

# Monitoring and Management of Piping Plovers and Colonial Waterbirds at Cape Cod National Seashore

2004



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## ABSTRACT

This report summarizes the 2004 Piping Plover (*Charadrius melodus*) and waterbird nesting season for Cape Cod National Seashore. Piping Plover nesting and brood-rearing were monitored at 16 beaches in Cape Cod National Seashore from Provincetown to Orleans. Observations of Piping Plovers began mid-March. Egg laying began in the fourth week of April in both the South and the North District. Peak nesting occurred during the fourth week of May. There were a total of 85.5 nesting pairs, 37.5 in the South District and 48 in the North. Hatching success was 56%. Fledging success was 52%. A total of 124 chicks fledged. Productivity was 1.45 chicks fledged/pair. Of 115 nests, 56 (48%) of all nests initiated failed to hatch at least 1 chick. The leading causes of nest loss included predation (51%), overwash (27 %) and nest abandonment (21%). Of 72 exclosed nests, 49 (68%) successfully hatched young. Of the 23 exclosed nests that did not hatch, 12 (52%) failed due to overwash, 9 (39%) to abandonment, and 2 (9%) were lost to predation. Of 38 unexclosed nests, 10 (26%) successfully hatched young. Of the 28 failed unexclosed nests, 22 (79%) were lost to predators, 3 (11%) were abandoned, 2 (7%) lost to overwash, and 1 (3%) was lost for unknown reason. Five nests were exclosed only to later have the exclosure removed once the plovers did not accept it. None of these five nests successfully hatched young. Of the 5 failed nests, 4 (80%) were lost to predators and 1 (20%) was lost to overwash. This was the seventh year the 1995 negotiated rule for ORV management was in effect. Thirty-six pairs of plovers nested within the ORV corridor. Twelve nest within the 2.2 mile section of Race Point North, five pair on Race Point South, north of Exit 8. Ten pairs nested in the 4.9-mile section of Race Point South Beach closed per Negotiated Rule, and nine pairs nested between Head of the Meadow and High Head. As a result, Race Point South Beach was closed to some extent for approximately 66 days. Closures, to some extent, were imposed on Race Point North Beach for a total of 58 days. By 19 August, all ORV corridors that could legally be opened under the negotiated rule were opened.

## INTRODUCTION

Cape Cod National Seashore (CACO) was authorized by congress in 1961 as a unit of the National Park Service. The Park preserves approximately 44,600 acres of uplands, wetland and tidal lands located on Outer Cape Cod. As reflected in CACO's enabling legislation (Public Law 87-126), this unit of the National Park System was established, in part, to protect the area's outstanding Natural Resources including Federal and/or State listed rare animals.

The Seashore provides miles of prime feeding, nesting and roosting habitat for beach-nesting birds, including the Piping Plover (*Charadrius melodus*). This species was federally listed in 1986 as threatened (Federal Register 1985). At that time, there were 139 pairs estimated to be nesting in the Commonwealth of Massachusetts.

In 1985, CACO began a Piping Plover monitoring/protection program and 18 pairs nested on beaches managed by the Seashore. Productivity (number of chicks fledged per pair) in 1985 was less than 1 chick fledged per pair (Figure 1). Over the next several years, numbers of plovers nesting in the Seashore decreased while numbers of plovers nesting in the state remained relatively stable. Eventually, numbers of nesting plovers rose significantly, both at CACO and throughout Massachusetts. Productivity at CACO rose from 0.3 in 1986 to a high of 2.6 fledged chicks per pair in 1991. This report summarizes the results of the 2004 Piping Plover/Colonial Waterbird monitoring and management program at Cape Cod National Seashore.

## STUDY AREA

Piping Plovers were monitored on 16 beaches in CACO from Provincetown to Eastham encompassing approximately 70 km (30 mi.) of beach. These study beaches are divided between two districts. The North District includes all NPS beaches located in Provincetown and Truro (Wood End - Long Point, Race Point Beach North, Race Point Beach South, High Head, and Ballston). The South District includes all NPS beaches located in Eastham and Wellfleet (Great Island, Jeremy Point, Duck Harbor, Bound Brook, Newcomb Hollow, Cahoon Hollow, White

Crest, LeCount Hollow, Marconi Beach, Marconi Station, Nauset Light, and Coast Guard Beach).

A map of all Piping Plover nest sites monitored by the CACO can be found in Appendix A.

Appendix B contains maps of North District Piping Plover nest sites. Maps of South District Piping Plover nest sites are located in Appendix C.

### **PRE-SEASON ACTIVITIES**

To ensure protection of nesting Piping Plovers, Coast Guard Beach was closed to pets and kite flying on 20 April 2004. Marconi Beach was not closed to these activities due to no plover nesting activity at this site. Kite flying was also prohibited in the North District near any potential plover nesting sites. Large signs were installed to inform beach-goers of these restrictions, and a press release was submitted to the local media. Coast Guard Beach was re-opened to pets and kites on 12 August after all plover nesting activities were complete.

In the South District, historic plover nesting sites on Coast Guard beach were closed with symbolic fencing and signs beginning 7 April. Great Island and Jeremy Point were posted the second and third week of April. In the North District, historic plover nesting sites on Race Point North were closed with symbolic fencing and signs by 15 April when the ORV corridor becomes open to permit holding visitors. Various plover and tern informational and regulatory signs were posted at the entrance of most beaches and at the nesting site.

### **METHODS**

Daily observations of Piping Plovers began April 1, after the plover's arrival and continued through August when plovers are observed in their southward migration. In March, during the period of arrival and courtship, most beaches were visited three to four times per week. The exception was Great Island and Wood End/Long Point, monitored every 3 days. Once nests were established, all beaches were visited almost daily ( $\geq 5$  times per week) except for Great Island, Jeremy Point, and Wood End/Long Point which were visited 3 times/week.

During the nest location phase, monitors searched the beach for the presence of plovers, nest scrapes and plover tracks in the sand. All active scrapes (potential nests) were marked with a few pieces of driftwood approximately 1 meter (m) away from the nest so that the scrape could easily be found on return visits. A concentrated area of plover tracks often meant a plover nest or potential nesting site was nearby, as did any plover exhibiting the “broken-wing” behavior. Nests were also found by searching for birds sitting low in the sand, incubating a nest. A signed closure was placed around all active scrapes and nests.

To provide accurate predictions of hatching dates, efforts were made to find nests before clutch completion. The ability to predict hatching dates is especially important in managing and protecting the plovers along the ORV corridors. Sections of beach are closed to vehicles in the corridor when chicks hatch out. Nest searching continued through mid-July. Signs and symbolic fence protected each nest or nesting area.

Predator exclosures were installed around nests upon clutch completion, although there were some exceptions. With permission from the State, some incomplete clutches were exclosed if (1) the chance of predation on eggs was imminent or (2) the pair was actively incubating an incomplete clutch.

Nests were not exclosed when they were: (1) located in thick vegetation and adults were prone to fly off the nest when disturbed, creating a potential for entanglement in the exclosure top; (2) located on the side of a dune that precluded us from installing an exclosure due to slope or nest location; or (3) when a group of exclosed nests were abandoned on a single day at a particular site and there were concerns regarding adult plover mortality associated with exclosure use.

In the North District, four-wheel-drive (4WD) vehicles and all-terrain vehicles (ATVs) were used to access all sites. Once chicks hatched out, however, ATVs were the preferred conveyance for most beaches, especially Wood End/Long Point. In the South District, all beaches were accessed by foot, 4WD, and ATV's.

## RESULTS AND DISCUSSION

### Seasonal Chronology

Plovers were first observed on CACO beaches on 20 March and most beaches had plovers present by mid-April. Plovers continued to arrive into mid-June. It is likely that some of these later arriving birds may have lost nests at other sites before moving to Seashore beaches.

Egg laying began in the fourth week of April in the South District and the fourth week in the North District. The first nest (with one egg) was found on 28 April on Race Point North. The first egg was laid on 28 April and the nest was completed on 6 May. The first nests to hatch chicks occurred on 31 May at Wood End/Long Point and Coast Guard Beach. Peak nesting for the Seashore occurred during the fourth week of May (Figure 2). The last nest was initiated on 23 June (3 days earlier than 2003) at Marconi Station. The last nest hatched on 26 July and fledged one chick on 19 August. Peak nesting fell within the historical peak nesting range for CACO.

Hatching dates ranged from 31 May to 26 July. Fledging dates ranged from 28 June to 19 August. These dates are comparable to those reported over the past several years.

### Nesting Pairs

Eighty-five and a half pairs of Piping Plovers were monitored at 16 sites in CACO in 2004. Number of nesting pairs at the 16 sites monitored increased by 1.5 from 2003 (84 pairs in 2003 to 85.5 pairs in 2004) (Fig. 1). Most beaches (9 out of 16) saw an increase in the number of nesting pairs in 2004 as in 2003. These beaches were Cahoon Hollow, High Head, Jeremy Point, LeCount, Marconi Station, Nauset Light, Race Point North, Race Point South, and White Crest. Two beaches saw the same number of nesting pairs; Great Island and Newcomb Hollow. The greatest increase in number of nesting pairs occurred at High Head, Nauset Light, Race Point North, Race Point South, and White Crest, which all increased by two nesting pairs. Five beaches, Ballston, Bound Brook, Coast Guard, Duck Harbor, Marconi and Wood End/Long Point

saw a decrease in nesting pairs. For the second consecutive year, no plovers nested at Marconi Beach due to extremely narrow beach conditions.

### Hatching Success

Hatching success (total number of eggs hatched/total number of eggs laid) for all sites combined was 56% and ranged from 0 to 100 % (Table 1). Overall, hatching success was 8% higher than in 2003.

Hatching success was greatest at Bound Brook and Ballston Beach (100%), Newcomb Hollow (75%), Race Point South (73%), Wood End/Long Point (70%), Race Point North (66%), Marconi Station (59%), White Crest (58%) and Great Island (55%). The lowest hatching success occurred on High Head (51%), Cahoon Hollow (50%), Duck Harbor (50%), Coast Guard (38%), LeCount (21%), Nauset Light and Jeremy Point (0%) (Table 1).

### Fledging Success

Fledging success (total number of chicks fledged/total number of eggs hatched) for all sites combined was 56% and ranged from 0 to 100% (Table 1). Overall, fledging success decreased 13% from 2003. The greatest fledging success occurred on Bound Brook (100%), Duck Harbor (100%), and White Crest (71%), with these sites representing only 4 nesting pairs. The sites with the lowest fledging success were Jeremy Point (0%), Newcomb Hollow (0%), and Nauset Light (0%) (Table 1).

### Productivity

Productivity (number of chicks fledged/nesting pair) for all sites was in 2004 was 1.45 (124 chicks fledged from 85.5 pairs) and ranged from 0 to 4.0 (Table 1). This is less than 2003 when total productivity was 1.55. The South District had higher productivity (1.49 chicks/pair) than the North District (1.42 chicks/pair). Productivity was greatest at Bound Brook (4.00), Duck

Harbor (4.00), and White Crest (5.00). The lowest productivity occurred at Wood End/Long Point (1.00) with Jeremy Point, Nauset Light, and Newcomb Hollow failing to fledge any chicks. (Table 1). According to the Atlantic Coast Piping Plover Recovery Plan productivity at a minimum of 1.24 is necessary to maintain the population at current levels (Melvin and Gibbs 1994).

### Nest Loss

Forty-eight percent (56 of 115) of all nests initiated failed to hatch at least 1 chick in 2004 (Table 3). This is a decrease from 2003 when 55% (67 of 121) nests failed. All of the South District beaches except Bound Brook and Newcomb Hollow lost at least one nest and all five North District beaches lost at least one nest in 2004 (Table 2). In the South District, predation of nests that were not exclosed (predation either occur prior to the exclosure being set up or at nests where exclosures were not used based on professional judgment) accounted for 42 % (n=16) of the nest losses (Table 4). In the North District, the main reason for early nest loss was also to predators accounting for 67% of the losses (n=12) (Table 4). Overall, predation (n= 28), overwash (n=15) and abandonment (n=12) were the leading causes of nest loss, accounting for 55 of the 56 (98%) nests lost (Table 2). Of the 56 lost nests, 28 (50%) had not been exclosed, 23 (41%) had been exclosed, and 5 (9%) had been initially exclosed but the exclosure was removed after the plovers did not accept the presence of the exclosure. Predators accounted for 79% (22 of 28) of unexclosed nest losses (Table 4).

### Predator Exclosures

To determine if and when a predator exclosure was going to be used, all nests were evaluated in compliance with guidelines prepared by the Atlantic Coast Piping Plover revised Recovery Plan (1996) for the use of predator exclosures.

In 2002 and 2003, an increased number of adult mortalities were associated with enclosed nests. In response to this, CACO explored the use of different enclosure types for 2004, to help reduce the rate of adult mortalities being associated with enclosed nests. Three enclosure designs were used in 2004 with the approval of the Massachusetts and Federal endangered species coordinators.

1. Single-top Enclosure – This design has been used at CACO since the early 1990's. The circular enclosure is 10' in diameter and 3' high, constructed of 2" x 4" wire fencing. A ½" plastic mesh bird netting is secured to the top. This enclosure type was used for all North District nests and for 29 nests in the South District.

2. Double-topped Enclosure – This design incorporates the single-top enclosure and netting top with an additional 12" piece of 2" x 4" enclosure fencing attached vertically around the top perimeter, creating a height of 4 feet. The upper horizontal wire of this addition was then removed creating 4" spikes along the outer perimeter of the enclosure. Second netting was secured down over the spikes creating an 8" buffer between the upper and lower netting. A total of 13 double-top enclosures were used in the South District.

3. Canopy Enclosure - This design uses 2" x 4" fencing to create a 4' x 4' square enclosure, which is 3 feet high. A heavy gauge plastic 2" x 2" deer netting is secured over the top and extends for 4 feet from all sides creating a canopy. The canopy is secured with wooden and steel posts. An additional 4' x 6' piece of fencing is attached to two of the sides creating a second, domed top. Five canopy enclosures were used on three sites in the South District in 2004.

One adult mortality was associated with a single-top enclosure. Two adult mortalities were associated with the double-topped enclosure. No adult mortalities were associated with nests enclosed with the Canopy Enclosure.

Predator enclosures were installed around 72 of the 115 (65%) nests. Of the 72 enclosed nests, 49 (68%) successfully hatched young. Of the 23 enclosed nests that did not hatch, 12(52%)

were lost to overwash, 9(39%) failed to abandonment, 12(52%) were lost to overwash and 2(9%) were predated (Table 4).

There were a total of 38 unexclosed nests. Of these nests, 28(74%) failed to hatch (Table 4). Although the number of unexclosed nests seems extremely high, many of these nests were incomplete clutches (with < 3 eggs), not actively being incubated, or the nest was located where an exclosure could not be used.

The greatest number of failed unexclosed nests was to predation; 22 out of 28 nests (79%) including: 10(45%) to crow, 5(23%) to coyote, 4(18%) to unknown predators, 2(9%) to gull, 1(5%) to skunk. The remaining loss of unexclosed nests were to abandonment 3(11%), overwash 2(7%), and one to an unknown reason (3%).

Five exclosures were installed and then removed on Jeremy Point and Coast Guard Beach after two adult plovers were found dead outside exclosures and concerns arose regarding adult plover mortality associated with exclosure use. All five of these nests failed to hatch (Table 4.) Four (80%) were lost to predators and one (20%) was lost to overwash.

#### Abandonment of Exclosed Nests

A review of eleven years of CACO data shows that 31% (236 of 754) of all exclosed nests fail to hatch. Thirty-four percent (80 of 236) of these failed nests were lost due to abandonment.

South District - Although there were concerns with the use of exclosures, all nests that were actively being incubated at the beginning of the nesting season were exclosed and monitored no less than every other day. Five exclosed nests were abandoned; two of these nests were abandoned due to adult mortality in early June. The other three exclosed nests were abandoned the last week of May. Heavy rainfall the day before abandonment of two of the nests obscured any evidence related to the abandonment. The third nest was located on a very narrow section of beach where human disturbance may have played a large factor in the abandonment. One

additional exclosed nest was abandoned for unknown reasons after the pair incubated the nest for over 30 days.

In 2004, 49% of the South Districts exclosed nests (20 of 41) failed to hatch. 17% of all exclosed nests (7 of 41) failed due to abandonment. Of the 20 failed nests, 7 were due to abandonment, identifying 35% of the South Districts exclosed failures due to abandonment. Great effort was taken to account for the nesting pairs that abandoned their nests at all sites

North District – On 30 May, two nests on Race Point North were found abandoned. No predator tracks led up to and around the nest bowl. Both pairs were seen in the immediate area and both renested. The eggs from the two nests were collected; six of the seven eggs contained well formed chicks.

In 2004, 10% of the North Districts exclosed nests (3 of 31) failed to hatch. 6% of all exclosed nests (2 of 31) failed due to abandonment. Of the 3 failed nests, 2 were due to abandonment, identifying 75% of the North Districts exclosed failures due to abandonment.

### Chick Mortality

Chick mortality factors are extremely difficult to assess. In the majority of cases when chicks are lost, there is no evidence as to why. A chick was presumed dead when it was never seen again before the remainder of the chicks in the brood fledged. A brood was considered lost when there was no sign of the chicks after five consecutive days of searching. As in years past, most chick mortality occurred within the first 10 days after hatching, which was consistent with data from previous studies (MacIvor 1990, Brown and Hoopes 1993). We could not directly attribute chick mortality to any specific factor, although shorebird personnel did note an increase in coyote (*Canis latrans*), red fox (*Vulpes fulva*), and skunk (*Mephitis mephitis*) sightings since 2001 (unpublished data) in the areas where mortality occurred; however this information is speculative. It is possible that these species, along with gulls and crows (which congregate in

large groups on the beachfront), and domestic dogs and feral cats may have contributed to chick mortality.

### Adult Mortality

South District –

On 2 June, a dead adult female plover was found approximately 10' away from a double-top enclosure at Jeremy Point. The bird was intact and had a puncture wound to the chest. There were no predator tracks in or leading up to the enclosure. Two owl feathers were found within 10 feet of the dead plover. Necropsy results from USGS National Wildlife Health Center concluded good body condition and adequate fat reserves. Hemorrhage in the body cavity and in the pectoral muscles was noted. Some muscle tissue had been removed by the predator or a scavenger. The adult male from this nest was observed making aerial territorial calls within the territory through the week.

On 5 June on the North end of Coast Guard Beach, Eastham, a partial wing and feathers were found five feet outside of a double-topped enclosure. A set of single line canid tracks led up to the enclosure. The mate of this pair was not observed.

Massachusetts and Federal endangered species coordinators were contacted by the park's Chief Natural Resource Management Specialist and informed of these mortalities. A decision was made by all agencies to stop enclosing any more nests at Coast Guard Beach and Jeremy Point and to remove all existing enclosures on these beaches to prevent any additional enclosure related deaths to plovers. All enclosures were removed on Jeremy Point on 3 June and Coast Guard Beach on 5 June.

North District -

On May 30<sup>th</sup>, a nest at High Head was discovered depredated by an unidentified avian species.

The enclosed nest was observed on 29 May being actively incubated. On 30 May the enclosure top was noted as having been ripped. No predator tracks led up to or around the enclosure although fresh human footprints were observed within five feet of the enclosure. Within the enclosure a partial wing was found along with some primary feathers. The eggs had also been depredated. The adult male (sex based on observed plumage differences) was seen in the immediate area displaying verbal signs of distress.

#### Account of Six Egg Nest at Jeremy Point

On 2 June, an adult female plover was found dead outside of an enclosure at Jeremy Point. The male from this pair was observed flying near the nest site performing aerial territorial calls for the following week. On 14 June the enclosure was taken down in response to the adult mortality associated with the enclosure and because the nest was believed to have been abandoned after the female mortality. At the time the enclosure was removed a six egg nest was observed within the enclosure approximately 3 feet away from the location of the original four egg nest. There were fresh plover tracks up to and around the nest. Carolyn Mostello from Massachusetts State Fish and Wildlife was contacted and stated that there have been several documented cases of egg confusion in which plovers roll nearby Least Tern and Common Tern eggs into their scrapes confusing the tern eggs for their own (C.Mostello and S. Gilmore per. Communication). It is theorized that the male paired with a new female after the loss of its mate. The new female laid two eggs and the pair rolled the original four egg clutch into the new nest bowl. The pair was actively incubating the six eggs until the nest was predated on 20 June by an unknown predator.

#### South District Beach Closures and Detours

Winter storm erosion caused some bay and ocean beaches to become unusually narrow in the South District in 2004. In areas of extreme narrow beaches, it was not always possible to

provide a large enough symbolic fence buffer to prevent disturbance to incubating pairs when pedestrians were present. In cases where this was a problem, temporary closures and detours were established to allow visitors continued use of these beaches. Informational signs were erected informing visitors of these closures.

Jeremy Point – The eastern side (0.2 miles) was closed on 23 May to protect two nests. The beach was re-opened on 3 June after both nests were lost. The west side of Jeremy Point remained open during this time.

Great Island - The area south of the “Gut” was closed from 3 June to 12 June to protect four nests. Access to Jeremy Point was available via the inland trail. On 12 June, 0.2 miles of this area south of the “Gut” were re-opened. A detour was provided for pedestrians to access the Great Island from the inland trail and from across a dune crossing. The “Gut” was completely open on 22 June.

Coast Guard Beach – A 0.4 mile section south of the parking lot was closed from 29 May to 3 June to protect one nest. A detour was made available during this time to allow the public access to the beach.

### Dogs off Leash

Dogs off leash continue to be a chronic problem in the South District. These unleashed dogs not only pose health and safety concerns to the visitor, they also can harass and potentially kill native wildlife. Ground nesting birds like the plovers and terns are extremely vulnerable to unleashed pets.

A total of 312 dogs were observed off leash from 18 April to 21 August in the South District. Unleashed dogs were encountered most frequently on the oceanside at LeCount Hollow and on the bayside at Duck Harbor. Most owners put their dogs on a leash when informed of the National Park Services pet regulations.

A total of 20 dogs were observed off leash from 9 May to 3 July in the North District. Unleashed dogs were encountered most frequently on High Head and Race Point South. Most owners put their dogs on a leash when informed of the National Park Services pet regulations.

### Implementation of the Negotiated Rule

*ORV Management* -- ORV management, as it relates to plover management at CACO, is a dynamic process. This was the seventh year of the negotiated rule of 1995. We observed no direct negative impacts to Piping Plover adults or chicks in 2004.

The presence of Piping Plover chicks caused the closure to ORV traffic on portions of Race Point North beach for a total of 58 days (11 days more than 2003). On 31 July (17 days later than 2003) the entire Race Point North oversand route was opened to ORV traffic due to the absence of Piping Plover chicks. Race Point South beach was closed to some extent between Exit 8 and Race Point South Self-contained Vehicle (SCV) Area for 43 days (4 days less than 2003) and was opened in entirety on 9 August. The night fishing corridor located at Coast Guard beach (Truro) was not effected due to lack of Piping Plover nesting. The stretch of beach between Head of the Meadow and High Head was closed to some extent for 50 days. As of 19 August, the entire ORV corridor was opened to vehicles.

*Plover Management* -- Thirty-six of 48 (67%) North District pairs nested within the ORV corridor (4 more than in 2003). Nineteen pairs of these pairs (23 nests) nested in areas seasonally closed to ORV traffic (opening/closure mandated by the Negotiated Rule). Seventeen pairs (19 nests) nested in the area open to ORV traffic. As these nests hatched, affected sections of the ORV corridor were closed to vehicles. Closures were imposed only when eggs hatched and were kept in effect through the chick-rearing stage until fledging.

The following is a chronological discussion of the principal events and responses. This information is summarized in Table 7, written in fulfillment of requirements of the Negotiated Rule.

A Piping Plover nest in Hatches Harbor began hatching on the morning of 3 June. North District Rangers and shorebird personnel worked together to monitor the brood continually until 2000 hours at which time Hatches Harbor was closed to vehicles. On 4 June and 5 June, North District Rangers and shorebird personnel monitored the brood from 0800 to 2000 to allow Hatches Harbor to remain open to vehicles. On 6 June, Hatches Harbor was closed to vehicles due to the brood's continued use of the Hatches Harbor corridor area until 27 June.

A Piping Plover nest along the Pole Line route began to hatch late afternoon of 7 June. North District Rangers and shorebird personnel worked together to monitor the brood continually until it safely moved into Hatches Harbor on 8 June. If not for this effort the pole-line route would have been closed and all visitors removed from the Hatches Harbor area.

The anticipated hatching of two nests in close proximity to ORV corridor entrances prompted several actions to be initiated to best accommodate both visitors and breeding pairs. In coming years, different management actions may be undertaken to what appears to be similar scenarios.

At Race Point North the location of a Piping Plover nest made it inevitable that upon hatching (expected 22 June) the area in which the Race Point North SCV Area occupied would be closed. Likewise on Race Point South, the location of another Piping Plover nest would restrict travel to 0.2 miles south of the Race Point South entrance upon hatching (expected 12 June).

On 20 June, a single-track lane for ORV passage was laid as high as possible across the Race Point North protected beach. This would enable large SCVs that could not navigate the Race Point South entrance to access the Race Point South SCV Area and the available corridor. The single-track corridor was posted with informational signs to Race Point North Protected Beach-goers warning that vehicles may be passing through from 1830-0800 and during emergency situations. Signs were also posted at either end of the single-track lane restricting travel to designated hours and emergency situations. In the afternoon of 20 June, the Race Point South plover brood moved into the SCV area causing the immediate removal of all SCV's and

vehicles from the area. The vehicles were escorted across the single-track through the protected beach to the RPN SCV area. All of Race Point South was closed to vehicles.

On the morning of 21 June (a day earlier than the estimated hatch date of the Piping Plover nest, the Race Point North plover nest hatched. The vehicles in the Race Point North SCV area were moved to Herring Cove parking lot. The Race Point North exit was closed with 0.6 miles of Race Point North accessible via the Pole Line Route.

On 22 June, 0.3 miles of Race Point South corridor was opened; 0.2 miles was reestablished for the SCV area and 0.1 miles for a vehicle parking area.

On 23 June the Race Point North entrance was opened for SCVs to access the single-track corridor to Race Point South SCV Area from 0600 to 0800 and from 1800 to 2000. In accordance with state and federal guidelines the brood was scrupulously monitored to insure it did not wander proximal the open Race Point North during this time.

On 25 June, the Race Point North entrance was opened with 0.1 miles available for parking and to access the single-track corridor to Race Point South SCV area. The single-track corridor was posted with informational signs to Race Point North Protected Beach-goers warning that vehicles may be passing through from 1830-0800 and during emergency situations. Signs were also posted at either end of the single-track lane restricting travel to designated hours and emergency situations.

On 16 July the Race Point North SCV area was reestablished for 0.1 mile. All SCVs present in Race Point South SCV Area were notified that the single-track corridor would be closed and removed at 0800 hours 17 July. All vehicles that could not navigate the Race Point South entrance must move to the Race Point North SCV Area prior to that date.

On 19 July, a Piping Plover brood moved into the Hatches Harbor corridor. Hatches Harbor was closed to vehicles until the brood fledged on July 31 which opened the entire Race Point North corridor.

## COLONIAL WATERBIRDS

### Least Terns

Least Terns returned to CACO during the second week of May. Egg laying began the first week in June, with most Least Terns on eggs by 15 June. Renesting attempts continued through late August. The first chick that hatched this year was observed on 3 July although the majority of chicks hatched out the third week of July. This late hatching date can be contributed to renesting due to both predation and overwash.

From June 20-25, an aerial estimate of 205 pairs nested on five beaches in the South District. Earlier in the season, 8 pairs nested at Middle Meadow on Great Island. These nests were quickly predated by coyote. There was no renesting at this site. Approximately 98% of the first nesting attempts on all beaches were depredated or overwashed through June and July. Tracks indicated canid sp. (probably coyote) and skunk to be the major predators; gull and crow tracks were commonly observed. Renesting continued for the duration of the breeding season. It was not uncommon to walk through colonies at Coast Guard Beach, Great Island and Jeremy Point and observe a moderate number of nests, only to return a week later to find empty scrapes. In total, only nine chicks <5days and four fledglings were observed in the South District. Productivity of the Least Tern continues to be extremely low.

The North District fared little better. A total of 65 pairs, a decrease of over 50%, nested on seven beaches. Heavy egg predation by coyote continued throughout the season at Race Point North causing renesting to continue for the duration of the breeding season; no chicks were seen on this beach. A new colony was found on Ballston Beach in early July. This small colony of 10 pairs had the North Districts highest productivity producing 10 of the Least Tern fledgers. Overall, heavy predation led to Least Terns having to reneest throughout the season and accounted for their low productivity; twenty chicks are believed to have fledged from all sites in the North District.

### Common Terns

Common Terns were first sighted on 12 May. No Common Terns nested in the South District in 2004. Until 2003, hundreds of Common Terns nested on New Island, Orleans with a few additional pairs nesting on Coast Guard Beach and Jeremy Point.

For the past three years, historic nesting sites in this district (New Island, Coast Guard Beach and Jeremy Point) experienced a steady decline in nesting birds and extremely low to no productivity due to intense predator pressure from coyote, crow, gull, and skunk.

In mid-August, a conservative estimate of 1000 immature and post-breeding Common Terns were observed on the mudflats of Nauset Marsh.

A single pair attempted to nest on Race Point North Beach in the North District; however, both nesting attempts were depredated by coyote.

### Roseate Terns

For the third consecutive year, no Roseate Terns nested on New Island. Since 1999, this island supported 3-4 nesting pairs. The Roseate Terns first nested at this site in 1999 when close to 2200 pairs of Common Terns nested on this small island. In 2001, when Common Terns failed to use New Island as a nesting site, so did the Roseate Terns. This loss, although relatively small, is a set back in the recovery efforts. Almost 100% of the state's nesting Roseate Terns are found in two locations (Bird and Ram Island in Buzzards Bay). Because this species nests in only a few concentrated areas, it is vulnerable to losing a large percentage of the population if a catastrophic event occurred. New Island was one of only a few alternative population sites in the state with nesting birds that ensured a few Roseate Terns would survive if the Buzzard Bay colonies were hit hard by some disaster.

In early-August, approximately 120 immature and post-breeding Roseate Terns were observed on the mudflat of Nauset Marsh and approximately 200 immature and post-breeding Roseate Terns were observed on Race Point South.

### Arctic Terns

The first sightings of an Arctic Tern occurred on 26 May when an individual bird was observed flying over New Island. On 17 June, a two egg nest was found on the southern tip of Coast Guard Beach. On 7 July, the first chick hatched. The second chick hatched on 9 July. Both chicks were present in the scrape on 9 July. The chicks were not observed again after that date. The adults left the area by 12 July. Coyote and gull tracks were common in the area of the nest.

### Black Skimmers

No Black Skimmers were sighted in 2004.

### Laughing Gulls

For the first time in over twenty years, there were no nesting Laughing Gulls on New Island. Historically, this island supported the largest Laughing Gull colony in the state. Over the past five years, the number of nesting pairs has slowly declined to one pair and productivity has been low to none. The main reason for this decline is thought to be intense predator pressure. A coyote was observed several times on the island. Predators can easily gain access to New Island from Nauset Beach, Orleans by swimming or walking over the exposed mud flats at low tide.

### American Oystercatchers

Two pairs of American Oystercatchers nested unsuccessfully on Jeremy Point on the southern tip of Jeremy Point. One pair hatched three chicks. The chicks were no longer observed after two days and are speculated to have been predated. The second pair lost two nests; the first to overwash and the re-nest to an unknown predator. Both pairs remained on Jeremy Point until mid-July.

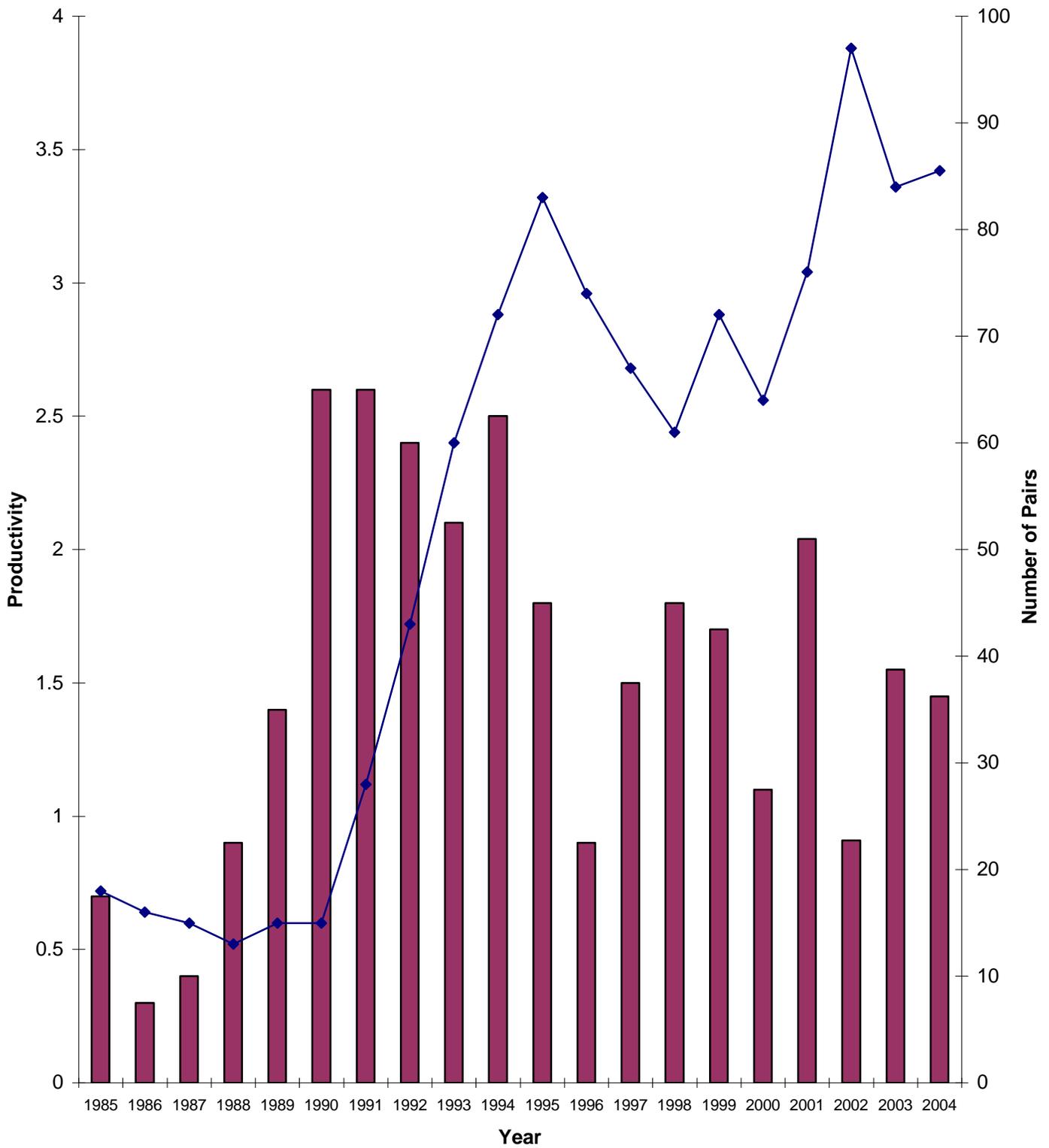
## MANAGEMENT RECOMMENDATIONS

1. Dogs off leash continue to be a chronic problem in the park. Ground nesting birds like the plovers and terns are extremely vulnerable to disturbance by unleashed pets. Many violations appear to be associated with people accessing seashore property from town beaches where signage and enforcement are less prevalent. The Seashore will continue to record incidences of dogs off leash formally in 2004 to determine usage trends.
2. Loss of enclosed nests to abandonment in the both districts needs to be evaluated both by the park and by Massachusetts and Federal endangered species coordinators. The reason(s) for abandonment also need to be better understood. Changes in enclosure design should continue to be used and explored.
3. The rapid decline in Least Terns, Common Terns, and Laughing Gulls needs to be evaluated both by the park and by Massachusetts and Federal endangered species coordinators. The use of decoys and electric fencing should be investigated to reestablish historical nesting colonies by these species.

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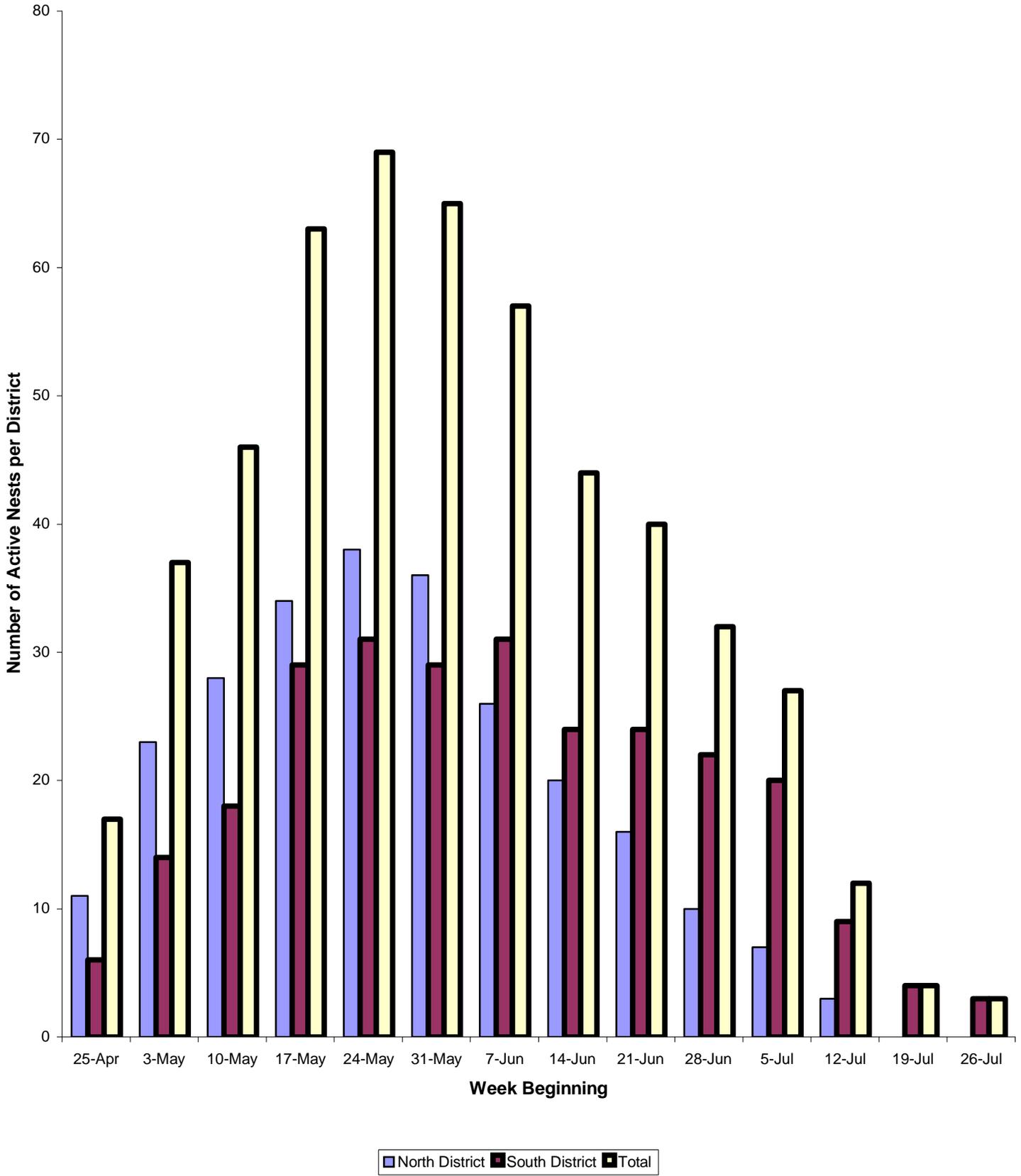
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**Figure 1. Number of Piping Plover breeding pairs and nest productivity on beaches managed by the National Park Service, Cape Cod National Seashore, 1985 - 2004.**



Productivity — Number of Pairs

**Figure 2. Weekly Active Piping Plover Nests at Cape Cod National Seashore  
2004**



**Table 1. Summary of Piping Plover Breeding Success, Cape Cod National Seashore, 2004**

Site	No. Pairs	No. Nests <sup>1</sup>	No. eggs Laid	No. eggs Hatched	No. Fledged per site	Hatching Success <sup>2</sup>	Fledging Success <sup>3</sup>	Productivity <sup>4</sup>
Coast Guard	10	17	68	26	14	0.38	0.54	1.40
Nauset Light	1	3	11	0	0	0.00	0.00	0.00
Marconi Station	4	6	22	13	5	0.59	0.38	1.25
LeCount	2	5	14	3	2	0.21	0.14	2.00
White Crest	1	3	12	7	5	0.58	0.71	5.00
Cahoon Hollow	3	5	20	10	7	0.50	0.70	2.30
Newcomb Hollow	1	1	4	3	0	0.75	0.00	0.00
Bound Brook	1	1	4	4	4	1.00	1.00	4.00
Duck Harbor	1	2	8	4	4	0.50	1.00	4.00
Great Island	8	12	41	23	15	0.55	0.68	1.90
Jeremy Point	5.5	8	28	0	0	0.00	0.00	0.00
Wood End / Long Point	7	7	27	19	7	0.70	0.36	1.00
Race Point North	12	14	54	36	23	0.66	0.64	1.92
Race Point South	16	17	59	43	22	0.73	0.51	1.38
High Head	10	13	49	25	14	0.51	0.56	1.40
Ballston Beach	3	1	4	4	2	1.00	0.50	0.50
<b>TOTAL</b>	<b>85.5</b>	<b>115</b>	<b>425</b>	<b>220</b>	<b>124</b>	<b>0.52</b>	<b>0.56</b>	<b>1.45</b>

<sup>1</sup> Includes renests

<sup>2</sup> Total number of eggs hatched/total number of eggs laid

<sup>3</sup> Total number of chicks fledged/total number of eggs hatched

<sup>4</sup> Total number of chicks fledged/total number of nesting pairs

**Table 2. Causes of Piping Plover Nest Failures, Cape Cod National Seashore, 2004 (page 1 of 2)**

Site	NESTS			Cause	PER SITE	
	Total No.	No. Lost	% Lost		No. Lost	% Lost
Coast Guard	17	10	59%	Predation (Net)	6	60%
				Abandoned (excl) - adult mortality	1	10%
				Overwash	3	30%
				Predation type		
				Crow (not excl)	2	32%
				Gull (not excl)	1	17%
				Skunk (excl)	1	17%
				Skunk (not excl)	1	17%
			Unknown predator (not excl)	1	17%	
Nauset Light	3	3	100%	Abandoned (excl) - non viable eggs	1	67%
				Overwash	2	33%
Marconi Station	6	2	33%	Overwash	2	100%
LeCount	5	4	80%	Predation (Net)	2	25%
				Overwash	2	25%
				Predation type		
				Crow (not excl)	1	50%
			Unknown predator (not excl)	1	50%	
White Crest	3	1	33%	Overwash	1	100%
Cahoon Hollow	5	2	40%	Abandoned (excl) - unknown reason	1	50%
				Overwash	1	50%
Newcomb Hollow	1	0	0%	No failures	0	0%
Bound Brook	1	0	0%	No failures	0	0%
Duck Harbor	2	1	50%	Overwash	1	100%
Great Island	12	6	50%	Predation (Net)	3	50%
				Abandoned (Net)	2	33%
				Overwash	1	17%
				Abandonment type		
				Abandoned (excl) - unknown reason	1	50%
				Abandoned (not excl) - unknown reason	1	50%
				Predation type		
				Coyote (not excl)	1	33%
Crow (not excl)	2	67%				
Jeremy Point	8	8	100%	Predation (Net)	4	56%
				Abandonment (Net)	4	44%
				Abandonment type		
				Abandoned (excl) - unknown reason	2	50%
				Abandoned (not excl) - unknown reason	1	25%
				Abandoned (excl) - adult mortality	1	25%
				Predator type		
Coyote (not excl)	3	80%				
Crow (not excl)	1	20%				

**Table 2. Causes of Piping Plover Nest Failures, Cape Cod National Seashore, 2004 (page 2 of 2)**

Site	NESTS			Cause	PER SITE	
	Total No.	No. Lost	% Lost		No. Lost	% Lost
Wood End - Long Point	7	2	29%	Predation (Net)	1	50%
				Abandoned (not excl)	1	50%
				Predation type		
				Unknown predator (not excl)	1	100%
Race Point Beach North	14	5	36%	Predation (Net)	2	40%
				Abandoned (excl) - unknown reason	2	40%
				Overwashed	1	20%
				Predation types		
				Coyote (not excl)	2	100%
Race Point Beach South	17	5	29%	Predation (Net)	4	80%
				Unknown reason	1	20%
				Predation types		
				Crow (not excl)	3	75%
				Gull (not excl)	1	25%
High Head	13	6	46%	Predation (Net)	5	83%
				Overwash	1	17%
				Predation types		
				Crow (not excl)	3	60%
				Gull (not excl)	1	20%
				Avian (sp?) (excl) - adult mortality	1	20%
Ballston Beach	1	0	0%	No failures		

**Table 3. Nest Loss Totals, Cape Cod National Seashore, 2004**

No. Nests	Nests			Cause	Per Cause	
	No. Hatched	No. Lost	% Lost		No. Lost	% Lost
115	60	55	48%			
				Predation (Net)	28	51%
				Abandoned (Net)	12	21%
				Overwash	15	27%
				Unknown reason	1	1%
				Abandonment type		
				Abandoned (excl) - adult mortality	2	16%
				Abandoned (excl) - non viable eggs	1	9%
				Abandoned (excl) - unknown reason	6	50%
				Abandoned (not excl) - unknown reason	3	25%
				Predation type		
				Avian (sp?) (excl) - adult mortality	1	4%
				Coyote (not excl)	6	21%
				Crow (not excl)	12	42%
				Gull (not excl)	3	11%
				Skunk (excl)	1	4%
				Skunk (not excl)	1	4%
				Unknown predator (not excl)	4	14%

**Table 4. Fates of Exclosed and Unexclosed Piping Plover Nests, Cape Cod National Seashore, 2004**

Nest	Total	No. Successful	No. Not Successful	% Successful	% Not-successful	Cause of Failure	No. Lost	% Lost
Exclosed	72	49	23	68%	32%			
						Predation (Net)	2	9%
						Abandoned (Net)	9	39%
						Overwash	12	52%
						Abandonment types		
						Abandoned - unknown reason	6	67%
						Abandoned - non viable eggs	1	11%
						Abandoned - adult mortality	2	22%
						Predator types		
						Avian (sp?) - adult mortality	1	50%
						Skunk	1	50%
Unexclosed	38	10	28	26%	74%			
						Predation (Net)	22	79%
						Abandoned (Net)	3	11%
						Overwash	2	7%
						Unknown reason	1	3%
						Abandonment types		
						Abandoned - unknown reason	3	100%
						Predation types		
						Coyote	5	23%
						Crow	10	45%
						Gull	2	9%
						Skunk	1	5%
						Unknown predator	4	18%
Exclosed initially then removed	5	0	5	0%	100%			
						Predation (Net)	4	80%
						Overwash	1	20%
						Predation types		
						Coyote	1	25%
						Crow	2	50%
						Gull	1	25%

**Table 5. Fate of Piping Plover Eggs, Cape Cod National Seashore, 2004 (page 1 of 2)**

SITE	No. Nests	Net Laid	No. Hatched	No. Lost	% Lost Per Site	CAUSE	# Eggs Lost	% Lost Per Cause
Coast Guard	17	68	26	42	62%	Predation (Net)	25	60%
						Abandoned (excl) - adult mortality	4	10%
						Non-viable	2	5%
						Overwash	11	25%
						Predation types		
						Crow (not excl)	9	36%
						Gull (not excl)	4	16%
						Skunk (not excl)	4	16%
						Skunk (excl)	4	16%
						Unknown predator (not excl)	4	16%
Nauset Light	3	11	0	11	100%	Abandoned (excl) - non viable	4	36%
						Overwash	7	64%
Marconi Station	6	22	13	9	41%	Non viable	1	11%
						Overwash	8	89%
LeCount	5	14	3	11	79%	Predation (Net)	2	18%
						Non-viable	1	9%
						Overwash	8	73%
						Predation type		
Crow (not excl)	1	50%						
Unknown predator (not excl)	1	50%						
White Crest	3	12	7	5	42%	Non-viable	1	20%
						Overwash	4	80%
Cahoon Hollow	5	20	10	10	50%	Abandoned (excl) - unknown reason	4	40%
						Non-viable	2	20%
						Overwash	4	40%
Newcomb Hollow	1	4	3	1	25%	Non-viable	1	100%
Bound Brk	1	4	4	0	0%	No losses		
Duck Harbor	2	8	4	4	50%	Overwash	4	100%
Great Island	12	41	23	18	44%	Predation (Net)	9	50%
						Abandoned (excl) - unknown reason	4	22%
						Abandoned (not excl) - unknown reason	2	11%
						Overwash	3	17%
						Predation type		
						Coyote (not excl)	3	33%
Crow (not excl)	6	67%						

**Table 5. Fate of Piping Plover Eggs, Cape Cod National Seashore, 2004 (page 2 of 2)**

SITE	No. Nests	Net Laid	No. Hatched	No. Lost	% Lost Per Site	CAUSE	# Eggs Lost	% Lost Per Cause
Jeremy Point	9	28	0	28	100%	Predation (Net)	16	57%
						Abandoned (Net)	10	36%
						Overwash	2	71%
						Abandonment type		
						Abandoned (excl) - adult mortality	4	40%
						Abandoned (excl) - unknown reason	5	50%
						Abandoned (not excl) - unknown reason	1	10%
						Predation type		
						Coyote (not excl)	14	88%
						Crow (not excl)	2	12%
Wood End - Long Point	7	27	19	8	30%	Predation (Net)	4	50%
						Abandoned (not excl) - unknown reason	4	50%
						Predation types		
Unknown predator (not excl)	4	100%						
Race Point North	14	54	36	18	33%	Predation (Net)	7	39%
						Abandonment (excl) - unknown reason	7	39%
						Overwashed	4	22%
						Predation types		
Coyote (not excl)	7	100%						
Race Point South	17	59	43	16	27%	Predation (Net)	10	62%
						Unknown Reason (not excl)	3	19%
						Non-viable	3	19%
						Predation types		
						Gull (not excl)	1	10%
Crow (not excl)	9	90%						
High Head	13	49	25	24	49%	Predation (Net)	20	84%
						Non-viable	2	8%
						Overwashed	2	8%
						Predation types		
						Crow (not excl)	12	60%
						Gull (not excl)	4	20%
Avian (sp?) (excl) - adult mortality	4	20%						
Ballston	1	4	4	0	0%			

**Table 6. Egg Loss Totals, Cape Cod National Seashore, 2004**

No. Nests	Eggs			Cause	Per Cause	
	No. Total	No. Lost	% Lost		No. Eggs Lost	% Lost
115	425	205	48%			
				Predation (Net)	97	47%
				Overwash	57	28%
				Abandoned (Net)	35	17%
				Non-viable	13	6%
				Unknown reason (not excl)	3	2%
				Abandonment types		
				Abandoned (excl) - unknown reason	16	46%
				Abandoned (not excl) - unknown reason	7	20%
				Abandoned - adult mortality	8	23%
				Abandoned - non viable eggs	4	11%
				Predation types		
				Unknown predator (not excl)	15	15%
				Skunk (not excl)	4	4%
				Skunk (excl)	4	4%
				Coyote (not excl)	24	25%
				Crow (not excl)	37	38%
				Gull (not excl)	9	10%
				Avian (sp?) (excl) - adult mortality	4	4%

**Table 7. North District Off-Road Vehicle Corridor Openings and Closures, Cape Cod National Seashore, 2004**

Date	Beach	Change	Net Mileage Open	Net Closed	Reason
15-Apr	RPN	0.5	1.7	0.5	Due to tidal conditions corner at Race Point closed
27-May	RPN		1.7	0.5	SCV area increased in anticipation of Memorial Day
2-Jun	RPN	0.4	1.3	0.9	N.No.3 hatched
3-Jun	RPN	0.1	1.2	1	N.No. 5 hatched. Hatches closed from 2000 to 0800 hours
3-Jun	RPN	0.1	1.8	0.4	N.No. 4 hatches - Race Point corner opened
4-Jun	RPN	0.2	1.2	1	Hatches Harbor closed from 2000 to 0800 hours
5-Jun	RPN	0.2	1.2	1	Hatches Harbor closed from 2000 to 0800 hours
6-Jun	RPN	0.1	1.6	1.1	Hatches Harbor closed
12-Jun	RPS	0	1.7	0.5	SCV area decreased to 0.2 miles due to RPS # 6 hatching
12-Jun	RPS	1.1	0.2	1.6	N.No.6 hatched
20-Jun	RPN	0	1	1.2	Single track laid through Protected Beach for SCV access <sup>1</sup>
20-Jun	RPS	0.4	0	1.8	SCV area closed, all SCV's moved to RPN SCV area
20-Jun	RPS	0.4	0	1.8	N. No. 6 moved through SCV area and into Protected beach
21-Jun	RPN	0.6	0.6	1.6	N. No. 9 hatched
23-Jun	RPS	0.4	0.4	1.4	SCV area reestablished 0.3 mi, parking area of 0.1 mi
23-Jun	RPS	0.4	0.4	1.4	SCV access across protected beach from 0600 - 0800 hrs
25-Jun	RPN	0.1	1	1.2	Parking area of 0.1 miles established at RPN exit
25-Jun	RPN	0.1	1.1	1.1	Additional 0.1 miles open at RPN exit
27-Jun	RPN	0.2	1.2	1	Hatches opened due to N.No. 5 chicks moved from area
27-Jun	RPN	0.1	1.4	0.8	SCV area of 0.1 miles is reestablished
28-Jun	RPN	0.6	1.6	0.8	N. No.3 and No. 4 fledge
30-Jun	RPN	0.3	1.1	1.1	N. No. 11 hatches
1-Jul	HH	1.1	1.1	0.4	Per Negotiated Rule
3-Jul	HH	0.2	1.3	0.2	N.No. 2 chicks fledge
15-Jul	HH	0.2	1.1	0.4	N. No. 12 hatches
17-Jul	RPN	0.1	1.6	0.6	Additional 0.1 miles open for SCV area
17-Jul	RPS	0.1	0.4	1.4	N. No. 6 fledged
19-Jul	RPN	0.2	1.4	0.8	N. No. brood moves into Hatches Harbor corridor
20-Jul	RPN	0.1	1.5	0.7	N. No.9 fledged
26-Jul	RPS	1.2	1.2	3.7	Chicks on Armstrong shelf fledged
27-Jul	RPN	0.5	2	0.2	N. No.13 fledged
30-Jul	RPN	0.2	2.2	0	All chicks from RPN have fledged
8-Aug	RPS	2.3	4.3	0.6	Chicks fledge
9-Aug	RPS	0.6	4.9	0	All chicks from RPS have fledged
19-Aug	HH	0.5	8.4	0	All of corridor open
1-Sep	HOM				Closed for season between HH & HOM per Negotiated Rule

\*\* All mileage of RPN includes Hatches Harbor

RPN = Race Point North RPS = Race Point South HH = High Head HOM = Head of the Meadow
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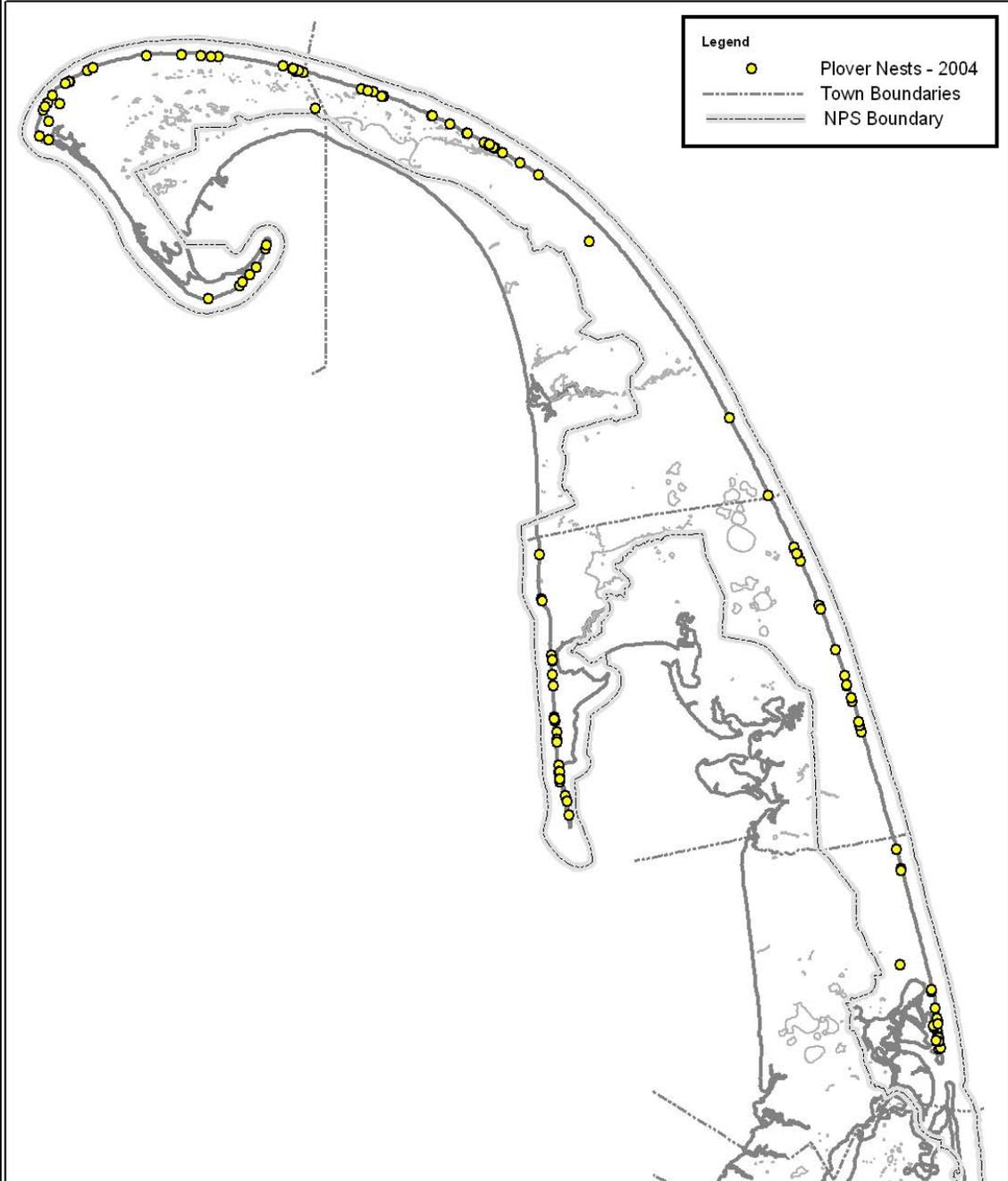
<sup>1</sup> = See Implementation of the Negotiated Rule in Results/Discussion

## Appendix A

### Maps of Cape Cod National Seashore 2004 Piping Plover Nest Sites



## Piping Plover Nest Sites -- 2004



Produced by CACO GIS plover\_all04.mxd

## Appendix B

### Maps of Cape Cod National Seashore, North District 2004 Piping Plover Nest Sites



## Piping Plover Nest Sites - Wood End/Long Point 2004



Produced by CACO GIS OFFICE plover\_cge04.mxd



## Piping Plover Nest Sites - High Head 2004



Produced by CACO GIS OFFICE plover\_cge04.mxd



## Piping Plover Nest Sites - North Truro 2004



Produced by CACO GIS OFFICE plover\_cge04.mxd



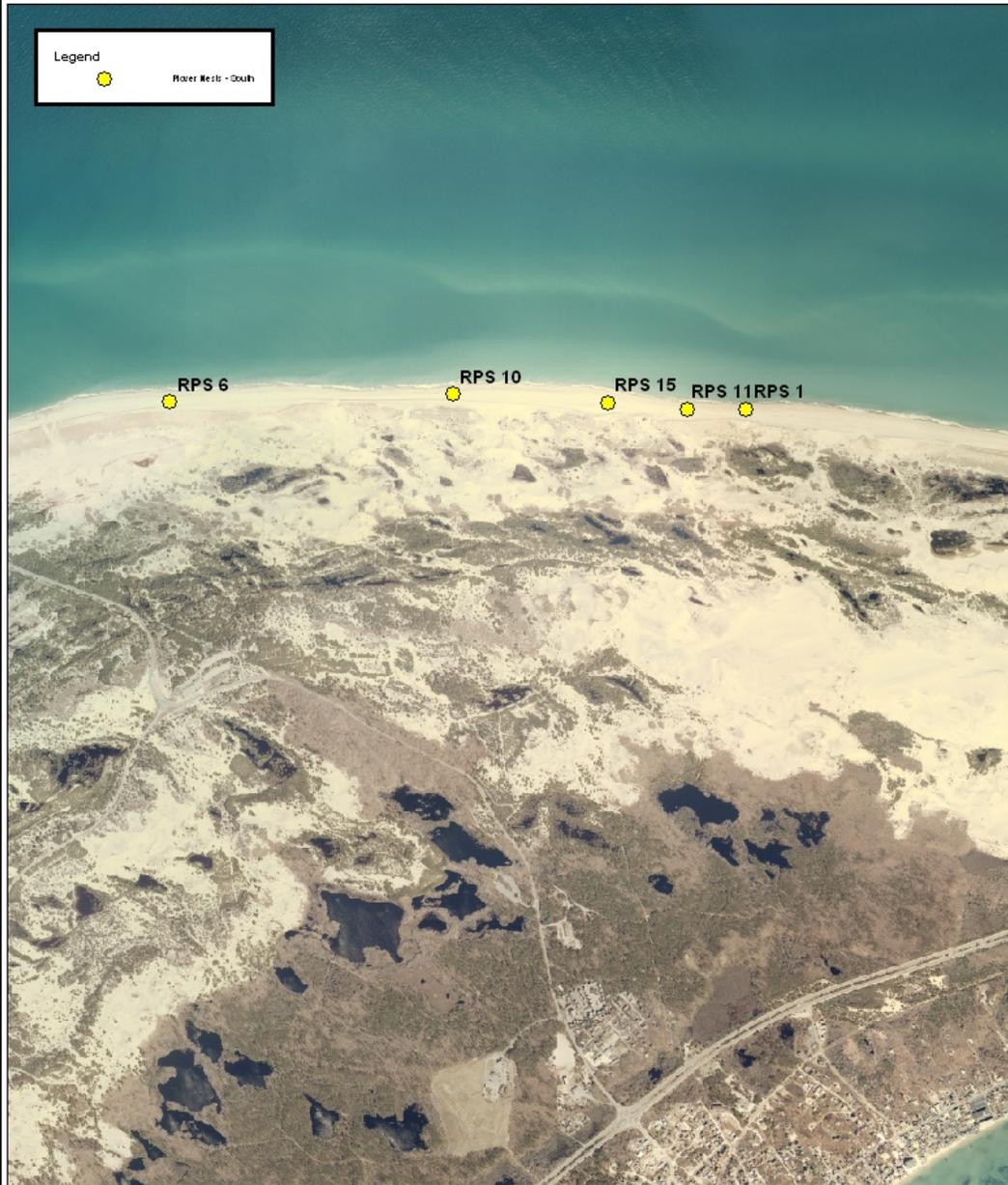
## Piping Plover Nest Sites - Race Point 2004



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## Piping Plover Nest Sites - Race Point South 2004



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## Appendix C

### Maps of Cape Cod National Seashore, South District 2004 Piping Plover Nest Sites

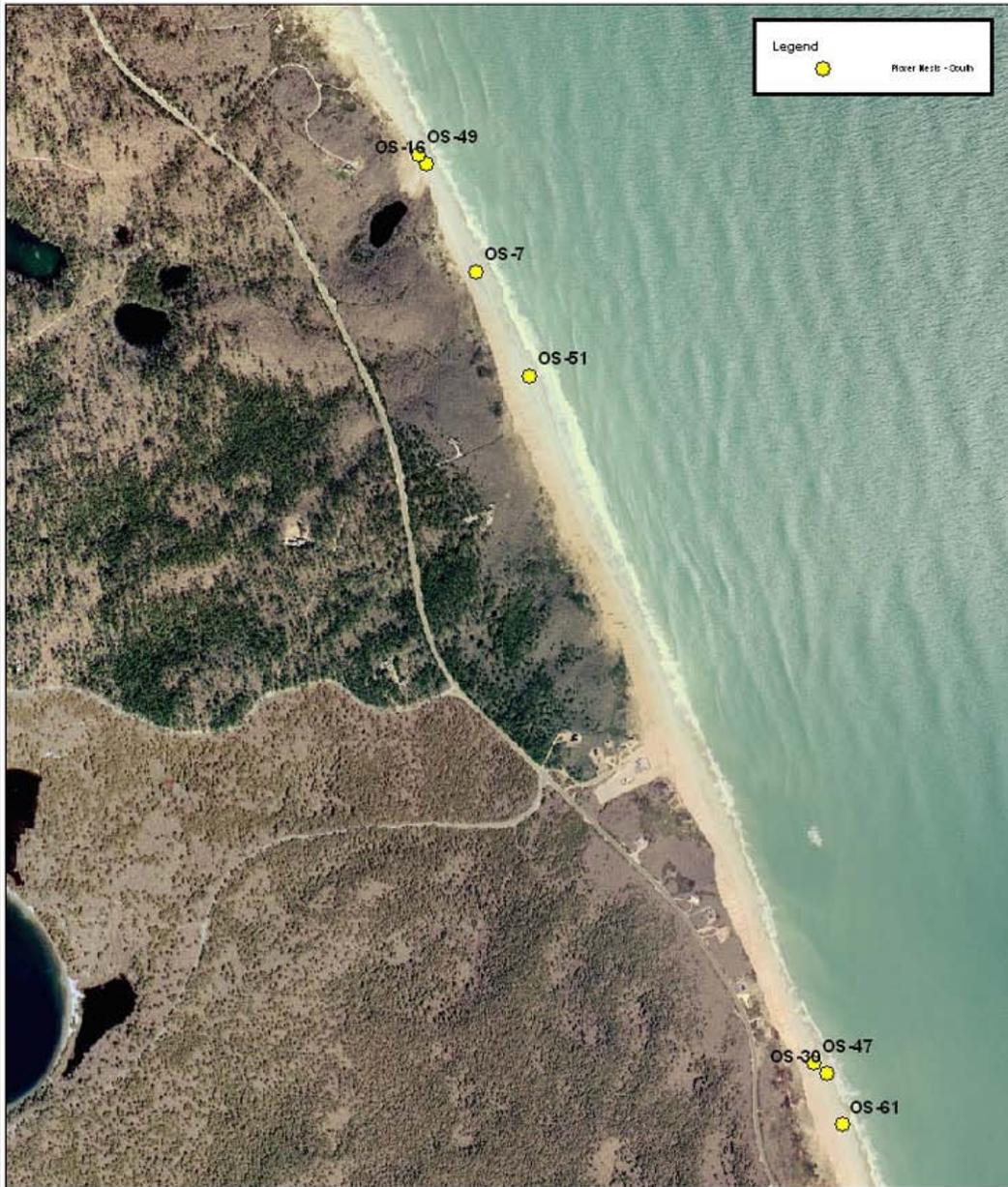


## Piping Plover Nest Sites - Newcomb Hollow 2004





## Piping Plover Nest Sites - Cahoon Hollow Beach 2004



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# Piping Plover Nest Sites - Coast Guard - Nauset Beach 2004



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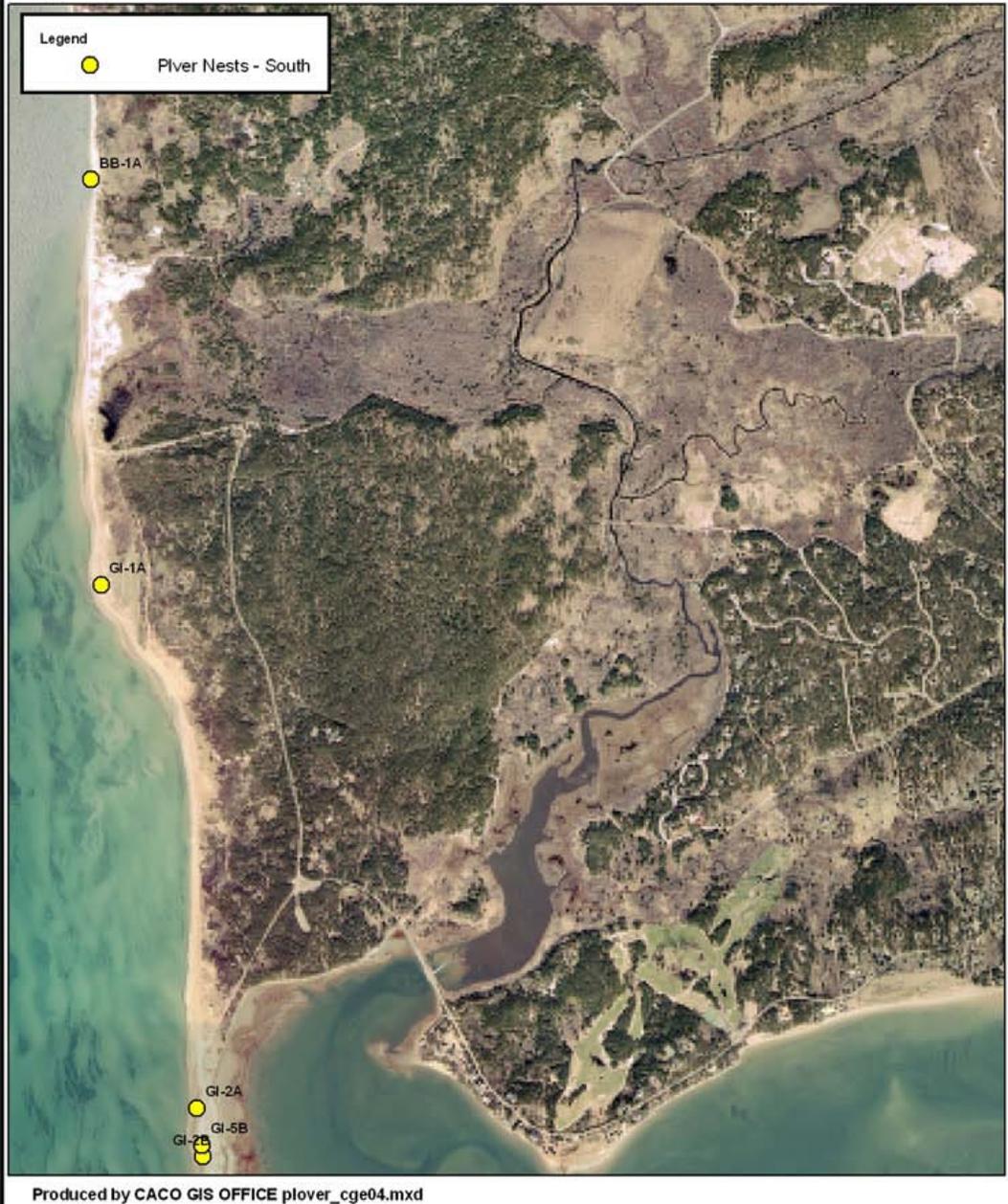
## Piping Plover Nest Sites - Great Island 2004



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## Piping Plover Nest Sites - Griffin Island 2004





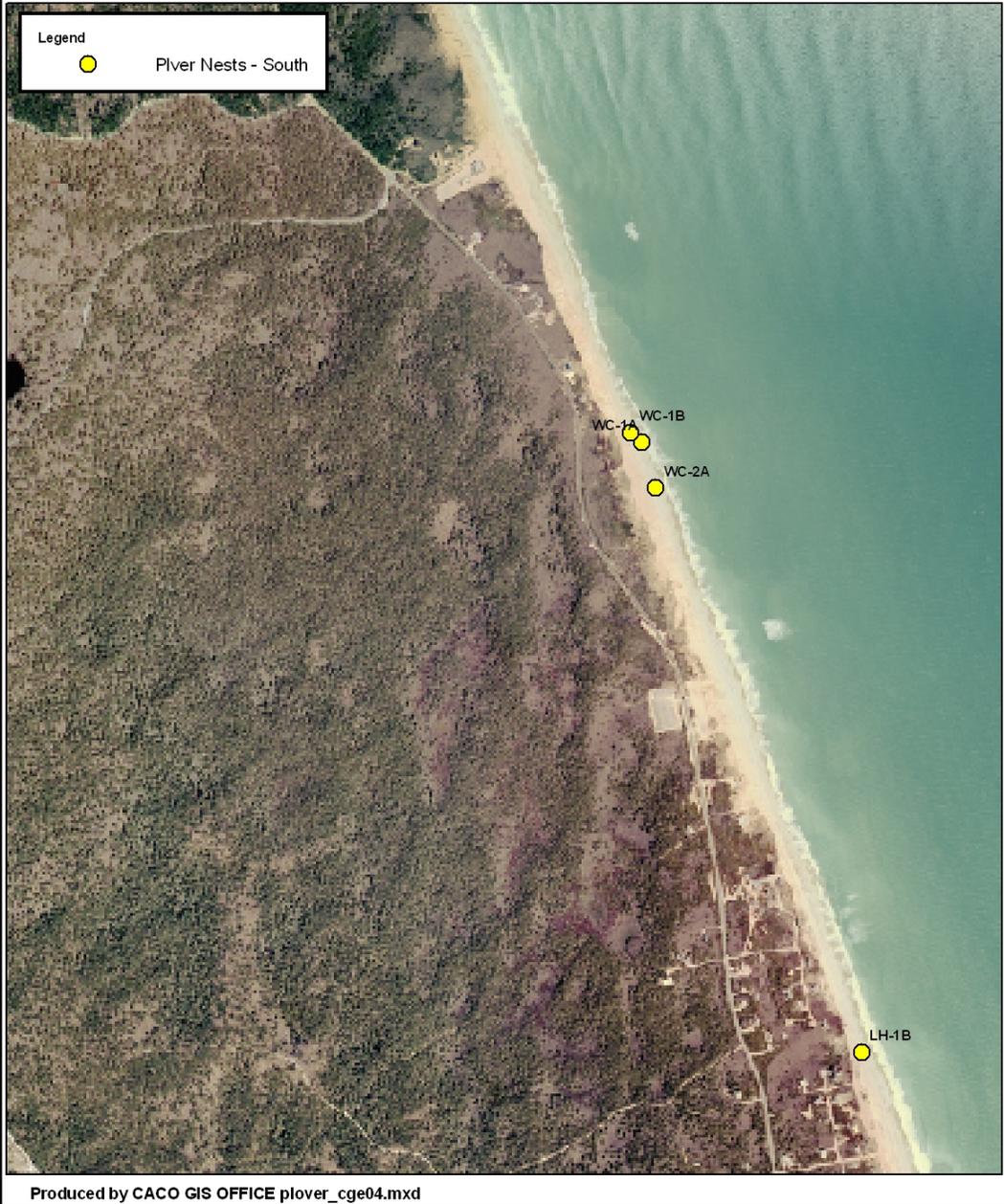
## Piping Plover Nest Sites - Jeremy Point 2004



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## Piping Plover Nest Sites - Marconi Site 2004



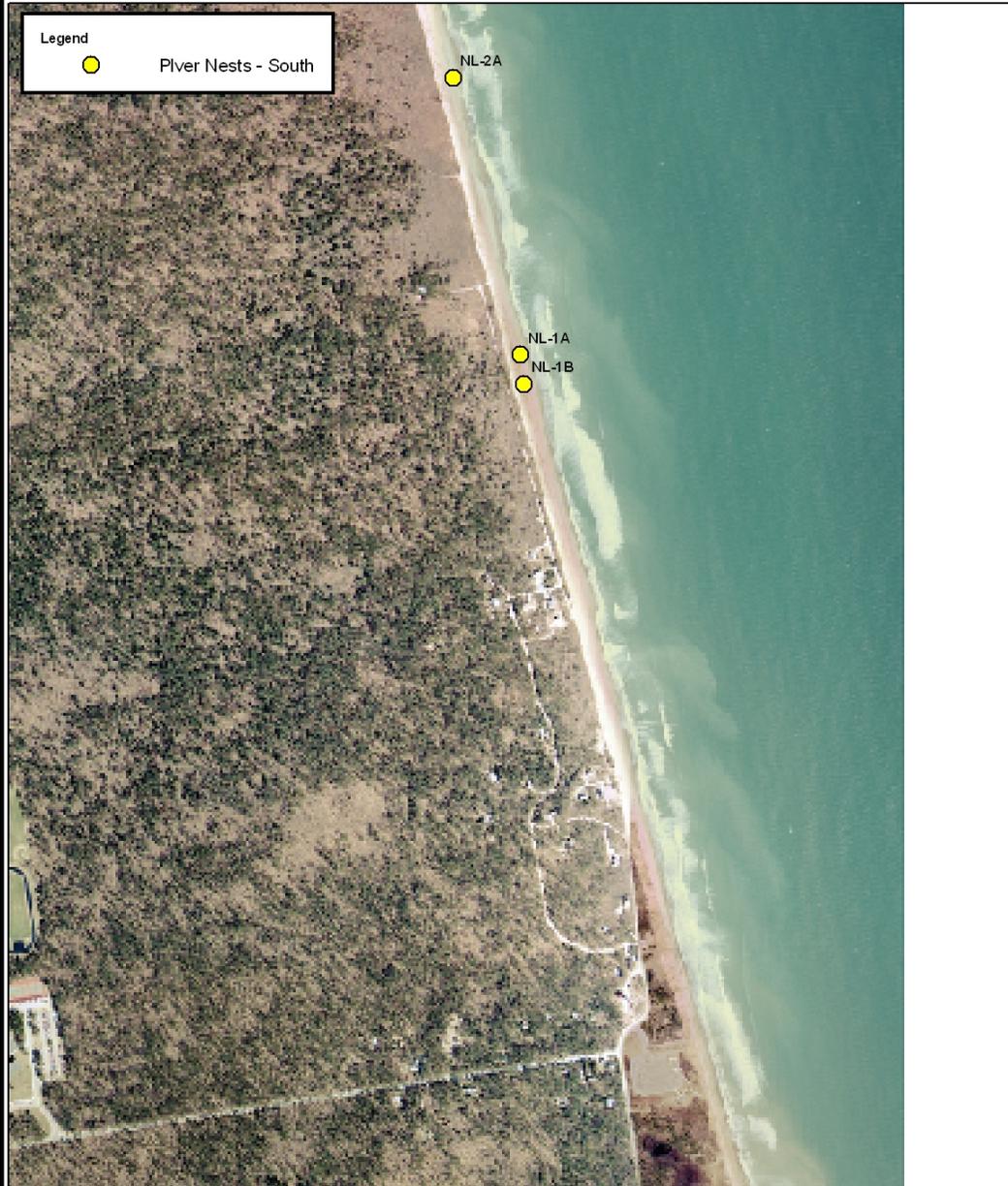


## Piping Plover Nest Sites - Marconi Site 2004





## Piping Plover Nest Sites - Nauset Light Beach 2004



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