcoos, and Bandon-New River-Floras Lake continue to have poor fledgling success rates despite having relatively high numbers of nests. Tenmile and Coos Bay North Spit continue to have very good fledgling success rates and therefore tend to be the main source of recruitment into the population. Predator control at Bandon-New River-Floras Lake, particularly targeting Red Fox, will hopefully result in higher fledgling success rates and therefore better recruitment. Siltcoos remains a problem both in terms of recreational activities as well as predation on nesting plovers. The increase in use by plovers at Tahkenitch is encouraging, as it tends to be a more remote location, and as Tenmile indicates plovers tend to be more successful at remote locations. However, it is important to keep disturbance at Tahkenitch to a minimum as well as addressing predator issues at this site, because plovers have had problems at this site in the past and subsequently nearly abandoned the site in 1999 and 2000.

Brood Movements

As we have seen in previous years brood movement tends to be unpredictable with some broods remaining on habitat restoration areas while other broods move long distances on open beaches. Large habitat restoration areas and dry sand restrictions on open beaches continue to provide the broods with relatively undisturbed areas to forage and seek refuge from predators, recreational activities, and inclement weather. Large

open habitat restoration areas also provide foraging habitat for some raptors, and we have recorded several species hunting low over HRA's, particularly at CBNS, including American Kestrel (*Falco sparverius*), Merlin (*Falco columbarius*), Peregrine Falcon (*Falco peregrinus*), and Northern Harrier (*Circus cyaneus*). We suspect these raptors may impact brood survival as well as adult mortalities around exclosures.

Activity Patterns on HRA's

Table 11 indicates that plovers will and do respond to habitat restoration areas. This suggests that the plovers prefer these open areas, and may have some limitations of available natural habitat. All the HRA's have had nesting plovers within a year or two of their creation, and most typical nesting season activities are occurring on the HRA's. We believe that this indicates that restoration areas are beneficial to plovers.

Habitat Restoration and Development Projects

The USFS completed 10 acres of restoration work at North Siltcoos. At Tahkenitch, contractors herbicided the European beachgrass on the South Spit in the fall of 2000.

At the Overlook, the USFS had prison crews hand pull the sprouting beachgrass on the north section of habitat. In addition approximately 20 acres of habitat was restored.

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. A private contractor completed a limited amount of herbiciding on patches European beachgrass on the South Spoil during the winter of 2001. The last few remaining debris piles were burned after the completion of the 2001 nesting season.

The habitat restoration project continued during the fall of 2000 at New River along the stretch of beach adjacent to the Storm Ranch boat launch and south. The original northern overwashes where the restoration 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 2002 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 restoration areas.
- Consider additional field staff to compensate for the continual annual expansion of habitat restoration areas.
- Continue the use of predator exclosures around nests; continue to evaluate the timing for placing exclosures around nests prior to 1 May.
- Implement predator control as defined in the Predator Control Environmental Assessment.
- Continue to coordinate with federal agency employees regarding time frames of any restoration work to be completed to minimize disturbance to nesting activity and broods.
- Coordinate agency activities in 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.
- Design informative/interactive presentations for schools for children.
- Create a short annual summary each year to inform the public of annual plover productivity.
- 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.

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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 nine primary 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.

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 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 - 2000.

Sutton:

- 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 back side 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:

- Close the entire estuary, which would benefit 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. Most people did not know the riverbank was closed. This includes both people on foot and people boating in the river.
- 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 Road.
- If the closed area during the 2002 nesting season is similar to the closed area during the 1999, 2000, and 2001 nesting season, we recommend the ropes and signs be set up early in the nesting season to be as effective as possible.
- Continue to prohibit dogs on the spits and near the estuary during nesting season. The north spit appears too confusing for people to understand the “dogs allowed/no dogs allowed” sections and trails, and it is difficult to put signs up everywhere a dog walker can access the beach from the north parking lot. A dog walker can access the estuary from the main road without encountering a “no dogs” sign.
- If the north spit is not closed we recommend a fence be placed around the parking lot of North Siltcoos to ensure everyone accesses the beach from the same access point. This will make signing and enforcement more effective.
- Continue the use of site monitors to educate people and keep them out of closed areas. Use monitors, especially during peak periods on weekends, and stagger their hours to cover evenings. Have monitors 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 area estuary at Siltcoos, we recommend exploration of various management methods.
- Changes should be made with the establishment of the Canoe Trail down the Siltcoos River, which will drop people off directly between the two plover nesting areas. Possible solutions to potential problems include development of a viewing platform on the Estuary Trail, which would allow people to get out of their boats, learn about the area and the plovers, and go back upstream before entering the nesting areas. This may also alleviate problems posed by people hiking the

Estuary Trail and crossing to the South Spit.

Overlook:

- Rope and sign of all suitable Snowy Plover nesting habitat in early April at the onset of the nesting season.
- 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 early September.

Tahkenitch:

- 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.

Tenmile North and South Spits:

- Continue to rope and sign plover nesting habitat on the south spit.
- Enforce vehicle closure to prevent violators from driving in the habitat restoration area.

Coos Bay North Spit:

- Continue to rope and sign the beach as early in the nesting season as possible.
- Clearly sign the entrance road 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 to reduce disturbance to the plovers, especially during the nesting season. The seasonal reroute of the road in 2001 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.

Bandon:

- Sign and rope around the China Creek overwash, the entrance point to the Christian Camp, and south of the trailhead early in the season. Even though we continue to have some problems with people entering the beach from the Christian Camp, overall violations were lower this season.
- Sign the beach 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. Several of these hikers camped in the Twomile Overwash area, indicating the importance of

signing this area.

New River:

- 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 and place some types of blockades that would prevent ATV's from accessing the open spit. Due to low water levels in New River, we had a number of problems with access from the Four Mile county property. We had repeated ATV violations, some which were very deliberate. Despite our vigilance, only some of the riders were identified and stopped by law enforcement. Others continued to ride even though the area is now well signed. We also had some problems with people and horseback riders approaching active nests that were on the open spit.
- 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.
- Coordination with the county sheriff and state police may help clarify concerns and issues regarding access and use of the New River area. We heard firearms discharging on the county land on the east side of the river and we found a badly wounded Great Horned Owl on the county land. This owl was taken into Free Flight where it was determined it had been shot and had to be euthanized. Vigilant patrols of this area are required to cease such illegal activities.
- Continue to keep the local landowners involved in the project and informed of all project plans and results.

Floras Lake:

- Continue the seasonal closure and use of the cyclone fence and additional roping and signing. Habitat may be available in both the closed and open section of the beach, therefore 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.
- Coordinate with Curry County to protect the north end of the beach where two large overwashes continue to be the best nesting habitat.

Habitat Restoration

Sutton:

- Control beachgrass to maintain and restore nesting areas on Sutton spit and elsewhere.
- Implement the proposed habitat restoration area behind the foredune.

Siltcoos:

- Maintain open nesting areas on North and South Spits by removing European beachgrass.

Overlook:

- Continue the restoration project as in 1999, but begin activities after the end of the nesting season.
- Continue the handpulling of beachgrass in previously cleared areas.

Tahkenitch:

- Maintain open areas with attention to overwash areas.

Tenmile:

- Restore the badly degrading habitat with heavy machinery, particularly on the South Spit. Break open foredune to encourage overwashes.
- Consider a large restoration area on the North Spit, and consider a future habitat restoration north along the beach towards the Umpqua River. This area is one of the most remote areas on the DNRA, and currently had little vehicle use and recreational activity. Consider this area for restoration due to its remote location.

Coos Bay North Spit:

- Maintain the annual disking to retard beachgrass growth and maintain the fence around the 94HRA.

New River Spit:

- Continue mechanical scraping of overwash areas with the goal of creating physical characteristics that will facilitate scouring and overwash of sites by winter storms.

Figure 2. Number of active Snowy Plover nests within 10 day intervals on the Oregon coast, 2001. Dashed lines represent ± 2 standard deviations.

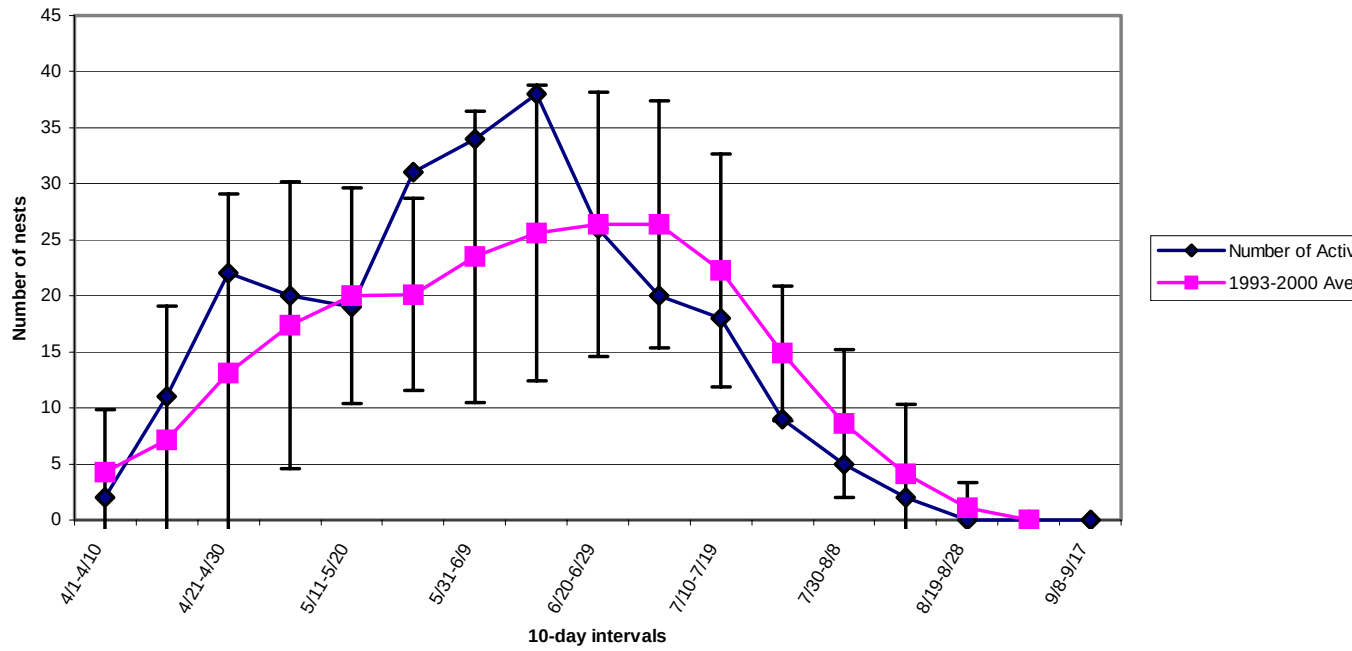
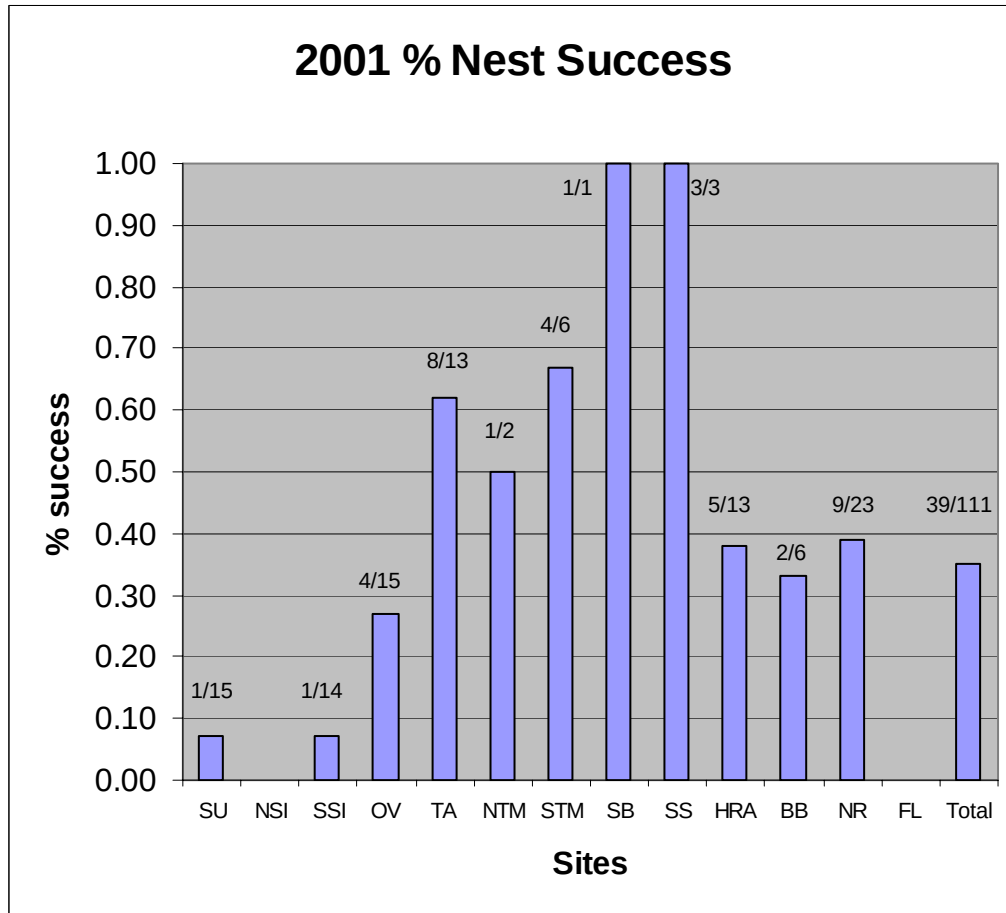
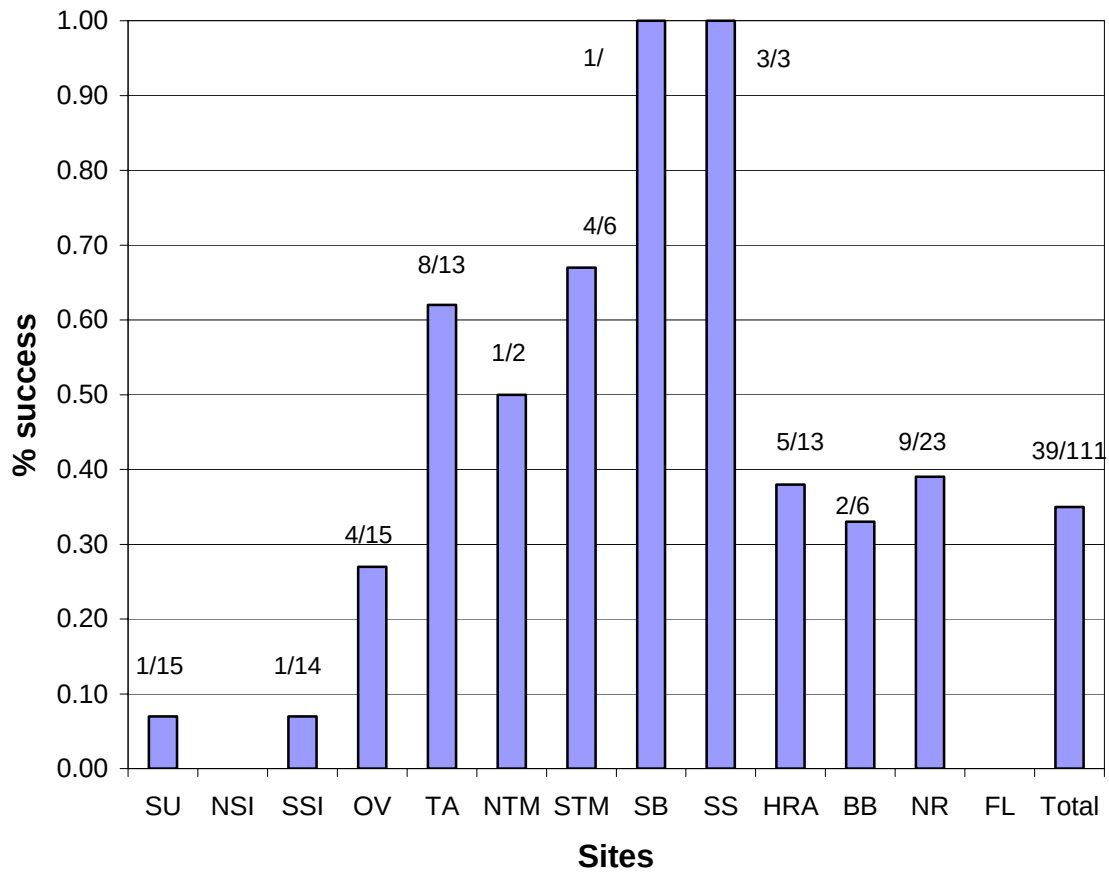


Figure 11. Percent nest success of Snowy Plovers along the Oregon coast for the 2001 nesting season. Above each bar is the number of hatched nests over the total number of nests.



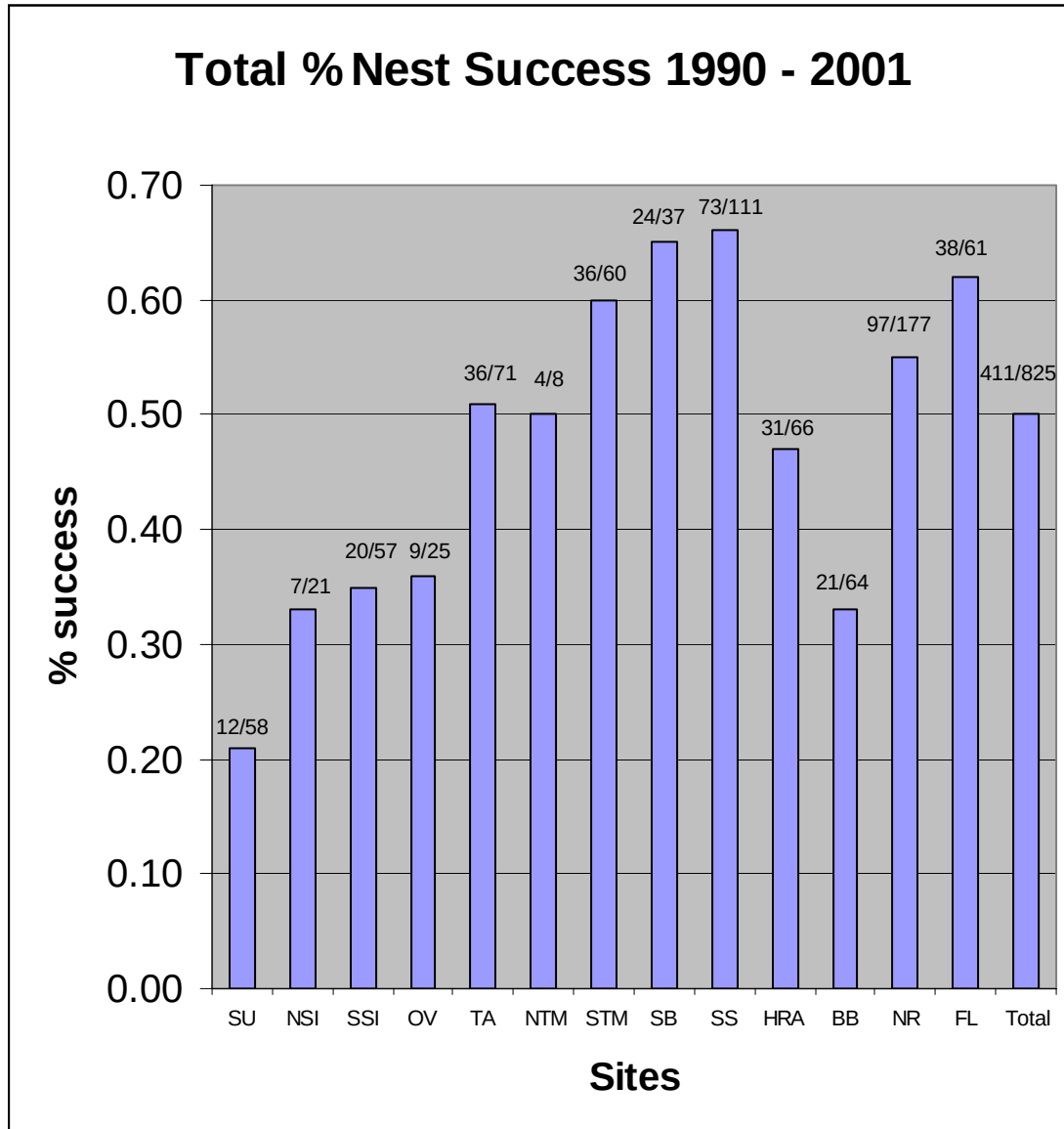
SU = Sutton; NSI = North Siltcoos; SSI = South Siltcoos; OV = Overlook; TA = Tahkenitch; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

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Figure 12. Total percent nest success for Snowy Plovers along the Oregon Coast, 1990 – 2001. Above each bar is the total number of nests that hatched over the total number of nests.



SU = Sutton; NSI = North Siltcoos; SSI = South Siltcoos; OV = Overlook; TA = Tahkenitch; 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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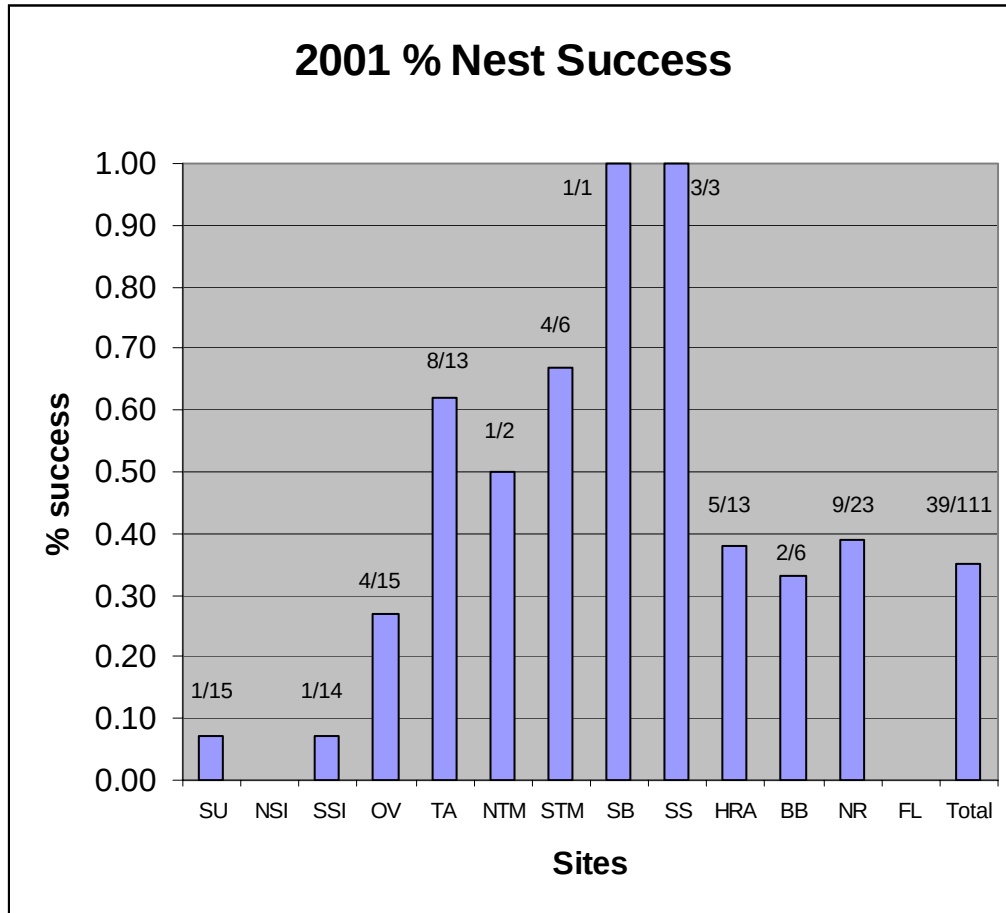
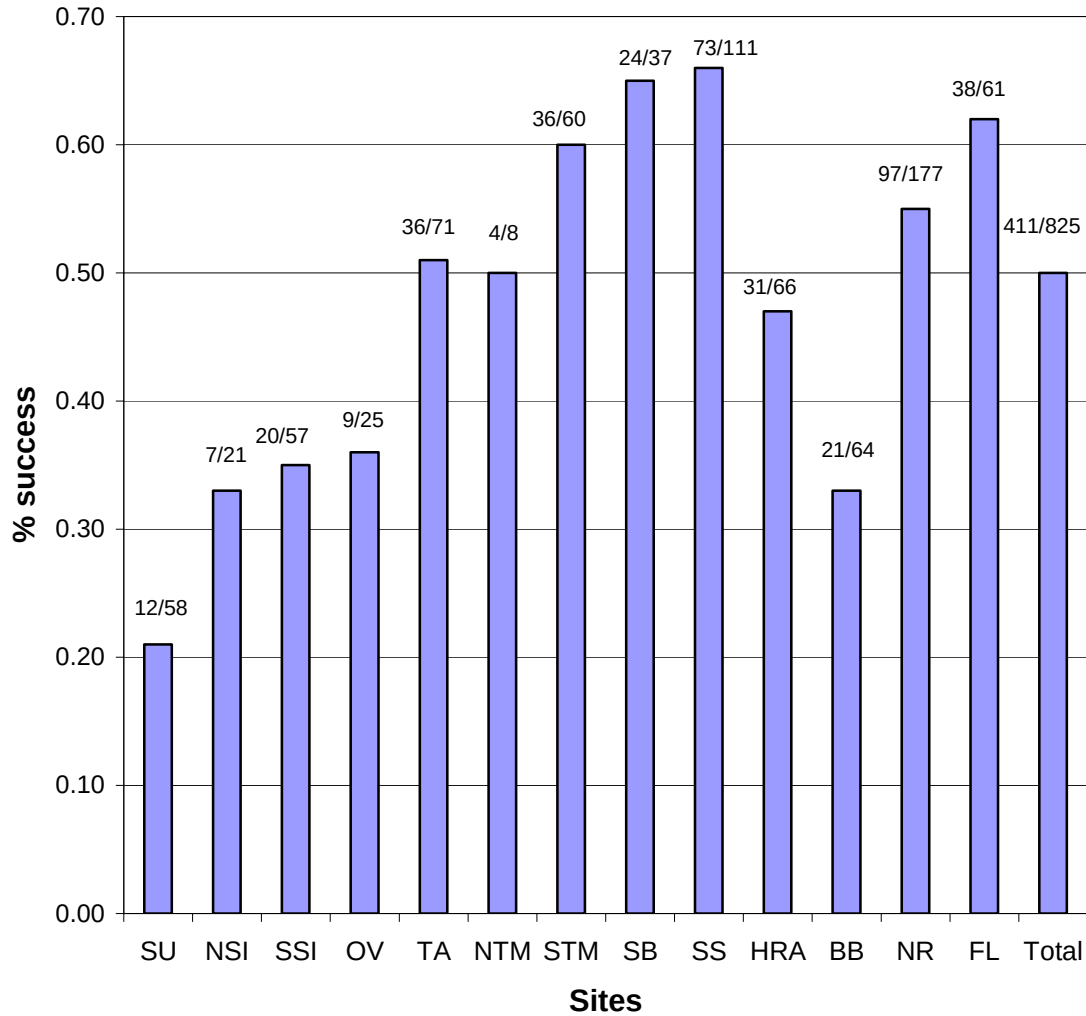
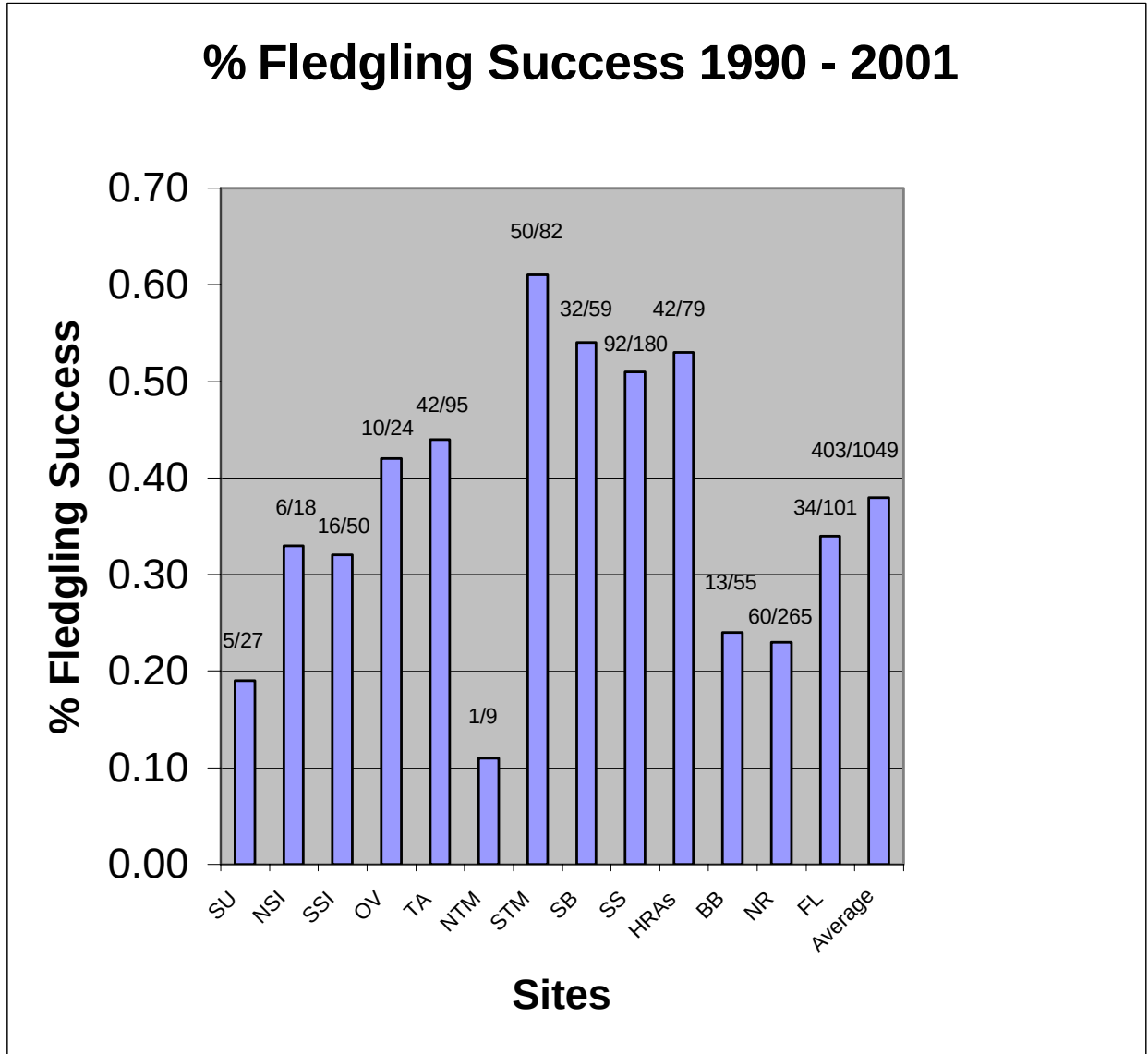


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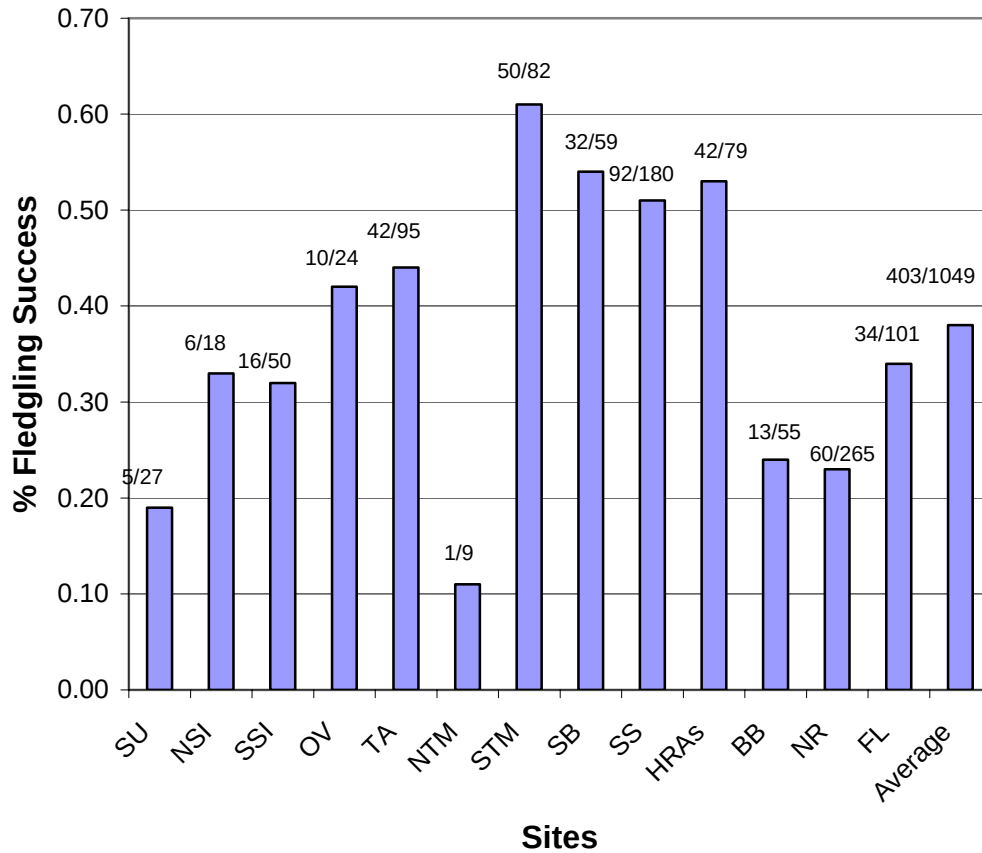
SU = Sutton; NSI = North Siltcoos; SSI = South Siltcoos; OV = Overlook; TA = Tahkenitch; NTM = North Tenmile; STM = South Tenmile; SB = South Beach; SS = South Spoil; HRA = Coos Bay North Spit 94, 95, and 98HRA's combined; BB = Bandon Beach; NR = New River; FL = Floras Lake.

Figure 13. Percent fledgling success of Snowy Plovers at each nesting site along the Oregon coast, 1990 – 2001. Above each bar is the number of fledglings over number of hatched eggs.



SU = Sutton; NSI = North Siltcoos; SSI = South Siltcoos; OV = Overlook; TA = Tahkenitch; 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 . Various usages of Habitat Restoration Areas by Snowy Plovers on the Oregon Coast, 1994-2001. Note that absence of a usage 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
Dunes Overlook						F?,N,B	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
95HRA		R,F,N,B	F,B	N,B	F,N,B	F,B	F,N,B	F?,N,B
98HRA							N	F?,N,B
98EHRA								R?,F?,N,B
New River						N	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 1. Population estimates of the Western Snowy Plover on the Oregon Coast, 1990-2001.

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

^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

Table 2. Distribution and abundance of adult Snowy Plovers along the Oregon coast during the 2001 breeding season.

Site Name	Mean ($\bar{x}$)	SD	Range	# Surveys (n)^a	Date of Peak Count	Dates of Surveys
Sutton Beach	11.37	5.15	0-19	27(52)	28 Aug	9 April- 6 Sept
Siltcoos:						
North Spit	3.69	6.18	0-19	26(29)	28 Aug	3 April-6 Sept
South Spit	4.59	4.19	0-13	27(62)	9 May	4 April-6 Sept
Overlook	4.33	2.97	0-9	30(72)	19 July	4 April-7 Sept
Tahk. Creek to Umpqua R.:						
N. Tahk. Spit	6.91	2.87	0-14	35(64)	25 Aug	5 April-7 Sept
S. Tahk. Spit	2.77	3.24	0-9	30(57)	15 July	5 April-5 Sept
Tenmile:						
North Spit to Umpqua R.	0.48	0.99	0-4	23(30)	18 June	11 April-25 Aug
South Spit	4.25	2.51	0-10	32(44)	8 July	11 April-5 Sept
Coos Bay N.S.:						
South Beach	5.63	3.21	0-11	32(36)	9,15 July	11 April-7 Sept
South Spoil	1.76	1.96	0-7	25(20)	15 July	11 April-13 Aug
HRA '94	4.48	3.16	0-11	25(32)	23 April	11 April-13 Aug
HRA '95/'98W	2.50	2.12	0-7	10(27)	21 May	11 April-22 July
HRA '98E	1.55	1.75	0-4	11(20)	21 May, 20 June	18 April-22 July
Bay Beach	0.00	0.00	0	4(4)	-	23 April-2 June
Bandon	3.70	2.21	0-9	30(44)	16 July	8 April-6 Sept
New River	9.68	2.24	5-14	28(54)	30 June	10 April-6 Sept
Floras Lake/New River Breach	0.33	0.62	0-2	15(15)	24 April	15 April-3 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 – 2001; 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	Total # nests	Total # broods ^a
Necanicum														1
Sutton Beach				2	1	2	6	14	8	3	7	15	58	1
Siltcoos:														
North Spit				0	2	4	2	0	1	4	8	0	21	0
South Spit				1	2	2	1	3	3	17	14	14	57	0
Overlook										2	8	15	25	0
Tahkenitch:														
North Spit				0	0	0	0	0	0	0	4	7	11	0
South Spit				0	3	9	18	14	6	3	1	6	60	1
Threemile Creek/ Umpqua River				0	0	0	1	0	0	0	0		1	0
Tenmile:														
North Spit					2	2	1	0	0	0	1	2	8	0
South Spit	2	0	9	8	5	4	3	2	11	5	5	6	60	2
Coos Bay North Spit:														
South Beach	0	4	6	3	4	3	3	6	6	0	1	1	37	9
South Spoil	20	9	4	6	9	12	22	14	5	2	5	3	111	13
North Spoil	5	1	1	0	0	0							7	0
Habitat Rest. Areas					4	3	2	3	7	12	22	13	66	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	64	2
New River Spit	6	6	2	0	6	20	18	25	26	28	17	23	177	6
Floras Lake/ New River Overwash	2	2	6	11	8	6	9	8	4	0	5	0	61	3
Total nests	36	36	36	41	51	76	89	93	78	78	100	111	825	
Total broods^a	2	1	5	7	4	6	11	5	3	1	2	0		47

^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, 1990-2001.

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	76	68	(51)	(48)
1995	43	62	5	(76)	(71)
1996	48	66	7	(89)	(87)
1997	43	52	24	(93)	(88)
1998	50	70	15	(78)	(70)
1999	51	62	40	(78)	(72)
2000	32	46	2	(100)	(91)
2001	26	67	4	(111)	(101)
mean	42.6 ± 16.9	66.8 ± 10.8	17.3 ± 19.2	(825)	(763)

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, 2001.

		NESTS EXCLOSED		NESTS NOT EXCLOSED	
SITE NAME	Total #	Hatch	Fail	Hatch	Fail
Sutton	15	1	3	0	11
North Siltcoos	0	-	-	-	-
South Siltcoos	14	1	5	0	8
Overlook '98 Clearing	15	4	5	0	6
Tahkenitch	13	8	2	0	3
3mi. Ck. - Umpqua R.	0	-	-	-	-
Tenmile:					
North	2	1	0	0	1
South	6	4	1	0	1
Coos Bay North Spit:					
South Beach	1	1	0	0	0
South Spoil	3	3	0	0	0
Habitat Restoration Areas	13	5	1	0	7
Bandon	6	2	0	0	4
New River	23	9	1	0	13
Floras Lake	0	-	-	-	-
TOTALS	111	39	18	0	54
% Success of known fate nests:		Nests Exclosed		Nests Not Exclosed	
Apparent		68%		0%	

Table 6. Causes of Snowy Plover nest failure at survey sites along the Oregon coast, 2001.

Site Name	Total Nests	# Fail	Depredation				Other				
			Egg Depredation			Adult Depredation					
			Corvid	Unk	Red Fox	Unknown Predator	Wind	Overwash	Infertile	Abandon ^a	Unk cause
Sutton	15	14	2	2	0	0	3	3	0	1	3
Siltcoos:											
North	0	-	-	-	-	-	-	-	-	-	-
South	14	13	3	2	0	2	1	0	0	2	3
Overlook	15	11	4	3	0	0	1	0	0	2	1
Tahkenitch	13	5	0	1	0	0	2	0	0	0	2
Tenmile:											
North	2	1	0	1	0	0	0	0	0	0	0
South	6	2	1	0	0	0	0	0	0	1	0
Coos Bay											
North Spit:											
South Beach	1	0	0	0	0	0	0	0	0	0	0
South Spoil	3	0	0	0	0	0	0	0	0	0	0
HRAs	13	8	7	0	0	0	0	0	1	0	0
Bandon	6	4	2	1	0	0	0	0	0	1	0
New River	23	14	1	4	5	0	0	0	1	3	0
Floras Lake	0	0	0	0	0	0	0	0	0	0	0
TOTALS	111	72	20	14	5	2	7	3	2	10	9

^a – includes 5 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, 2001.

Cause of Failure		Exclosed	Unexclosed	Totals
Egg Depredation	Corvid Predation	3	17	20
	Unknown Predation	0	14	14
	Red Fox Predation	0	5	5
Adult Depredation	Unknown Predation	2	0	2
Other	Wind	6	1	7
	Overwash	0	3	3
	Infertility	2	0	2
	Abandoned^a	3	7	10
	Unknown Cause	2	7	9
Totals		18	54	72

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

Table 8. Total number of young fledged for all sites on the Oregon Coast 1990-01; includes fledglings from broods from undiscovered nests.

Site Name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	TOTALS
Necanicum											1		1
Sutton							0	1	1	0	3	0	5
Siltcoos:													
North Spit					0		0	0	2	4	0	0	6
South Spit					1	2	0	0	4	2	7	0	16
Overlook '98 clearing										3	5	2	10
Tahkenitch					1	12	8	7	1	1	5	8	43
Tenmile:													
North Spit					0	1	0	0	0	0	0	0	1
South Spit			14	7	3	3	4	4	3	7	5	4	54
Coos Bay North Spit:													
South Spoil	3	2	4	13	17	17	22	9	6	5	3	4	105
South Beach		11	9	2	6	2	2	7	2	0	0	1	42
Habitat Rest. Areas					7	2	1	1	1	22	6	5	45
Bandon		1	1	3	5	0	1	0	1	1	0	1	14
New River Spit			4	0	7	12	8	9	11	8	5	6	70
Floras Lake/ New River Overwash	0	2	1	11	9	6	1	3	0	0	3	0	36
TOTALS	3	16	33	36	56	57	47	41	32	53	43^a	31	448

^a – increased total fledglings based on breeding season 2001 sightings

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	31	41
1998	50	26	32
1999	51	43	53
2000 ^d	32	41	43
2001	26	33	31
	Mean = 42.6±16.9	Overall = 37	Total = 448

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 2001 sightings

Table 10. Fledging and Brood Success of Snowy Plovers on the Oregon Coast, 2001.

Site Name	Total # Broods*	% Brood Success*	Total # Eggs Hatched	Min. # Fledged		% Fledging Success**
				From Known Nests	From Undiscovered Nests	
Necanicum						
Sutton	1	0	2	0	0	0
Siltcoos:						
North Siltcoos	0	0	0	0	0	0
South Siltcoos	1	0	1	0	0	0
Overlook '98 Clearing	4	50	10	2	0	20
Tahkenitch	8	75	22	8	0	36
Tenmile:						
North Spit	1	0	1	0	0	0
South Spit	4	75	9	4	0	44
Coos Bay N. Spit						
South Spoil	3	67	7	4	0	57
South Beach	1	100	3	1	0	33
HRA	5	80	11	5	0	45
Bandon	2	50	6	1	0	16
New River Spit	9	44	22	6	0	27
Floras Lake/New River Overwash	0	0	0	0	0	0
TOTALS	39	59	94	31	0	33
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.

Table 11. Activity patterns of Snowy Plovers on Habitat Restoration Areas along the Oregon Coast, 1994-2001. 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
Dunes Overlook						F?,N,B	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
95HRA		R,F,N,B	F,B	N,B	F,N,B	F,B	F,N,B	F?,N,B
98HRA							N	F?,N,B
98EHRA								R?,F?,N,B
New River						N	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. 2000 hatch year Snowy Plovers that returned to the Oregon coast in 2001.

Chick Combos	New Combo	Sex	2000 Banding Location	2001 Location(s)	2001 Nest
BY:Y		F	Takhenitch	BB/7,NR/7	No
BY:Y		M	Takhenitch	SU/5,BB/7,NR/7	No
G/W/G:Y (G:Y)		F?	New River	TA/4	No
GY:Y		M	94HRA	SU/6	No
GY:Y	LB:YY	M	94HRA	SB/4,HRA/4,SS/5, TM/6	Yes
LG:Y		M	Sutton	SB/4,HRA/4,SS/6	Yes
R/B/R:Y		F	Tenmile	HRA/4,SB/5,SS/5	Yes
R/B/R:Y		M	Tenmile	SU/4,TA/5,TM.7	Yes
RY:Y		F?	Overlook	SI/8	No
S:Y		F	Unknown	SB/4,HRA/5	Yes
W/G/W:Y	LB:WW	M	New River	BB/4,NR/8	Yes
WB:Y		M	95HRA	SU/4,OV/4,TA/6	Yes
WB:Y		M	95HRA	SB/4,HRA/5,SS/5	Yes
WB:Y	YW:GG	F	95HRA	SB/4,HRA/4,SS/5, NR/6	Yes
WY:Y	RL:YY	F	Floras Lake	SI/4,TM/6	Yes
WY:Y		M?	Floras Lake	SU/4	No
Y/B/Y:Y		F	Overlook	BB/4,NR/4	Yes
Y:Y		F	Unknown	SB/5,HRA/5	Yes
Y:Y		F	Unknown	NR/6,BB/7	No
Y:Y		F	Unknown	SI/4,OV/5,TA/6, SU/9	No
YG:Y		F	Siltcoos	SU/4	Yes
YR:Y		M	South Spoil	TA/4,TM/4,OV/6	Yes
YW:Y		?	Takhenitch	SU/5	No