

**BREEDING ECOLOGY OF PIPING PLOVERS NESTING
AT CAPE COD NATIONAL SEASHORE, 1999**

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and

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ACKNOWLEDGEMENTS

Monitoring plovers at Cape Cod National Seashore is a large and ever increasing task. While each district has personnel devoted to shorebird management, these personnel often work between districts as needs shift and problems arise.

Plovers were monitored this year by: John O'Neill (Shorebird Ranger, North District), Randy Follett (Shorebird Ranger, South District), Anna Patnode (SCA, North District), and Mai Mahegian (SCA, South District). All of these individuals assistance was appreciated. North and South district Supervisory rangers Gene Valli and Dennis St. Aubin provided logistic and monitoring assistance throughout the season; their continual contributions to the shorebird program are always appreciated. Thanks are also due to Nancy Finley (Chief, Division of Natural Resources) and Bob Cook (I & M Coordinator for Cape Cod National Seashore). Finally, thanks to all those who have helped with exclosures, signs, and all the rest of the back-breaking work that goes into managing Piping Plovers every year. They all can take great pride in the fact that plovers did so well this year.

ABSTRACT

This report summarizes the 1999 Piping Plover nesting season for Cape Cod National Seashore (CACO). Piping Plover nesting and brood-rearing were monitored at 8 beaches in Cape Cod National Seashore from Provincetown to Orleans. Observations of Piping Plovers began on 1 April. Seventy-two pairs of plovers were monitored at these 8 sites. Egg-laying began the last week of April in the South District and the first week of May in the North District. Peak nesting occurred during the last week of May and first week of June. Peak hatching occurred in the last week of June. Hatching success was 79%. Fledging success was 55%. Productivity was 1.7 fledged chicks/pr. Sixteen percent of all nests initiated failed to hatch at least 1 chick. Overwash, abandonment, and predation by crows were the leading causes of nest loss. In 1999, our sites had the lowest level of nest loss recorded since observations began in 1985. Of 69 exclosed nests, 59 (86%) successfully hatched young. Of the 10 exclosed nests that did not hatch, 5 (50%) failed due to overwash and 5 (50%) were abandoned. Of the 13 unexclosed nests, 9 (69%) failed to hatch. Of these 9 nests, 3 (33%) were lost to crows, 2 (22%) were lost to unknown causes, and overwash, abandonment, unknown avian predation and infertile eggs caused 1 nest failure each. Berm habitat was used for nesting 63% of the time. This was the second year the 1995 negotiated rule for ORV management was implemented. At various times during the season, more areas were available to ORV travel. Twenty-three pairs of plovers nested within the ORV corridor, however, all but 5 of these pairs nested in the 4-mile section of Race Point South Beach that was closed from 1 April to 22 July. Additional beach-closings, beyond those imposed by the negotiated rule, were required. As a result all but approximately 1.3 miles of the South Beach were closed for approximately one month. By 10 August, all of the ORV corridor that could legally be opened under the negotiated rule was opened except for the area between High Head and Head of the Meadow and the High Head access. This area was closed due to impassable beach conditions and the High Head access was not safe to use because of a very steep, scarped face.

INTRODUCTION

The Piping Plover (*Charadrius melodus*) is a Nearctic shorebird endemic to central and eastern North America. Three distinct populations exist - Great Lakes, Northern Great Plains, and Atlantic Coast. Both the Northern Great Plains and Atlantic Coast populations were federally listed in 1986 as threatened (Federal Register 1985). The Great Lakes population was listed as endangered.

Plovers on the Atlantic coast traditionally nest from the Maritime provinces of Canada south to the North Carolina - South Carolina state line. The Atlantic coast population is currently estimated at nearly 1400 pairs, up significantly from the 790 pairs estimated in 1985. It is believed that prior to listing the population had declined significantly since the 1940's, mostly due to loss of habitat from development, increased human recreational use of the coastal zone, and, to a lesser extent, natural habitat loss (U.S. Fish and Wildlife Service 1986).

The first concerted efforts to monitor Piping Plovers on the Atlantic coast were initiated in 1985. At that time, there were 139 pairs estimated nesting in the Commonwealth of Massachusetts. Also in 1985, the National Park Service (NPS) began a plover monitoring program and 18 pairs nested on Cape Cod National Seashore beaches managed by the NPS. Productivity that year 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 Cape Cod National Seashore and throughout Massachusetts. In 1999, 72 pairs representing approximately 14% of the state total, nested on beaches managed by the NPS. Productivity (number of chicks fledged per pair) at Cape Cod National Seashore rose from 0.3 in 1986 to a high of 2.6 fledged chicks per pair in 1991.

This report summarizes the 1999 nesting season at Cape Cod National Seashore. A variety of factors are discussed including seasonal chronology, productivity, limiting factors, and nesting habitat.

STUDY AREA

Piping Plover nesting and brood-rearing were monitored at 8 beaches in Cape Cod National Seashore from Provincetown to Orleans. These study beaches were divided among two districts:

North (Wood End/Long Point, Race Point Beach North, Race Point Beach South, High Head, and Ballston) and South (Great Island/Jeremy Point, Marconi Beach, and Coast Guard Beach). These sites were described in Meisel (1991), Brown (1992), and Brown and Hoopes (1993).

METHODS

Daily observations of Piping Plovers began on 1 April just after plover arrival and just before territory establishment began and continued through August when plovers are observed in their southward migration. In April, during the period of the plovers' arrival and courtship, most beaches were visited three to four times per week. Exceptions were Great Island, monitored every 3-6 days and Wood End/Long Point, and Ballston, Beach, that were monitored every six to ten days. Once nests were established, all beaches were visited almost daily (≥ 5 times per week) except for Long Point and Ballston, which were visited 4 times per week and Great Island which was visited only twice per week. During each visit to a beach, monitors searched for new nests until the end of the first week in July. A variety of information was collected at each site and included: 1) sex of bird incubating the nest, 2) signs of predation, 3) locations and behavior of adults and chicks, and 4) number and location of chicks in each brood.

The 8 beaches where plover monitoring occurred are dispersed over approximately 70 km (30 mi) of beach. To access these sites, varying methods were used. In the North District, four-wheel-drive (4WD) vehicles and all-terrain vehicles (ATV's) were used to access all sites. Once chicks hatched out, however, ATV's were the preferred conveyance for most beaches, especially Wood End/Long Point. In the South District, Great Island was accessed by 4WD vehicle and on foot. Marconi and Coast Guard beaches were accessed primarily by foot.

Each nest or nesting area was protected by symbolic fencing. Predator exclosures were installed around plover nests after clutch completion. All exclosures were topped with fruit netting (1/4" mesh).

RESULTS AND DISCUSSION

Seasonal Chronology

Plovers were first observed on Cape Cod National Seashore beaches on 16 March and most study beaches had plovers present by mid-April. Plovers were not observed on Ballston Beach until early May. Plovers continued to arrive at the sites 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. High Head had very little suitable nesting habitat available until mid June and a wide berm, not susceptible to normal high tides, did not build up there the entire summer.

Egg-laying began in the third week of April in the South District and last week of April in the North District. Peak nesting for the Seashore occurred during the last week of May and the first week of June (Fig. 2). The last nest was initiated on 12 June at Ballston Beach. This nest fledged 2 chicks in mid August. Peak nesting for the Seashore this year is consistent with the patterns exhibited in past years. However, prior to the use of exclosures, peak nesting typically occurred 1 - 2 weeks later in the season (MacIvor et al. 1987a).

Peak hatching for the Seashore occurred during the last week of June. Hatching dates ranged from 30 May to 13 July. Fledging dates ranged from 25 June to 13 August. These dates are comparable to those reported over the past several years.

Productivity

Seventy-two pairs of Piping Plovers were monitored at 8 sites in Cape Cod National Seashore (Table 1). This represents approximately 14% of the total breeding population of Massachusetts. Numbers of nesting plovers at the 8 sites monitored increased by 18% from 1998. This increase is most likely due to increased productivity from Outer Cape beaches in 1998. The greatest increase in numbers of nesting pairs from 1998 occurred at Race Point South Beach, where numbers rose from 14 to 19 pairs; and at Great Island and Jeremy Point, where numbers rose from 8 to 12 pairs.

Hatching success (total number of eggs hatched/total number of eggs laid) for all sites combined was 79% and ranged from 36% to 100% (Table 1). Overall, hatching success was 10% higher than in 1998. High Head (100%), Race Point South (85%), and Ballston Beach (83%) had the

highest hatching success; while Race Point North (36%), Marconi Beach (64%), and Wood End/Long Point (74%) had the lowest hatching success (Table 1). Race Point North continued to have the lowest hatching success in the park, although it was up from the previous 2 years. It is believed the tremendous predation pressure that was exerted on this site in 1995 created a “sink-hole” effect in the population and that it may take several more years of low predation before more birds utilize this site.

Sixteen percent of the nests that hatched left 1 egg in the scrape. This is considerably less than in the mid 90's when 20 -35% of nests failed to hatch 1 or 2 eggs. Partially hatched clutches may be reflective of younger, less experienced birds' attempts at nesting. The reason for the differences in numbers of unhatched eggs between years is unknown.

Fledging success (total number of chicks fledged/total number of eggs hatched) for all sites combined was 55% and ranged from 40% to 100% (Table 1). Overall, fledging success decreased 11% from 1998. High Head (100%), Race Point North (100%), and Great Island (75%) had the highest fledging success; while Race Point South (40%), Marconi Beach (44%), and Coast Guard Beach (53%) had the lowest fledging success (Table 1). Fledging success at High Head is high consistently, but represents few nests. Coast Guard Beach fledging success was 1% higher than in 1998, but typically has been lower than other sites.

Productivity (number of chicks fledged/nesting pair) for all sites was 1.71 (123 chicks fledged from 72 pairs) and ranged from 1.10 to 4.00 (Table 1). Overall, productivity decreased from 1998. High Head (4.00), Great Island (2.50), and Ballston Beach (2.20) had the highest productivity; while Marconi Beach (1.10), Race Point North (1.33), and Coast Guard Beach (1.50) had the lowest productivity (Table 1). It is important to note that productivity greater than 2.0 is considered outstanding. Further, productivity at Cape Cod National Seashore exceeded productivity statewide. Preliminary data suggests 1999 productivity for the state was 1.5 (S. Melvin, pers. comm.).

Nest Loss

Sixteen percent (13 of 82 nests) of all nests initiated failed to hatch at least 1 chick (Table 2). No nest loss was observed at Ballston Beach and High Head. Abandonment (n=3), predation by crows (n=3), and overwash (n=3) were the leading causes of nest loss, accounting for 9 (69%) of the

13 nests lost (Table 2). All of the remaining sites except Great Island/Jeremy Point had one of the above factors as the leading cause of nest failure. Race Point South and Marconi beaches had the highest numbers of nests lost, 3 each. Fifty percent of the losses at these sites were attributable to crows. In each case of crow predation, nests were lost prior to clutch completion. In 1999, Cape Cod National Seashore sites had the lowest level of nest loss recorded since observations began in 1985.

Predator Exlosures

Predator exlosures were installed around 69 of the 82 (84%) nests. Of the 69 exclosed nests, 59 (86%) successfully hatched young. Of the 10 exclosed nests that did not hatch, 5 (50%) failed due to overwash, and 5 (50%) were abandoned (Table 3). Of the 13 unexclosed nests, 9 (69%) failed to hatch. Of these, 3 (33%) were lost to crows, 2 (22%) were lost to unknown causes, and 1 (11%) nest was lost to each of the following causes; overwash, abandonment, unknown avian spp., and infertile eggs. Ten of the 13 unexclosed nests were lost prior to clutch completion. The remaining 3 nests were 4-egg clutches that were unexclosed because they were located in thick vegetation and the adults may have flown off the nest when disturbed thereby creating a potential for entanglement in the exclosure top.

Mortality

Chick mortality factors are extremely difficult to assess. Most of the time chicks are lost, there is no evidence as to why. A chick was presumed dead only when it was never seen again before the remainder of the chicks in the brood fledged. A brood was considered lost only when there was no sign of the chicks after five consecutive days of searching. Most chick mortality at the 8 sites occurred within the first 10 days after hatching. This pattern is consistent with data from previous years (MacIvor 1990, Brown and Hoopes 1993). This year, we could not attribute chick mortality to any specific factor.

Nesting Habitat

Nesting habitat for 40 nests was categorized according to the macrohabitat types defined by MacIvor (1990). Berm habitat was used for nesting 63% of the time (Table 4). The next most utilized habitat for nesting was foredune (28%, Table 4). Nesting habitat data for South District sites were

unavailable this year. It is interesting to note that all but 2 pairs on Race Point Beach South nested in the area that was closed starting 1 April by the negotiated rule. Of the 17 pairs that nested inside the closed area, 9 pairs nested within a one-half-mile length of beach, making the area one of the densest nesting concentrations on the East coast.

Implementation of the Negotiated Rule

ORV Management - ORV management, as it relates to plover management at Cape Cod National Seashore, is a dynamic process. This was the second year of the negotiated rule of 1995. We observed no direct negative impacts to Piping Plover adults and chicks in 1999.

Plover Management - This year, 23 pairs of plovers nested along the ORV corridor (4 more pair than in 1998). While most of these nests were in the area closed by the rule during the first part of the season, there were several nests that were in areas 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 north self-contained area was moved once due to an expected hatching. Approximately 0.6 mi. of the North Beach was closed for 29 days while unfledged chicks were in the area. The South Beach was closed, between Exit 8 and approximately 0.25 mi. north of the Mission Bell for 6 weeks starting on 3 June while 2 broods of unfledged chicks were in the area. As chicks fledged, portions of the ORV corridor that could be opened, were. By 9 August, the entire ORV corridor was reopened to vehicles. For a more detailed account of ORV corridor management, see Table 1 in the report written in fulfillment of requirements of the negotiated rule.

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MANAGEMENT RECOMMENDATIONS

1. The Great Island (GI) and Jeremy Point (JP) area has been one of the most productive nesting areas for Piping Plovers and Least Terns, largely because it is remote. In order to get to JP, visitors must walk nearly 4 miles from the closest parking lot. Along with hikers, it is common to see a small cluster of boats coming ashore to spend the day at the tip of JP. Presently, human activity in this area is low, however, there is concern about increased use of this area in the future, especially by boaters. Because of JP's narrowness, nesting shorebirds are especially vulnerable to human disturbance. In order to better protect nesting shorebirds while providing access to this area, park managers should consider designating specific boat landing areas north of the spit between 1 May and 31 August.
2. NPS access to GI and JP via the Duck Harbor access must be re-established. Accessing GI and JP via the interior route is not practical and is not environmentally sound.
3. Because many of the Protection Rangers are certified motor boat operators, water-based, rather than vehicle, patrols should be initiated around the GI and JP area, especially during times when increased human use of the area is anticipated (e.g., Memorial Day, July 4th weekends)
4. Plovers and terns often nest in close proximity to protected bathing beaches in the South District. In order to provide safe swimming conditions for the public and protect nesting shorebirds, Natural Resources and Resource Protection staff should seek to maximize the distance between the protected beach and the nearest nesting plover whenever possible.
5. If the park plans to go ahead with re-establishing the ORV access point at Head of the Meadow, all work should be completed by 1 April 2000.
6. Every effort should be made to bring SCA's on by 15 May.

Figure 1. Number of Piping Plover breeding pairs and nest productivity on beaches managed by the National Park Service, Cape Cod National Seashore, 1985-1999

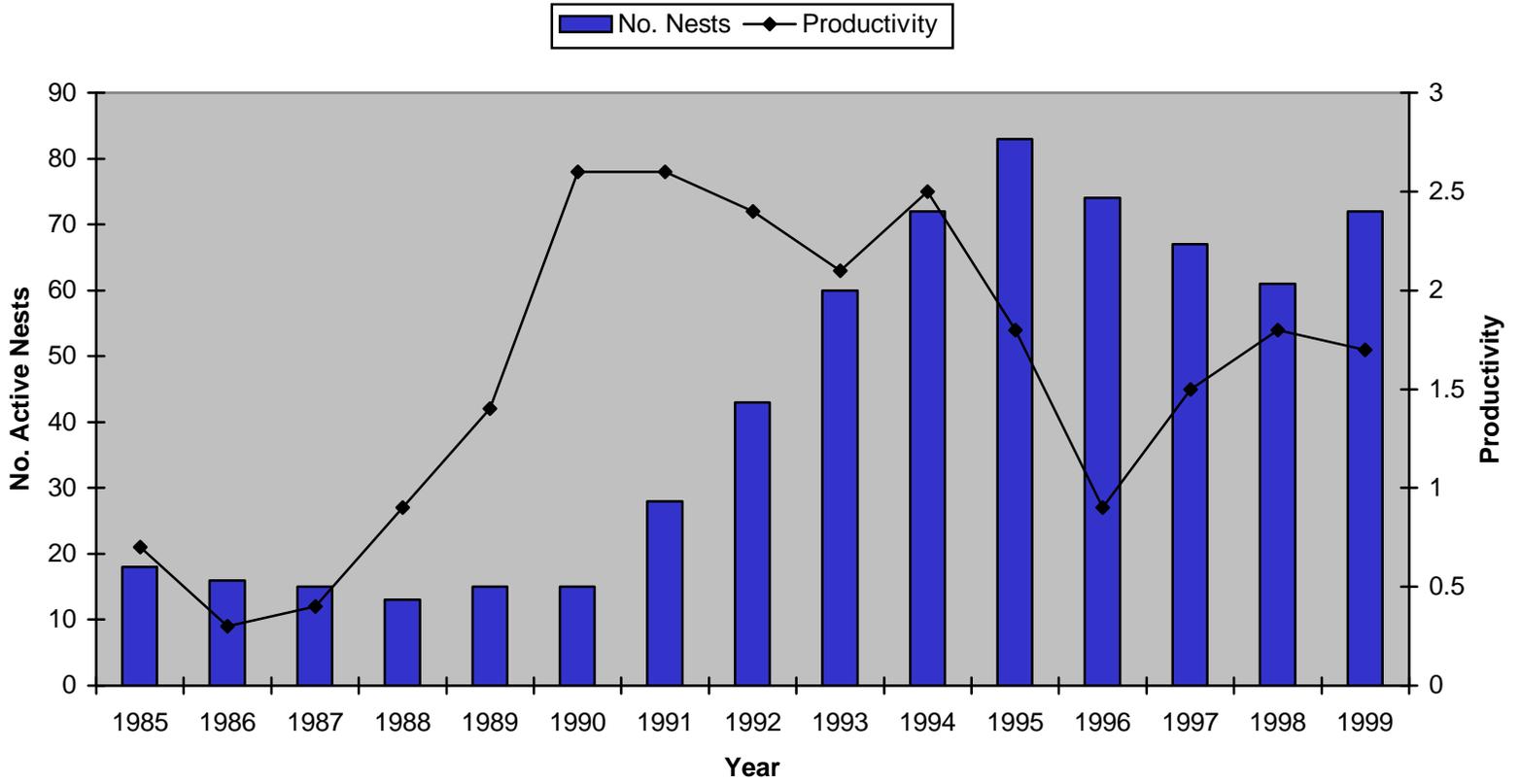


Figure 2. Nesting chronology of active nests in the North and South districts and in total, Cape Cod National Seashore, 1999

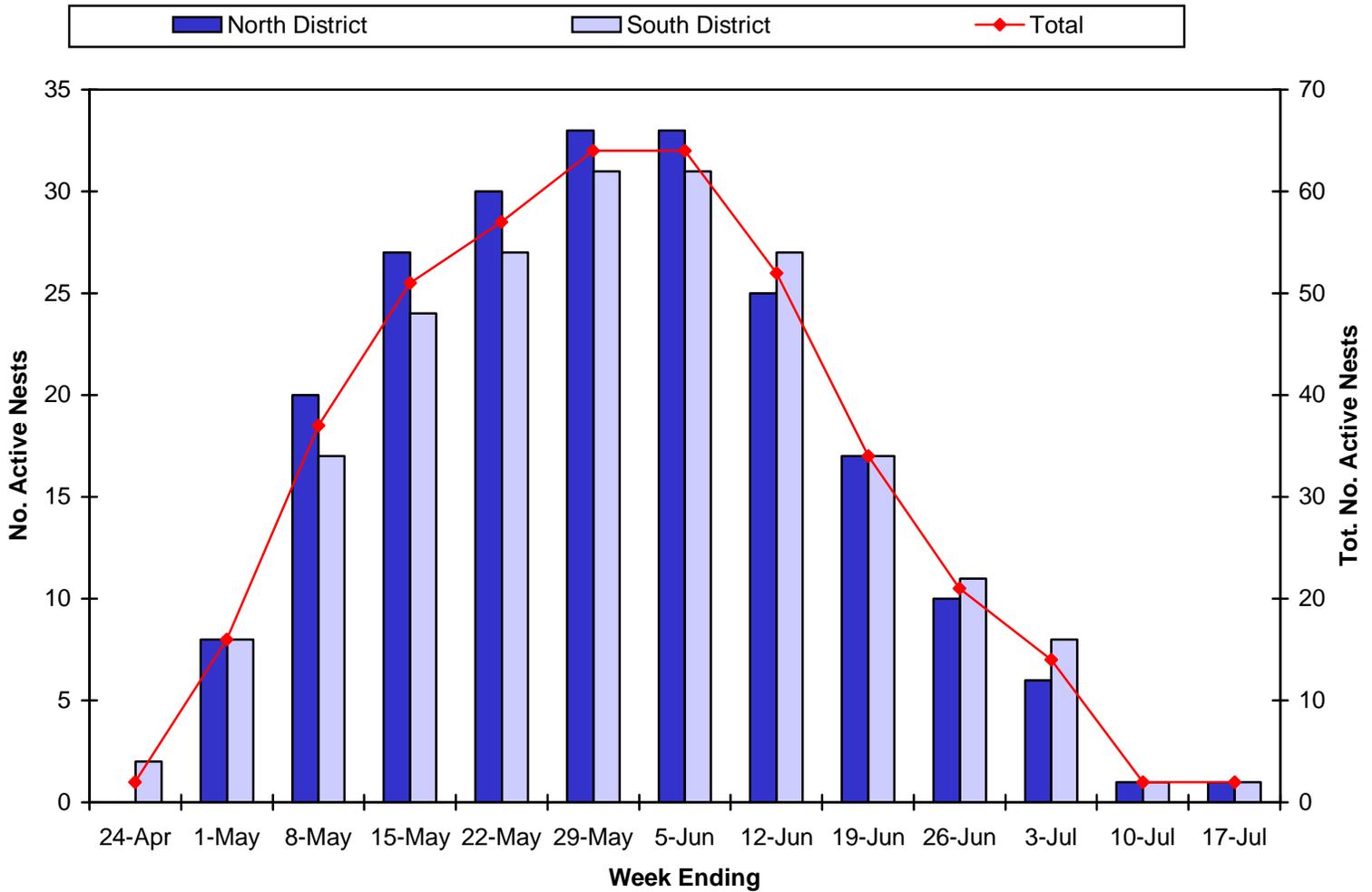


Table 1. Number of Piping Plover breeding pairs, hatching and fledging success, and nest productivity, by site, Cape Cod National Seashore, 1999

Site	No. Pairs	No. Nests ¹	No. Eggs Laid	No. Eggs Hatched	Total. No. Chicks Flgd.	Hatching Success ²	Fledging Success ³	Prod. ⁴
Coast Guard Beach	14	16	51	40	21	0.78	0.53	1.50
Marconi Beach	10	13	39	25	11	0.64	0.44	1.10
Great Is./Jeremy Point ⁵	12	13	48	40	30	0.83	0.75	2.50
Ballston Beach	5	5	19	16	11	0.84	0.69	2.20
High Head	1	1	4	4	4	1.00	1.00	4.00
Race Point Beach South	19	22	82	70	28	0.85	0.40	1.47
Race Point Beach North	3	3	11	4	4	0.36	1.00	1.33
Wood End/Long Point	8	9	35	26	14	0.74	0.54	1.75
Total	72	82	289	225	123	0.79	0.55	1.71

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 pairs

⁵ Includes 1 nest that was not found until chicks appeared on beach. Not included in number of eggs laid or hatched

Table 2. Causes of Piping Plover nest failures, by site, Cape Cod National Seashore, 1999

Site	No. Nests	No. Nests Lost	Cause	No. lost	% Lost
Coast Guard Beach	16	2	Unknown	1	50
			Abandoned	1	50
Marconi Beach	13	3	Crow	2	67
			Overwash	1	33
Great I./Jeremy Point	13	1	Unkown	1	100
Ballston Beach	5	0	None	0	0
High Head	1	0	None	0	0
Race Point Beach South	22	3	Crow	1	33
			Infertile	1	33
			Abandoned	1	33
Race Point Beach North	3	2	Abandoned	1	50
			Avian	1	50
Wood End/Long Point	9	2	Overwash	2	100
TOTAL	82	13	Abandoned	3	23
			Crow	3	23
			Overwash	3	23
			Unknown	2	15
			Infertile	1	8
			Avian	1	8

Table 3. Fates of exclosed and unexclosed Piping Plover nests, Cape Cod National Seashore, 1999

	Total	Successful (%)	Not Successfull (%)	Cause of Failure	No. Lost (%)
Exclosed	69	59 (86)	10 (14)	Overwash Abandoned	5 (50) 5 (50)
Unexclosed	13	3 (31)	9 (69)	Crow Unknown Overwash Abandoned Unk. Avian Infertile	3 (33) 2 (22) 1 (11) 1 (11) 1 (11) 1 (11)

Table 4. Nesting habitat of Piping Plovers in the North District, Cape Cod National Seashore, 1999

Site	Habitat					Total
	Berm	Foredune	Interdune	Dune	Overwash	
Wood End/Long Point	4	3	0	0	2	9
Race Point Beach North	1	1	1	0	0	3
Race Point Beach South	14	7	1	0	0	22
High Head	1	0	0	0	0	1
Ballston Beach	5	0	0	0	0	5
Total	25	11	2	0	2	40

Appendix A

Map of Piping Plover Nest Locations, Cape Cod National Seashore, 1999

Piping Plover Nests 1999

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

-  Piping Plover Nests
-  Park Boundary



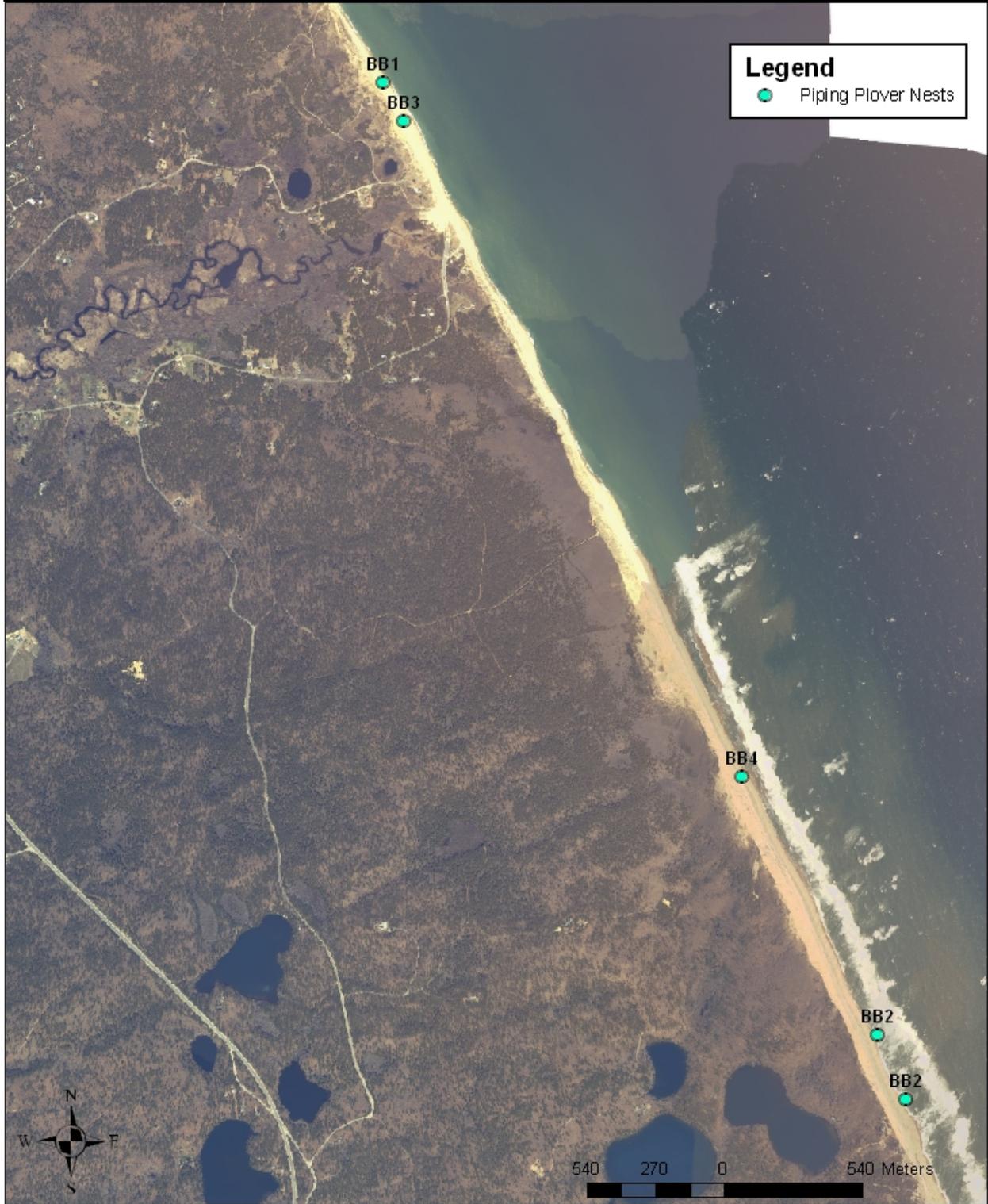
Appendix B

Maps of Cape Cod National Seashore, North District 1999 Piping Plover Nest Sites

Piping Plover Nests 1999

Ballston Beach, Truro

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Piping Plover Nests 1999

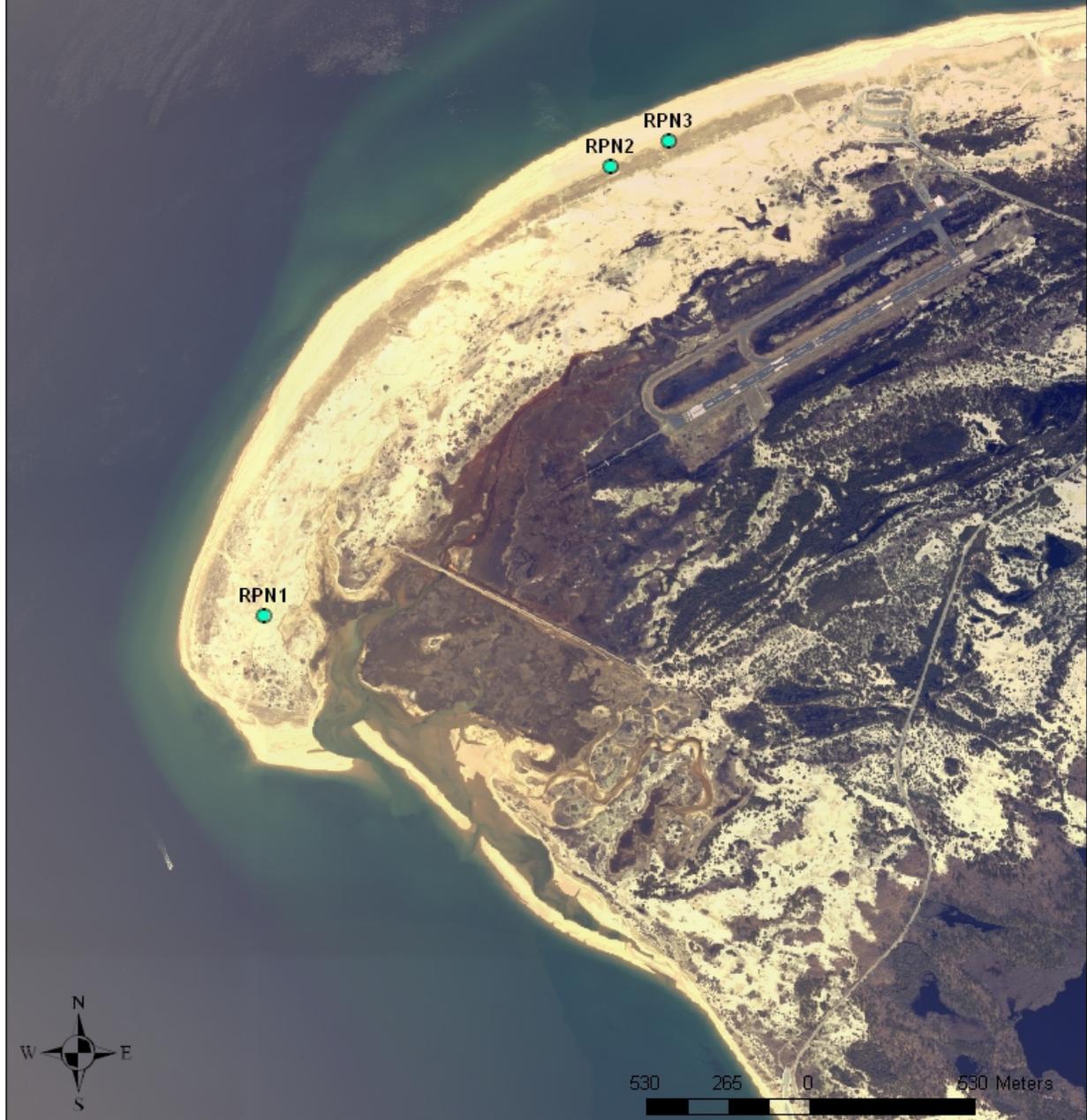
Race Point North, Provincetown

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

 Piping Plover Nests



Piping Plover Nests 1999

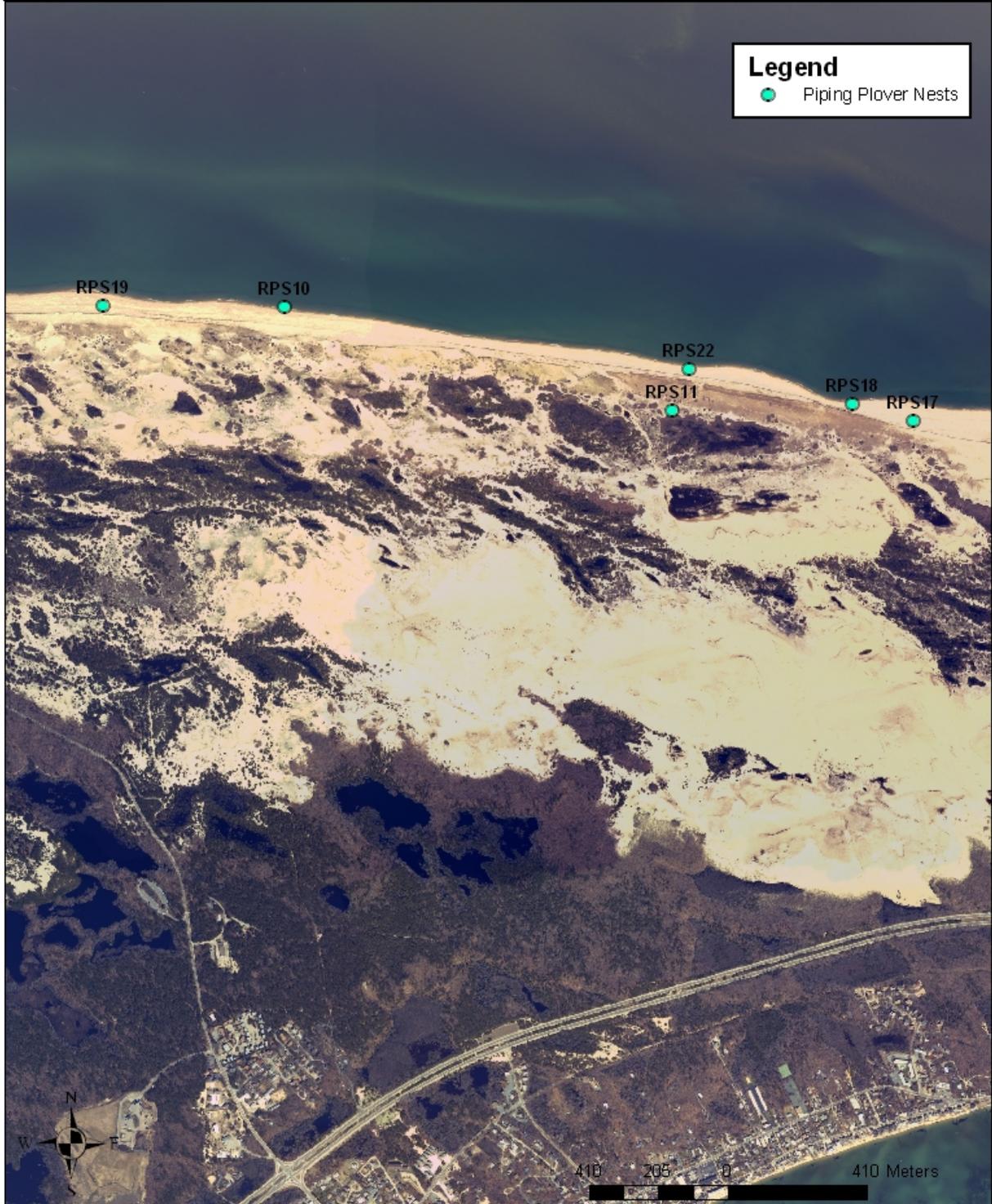
Race Point South, Provincetown (part 1)

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

-  Piping Plover Nests



Piping Plover Nests 1999

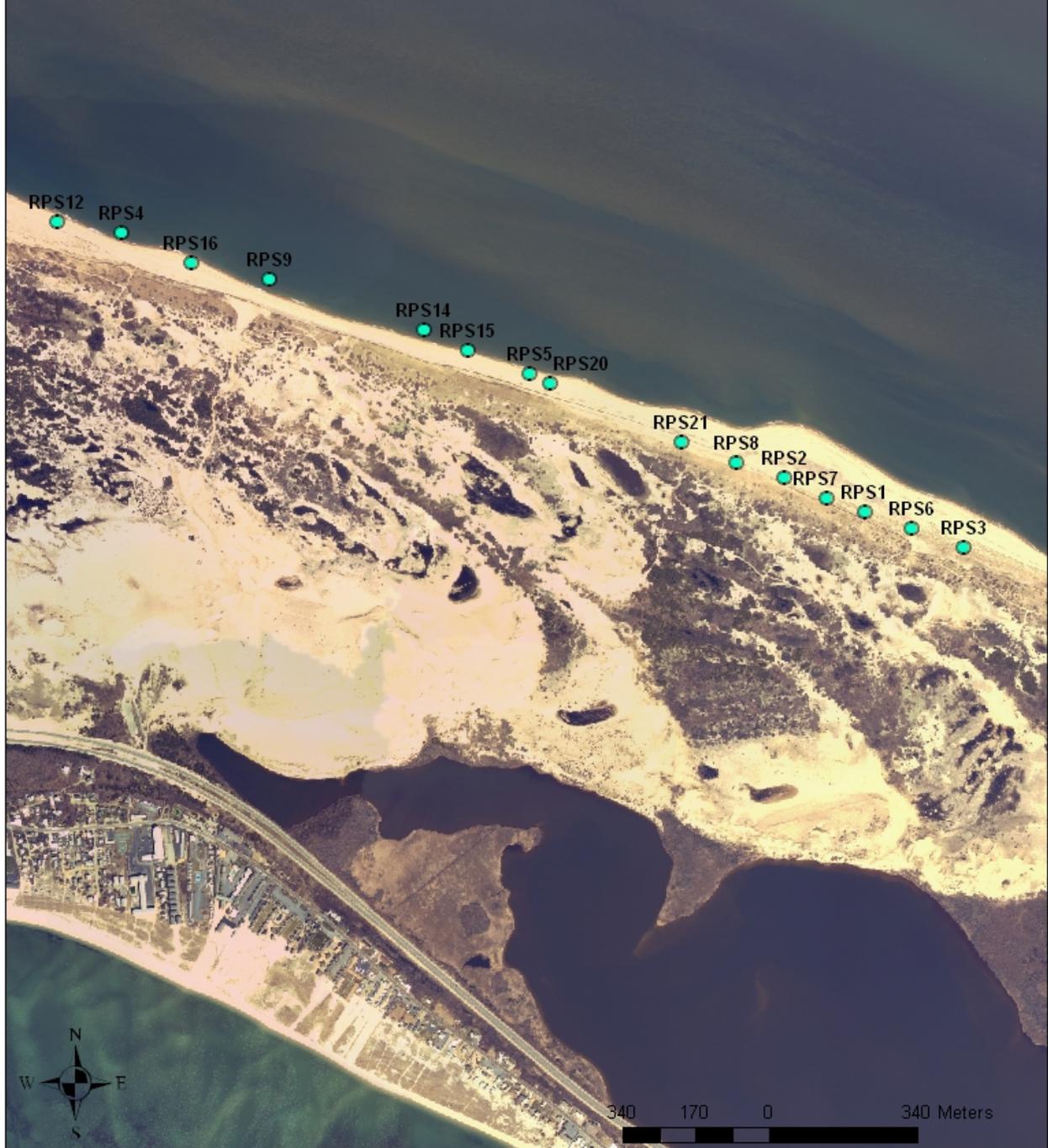
Race Point South, Provincetown (part 2)

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

 Piping Plover Nests



Piping Plover Nests 1999

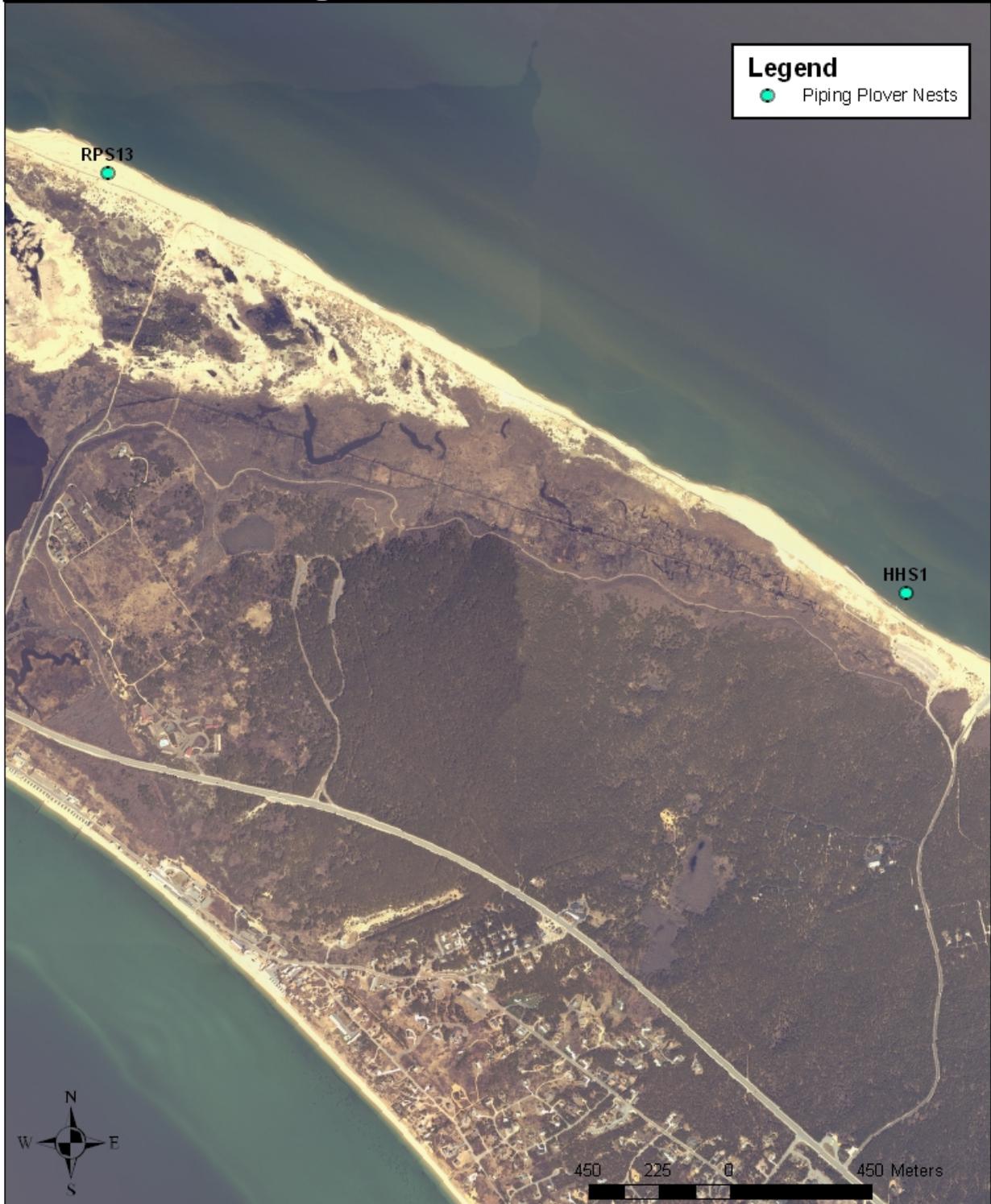
Race Point South / High Head

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

-  Piping Plover Nests



Piping Plover Nests 1999

Wood End / Long Point, Provincetown

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend
● Piping Plover Nests



Appendix C

Maps of Cape Cod National Seashore, South District 1999 Piping Plover Nest Sites

Piping Plover Nests 1999

Marconi Site, Wellfleet

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

-  Piping Plover Nests



Piping Plover Nests 1999

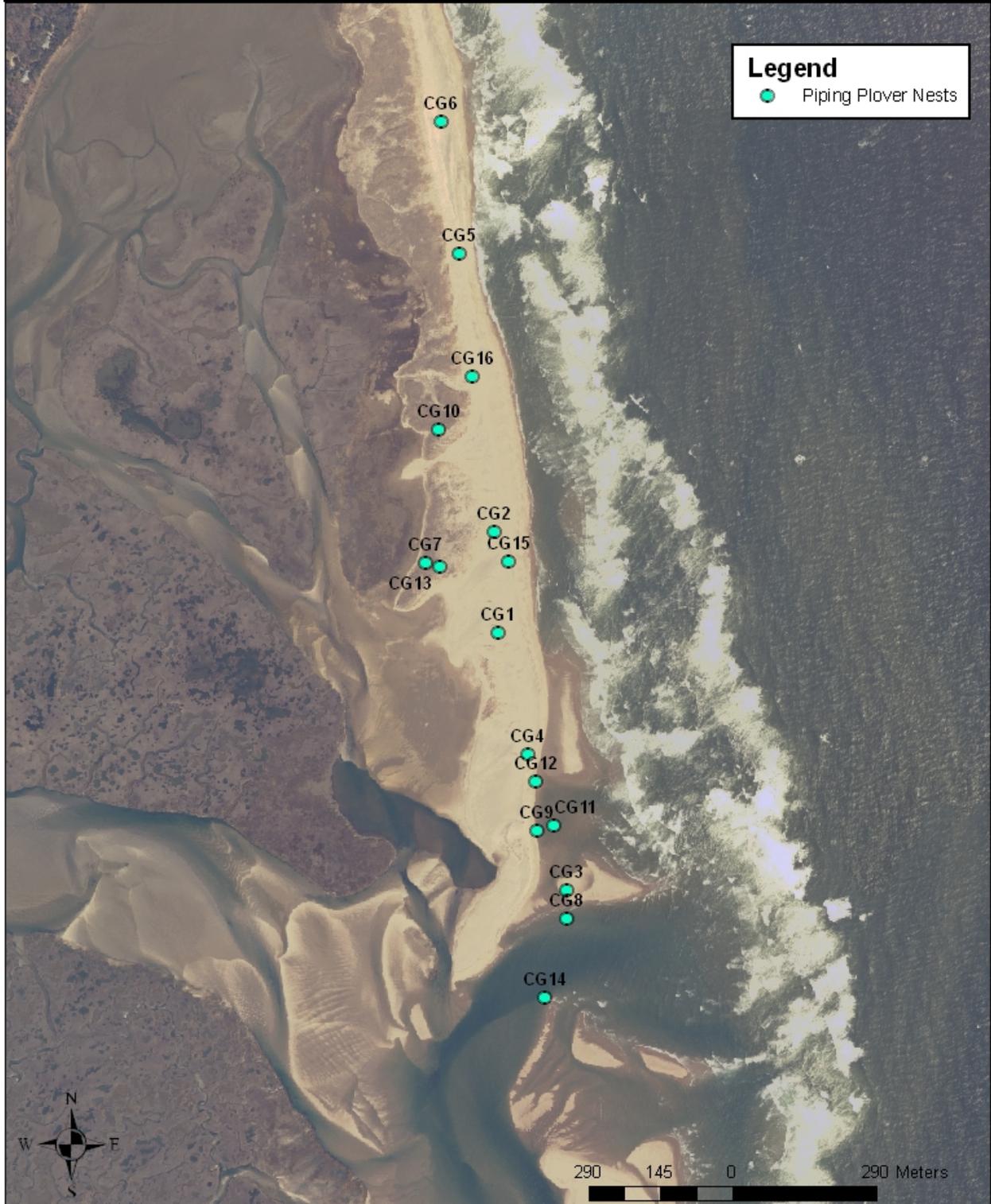
Coast Guard Beach, Eastham

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

 Piping Plover Nests



Piping Plover Nests 1999

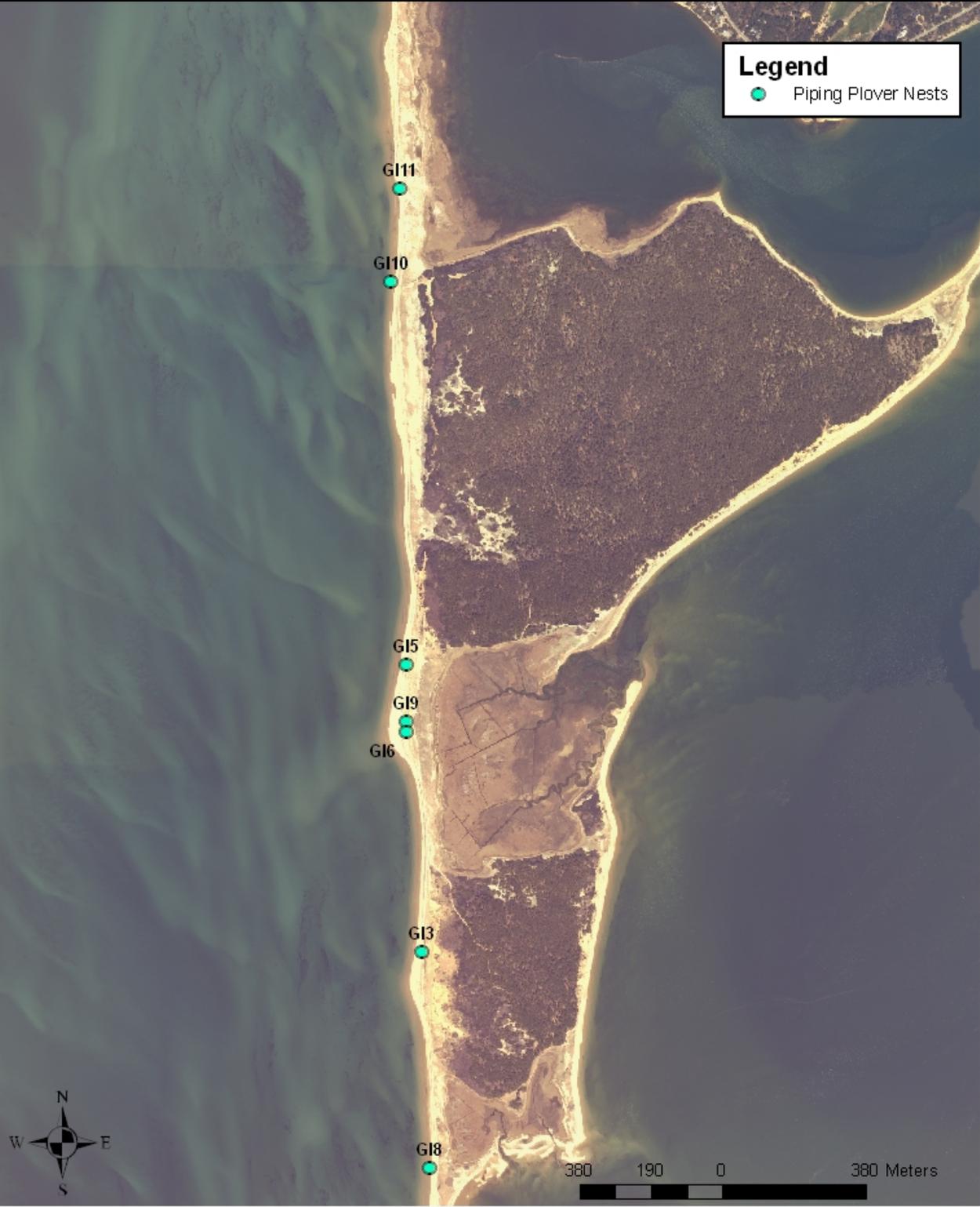
Great Island, Wellfleet

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior



Legend

● Piping Plover Nests



Piping Plover Nests 1999

Jeremy Point, Wellfleet

Cape Cod National Seashore
National Park Service
U.S. Department of the Interior

