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

2005

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ABSTRACT

This report summarizes the 2005 Piping Plover (*Charadrius melodus*) and waterbird nesting season for Cape Cod National Seashore. Piping Plover nesting and brood-rearing were monitored at 17 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 77 nesting pairs, 31in the South District and 46 in the North. Hatching success was 43%. Fledging success was 52%. A total of 87 chicks fledged. Productivity was 1.13 chicks fledged/pair. Of 118 nests, 69 (58%) of all nests initiated failed to hatch at least 1 chick. The leading causes of nest loss included predation 25 (36%) overwash 20(30%), nest abandonment 11(16%) and sanded over 11(16%). Of 47 exclosed nests, 32(68%) successfully hatched young. Of the exclosed nests that did not hatch, 10(67%) failed to abandonment, 4(26%) due to overwash, and 1(7%) were non-viable eggs. Of unexclosed nests, 16(23%) successfully hatched young. Of the 55 failed unexclosed nests, 25(45%) were lost to predators, 1(2%) were abandoned, 17(31%) lost to overwash, 11(31%) sanded over and one (2%) sanded over due to a cliff collapse. This was the eighth year the 1995 negotiated rule for ORV management was in effect. Thirty-four pairs of plovers nested within the ORV corridor. Eleven within the 2.2 mile section of Race Point North, six pair on Race Point South, north of Exit 8. Eleven pairs nested in the 4.9-mile section of Race Point South Beach closed per Negotiated Rule, and six pairs nested between Head of the Meadow and High Head. As a result, Race Point South Beach was closed to some extent for approximately (68) days. Closures, to some extent, were imposed on Race Point North Beach for a total of 84 days. By 6 September, 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 2005 Piping Plover/Colonial Waterbird monitoring and management program at Cape Cod National Seashore.

STUDY AREA

Piping Plovers were monitored on 17 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 CACO can be found in Appendix A. Maps of North District and South District piping plover nest sites are located in Appendix B and C, respectively.

PRE-SEASON ACTIVITIES

To ensure protection of nesting Piping Plovers, Coast Guard Beach was closed to pets and kite flying on 20 April 2005. Marconi Beach was not closed to these activities in 2005 because there were no plovers nesting at this site. Kite flying was also prohibited in both the North and South District within 200 meters of plover nesting sites as per the CACO compendium. 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 20 August after all plover and tern 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 similarly posted the 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 sites. Many of these areas had to be re-posted in late April and/or early May after severe storms.

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 - 5 days. Once

nests were established, all beaches were visited almost daily (≥5 times per week) and except for 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 most nests upon clutch completion; although there were some exceptions. With permission from the Massachusetts Division of Fisheries and Wildlife, 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 or cliff 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 both the South District and North District. The first nest (with one egg) was found on 30 April on Great Island. The first egg was laid on 30 April and the nest was lost on 5 May to Crow predation. The first nests to hatch chicks in the South District occurred on 7 June at Coast Guard Beach and on 8 June on Race Point North in the North District. Peak nesting for the Seashore occurred during the first two weeks in June (Figure 2). The last nest was initiated on 25 June and complete (three eggs) on 28 June at Cahoon Hollow. This was also the last nest to hatch on 26 July. No chicks fledged from this nest. The 2005 peak nesting period fell within the historical peak nesting range for CACO.

Hatching dates ranged from (South District 7 June to 26 July). Fledging dates ranged from (South District 1 July to 6 September). These dates are comparable to those reported over the past several years.

Nesting Pairs

Seventy seven pairs of Piping Plovers were monitored at 17 sites in CACO in 2005. Number of nesting pairs at the 17 sites monitored decreased by 8 pairs from 2004 (85.5 pairs in 2004 to 77 pairs in 2005) (Fig. 1). Most beaches (7 of 17) saw a decline of one or two nesting pairs from 2004 to 2005. These beaches were Nauset Light, Marconi Station, LeCount Hollow, Cahoon Hollow, Great Island, Race Point North, and High Head. Five beaches saw the same

number of nesting pairs; Coast Guard Beach, Newcomb Hollow, Bound Brook, Duck Harbor, and Ballston. Marconi Beach (south of the protected beach) had one pair return to the site in 2005. For the third consecutive year, no plovers nested north of the stairs 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 43% and ranged from 0 to 80% (Table 1). Overall, hatching success was 13% lower than in 2004.

Hatching success was greatest at White Crest (80%) and LeCount Hollow (75%), Marconi Beach (67%), Cahoon Hollow (64%), Duck Harbor and Ballston (58%). The lowest hatching success occurred at Race Point North (41%), Race Point South (38%), Jeremy Point (36%), High Head (32%), Great Island (21%). No eggs hatched Newcomb Hollow (Table 1).

Fledging Success

Fledging success (total number of chicks fledged/total number of eggs hatched) for all sites combined was 53% and ranged from 0 to 86% (Table 1). Overall, fledging success decreased 3% from 2004. The greatest fledging success occurred on Great Island (86%), Wood End/Long Point (80%), Coast Guard Beach, Eastham (74%), LeCount Hollow (67%), Race Point South (56%). The sites with the lowest fledging success were Duck Harbor and Ballston (29%) and High Head (25%). Sites that hatched chicks but had no fledged chicks include White Crest, Cahoon Hollow, Newcomb Hollow and Bound Brook. (Table 1).

Productivity

Productivity (number of chicks fledged/nesting pair) for all sites was in 2005 was 1.13 (87 chicks fledged from 77 pairs) and ranged from 0 to 2.3 (Table 1). This is less than 2004 when

total productivity was 1.45. The South District had higher productivity (1.29 chicks/pair) than the North District (1.02 chicks/pair). Productivity was greatest at Coast Guard Beach (2.30), LeCount Hollow (2.00), Wood End/Long Point (1.33), Race Point North (1.18), and Race Point South (1.06). The lowest productivity occurred at Marconi Station (1.00), Duck Harbor (1.00) and Great Island (1.00), Ballston (0.67), and High Head (.33). White Crest, Cahoon Hollow, Newcomb Hollow and Bound Brook failing to fledge any chicks. (Table 1). According to the Atlantic Coast Piping Plover Recovery Plan a minimum productivity of 1.24 is necessary to maintain current population levels (Melvin and Gibbs 1994).

Nest Loss

Fifty-eight percent (69 of 118) of all nests initiated failed to hatch at least 1 chick in 2005 (Table 3). This is an increase from 2004 when 48% (56 of 115) nests failed. All of the South District beaches except Marconi Beach and Lecount Hollow lost at least one nest and all five North District beaches lost at least one nest in 2005 (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 32 % (n=9) of the nest losses (Table 4). In the North District, the main reason for early nest loss was also to predators accounting for 39% of the losses (n=16) (Table 4). Overall, predation (n= 25), over wash (n=20), sanded over (n=11) and abandonment (n=11) were the leading causes of nest loss, accounting for 67 of the 69 (97%) nests lost (Table 2). Of the 69 lost nests, 54(78%) had not been exclosed, 15(22%) had been exclosed.

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 exclosed nests. In response to this, in 2004, CACO began exploring the use of different exclosure designs to help reduce the rate of adult mortalities being associated with exclosed nests. Two exclosure designs were used in 2005 with the approval of the Massachusetts and Federal endangered species coordinators.

1. Single-top Exclosure – This design has been used at CACO since the early 1990's. The circular exclosure 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 exclosure type was used for all North District nests and for 29 nests in the South District.

2.. Canopy Exclosure - This design uses 2" x 4" fencing to create a 4' x 4' square exclosure, 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. Twelve canopy exclosures were used on five sites in the South District in 2005

Predator exclosures were installed around 47 of the 118 (40%) nests. Of the 47 exclosed nests, 32 (68%) successfully hatched young. Of the 15 exclosed nests that did not hatch, 10 (67%) failed to abandonment, 4(26%) were lost to overwash, and 1 (7%) nest had non-viable eggs.

There were a total of 71 unexclosed nests. Of these nests, 54 (77%) failed to hatch (Table 4). Although the number of unexclosed nests seems extremely high many of these nests were incomplete clutches (with < 3 eggs), or the nest was located where an exclosure could not be used. The greatest number of failed unexclosed nests was to predation 25 out of 55 nests (46%) including: 8(32%) to unknown predators, 6(24%) to coyote, 5(20%) to crow, 2(8%) to gull, 2(8%) to weasel, 1(4%) to small mammal (Sp?), 1(4%) to harrier hawk. The remaining loss of unexclosed nests were to overwash 16(30%), to being sanded over 11(20%) , abandonment 1(2%), and one (2%) to being sanded over due to cliff collapse (Table 4.)

Abandonment of Exclosed Nests

A review of twelve years of CACO data shows that 31% (251 of 801) of all exclosed nests fail to hatch. Thirty-six percent (90 of 251) of these failed nests were lost due to abandonment.

South District -. A total of four exclosed nests were abandoned. No known adult mortalities were associated with any of the abandonments. No predator track led up to or around any of the exclosures and the cause of the abandonment was undetermined. Two of the four pairs successfully renested. One pair renested and then lost all but one egg to overwash which the pair subsequently abandoned. The forth pair was not observed in the area again. Great effort was taken to account for the nesting pairs that abandoned their nests at all sites and exclosures were monitored no less than every other day. In 2005, 24% of the South Districts exclosed nests (5 of 21) failed to hatch. This is a substantial decrease from last season when 49% of exclosed nests failed to hatch. Of the 5 failed nests, 4 were due to abandonment, identifying 80 % of the South District's exclosed failures due to abandonment.

North District – A total of six exclosed nests were abandoned. No known adult mortalities were associated with any of the abandonments. No predator track led up to or around any of the exclosures and the cause of the abandonment was undetermined. None of the six pairs are known to have renested. The eggs from three nests were collected; six of the eggs contained well formed chicks and three eggs showed embryonic development. No development could be detected in the other three clutches of eggs. In 2005, 35% of the North Districts exclosed nests (9 of 26) failed to hatch. Of the 9 failed nests, 6 were due to abandonment, identifying 67% of the North District's 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 is consistent with data from previous studies (MacIvor 1990, Brown and Hoopes 1993).

South District - A total of 11 less then 1 day old chicks and eggs from three nests located between White Crest and Cahoon Hollow were predated by coyote. On 9 July, two recently hatched chicks and two eggs were observed inside a circular exclosure. Heavy coyote tracks were observed digging under and walking around the perimeter of the exclosure. On 10 July, there were more tracks around the exclosure and the netting of the exclosure was ripped with coyote tracks inside the exclosure. There were no chicks or eggs inside the exclosure. It is impossible to determine if the coyote predated the chicks inside or outside the exclosure. On 16 July, eggs were missing from a nest in a circular exclosure and from a canopy exclosure on or near the estimate hatching dates. Fresh coyote tracks were found digging under and circling the perimeter of the exclosures. There were no signs of the coyote gaining access inside either exclosure. Tracking suggests that the coyote harassed the recently hatched chicks out of the exclosure, and then killed the chicks shortly after or as they left the exclosure. The coyote returned on 17 July, and jumped into the unused circular exclosure.

A two day old plover chick was found at Coast Guard Beach in Eastham on 5 July. The chick was found belly up on the mud flats of Nauset Marsh. The chick was collected and sent to National Wildlife Health Center in Madison, Wisconsin for analysis. The Seashore has not yet received the necropsy report.

North District - On 23 June, one chick was found actively hatching after the female and two chicks had already left the nest area. The chick finished hatching on 23 June and was found

dead within the exclosure on 24 June. This is the same nest which had an adult mortality associated with it on 21 June. On 7 July, one adult was brooding one very weak chick in the vehicle tracks on High Head. On 8 July, the chick was found dead in the same spot as it had been observed on the previous day. Unseasonably cold, (55 degrees F) and rainy weather are attributed to the mortality. On 18 July, a dead and dessicated chick was found in the Head of the Meadow parking lot. The chick had been 5-7 days of age at time of mortality. Due to the location of the chick a full investigation was completed by law enforcement personnel. No definitive cause of death could be directly attributed to the mortality although cold and rainy weather or vehicle impact may have been the cause of the mortality.

It is unknown how the majority of chicks were lost. It is probable that the five day period of unseasonably cold and wet weather (50 and 60 degrees) during the first week of July contributed to a number of young chick disappearances during that time. Shorebird personnel did note an increase in coyote (*Canis latrans*) sightings since 2003 (unpublished data) in the areas where mortality occurred; however this information is speculative. It is possible that these species, along with gulls (which congregate in large groups on the beachfront), fox, skunk, crows, domestic dogs and feral cats may also contribute to chick mortality.

Adult Mortality

South District - There were no documented cases of adult mortality in the South District in 2005. The replacement of the circular exclosure with canopy exclosures on beaches where there was a high incidence of adult mortality associated with the use of circular exclosures in 2004 may have contributed to the reduction of exclosure related deaths.

North District - On May 2, a dead adult was found in vehicle tracks in the Self-Contained Vehicle area on Race Point North by law enforcement officer John O'Neill. Due to the location of the dead adult a full investigation was completed by law enforcement personnel. The dead adult was sent to the National Wildlife Health Center in Madison, Wisconsin. It was determined

that the adult had sustained massive body trauma indicative of having been struck or crushed by a vehicle.

On June 21, a dead adult was found approximately 20 feet outside of an exclosure on Race Point North. The second adult was incubating two chicks and two eggs at the time the dead adult was found. No predator tracks led up to or around the exclosure. The dead adult was sent to National Wildlife Health Center in Madison, Wisconsin. It was determined that the adult male had sustained puncture wounds to the shoulder and base of neck that were characteristic of a raptor kill. The male had good body reserves at the time of death.

South District Beach Closures and Detours

Winter storm erosion continues to cause bay and ocean beaches to become narrow in the South District. In areas of extreme narrow beaches, it was not always possible to provide a large enough symbolic fence buffer especially at high tide to prevent disturbance to incubating pairs when pedestrians were present. In cases where this was a problem, beaches were closed at times of high tide or small sections of beach were completely closed. Where possible, detours were established to allow visitors continued use of these beaches. Informational signs were erected informing visitors of these closures.

Jeremy Point – The western side (0.2 miles) was closed on 18 June to protect one nest. The beach was re-opened on 22 June after nest was washed over. The east side of Jeremy Point remained open during this time.

Great Island – 0.2 miles of beach at the "Gut" was closed to pedestrians at high tide from 4 June to 2 July to protect one nest. Signs explaining the detour were posted at the two access paths on the inland trail across from the Gut. At low tide, there was enough exposed beach to allow visitors to walk around the posted fencing without disturbing the incubating bird. The area was re-opened when the chicks hatched.

Dogs off Leash

South District - A total of 227 dogs were observed off leash from 24 April to 20 August by plover staff alone. Unleashed dogs were encountered most frequently on the oceanside at LeCount Hollow and on the bayside at Duck Harbor and Bound Brook. In 2005, there were four cases of dogs directly disturbing and harassing adult plovers and their chicks inside and outside the symbolic fencing. In one incident at Coast Guard, a small dog was seen chasing three, two day old plover chicks and the adult plovers. There were three other observations of dogs off leash running within 15 meters of unfledged plover chicks.

North District - A total of 104 dogs were observed off leash from 17 April to 5 Sept. Unleashed dogs were encountered most frequently on Race Point North, the Race Point North Protected Beach 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 eighth year of the negotiated rule of 1995. In 2005 we documented two direct negative impacts to Piping Plover adults and chicks. These two cases are reported above in the adult mortality and chick mortality sections.

The presence of Piping Plover chicks caused the closure to ORV traffic on portions of Race Point North beach for a total of 86 days (28 days more than 2004). On 2 September (33 days later than 2004) 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 the Race Point South exit and the High Head exit for 68 days and was opened in entirety on 6 September. 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 60 days. As of 6 September, the entire ORV corridor was opened to vehicles.

Plover Management -- Thirty-three of 46 (27%) North District pairs nested within the ORV corridor (1 more than in 2004). Fifteen of these pairs (23 nests) nested in areas seasonally closed to ORV traffic (opening/closure mandated by the Negotiated Rule). Eighteen pairs (27 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 along the Pole Line route began to hatch in the early morning of 9 June. The Pole Line route was closed from the Hatches Harbor access to the intersection of the Pole Line route with the access road to the beach. This allowed the remainder of the Pole Line route to remain open. Shorebird personnel and law enforcement staff stationed an observer to monitor the brood continually until it safely moved into Hatches Harbor marsh later in the morning. If not for this effort the entire Pole Line route would have been closed and all visitors removed from the Hatches Harbor area.

On 16 June, a second nest along the Pole Line route began to hatch. Shorebird personnel and law enforcement staff monitored the brood continually until 2000 hours at which time the Pole Line route was closed to vehicles. On 17 June, the Pole Line route was opened at 0630 to vehicles while an observer was posted to monitor the plover brood. In anticipation of the brood moving towards the beach, 0.4 of a mile was closed on RPN also. At 2000 hours the Pole Line route was closed to vehicle due to the plover brood still in close proximity to the road. On 18 June, the Pole Line route was reopened to vehicles while an observer was posted to monitor the

plover brood. At 1140 hours the brood moved into the Hatches Harbor marsh and the 0.4 mile closure on RPN beach was reopened.

A Piping Plover nest in Hatches Harbor began hatching on the morning of 20 June. Shorebird personnel and law enforcement staff monitored the brood continually until 2000 hours at which time Hatches Harbor was closed to vehicles. On 28 June Hatches Harbor corridor was reopened due to the plover brood moving out of the 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 27 June – 1 July) the area in which the Race Point North SCV Area and Race Point North exit would be closed. Likewise on Race Point South, the location of another Piping Plover nest would close the Race Point South entrance upon hatching (expected 30 June – 4 July).

On 1 July, in anticipation of the plover nest located within 300 meters of the exit hatching, the Race Point North SCV area and exit were closed. Four-tenths of a mile of Race Point North was accessible via the Pole Line Route. To accommodate the SCV users that could not negotiate the High Head exit a SCV area at Pilgrim Heights was established. On July 1, in accordance to the Negotiated Rule, the High Head exit was opened to the Head of the Meadow beach due to no plover broods located on the beach. A SCV area was established north of the High Head exit. On 1 July, a plover nest in close proximity of the Race Point South exit began hatching closing the Race Point South exit.

On 4 July, the Race Point North exit and one mile of corridor was reopened due to the overdue hatching of the plover nest in close proximity to the exit. The SCV area was also reestablished. On 4 July, the nest located in the dune restoration area of the Head of the Meadow parking lot began hatching. The parking lot was closed at 2100 hours due to chicks present

within the nest. On 5 July the Head of the Meadow parking lot was reopened with an observer to monitor the brood. The brood moved to the Head of the Meadow beach on 5 July. On 12 June a plover brood moved back into the area of the Head of the Meadow parking lot and the lot was closed until the brood moved from the area on 23 July.

On 16 July, the Pole Line route was closed at 2100 hrs due to unfledged plover chicks moving into close proximity of the road. On 17 July the Pole Line route was opened at 0800 while an observer monitored the brood. The road was closed for the night at 2100 hrs. On 18 July the Pole Line route was opened at 1000 hrs while an observer monitored the brood. The road was closed for the night at 2100 hrs. On 19 July the Pole Line route was opened at 0800 hrs due to the plover brood fledging. If not for this effort the Pole Line route would have been closed at all times and all visitors removed from the Hatches Harbor area.

On 22 July, a plover nesting in close proximity to the Race Point North exit began hatching closing the Race Point North SCV area and the exit at 2000 hours. To accommodate the SCV users that could not negotiate the High Head exit a SCV area at Pilgrim Heights was established. One mile and one tenth of a mile of Race Point North was accessible via the Pole Line Route.

On 3 August the Head of the Meadow exit was reopened due to the fledging of the plover brood. On 5 August, a plover brood moved south of the High Head exit closing the exit. Seven tenths of a mile was accessible via the Head of the Meadow exit. On 7 August the exit was reopened due to the brood moving out of the area.

On 2 September the Race Point North exit and all 0.2 mile were opened due to the last plover brood fledging. All of Race Point North was open to vehicles.

On 6 September, 0.7 of a mile were opened on Race Point South opening the complete corridor from Race Point South to High Head.

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 2005. Renesting attempts continued through late August. The first and last chicks to hatch this year were at Jeremy Point (29 June and 23 August respectively), although the majority of chicks hatched out the second and third week of July. This late hatching date can be contributed to renesting due to both predation and overwash.

In late June, an aerial estimate of 113 pairs nested on five beaches in the South District. Four of these colonies, located at Marconi Station, Lecount Hollow, Cahoon Hollow, and Jeremy Point were small, consisting of 3-20 nesting pairs. Renesting continued for the duration of the breeding season. Due to the narrow beaches, many nests were lost to overwash and some to predators. Tracks indicated canid sp. (probably coyote) to be the major predator; gull and crow tracks were also observed in the colonies. Very few chicks hatched and productivity was low at these sites (< 5 chicks fledged from all four sites).

The fifth colony at Coast Guard Beach was the largest and most productive. In early June, approximately 77 pairs were counted along with 25 nests. In late June, many nests were lost to overwash and the colony dropped to < 20 pairs. At the same time, Nauset Beach in Orleans observed an increase in Least Tern numbers (Barbara Walsh per communication). It is likely that, due to the close proximity of these two barrier spits, the majority of terns from Coast Guard shifted over to Nauset Spit to renest. By early to mid July, over 200 pairs returned to nest at Coast Guard. This coincided with a decline of nesting terns at Nauset, Orleans. Throughout July and August chicks and fledglings were commonly observed in the colony and productivity was fair to good.

A total of 49 pairs, nested on six beaches in the North District. Heavy egg predation by coyote continued throughout the season at Race Point North causing renesting to continue for the

duration of the breeding season; three chicks were fledged on this beach. A small colony (32 pairs) at Long Point suffered heavy predation and abandoned between 14 June and 16 June. Thirteen pairs did return to the colony although only 4 renests were found. Overall, heavy predation led to Least Terns having to renest throughout the season and accounted for their low productivity; five chicks are believed to have fledged from all sites in the North District.

Common Terns

Common terns were first sighted on 14 May 2005. For the past four years, historic nesting sites in the South District (New Island, Coast Guard Beach and Jeremy Point) experienced a steady decline in nesting terns and extremely low to no productivity due to intense predator pressure from coyote, crow, gull, and skunk. In 2005, a small group of approximately eight pair recolonized the northeast corner of New Island. Four nests were counted on 9 June, along with two additional nests that had been predated. Only one large chick was observed on 30 July which is unknown to have fledged.

In mid-July, a conservative estimate of 400 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, its nesting attempt was depredated by an unknown predator.

Roseate Terns

No nesting pairs in 2005. In early-August, approximately 50 immature and post-breeding Roseate Terns were observed on the mudflat of Nauset Marsh.

Arctic Terns

The first sightings of an artic terns occurred on 1 June 2005 when a pair was observed within a flock of common terns at New Island, Orleans. On 12 June, a one egg nest was found on the southern tip of Coast Guard Beach. A second egg was laid on or before 16 June. The nest was lost to coyote on 28 June. The pair never renested but was observed in the area through July.

Black Skimmers

No black skimmers were sighted in 2005.

Laughing Gulls

No nesting pairs in 2005

American Oystercatchers

The first american oystercatcher was observed on 22 April 2005 at the southern tip of Jeremy Point. In 2005, two pairs nested unsuccessfully on Jeremy Point. Both nests were found with two eggs on 5 May. One pair located on the southern tip of Jeremy Point, lost three nests to wash over. The second pair lost two nests; the first was sanded over during a storm and the second nest as infertile. The pair eventually abandoned the nest after 40 days. Both pairs remained on Jeremy Point until mid-August. No oystercatchers were observed in the North District.

MANAGEMENT RECOMMENDATIONS

1. Dogs off leash continue to be a chronic problem in the park. Ground nesting birds like plovers and terns are extremely vulnerable to disturbance and predation by unleashed dogs. Increased patrols, enforcement and citations issued by LE rangers is needed to ensure compliance of the leash law. Historically, dog owners are permitted to walk their dogs through protected life guard beaches within the park. This is contradictory to CFR Title 36 section 2.15 which states that pets are prohibited in designated swimming beach. In 2006, to keep within the CFR dogs should not be permitted to walk through Protected Beaches from 9:00 a.m. to 5:00 p.m

   Seasonal beach closures to dogs from 20 April until nesting is complete should occur if (1) beaches are narrow making the buffer between the dog and nesting plovers small and the chance of disturbance, injury or death to the bird great or (2) beaches that have had historically low compliance to the leash laws. The Seashore will continue to record incidences of dogs off leash 2006 to determine usage trends.

2. Loss of exclosed 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 exclosure 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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Figure 1. Number of Piping Plover breeding pairs and nest productivity on beaches managed by the National Park Service, Cape Cod National Seashore, 1985 - 2005

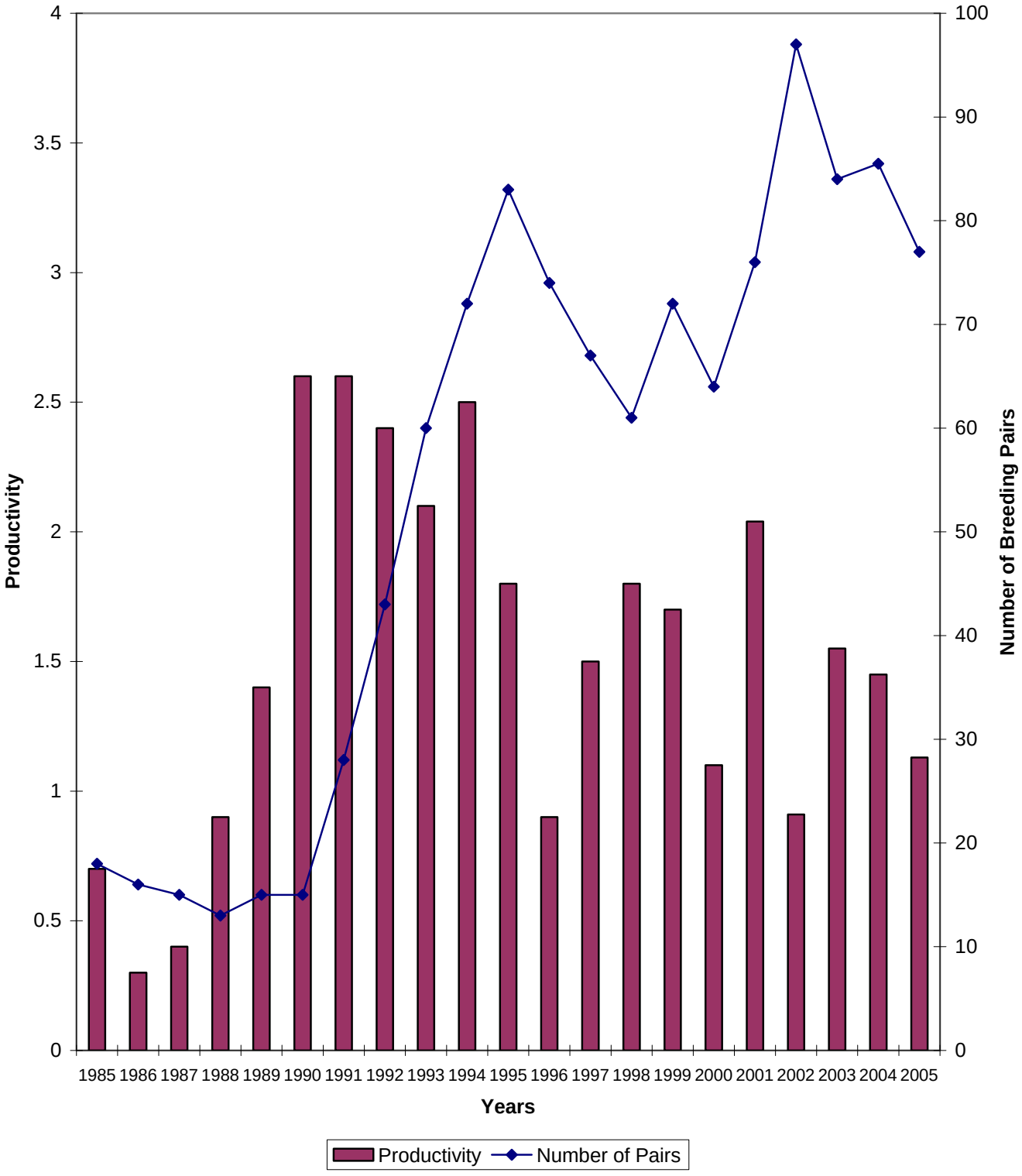


Figure 2. Weeky Active Piping Plover Nests at Cape Cod National Seashore 2005

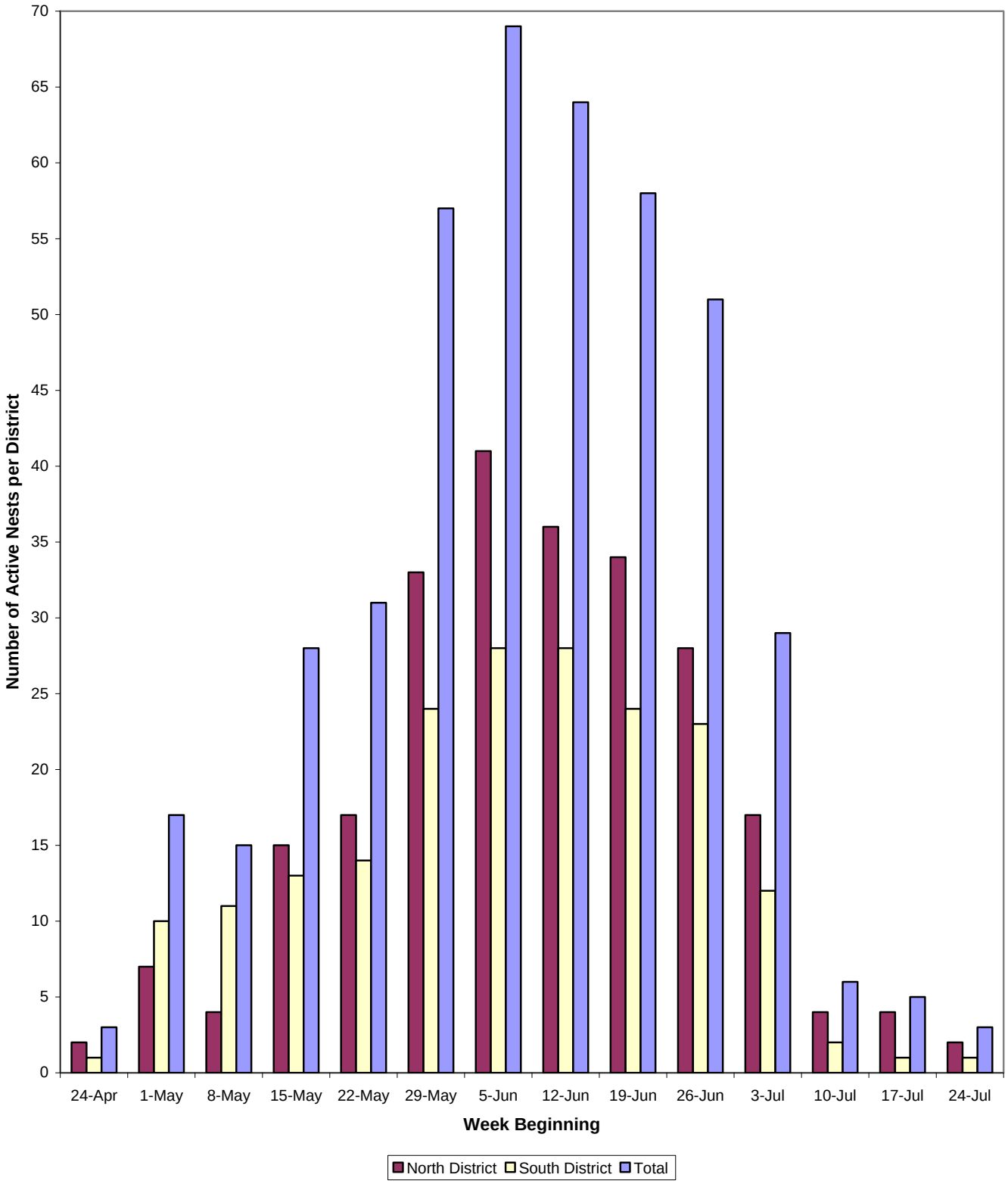


Table 1. Summary of Piping Plover Breeding Success, Cape Cod National Seashore, 2005

Site	No. Pairs	No. Nests[1]	No. eggs Laid	No. eggs Hatched	No. Fledged per site	Hatching Success[2]	Fledging Success[3]	Productivity[4]
Coast Guard	10	17	54	31	23	0.57	0.74	2.30
Nauset Light	0	0	0	0	0	0.00	0.00	0.00
Marconi Beach	1	1	3	2	1	0.67	0.50	1.00
Marconi Station	2	3	7	4	2	0.57	0.50	1.00
LeCount	1	1	4	3	2	0.75	0.67	2.00
White Crest	1	2	5	4	0	0.80	0.00	0.00
Cahoon Hollow	1	4	11	7	0	0.64	0.00	0.00
Newcomb Hollow	1	1	4	0	0	0.00	0.00	0.00
Bound Brook	1	2	8	4	0	0.50	0.00	0.00
Duck Harbor	2	4	12	7	2	0.58	0.29	1.00
Great Island	6	11	33	7	6	0.21	0.86	1.00
Jeremy Point	5	6	22	8	4	0.36	0.50	0.80
Wood End/Long Pt	9	9	36	15	12	0.42	0.80	1.30
Race Point North	11	17	58	24	13	0.41	0.54	1.18
Race Point South	17	26	84	32	18	0.38	0.56	1.06
High Head	6	10	25	8	2	0.32	0.25	0.33
Ballston Beach	3	4	12	7	2	0.58	0.29	0.67
TOTAL	77	118	378	163	87	0.43	0.53	1.13

[1] Includes renests

[2] Total number of eggs hatched/total number of eggs laid

[3] Total number of chicks fledged/total number of eggs hatched

[4] Total number of chicks fledged/total number of nesting pairs

Table 2. Causes of Piping Plover Nest Failures, Cape Cod National Seashore, 2005 (page 1 of 2)

Site	NESTS			Cause	PER SITE	
	Total No.	No. Lost	% Lost		No. Lost	% Lost
Coast Guard	17	7	41%	Sanded over	5	72%
				Predation (Net)	1	14%
				Overwash	1	14%
				Predation types		
				Crow (not excl)	1	100%
Marconi Beach	1	0	0%	No failures		
Marconi Station	3	2	67%	Abandoned (excl) - unknown reason	1	50%
				Predation (net)	1	50%
				Predation types		
				Coyote (not excl)	1	100%
Le Count Hollow	1	0	0	No failures		
White Crest	2	1	50%	Sanded over	1	100%
Cahoon Hollow	4	2	50%	Overwash	1	50%
				Sanded over	1	50%
Newcomb Hollow	1	1	100%	Overwash	1	100%
Bound Brook	2	1	50%	Abandoned (excl) - unknown reason	1	100%
Duck Harbor	4	2	50%	Overwash	2	100%
Great Island	11	9	82%	Predation (Net)	5	56%
				Abandoned (excl) - unknown reason	2	22%
				Overwash	2	22%
				Predation types		
				Crow (not excl)	1	20%
				Small mammal (sp?) (not excl)	1	20%
				Unknown predator (not excl)	3	60%
Jeremy Point	6	4	67%	Predation (Net)	2	50%
				Overwash	1	25%
				Sanded over	1	25%
				Predation types		
				Unknown predator (not excl)	2	100%

Table 2. Causes of Piping Plover Nest Failures, Cape Cod National Seashore, 2005 (page 2 of 2)

Site	NESTS			Cause	PER SITE	
	Total No.	No. Lost	% Lost		No. Lost	% Lost
Wood End - Long Point	9	5	56%			
				Predation (Net)	4	80%
				Overwash	1	20%
				Predation type		
				Unknown predator (not excl)	1	25%
				Coyote (not excl)	3	75%
Race Point Beach North	17	10	59%			
				Overwashed	3	30%
				Predation (Net)	2	20%
				Abandoned (excl) - unknown reason	2	20%
				Sanded over	2	20%
				Non -viable eggs	1	10%
				Predation types		
				Harrier (not excl)	1	50%
				Unknown predator (not excl)	1	50%
Race Point Beach South	26	17	65%			
				Predation (Net)	8	47%
				Overwashed	4	24%
				Abandoned (excl) - unknown reason	3	18%
				Sanded over	2	11%
				Predation types		
				Coyote (not excl)	1	12%
				Crow (not excl)	2	25%
				Gull (not excl)	2	25%
				Unknown predator	1	12%
				Weasel (not excl)	2	25%
High Head	10	7	70%			
				Overwash	3	43%
				Predation (Net)	2	29%
				Abandoned (excl) - unknown reason	1	14%
				Abandoned (not excl) - unknown reason	1	14%
				Predation types		
				Coyote (not excl)	1	50%
				Crow (not excl)	1	50%
Ballston Beach	4	2	50%	Overwash	2	100%

Table 3. Nest Loss Totals, Cape Cod National Seashore, 2005

Nests					Per Cause	
No. Nests	**No. Hatched**	**No. Lost**	**% Lost**	**Cause**	**No. Lost**	**% Lost**
118	49	70	58%	Predation (Net)	25	36%
				Overwash	20	30%
				Abandoned (Net)	11	16%
				Sanded over	11	16%
				Non-viable eggs	1	1%
				Sanded over (on side of cliff)	1	1%
				Abandonment type		
				Abandoned (excl) - unknown reason	10	91%
				Abandoned (not excl) - unknown reason	1	9%
				Predation type		
				Coyote (not excl)	6	24%
				Crow (not excl)	5	20%
				Gull (not excl)	2	8%
				Harrier (not excl)	1	4%
				Small Mammal (Sp?) (not excl)	1	4%
				Unknown predator (not excl)	8	32%
				Weasel (not excl)	2	8%

Table 4. Fates of Exclosed and Unexclosed Piping Plover Nests, Cape Cod National Seashore, 2005

Nest	Total	No. Successful	No. Not Successful	% Successful	% Not Successful	Cause of Failure	No. Lost	% Lost
Exclosed	47	32	15	68%	32%			
						Abandoned – unknown reason	10	67%
						Overwash	4	26%
						Non-viable eggs	1	7%
Unexclosed	71	16	55	23%	77%			
						Predation (Net)	25	46%
						Abandoned – unknown reason	1	2%
						Overwash	17	30%
						Sanded over	11	20%
						Sanded over (on cliff)	1	2%
						Predation types		
						Coyote	6	24%
						Crow	5	20%
						Gull	2	8%
						Harrier	1	4%
						Small mammal (sp?)	1	4%
						Unknown predator	8	32%
						Weasel	2	8%

Table 5. Fate of Piping Plover Eggs, Cape Cod National Seashore, 2005 (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	54	31	23	43%	Sanded over	15	65%
						Overwash	3	17%
						Non-viable	4	13%
						Predation (Net)	1	4%
						Predation types		
						Crow (not excl)	1	100%
Marconi Beach	1	3	2	1	33%	Overwash	1	100%
Marconi Station	3	7	4	3	43%	Predation (net)	2	67%
						Abandoned (excl) - unknown reason	1	33%
						Predation types		
						Coyote (not excl)	2	100%
Le Count Hollow	1	4	3	1	25%	Non-viable	1	100%
White Crest	2	5	4	1	20%	Sanded over	1	100%
Cahoon Hollow	4	11	7	4	36%	Overwash	2	50%
						Sanded over	2	50%
Newcomb Hollow	1	4	0	4	100%	Overwash	4	100%
Bound Brook	2	8	4	4	50%	Abandoned (excl) - unknown reason	4	100%
Duck Harbor	4	12	7	5	42%	Overwash	5	100%
Great Island	11	33	7	26	79%	Predation (Net)	14	54%
						Abandoned (excl) - unknown reason	8	31%
						Overwash	3	11%
						Non-viable	1	4%
						Predation types		
						Crow (not excl)	1	7%
						Small mammal (sp?) (not excl)	4	29%
						Unknown predator (not excl)	9	64%
Jeremy Point	6	22	8	14	64%	Predation (Net)	8	58%
						Overwash	3	21%
						Sanded over	3	21%
						Predation types		
						Unknown predator (not excl)	8	100%

Table 5. Fate of Piping Plover Eggs, Cape Cod National Seashore, 2005 (page 2 of 2)

SITE	No. Nests	Net Laid	No. Hatched	No. Lost	% Lost Per Site	CAUSE	# Eggs Lost	% Lost Per Cause
Wood End - Long Point	9	36	15	21	58%	Predation (Net)	16	76%
						Overwash	4	19%
						Non-viable	1	5%
						Predation type		
						Coyote (not excl)	12	75%
						Unknown predator (not excl)	4	25%
Race Point North	17	58	24	34	59%	Overwashed	11	32%
						Abandoned (excl) - unknown reason	7	20%
						Predation (Net)	6	18%
						Non -viable eggs	5	15%
						Sanded over	5	15%
						Predation types		
						Harrier (not excl)	2	25%
						Unknown predator (not excl)	4	75%
Race Point South	26	84	32	52	62%	Predation (Net)	22	42%
						Overwashed	12	24%
						Abandoned (excl) - unknown reason	9	17%
						Sanded over	7	13%
						Non-viable	2	4%
						Predation types		
						Coyote (not excl)	4	18%
						Crow (not excl)	4	18%
						Gull (not excl)	4	18%
						Unknown predator	3	14%
						Weasel (not excl)	7	32%
High Head	10	25	8	17	68%	Overwash	7	41%
						Predation (Net)	4	24%
						Abandoned (excl) - unknown reason	4	24%
						Abandoned (not excl) - unkn reason	2	11%
						Predation types		
						Coyote (not excl)	3	75%
						Crow (not excl)	1	25%
Ballston	4	12	7	5	42%	Overwash	4	80%
						Non-viable	1	20%

Table 6. Egg Loss Totals, Cape Cod National Seashore, 2005

	Eggs				Per Cause	
No. Nests	**No. Total**	**No. Lost**	**% Lost**	**Cause**	**No. Eggs Lost**	**% Lost**
118	378	215	57%			
				Predation (Net)	73	34%
				Overwash	59	27%
				Abandoned (Net)	35	16%
				Sanded over	33	15%
				Non-viable	15	8%
				Abandonment types		
				Abandoned (excl) - unknown reason	33	94%
				Abandoned (not excl) - unknown reason	2	6%
				Predation types		
				Coyote (not excl)	21	29%
				Crow (not excl)	7	10%
				Gull (not excl)	4	5%
				Harrier (not excl)	2	3%
				Small mammal (Sp?) (not excl)	4	5%
				Unknown predator (not excl)	28	38%
				Weasel (not excl)	7	10%

Table 7. North District Off-Road Vehicle Corridor Openings and Closures, Cape Cod National Seashore, 2005 (page 1 of 2)

Date	Beach	Change	Net Mileage Open	Net Closed	Reason
9-Jun	Pole Line	Hatches Pole	2	0.2	N #5 hatched; closed at lighthouse access to exit 0630 - 10:30
16-Jun	Pole Line	Pole Line	n/a	n/a	N #8 hatched, Pole Line Route closed at dusk
17-Jun	Pole Line	Pole Line	n/a	n/a	Opened to traffic at 0630, brood monitored
17-Jun	RPN	0.4	1.8	0.4	N #8 brood moving towards beach
17-Jun	Pole Line	Pole Line	n/a	n/a	Closed to traffic at dusk due to N #8 brood
18-Jun	Pole Line	Pole Line	n/a	n/a	Opened to traffic at 0630, brood monitored
18-Jun	RPN	0.4	2.2	0	Opened due to brood moving into Hatches Harbor marsh
20-Jun	Hatches	0.2	1.6	0.6	Closed due to N #6 hatching
21-Jun	RPN	0.4	1.6	0.6	Closed due to N #7 hatching
28-Jun	Hatches	0.2	1.8	0.4	Hatches harbor corridor opened, N #6 brood moves from area
1-Jul	HH	1.5	1.5	0	Per Neg. Rule, opened High Head to Head of the Meadow
1-Jul	HH	0	1.5	0	Established SCV area in anticipation of RPN SCV area closing
1-Jul	RPS	4.9	0	4.9	RPS exit closed to nests hatching within 0.2 miles from exit
1-Jul	RPN	0.4	1.3	0.9	RPN exit closed in anticipation of N #10 hatching 300 ft of exit
4-Jul	RPN	0.2	1.5	0.7	Opened for overdue hatching of N #10, 0.2 miles SCV area
4-Jul	HOM	Parking lot	1.3	0.2	N #5 hatching HOM parking lot closed 2100
5-Jul	HOM/HH	0.3	1	0.5	HOM parking lot opened at 0740, N #4 hatching, closed 0.3
6-Jul	HH	0.2	0.8	0.7	Closed 0.2 miles to accommodate moving N #4 brood
8-Jul	RPN	0.6	1.1	1.1	Closed 0.6 due to N #13 hatching
12-Jul	HOM	Parking lot	n/a	n/a	HOM lot closed at 1900 hrs
13-Jul	HOM	Parking lot	n/a	n/a	HOM 1st tier of lot closed, unfledged chicks move into area
13-Jul	HOM	Parking lot	n/a	n/a	HOM lot closed to N #5 brood movements
16-Jul	Pole Line	Pole Line	n/a	n/a	Pole Line Rte closed at 2100, unfledged chicks move into area
17-Jul	Pole Line	Pole Line	n/a	n/a	Pole Line Rte opened at 0800 hr, closed at 2100
18-Jul	Pole Line	Pole Line	n/a	n/a	Pole Line Rte opened at 1000 hr, closed at 2100

Table 7. North District Off-Road Vehicle Corridor Openings and Closures, Cape Cod National Seashore, 2005 (page 2 of 2)

Date	Beach	Change	Net Mileage Open	Net Closed	Reason
19-Jul	Pole Line	Pole Line	n/a	n/a	Pole Line Rte opened at 0800 hr due to plover chicks fledging
22-Jul	RPN	0.6	1.8	0.4	N #7 fledged, beach opened at 0815 hr
22-Jul	RPN	0.3	1.5	0.7	RPN exit and SCV area closed due to N #16 hatching 2000 hrs
22-Jul	HH	0.2	0.5	1	0.2 miles closed north of the HH exit for N #10 hatching
23-Jul	HOM	Parking lot	n/a	n/a	HOM parking lot opened due to N #5 brood moving north
23-Jul	HH	150 feet	0.5	1	To accommodate N #10 brood moving south
28-Jul	HH	150 feet	0.5	1	To accommodate N #10 brood moving south
31-Jul	RPS	1.1	1.1	3.8	RPS exit and 1.1 miles opened due to plover chicks fledging
3-Aug	HOM	0.5	1.3	0.2	Opened HOM exit and 0.56 miles due to N #5 fledging
4-Aug	HH	0.07	0.5	1	N #10 brood moving south
5-Aug	HH	0.5	0	1.5	HH exit closed - N #10 brood moved south of exit
7-Aug	RPN	0.5	2	0.2	Opened due to N #12 fledging
10-Aug	RPS	1	2.8	2.1	Opened due to N #11 fledging
13-Aug	RPS	0.2	2.6	2.3	Closed north to accommodate moving N #24 brood
21-Aug	RPS	2.7	4.4	0.5	Opened north from the HH exit to RPS due to N #10 fledging
2-Sep	RPN	0.3	0	2.2	Opened RPN exit due to N #16 fledging
6-Sep	RPS	0.7	0	4.9	Opened .7 miled due to N #24 fledging

** All mileage of RPN includes Hatches Harbor

RPN = Race Point North

RPS = Race Point South

HH = High Head

HOM = Head of the Meadow

Table 8. Number of Pairs of Other Waterbirds Nesting at Cape Cod National Seashore, 2005

SITE	LETE	COTE	ARTE	ROST	AMOY	LAGU	BLSK
Coast Guard	260	0	1	0	0	0	0
Nauset Light	0	0	0	0	0	0	0
Marconi Beach	0	0	0	0	0	0	0
Marconi Station	10	0	0	0	0	0	0
LeCount	9	0	0	0	0	0	0
White Crest	0	0	0	0	0	0	0
Cahoon Hollow	20	0	0	0	0	0	0
Newcomb Hollow	0	0	0	0	0	0	0
Bound Brook	0	0	0	0	0	0	0
Duck Harbor	0	0	0	0	0	0	0
Great Island	0	0	0	0	0	0	0
Jeremy Point	20	0	0	0	2	0	0
New Island, Orleans	0	11	0	0	0	0	0
Wood End/Long Point	32	0	0	0	0	0	0
Race Point North	11	1	0	0	0	0	0
Race Point South	14	0	0	0	0	0	0
High Head	4	0	0	0	0	0	0
Ballston	0	0	0	0	0	0	0
Total	380	12	1	0	2	0	0

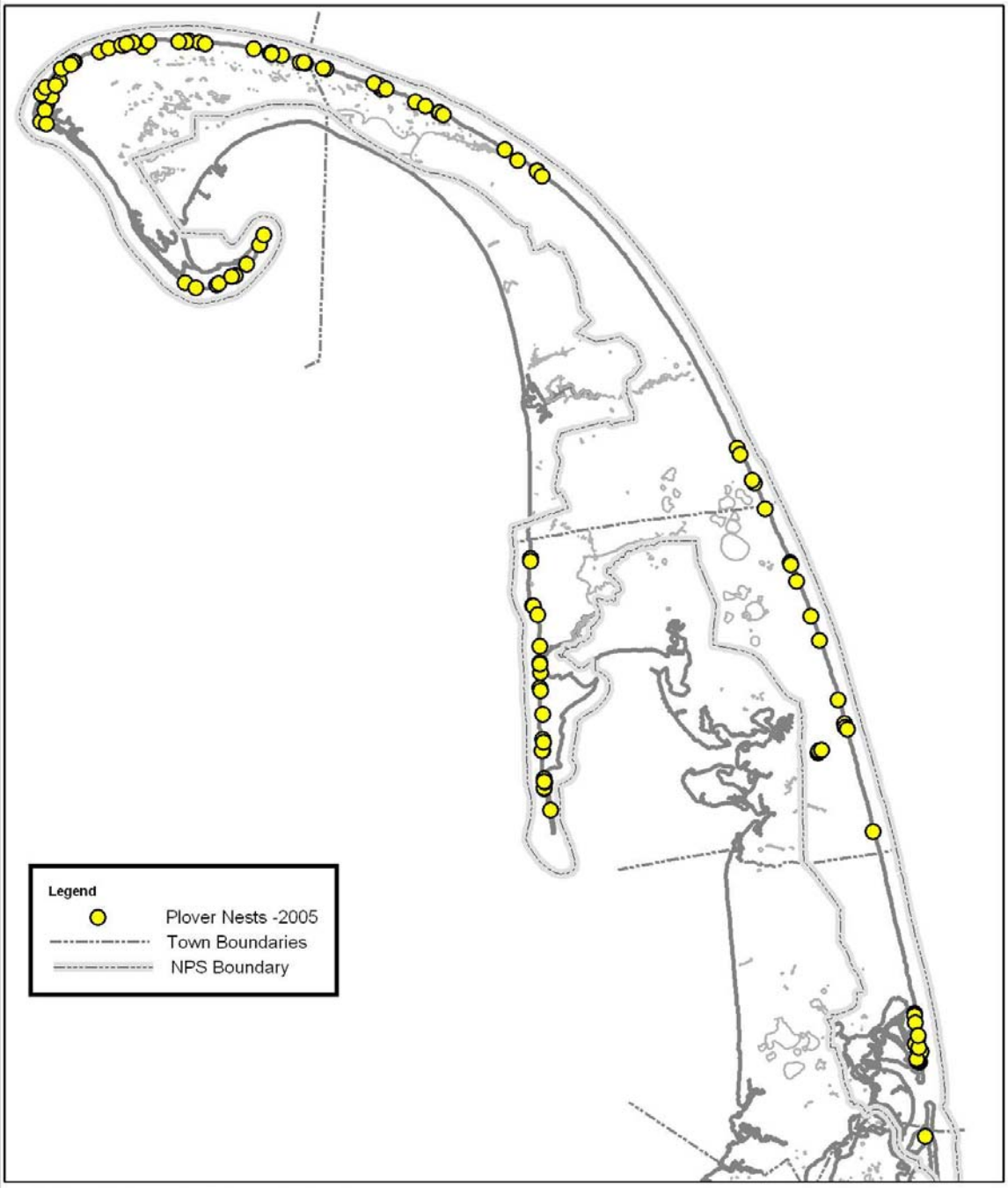
Appendix A

Map of Cape Cod National Seashore 2005 Piping Plover Nest Sites

Cape Cod National Seashore
Massachusetts

National Park Service
U.S. Department of the Interior

Piping Plover Nest Sites -- 2005



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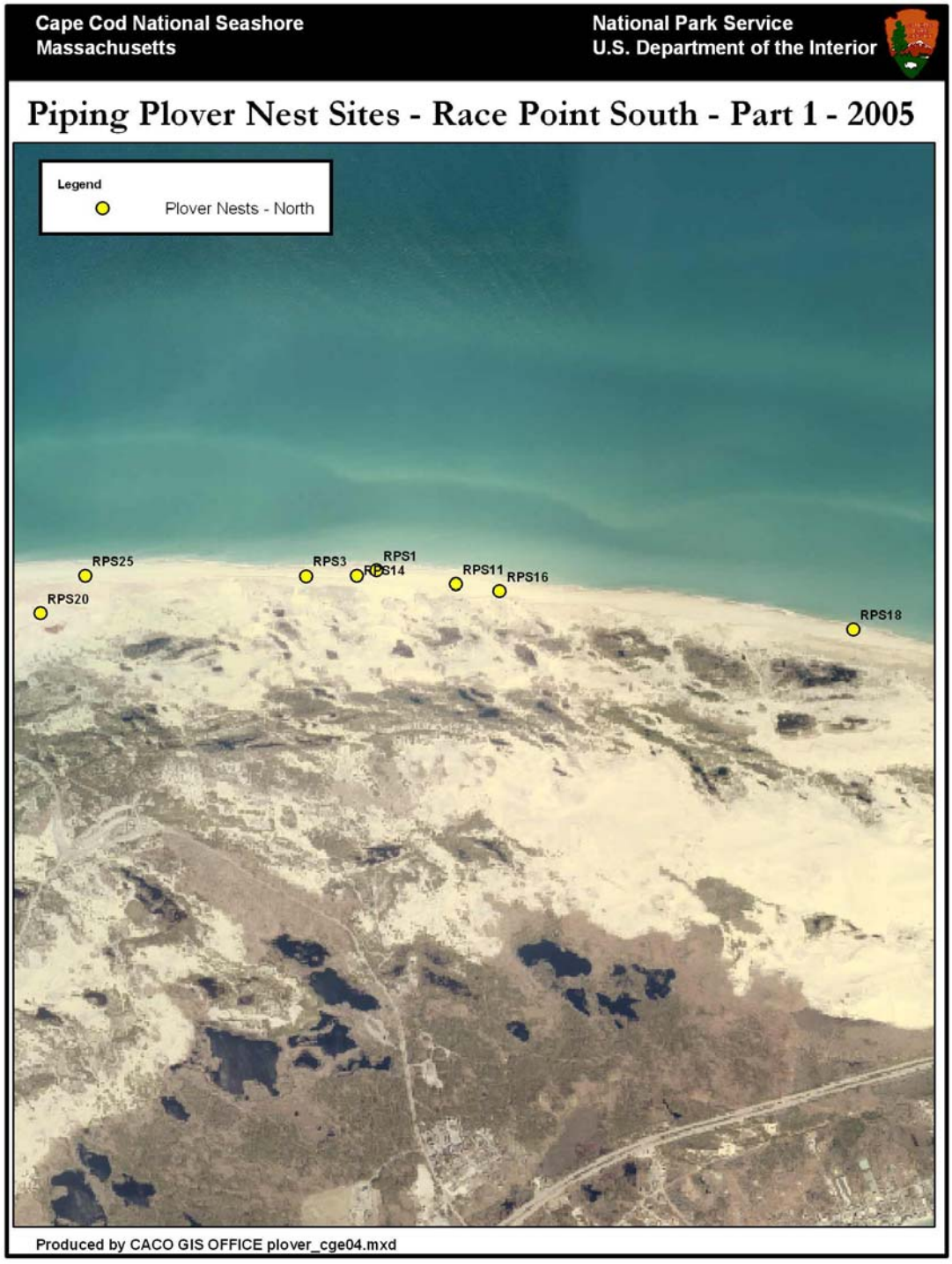
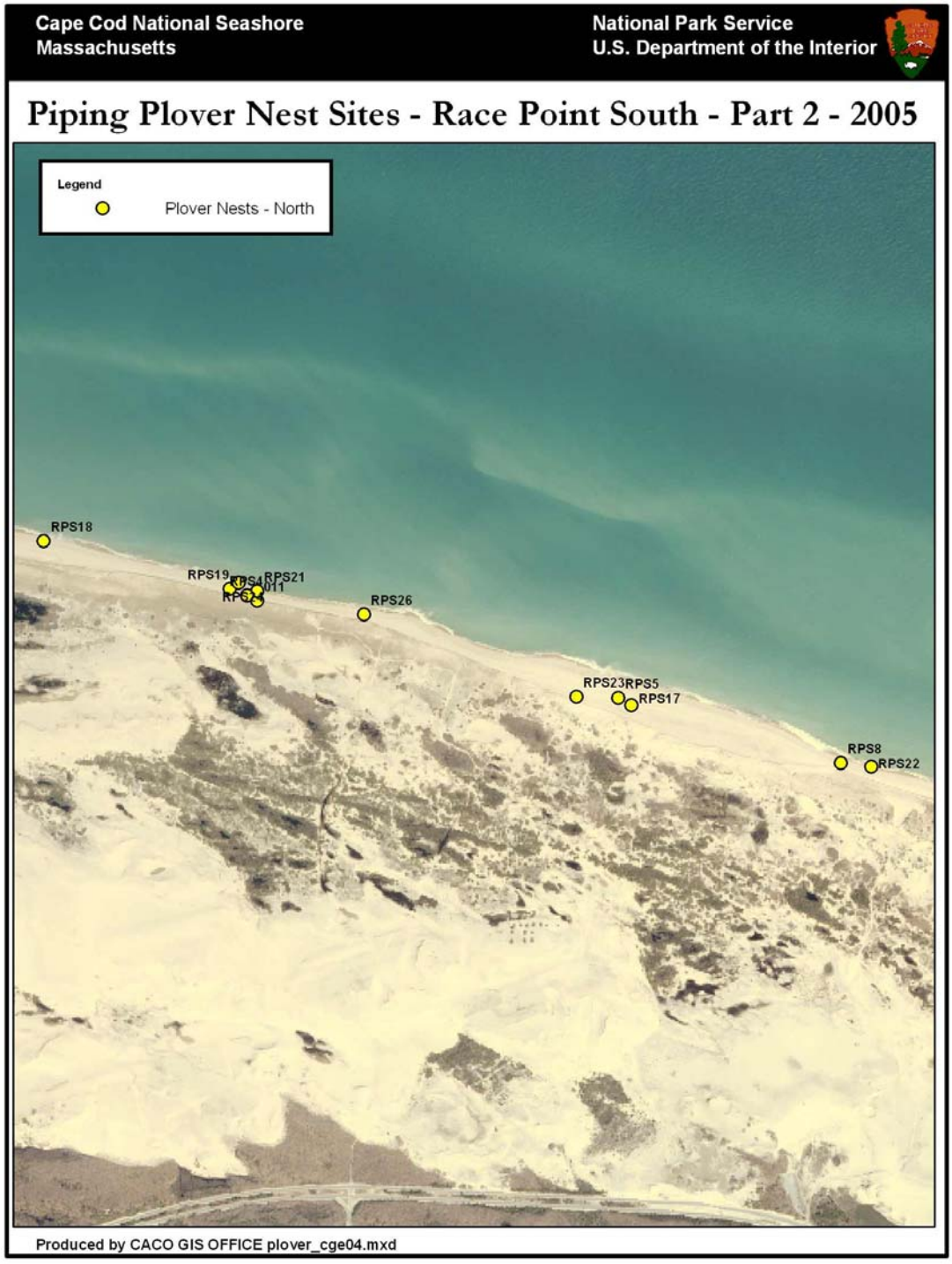
Appendix B

Maps of Cape Cod National Seashore, North District
2005 Piping Plover Nest Sites


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Wood End/Long Point
Legend
Plover Nests - North
WEL6
WEL5
WEL4
WEL7
WEL3
WEL8
WEL2
WEL1
WEL9
Produced by CACO GIS OFFICE plover_woodend.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - High Head 2005
Legend
Plover Nests - North
RPS15
RPS6
RPS10
HH10
HH6
HH3
HH7
HH9
HH4
HH5
HH1
HH2
HH8
Produced by CACO GIS OFFICE plover_highhead04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Race Point South - Part 1 - 2005
Legend
Plover Nests - North
RPS25
RPS20
RPS3
RPS1
RPS14
RPS11
RPS16
RPS18
Produced by CACO GIS OFFICE plover_cge04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Race Point South - Part 2 - 2005
Legend
Plover Nests - North
RPS18
RPS19
RPS21
RPS26
RPS23
RPS5
RPS17
RPS8
RPS22
Produced by CACO GIS OFFICE plover_cge04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Race Point South 2005
Legend
Plover Nests - North
RPS25
RPS27
RPS9
RPS7
RPS13
RPS20
RPN16
RPN10
RPN15
RPN9
RPN13
RPN4
RPN14
RPN8
RPN7
RPN12
RPN3
RPN17
RPN11
RPN5
RPN1
RPN6
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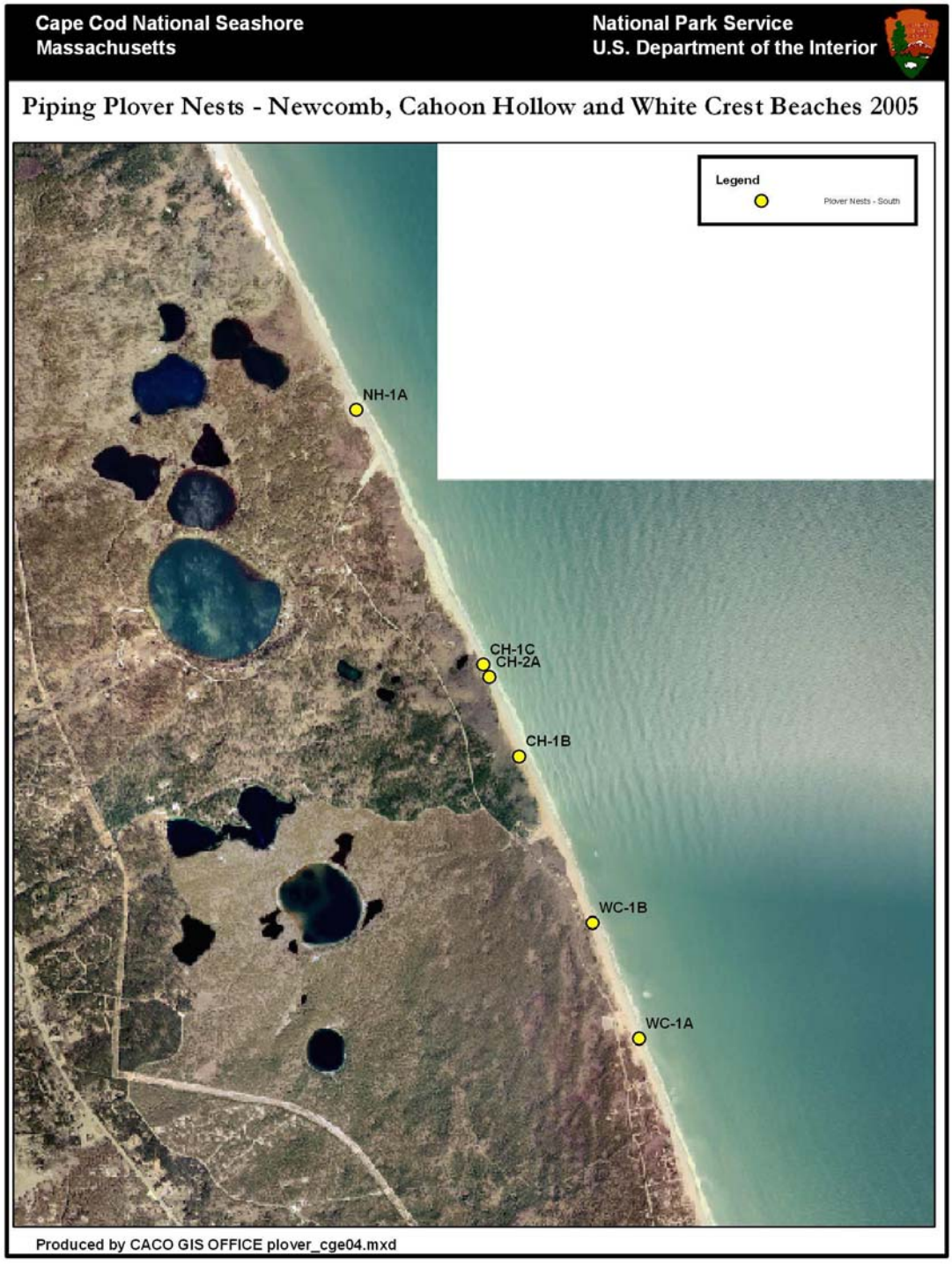
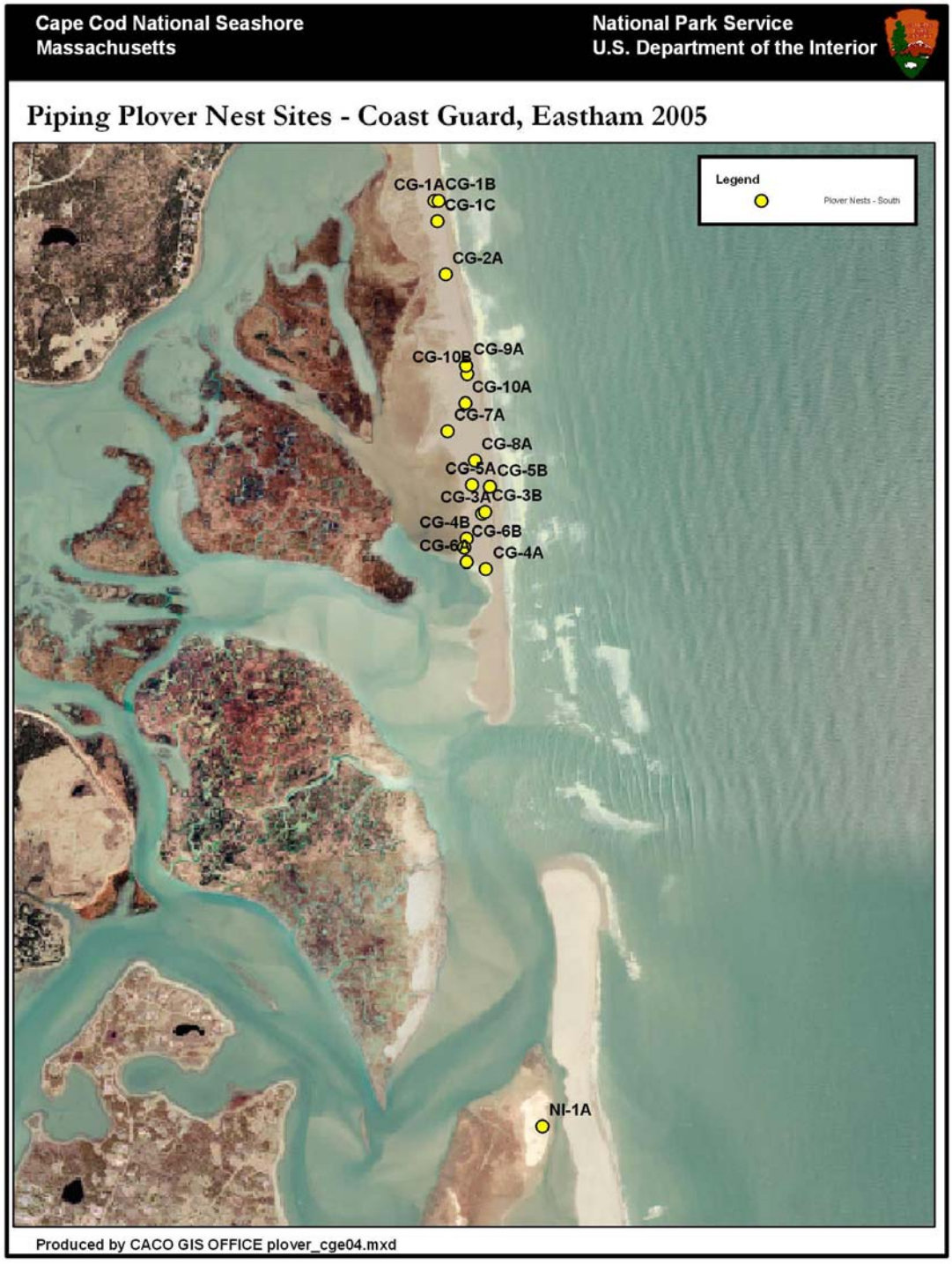
Appendix C

Maps of Cape Cod National Seashore, South District
2005 Piping Plover Nest Sites


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Bound Brook Island/Duck Harbor/Griffin Island 2005
Legend
Plover Nests - South
BB-1A
BB-1B
DH-1A
DH-1B
DH-2A
DH-2B
GI-5A
GI-1B
GI-1C
GI-1A
Produced by CACO GIS OFFICE plover_cge04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nests - Newcomb, Cahoon Hollow and White Crest Beaches 2005
Legend
Plover Nests - South
NH-1A
CH-1C
CH-2A
CH-1B
WC-1B
WC-1A
Produced by CACO GIS OFFICE plover_cge04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Coast Guard, Eastham 2005
Legend
Plover Nests - South
CG-1A
CG-1B
CG-1C
CG-2A
CG-10B
CG-9A
CG-10A
CG-7A
CG-8A
CG-5A
CG-5B
CG-3A
CG-3B
CG-4B
CG-6B
CG-6A
CG-4A
NI-1A
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Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Coast Guard, Eastham 2005
Legend
Plover Nests - South
CG-1A
CG-1B
CG-1C
CG-2A
CG-9A
CG-10B
CG-10A
CG-7A
CG-8A
CG-5A
CG-5B
CG-3A
CG-3B
CG-4B
CG-6B
CG-6A
CG-4A
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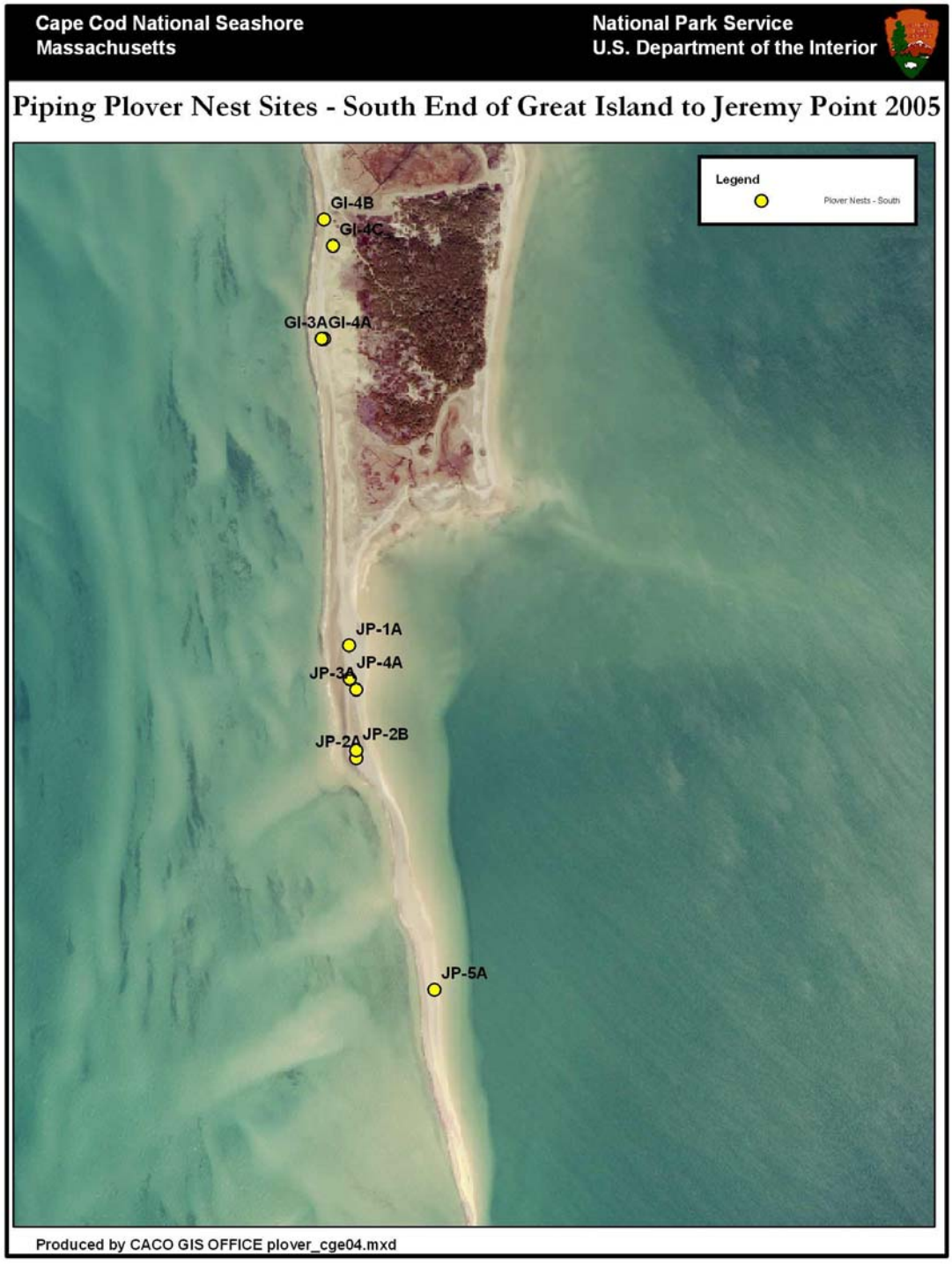
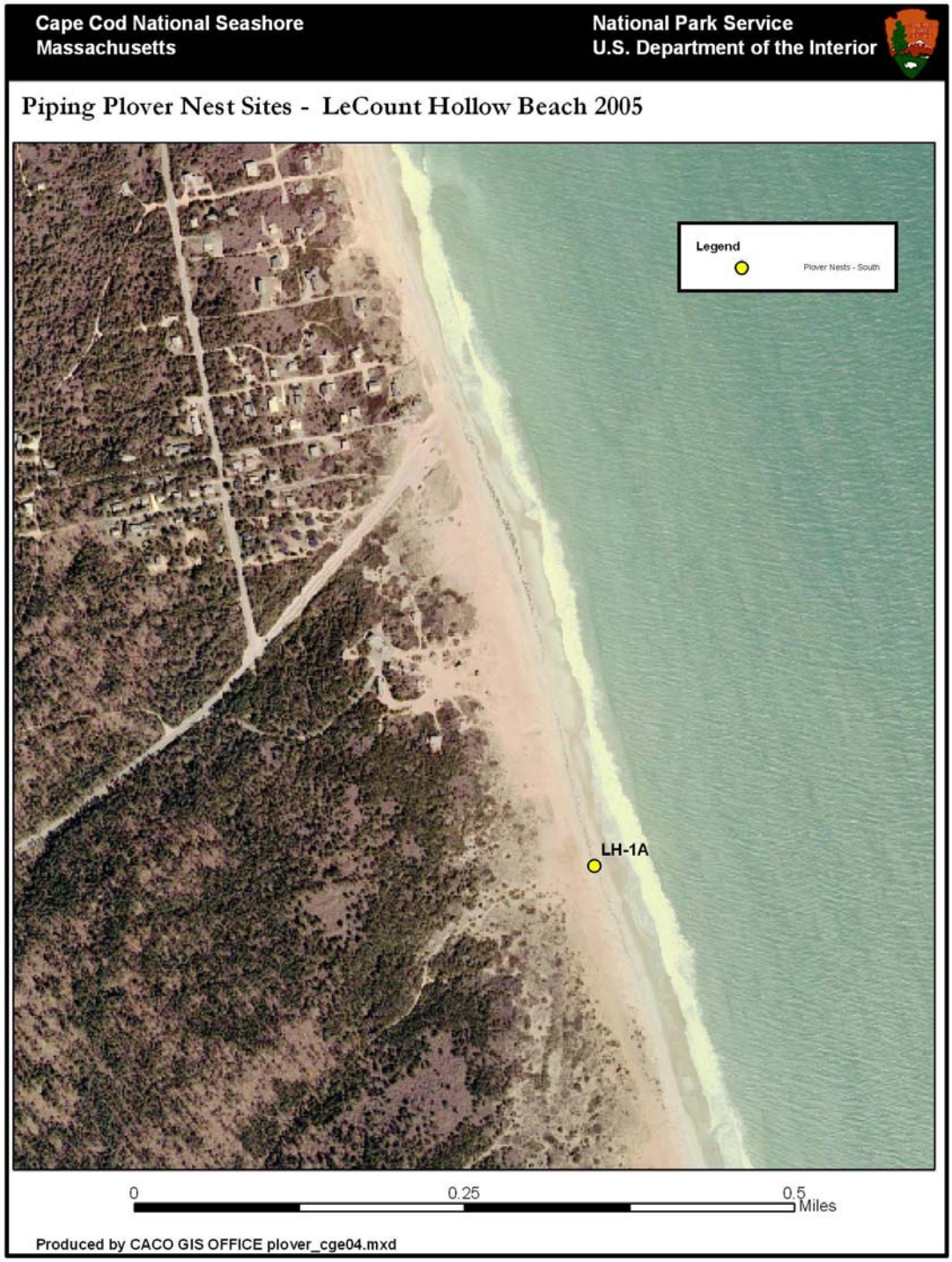
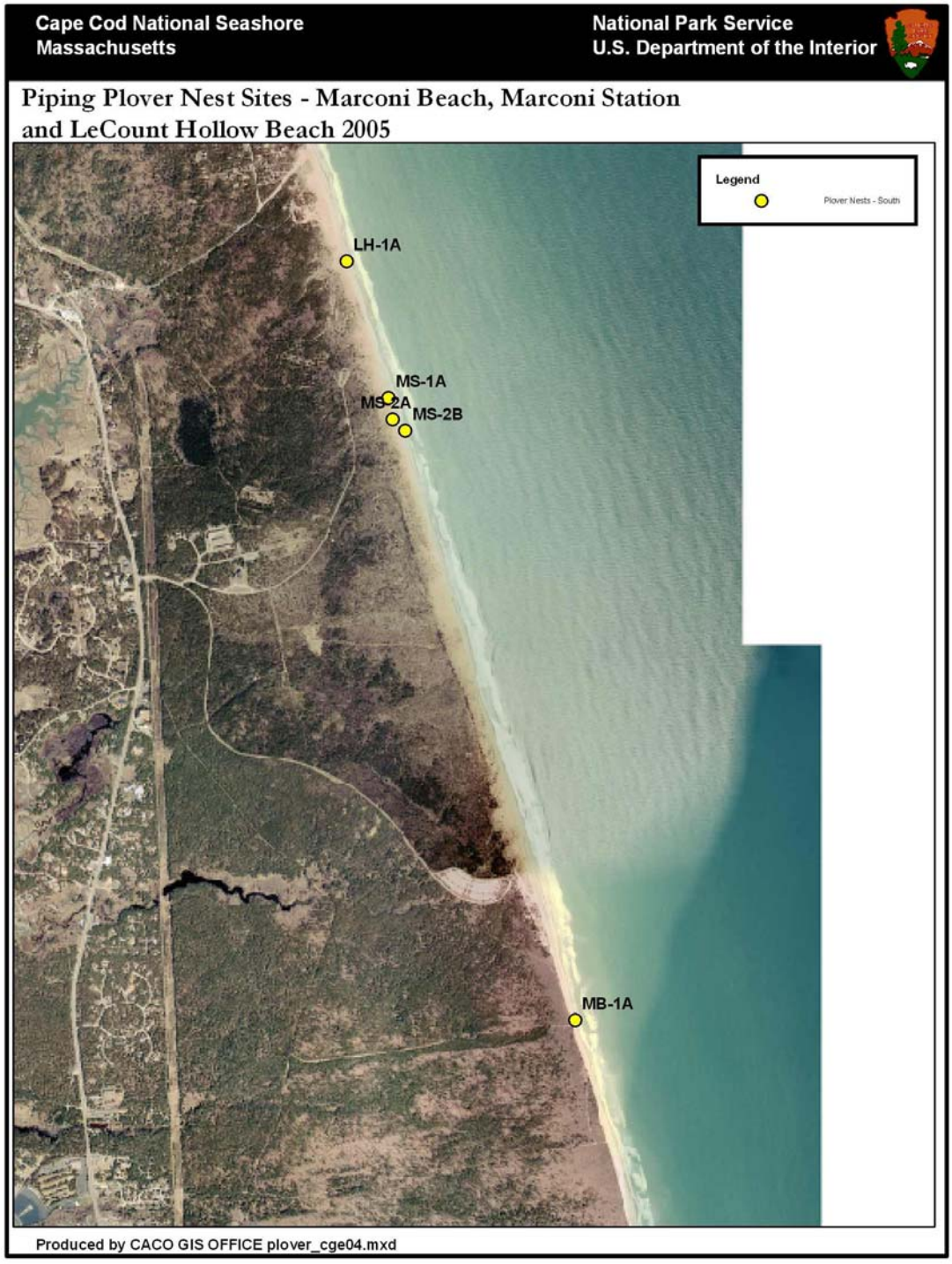
Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Great Island Area - 2005
GI-5A
GI-1B
GI-1C
GI-1A
GI-2A
GI-2B
GI-6A
Legend
Piping Plover Nests 2005
1005 0 0 100 200 300 400 500 600
Meters
Produced by CACO GIS OFFICE plover_gi04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - South End of Great Island to Jeremy Point 2005
Legend
Plover Nests - South
GI-4B
GI-4C
GI-3A
GI-4A
JP-1A
JP-4A
JP-3A
JP-2A
JP-2B
JP-5A
Produced by CACO GIS OFFICE plover_cge04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - LeCount Hollow Beach 2005
Legend
Plover Nests - South
LH-1A
0
0.25
0.5
Miles
Produced by CACO GIS OFFICE plover_cge04.mxd


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Piping Plover Nest Sites - Marconi Beach, Marconi Station
and LeCount Hollow Beach 2005
Legend
Plover Nests - South
LH-1A
MS-1A
MS-2A
MS-2B
MB-1A
Produced by CACO GIS OFFICE plover_cge04.mxd