

**BREEDING ECOLOGY OF PIPING PLOVERS  
IN CAPE COD NATIONAL SEASHORE - 1993**

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CACO Natural Resource Report 93-1

Cape Cod National Seashore

South Wellfleet, MA 02663

August 1993

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## ABSTRACT

Sixty pairs of Piping Plovers (*Charadrius melodus*) were monitored from 6 April to 31 August 1993 on eight beaches in Cape Cod National Seashore. Plovers began laying eggs in mid-April and continued through June, with the greatest number of active nests between 23 May and 12 June. Hatching dates ranged from 27 May to 21 July. Hatching success (number of eggs hatched/number of eggs laid) was 67% for all beaches. Crows accounted for 50% of lost nests. Fledging dates ranged from 26 June to 15 August. Fledging success (number of chicks fledged/number of eggs hatched) was 69% for all beaches. Most chick mortality occurred within the first 10 days of hatching. Based on 124 chicks from 60 pairs, the mean number of chicks fledged per pair was 2.1.

## INTRODUCTION

The Atlantic Coast population of the Piping Plover (*Charadrius melodus*) was federally listed as "threatened" under the Endangered Species Act in 1986. One year prior to this, the National Park Service (NPS) began monitoring and managing the plovers breeding at Cape Cod National Seashore (CCNS). At the same time, Massachusetts Natural Heritage Program initiated an annual state-wide plover census.

131 pairs of plovers were counted in the first state census (Melvin 1991). Since then, the number of breeding pairs in the state has slowly climbed, reaching a peak of 213 pairs in 1992 (Melvin 1992). Preliminary figures for 1993 indicate approximately 287 breeding pairs, an increase of 74 pairs from 1992 (S. Melvin, Mass. Natural Heritage Program, Westborough, MA, pers. comm.). However, initial reports from most other Atlantic states do not indicate a similar increase in the number of breeding pairs (S. Melvin, pers. comm.).

When monitoring first began in 1985, 18 pairs nested on CCNS beaches from Provincetown to Eastham, and less than one chick (0.7) fledged per pair (Table 1). This year 60 pairs, representing 21% of the state total, nested in CCNS. This is a 233% increase (18 to 60 pairs) since intensive monitoring began in 1985 (Table 1). During this same time period, productivity (number of chicks fledged/number of pairs) at CCNS has risen from 0.7 to 2.6 chicks/pair in 1990 and 1991.

## STUDY AREAS

During the 1993 field season, we monitored Piping Plovers nesting at eight beaches in CCNS from Provincetown to Eastham. These beaches are divided into two districts: the North District (Long Point, Race Point North, Race Point South, High Head, and Ballston) and the South District (Jeremy Point, Marconi, and Coast Guard). The sites were described in Meisel (1991) and Brown (1992), however, the Marconi site

description needs to be modified. This site now extends from the stairs at Marconi Beach north to White Crest Beach. This includes the town-managed LeCount Hollow Beach where this year, for the first time, a pair nested north of the public beach.

Data from the eight beaches located from Provincetown to Eastham are presented in this report. (It is important to note that the 1992 Annual Report included data from all sites within CCNS boundaries, Provincetown to Chatham. Numbers from the two reports can not be directly compared. See Appendix A for numbers and productivity at CCNS sites, Provincetown to Chatham, 1985-1993).

## **METHODS**

We conducted fieldwork from 6 April to 31 August 1993. Early in the season, beaches and tidal flats were censused for arriving plovers, and territorial behavior was noted. Race Point North, Race Point South, High Head, Marconi, and Coast Guard were visited three to four times per week. Long Point, Ballston, and Jeremy Point were checked once every six to ten days. From the beginning of nest establishment to the end of fledging, the beaches were visited more frequently. Race Point North and South, High Head, Marconi, and Coast Guard were monitored almost daily. Jeremy Point was checked at least four times a week. Ballston and Long Point were checked three times a week. During the visits, we noted the locations and behavior of adults, searched for nests using tracks and cues from adult behavior, noted the sex of the incubating birds, and recorded the numbers and location of chicks in each brood. If a nest had been predated, we looked for any evidence of predators (tracks up to or near the nest, egg shells, plover feathers or body parts).

Monitoring the plovers was a cooperative effort. The North District was monitored primarily by Ed Hoopes (CCNS Biological Technician), Sabrina McGary (Student Conservation Association Intern), and Joe Kenneway and John O'Neill (Shorebird

Rangers). Jennifer Brown (CCNS Biological Technician), Nora Sulzmann (Student Conservation Association Intern), and Janet Barricman and Russ Keyes (Shorebird Rangers) monitored the South District.

We used four-wheel drive and four-track vehicles to access nests in the North District of CCNS. We monitored Jeremy Point and Marconi Beach on foot or by vehicle. Coast Guard Beach was monitored on foot.

Since the US Fish & Wildlife Service banding moratorium in 1989, the number of banded plovers seen at CCNS has decreased. This year only seven banded plovers nested in CCNS (6% of all nesting birds, Appendix B).

Symbolic fencing was used around each nest or nesting area. Predator exclosures were also installed around completed nests, as described by Meisel (1991) and Brown (1992). After exclosed nests on Marconi and Race Point Beach were predated by crows, we covered all exclosures with cotton twine spaced 4-6" apart. Only one pair did not accept an exclosure when it was installed the day after clutch completion. The exclosure was immediately removed and re-installed five days later and the pair accepted it.

This year we used a global positioning system to record accurate nest locations. The data, however, are not currently available to include in this report.

## **SEASONAL CHRONOLOGY**

Sixty pairs of Piping Plovers nested on beaches managed by the NPS at CCNS (Table 2). Thirty-seven pairs nested in the North District, and 23 pairs nested in the South District (Appendix C). These numbers represent increases of 54% and 21% (from 24 and 19 pairs), respectively, from 1992 numbers.

Plovers began arriving on outer Cape Cod beaches in late March. By mid-April, plovers were present on most beaches and courtship behavior was observed. In the

North District, pairs continued to arrive through early June. Some of these later pairs may have already lost a nest before they moved into this area.

### **Breeding Chronology**

Egg-laying began in mid-April. Seventy-five nests were laid in CCNS. Eight nests were initiated between 18 and 30 April, six in the South District and two in the North. Four of these early nests successfully fledged young. The other nests failed at the egg stage. Most of the remaining nests were laid by the end of May, however, fifteen were initiated in June. Eleven of the fifteen June nests were in the North District. The last nest was initiated 21 June at Marconi Beach.

A nest is "active" from the time the first egg is laid until the nest hatches or fails. We plotted the number of active nests for each week of the breeding season. When the initiation dates were unknown, we determined them by counting backwards from the hatch date 28 days, plus two days for each egg laid. Nesting activity for all nests peaked during the last week of May and the first week of June when the number of active nests was 46 (Figure 1). This peak is fairly consistent with the 1992 chronology. Prior to the use of predator exclosures, the peak occurred one to two weeks later (MacIvor et al. 1987). When the districts are examined separately, we found that the peaks occurred at different times. Numbers of nests in the South District reached a maximum during the last two weeks in May (Figure 2). In the North District, the peak was during the first three weeks of June (Figure 3). This later peak suggests that pairs had lost first nests elsewhere and then re-nested on the North District beaches. Because few birds were banded, we had difficulty, particularly on Race Point South, determining if a pair that lost its nest re-nested.

Predator exclosures were installed around 63 of the 75 nests (84%). Twelve nests did not have exclosures because the nests were predated before clutch completion. Of these 63 exclosed nests, 86% (54) were successful (the nests hatched). Those nests

that were not successful failed primarily because of crow predation and abandonment. Crows were able to enter the exclosures that were not covered with string.

Hatching dates ranged from 27 May to 21 July. Fledging dates ranged from 26 June to 15 August. These dates are comparable between the two districts.

## **PRODUCTIVITY**

Sixty pairs of Piping Plovers were monitored at eight sites in CCNS (Table 2). This represents approximately 21% of the total breeding population in Massachusetts (based on 60 of 287 nesting pairs). The eight sites showed a 40% increase in the number of breeding pairs from 1992 to 1993 (from 43 to 60 pairs), and a 114% increase since 1991 (from 27 to 60 pairs). The number of pairs at each of these beaches increased from 1992 to 1993, except for Ballston and Coast Guard Beach which had one and eight nesting pairs, respectively, in both years. The largest increase in number of pairs occurred at Long Point, where numbers rose from two to seven pairs, and High Head, which had three pairs in 1992 and eight pairs in 1993. Most other sites showed a one to two pair increase.

### **Hatching Success**

Hatching success for all of the sites combined was 67% (total number of eggs laid/total number of eggs hatched). For individual beaches, hatching success ranged from 52 to 100% (Table 2). The highest hatching success rates were at Ballston, High Head, and Long Point. The lowest hatching success rate was at Marconi and Jeremy Point. Thirty-five percent (20 of 57 nests) of the nests that hatched had one or two eggs that were left in the scrape. Agencies working at sites throughout the state also reported a high number of partially-hatching nests (S. Melvin, pers. comm.). Reasons for this are unknown, but the age of the adults may be involved.

## **Fledging Success**

Fledging success for all of the sites combined was 69% (the number of chicks fledged/ the number of eggs hatched). Individual beaches had success rates from 44 to 100% (Table 2). Jeremy Point and High Head both fledged 92% of the chicks that hatched. This number is a marked increase for Jeremy Point where 54% of the chicks fledged in 1992, and only 25% in 1991. The number of chicks fledged per nesting pair for all beaches combined was 2.1 (based on 124 chicks from 60 pairs). This is down from the 2.4 chicks fledged per pair in 1992, and 2.6 in 1990 and 1991. Individual beaches with high productivity include Marconi, Long Point, High Head, and Ballston (2.4-3.0 chicks fledged/pair).

## **Nest Failures**

Eighteen out of 75 nests (24%) failed to hatch at least one chick. Avian predation, specifically crows, was the major cause of nest failure in 1993, as it had been in 1992 (Table 3). At nine of the 18 failed nests, we found the scrapes empty and crow tracks leading up to and through the scrapes. Race Point South and Marconi Beach had the highest nest loss with five failed nests on each beach. Crows accounted for half of these failures. Coast Guard Beach had the second highest nest loss with three failed nests. Two of these were lost to crows and one was abandoned. Red fox did not seem to be a factor in nest failure at Coast Guard Beach as they have been in past years (MacIvor et al. 1987) (but see Chick Mortality). Although fox and their tracks were frequently seen on the beach, none were observed leading up to a predated nest.

One nest at Long Point was stepped on by a pedestrian. This occurred within the first hour after the nest was found, when we had left the beach to pick up signs to post around the nest.

### **Chick Mortality**

A chick was presumed dead only when it was never seen again before the remainder of the brood fledged. Most chick mortality in CCNS occurred from the time of hatching until 10 days of age (Table 4). This pattern is consistent with data from previous years (Brown 1992, Meisel 1991; Brown et al. 1989). Chick mortality resulted from a number of factors, most of which were impossible to determine because predation was not witnessed and chick carcasses were not found. We suspect that red foxes were a major cause of chick mortality at Coast Guard Beach. Foxes were frequently seen and tracks were observed daily on the beach. Merlins were commonly seen on Race Point Beach during the chick-rearing stage and may have been a factor in mortality.

### **Adult Mortality**

Two plovers died during the breeding season, one on Race Point South and another at Jeremy Point. A female on Race Point South was predated, presumably while incubating or in the vicinity of her nest. Feathers and body parts were found immediately adjacent to the nest. We found a decaying adult plover skeleton approximately 10' from an abandoned nest at Jeremy Point.

### **NESTING HABITAT**

Nesting habitat for 74 nests was categorized according to the macrohabitat types outlined by MacIvor et al. (1987), and an additional category of heathlands (Table 5). Habitat ranged from unvegetated berms to heathlands. 53% of the plover nests were in berm habitat, 20% in foredune, 14% in overwash, and the remainder in interdune (9%) and heathlands (4%). As winter storms reconfigure the beaches each year, the distribution of nests changes among the habitats. In 1992, 64% of the nests were in berm habitats, 18% in overwash habitat, and only 8% in foredune.

This year five pairs of plovers nested in areas or habitats where nests had not been previously documented. None of these nests fledged any young. Three pairs nested in the heathlands on top of the bluff at Marconi. The distances from the nests to the bluff edge were 4.4, 11.8, and 58 meters. At this site, the bluff is estimated to be 50' above mean sea level. One pair nested on the east side of Great Island. Another pair nested about one-third of a mile from the beach in the inner dune area behind Race Point South Beach. This nest was actually closer to Pilgrim Lake than it was to the ocean.

### **ORV MANAGEMENT**

Twenty-one pairs of Piping Plovers nested along the off-road vehicle (ORV) corridor in the North District (5 more pairs than in 1992, an increase of 30%). As these nests hatched, sections of the corridor were closed to vehicles (Appendix D). Closures occurred from the time the eggs hatched until the chicks fledged (approximately 28-32 days). When the entrance of Race Point North was closed in late May, the Power Line Route was opened to allow vehicles access to Race Point. The North Self-Contained area was relocated twice due to beach closures. The entire 6.5 miles of Race Point South Beach was closed for a month and one-half because the nests hatched asynchronously and access is limited to the entrance south of Race Point Ranger Station and the entrance at High Head. The location of the nests with chicks and beach morphology, relative to these two access points, determined how much beach could be opened to vehicles. Both North and South beaches were reopened to vehicle traffic by the middle of August.

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Table 1: Number of Piping Plover breeding pairs and nest productivity on beaches managed by the National Park Service at Cape Cod National Seashore, 1985-1993.

Year	No. of Pairs	No. Chicks Fledged/Pair
1985	18	0.7
1986	16	0.3
1987	15	0.4
1988	13	0.9
1989	15	1.4
1990	15	2.6
1991	28	2.6
1992	43	2.4
1993	60	2.1

Table 2: Numbers of Piping Plover breeding pairs and nest productivity in Cape Cod National Seashore by location, 1993.

Site	No. Breed. Pairs	No. <sup>1</sup> Nests	No. <sup>1</sup> Eggs/ Site	No. Eggs Hatch	No. Chicks Fledge	Hatch <sup>1,2</sup> Success	Fledge <sup>3</sup> Success	Chicks Fledged/ Pair
Long Pt.	7	8	31	23	18	0.74	0.78	2.6
Race Pt. North	6	8	31	22	12	0.71	0.55	2.0
Race Pt. South	15 <sup>4</sup>	20	69	45	25	0.65	0.56	1.7
High Head	8	8	30	25	23	0.83	0.92	2.9
Ballston	1	1	3	3	3	1.00	1.00	3.0
Jeremy Pt.	6	7	23 <sup>5</sup>	12 <sup>5</sup>	11	0.52 <sup>5</sup>	0.92	1.8
Marconi	9	13	47	27	22	0.57	0.82	2.4
Coast Guard	8	10	35	22	10	0.63	0.44	1.3
Total	60	75	269 <sup>5</sup>	179	124	0.67 <sup>5</sup>	0.69	2.07

<sup>1</sup> Includes renests.

<sup>2</sup> Total No. of Eggs Hatched/Total No. Eggs Laid

<sup>3</sup> Total No. Chicks Fledged/Total No. Eggs Hatched

<sup>4</sup> Best estimate possible because birds were not banded.

<sup>5</sup> Does not include one nest that had an unknown number of eggs laid and hatched.

Table 3: Causes of Piping Plover nest failures in Cape Cod National Seashore, 1993.

Site	Total No. Nests	No. Failed Nests	Cause of Failure	No. Failed	% Failed
Long Point	8	1	pedestrian	1	100
Race Point North	8	2	crow	2	100
Race Point South	15	5	overwash	2	40
			crow	1	20
			adult mortality	1	20
			abandoned	1	20
High Head <sup>1</sup>	8	0	---	---	---
Ballston					
Jeremy Point	7	2	adult mortality	1	50
			unknown	1	50
Marconi	13	5	crow	3	60
			probably crow	1	20
			abandoned	1	20
Coast Guard	10	3	crow	2	67
			abandoned	1	33

<sup>1</sup> One nest had two of the four eggs predated by crow. Birds continued incubating.

Table 4: Life table of Piping Plover chick survival in Cape Cod National Seashore, 1993.

Age (days)	No. Survived $s^1$	No. Deaths $d^2$	Mortality Rate $q^3$
0-5	157	27	0.17
6-10	139	18	0.13
11-15	121	4	0.03
16-20	115	5	0.04
21-25	114	0	0
26-30 <sup>4</sup>	43	0	0

<sup>1</sup> s = Number of chicks alive at the end of each time period.

<sup>2</sup> d = Number of chicks that died during each time period.

<sup>3</sup> q = d/s

<sup>4</sup> Includes only those chicks still observed at this age.

Table 5: Nesting habitat of Piping Plovers in Cape Cod National Seashore, 1993.

Site	Berm	Foredune	Interdune	Overwash	Blowout	Heathlands
Long Point	5	3	0	0	0	0
Race Pt. North	4	4	0	0	0	0
Race Pt. South	12	4	4	0	0	0
High Head	8	0	0	0	0	0
Ballston	0	1	0	0	0	0
Jeremy Pt.	3	0	3	0	0	0
Marconi	7	3	0	0	0	3
Coast Guard	0	0	0	10	0	0
Total	39	15	7	10	0	3

Figure 1. Nesting chronology for Piping Plovers nesting in Cape Cod National Seashore, 1993.

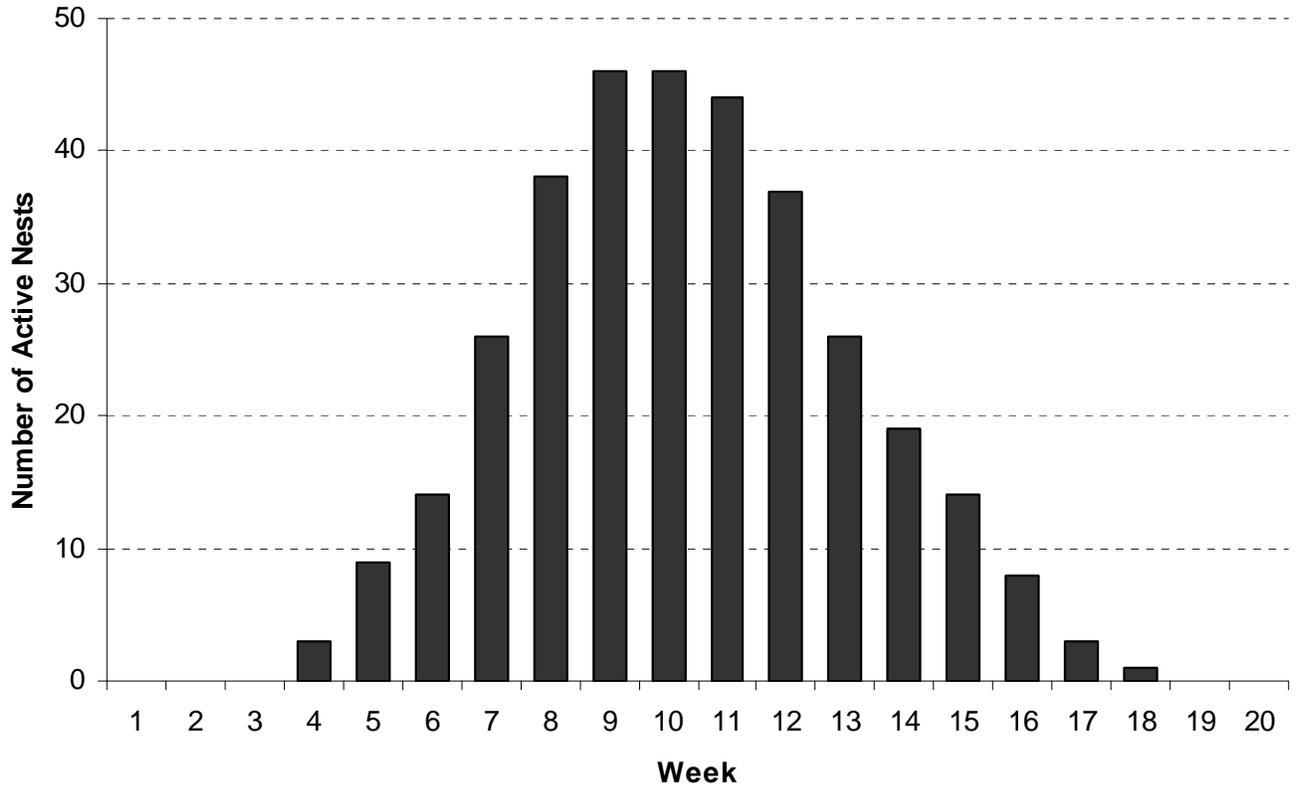


Figure 2. Nesting chronology for Piping Plovers nesting in the South District of Cape Cod National Seashore, 1993.

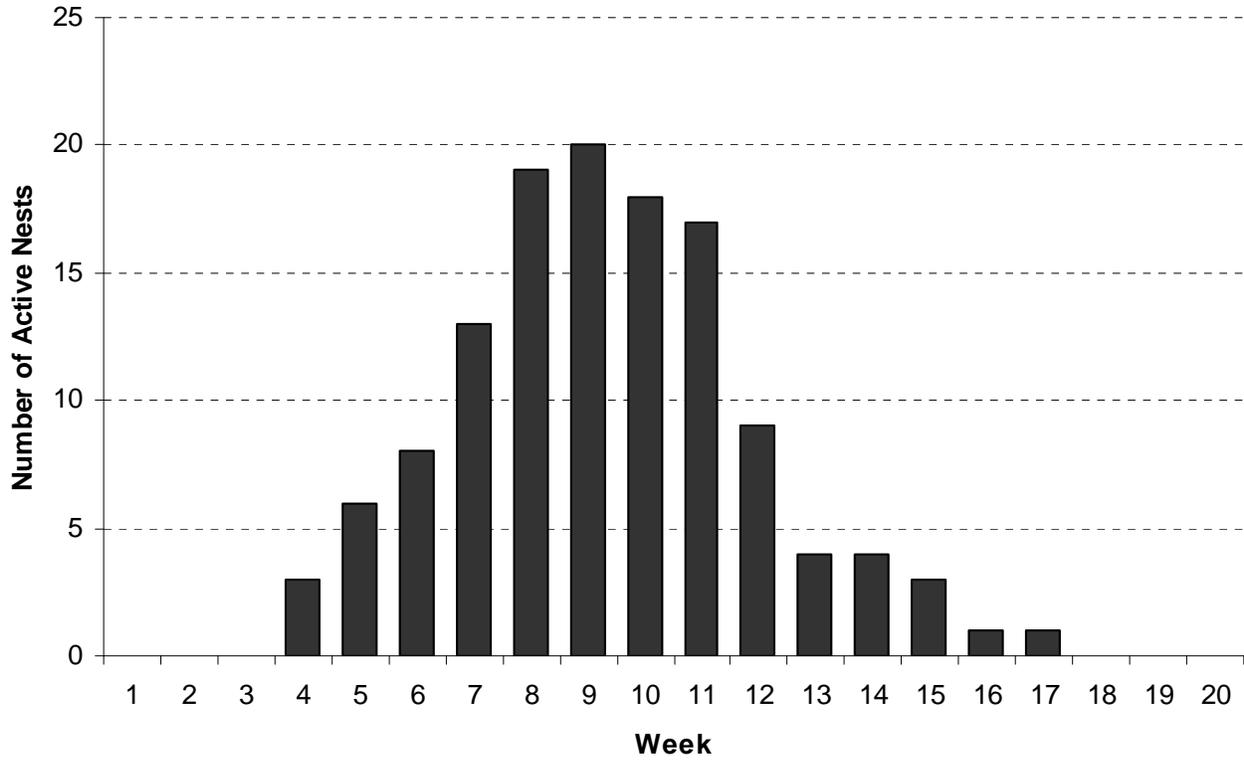
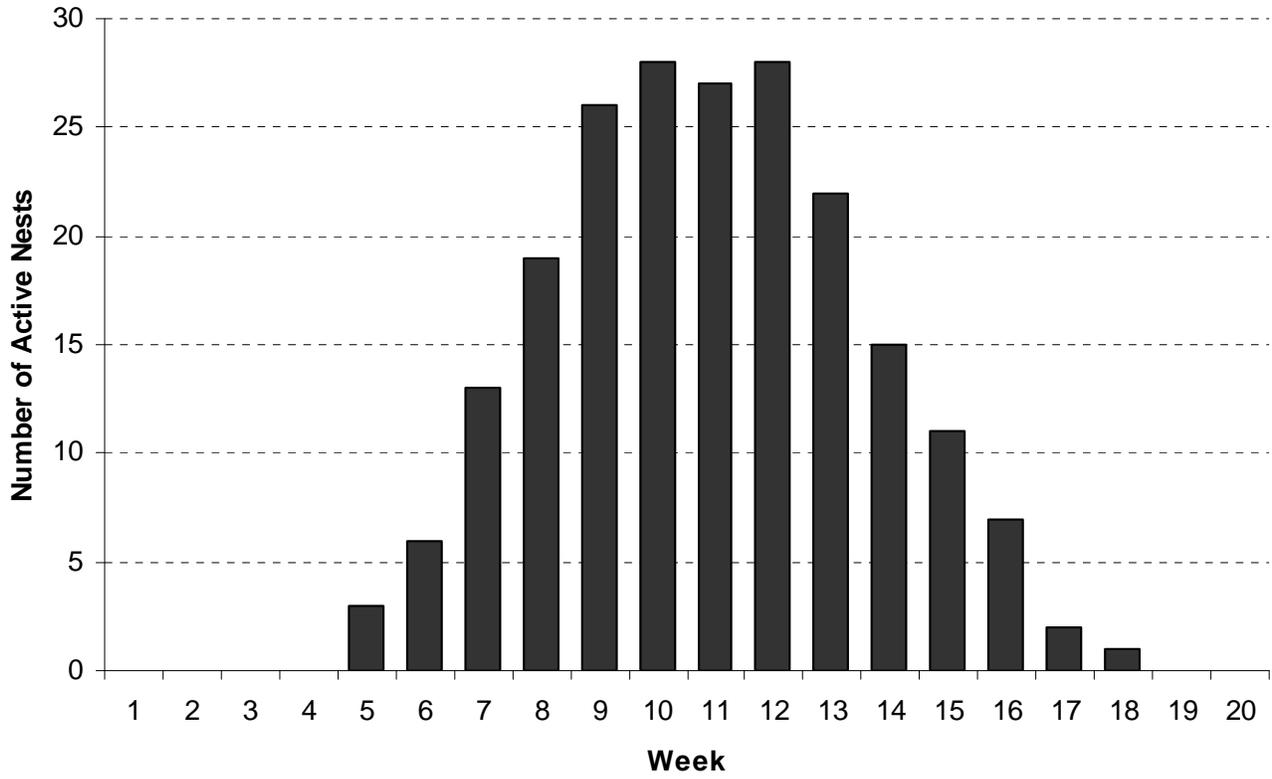


Figure 3. Nesting chronology for Piping Plovers nesting in the North District of Cape Cod National Seashore, 1993.



## APPENDIX A

Number of Piping Plover Breeding Pairs and Nest Productivity on all Beaches in Cape Cod National Seashore, 1985-1993 (1985-1991 from Melvin, 1991)

Year	No. of Pairs	No. Chicks Fledged/Pair
1985	27	0.7
1986	28	0.3
1987	25	0.3
1988	20	0.9
1989	23	1.4
1990	24	2.2
1991	43	2.4
1992	79	2.4
1993	110	2.0

## APPENDIX B

### Color-banded Piping Plovers Nesting in Cape Cod National Seashore, 1993

The birds' left leg bands are read first, from top to bottom, then the right leg bands are read. Adults and chicks were color-banded at CCNS from 1985 to 1988.

S: USFWS silver band  
 f: black flag  
 B: black

G: light green  
 O: orange  
 \_: no band

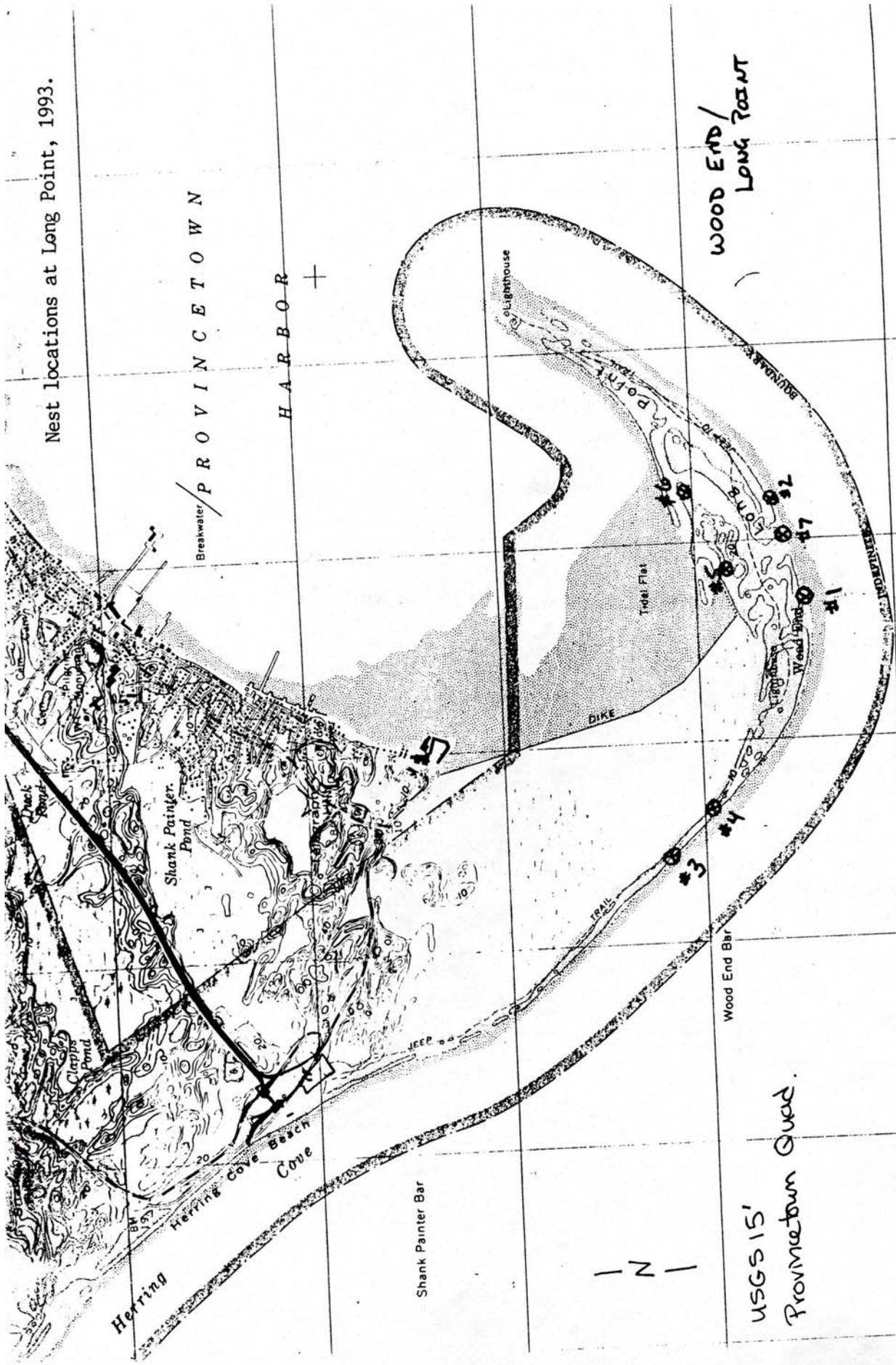
Color-bands	Sex	Nest Location	Nest Name
S:f	M	Long Pt.	Inside
S:f	M	Race Pt.North	Emergency Rte
B:S	M	Race Pt.South	Frenchies
BS:___	M	Marconi	North LeCount
S:___	F	Marconi	North LeCount
S:f	M	Marconi	Bluff & S:f Renest
SB:___ <sup>1</sup>	M	Coast Guard	SB:___'s

<sup>1</sup>Bird was probably banded as SB:fR/WR/W (has a brown spot on his breast).  
 Nested on Coast Guard since 1987.

## **APPENDIX C**

Nest Locations on Beaches Managed By Cape Cod National Seashore, 1993

Nest locations at Long Point, 1993.



WOOD END / LONG POINT

C A P E

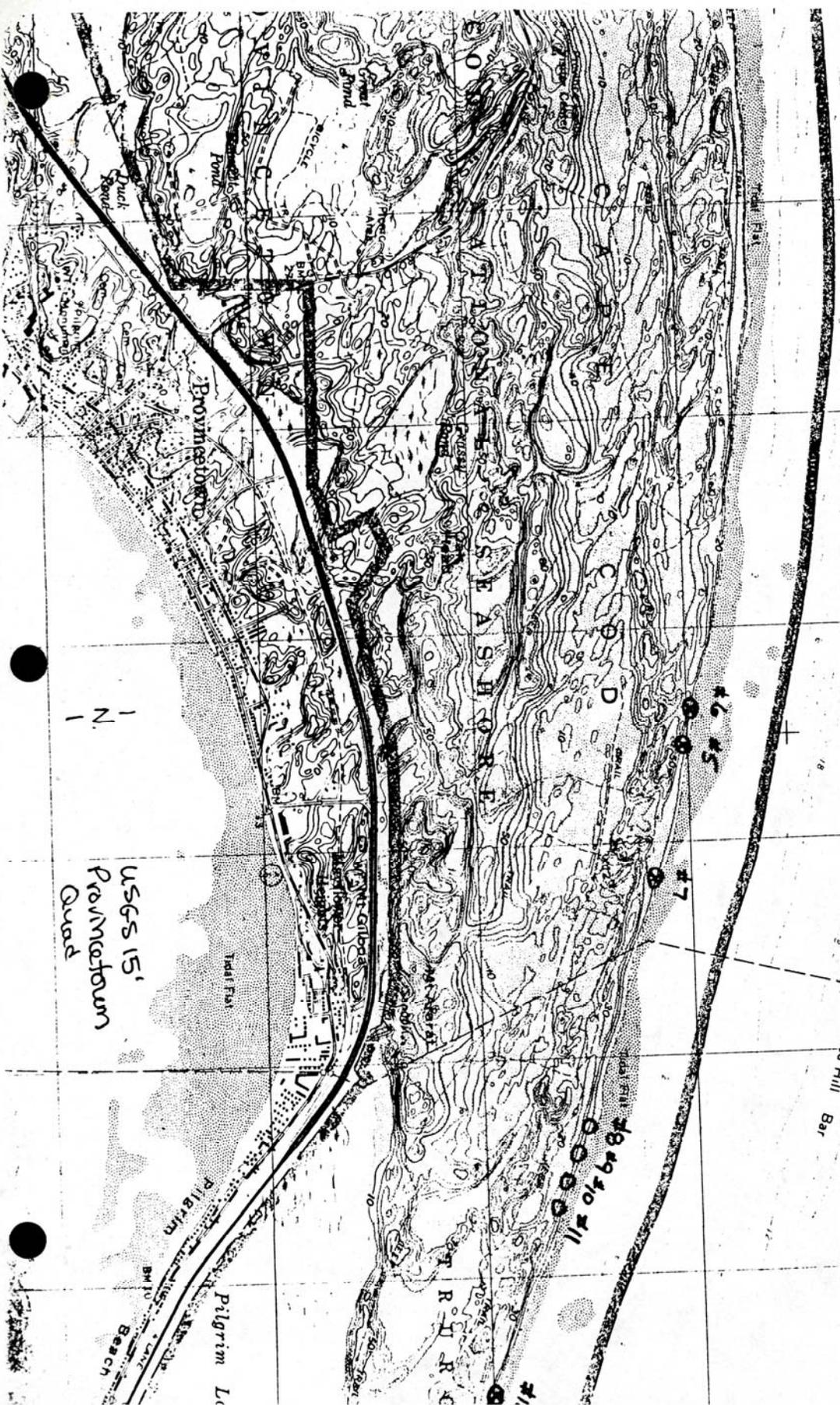
C O O D

USGS 15' Provincetown Quad.

I N I

Race Point Beach South  
(Part 2)

Nest Locations at Race Point South, Part 2/3, 199



N

USGS 15'  
Provincetown  
Quad



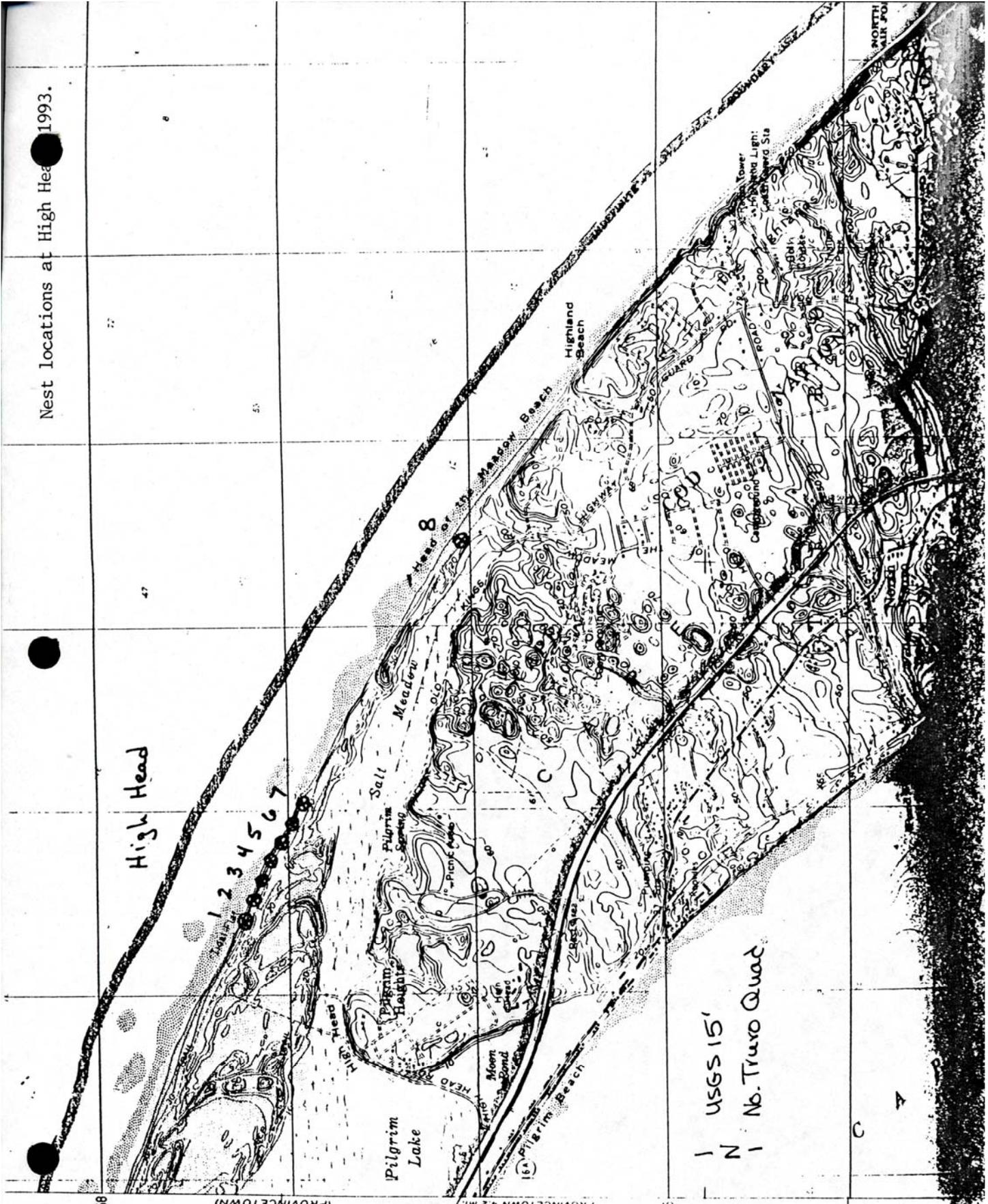
Nest Locations at High Head 1993.

High Head

1 2 3 4 5 6 7

8

USGS 15'  
N. Truro Quad



458

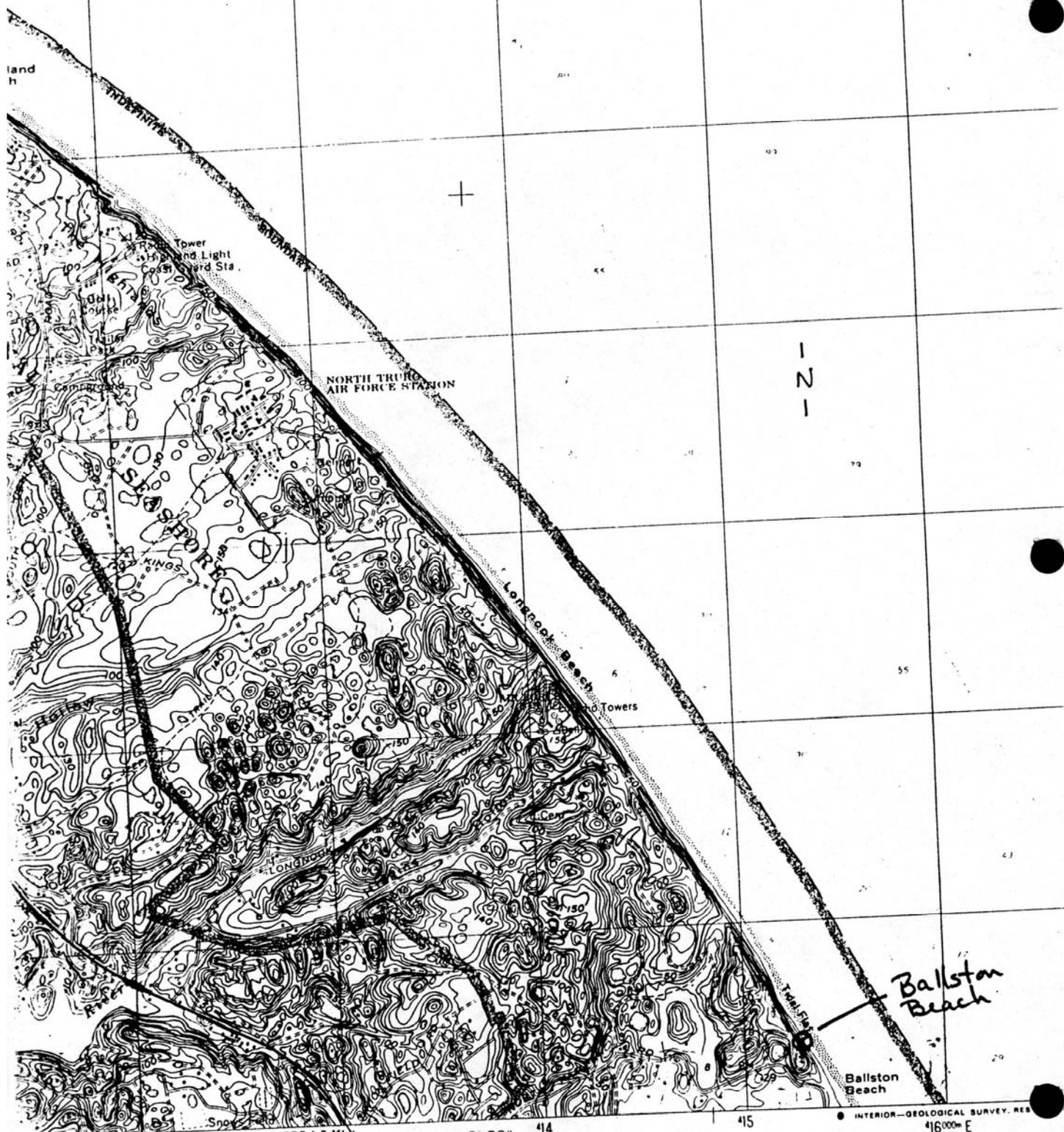
PROVINCE TOWN 4.2 MI.  
(PROVINCE TOWN)  
6098 11 SW

PROVINCE TOWN 4.2 MI.

C

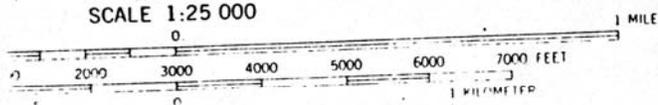
NORTH  
AIR PO

Nest location at Ballston, 1993.



(WELLFLEET)  
69671 NE  
SCALE 1:25 000

WELLFLEET 4.8 MI.  
ORLEANS 17 MI.

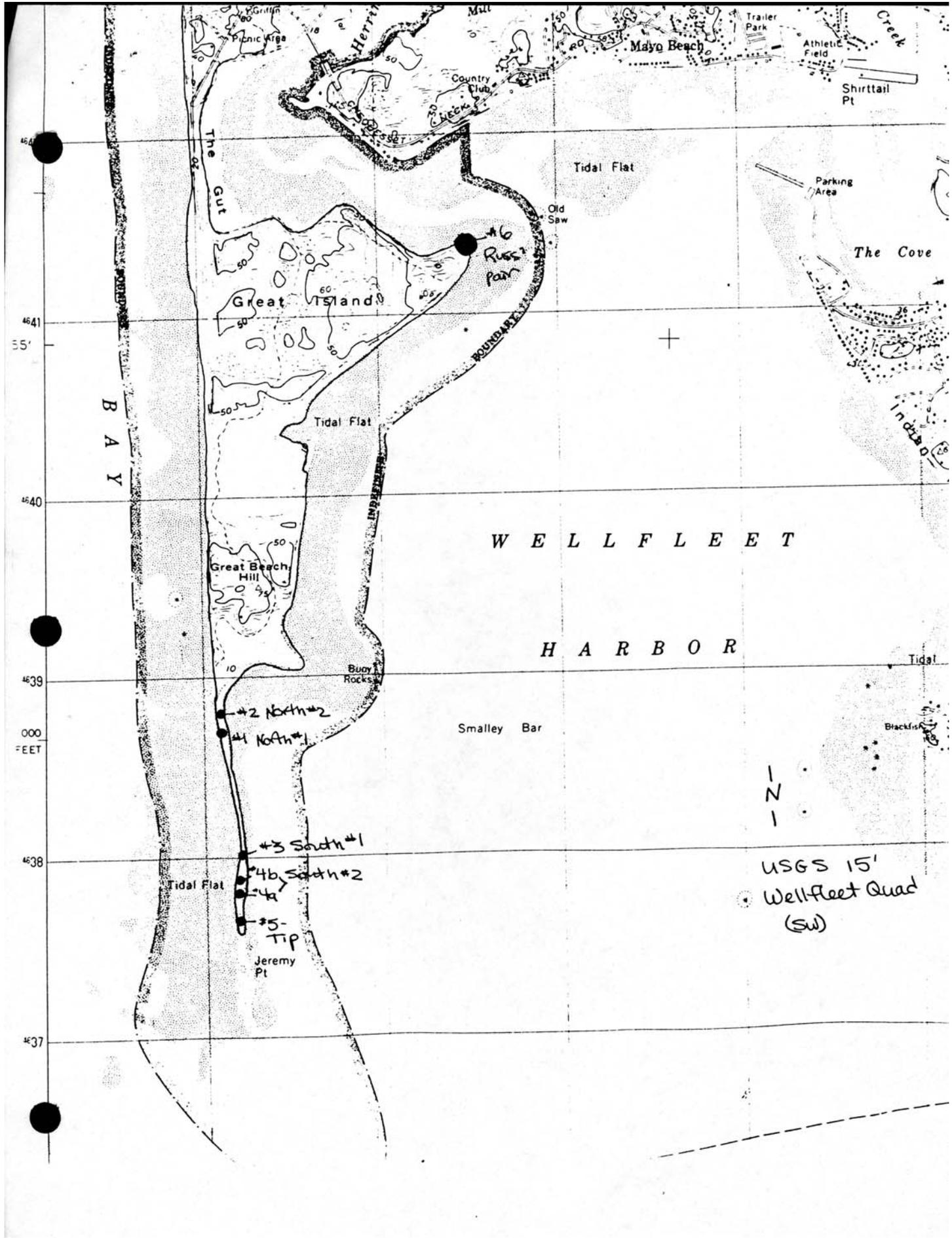


USGS 15'  
No. Truro Quad  
(SE)

ROAD CLASSIFICATION

Primary highway, hard surface	Light-duty ro- improved sur
Secondary highway.	Unimproved

INTERIOR—GEOLOGICAL SURVEY, RES  
4160000 E



46

461  
5'

460

4639

000  
EET

4638

4637

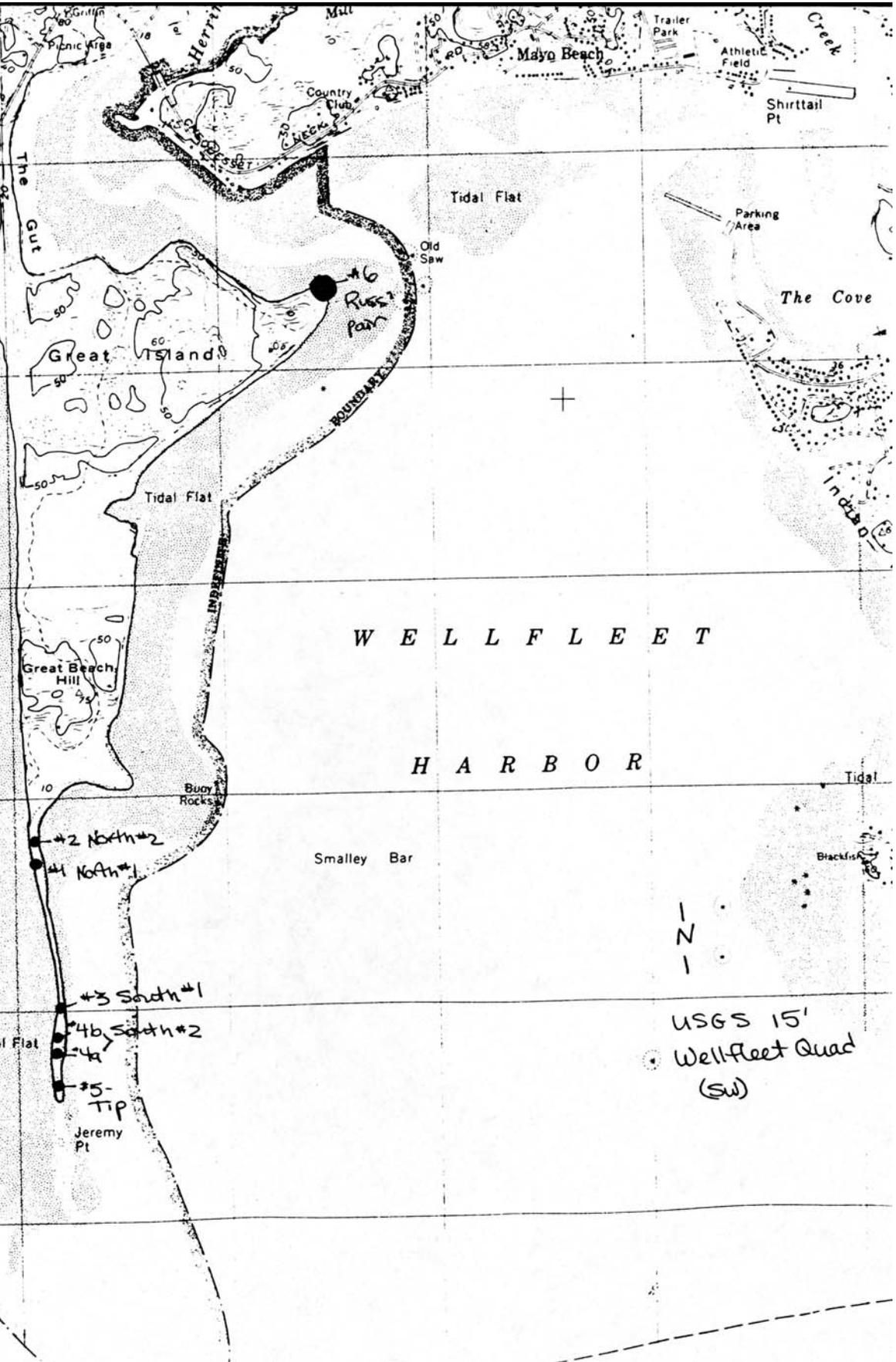
B  
A  
Y

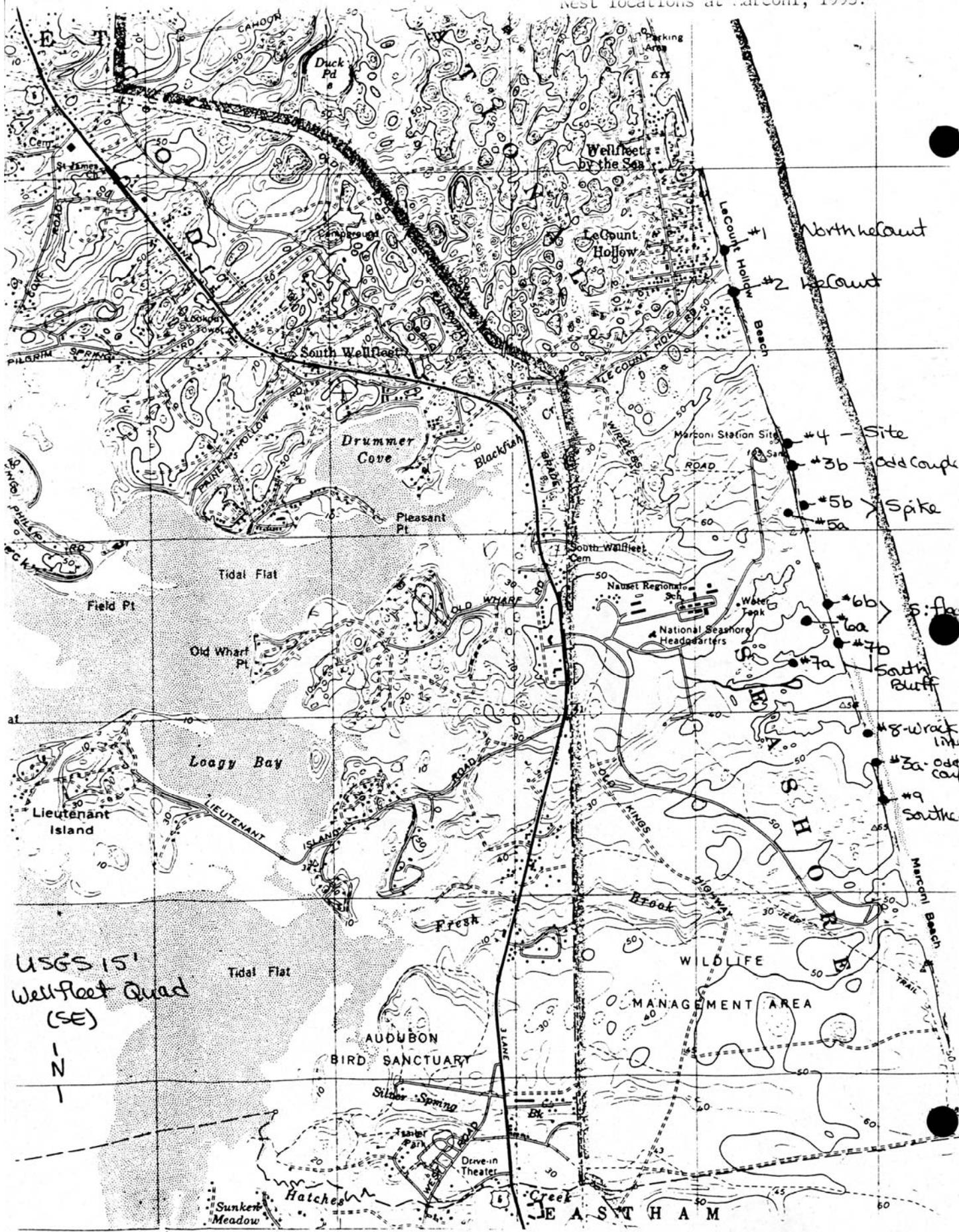
W E L L F L E E T

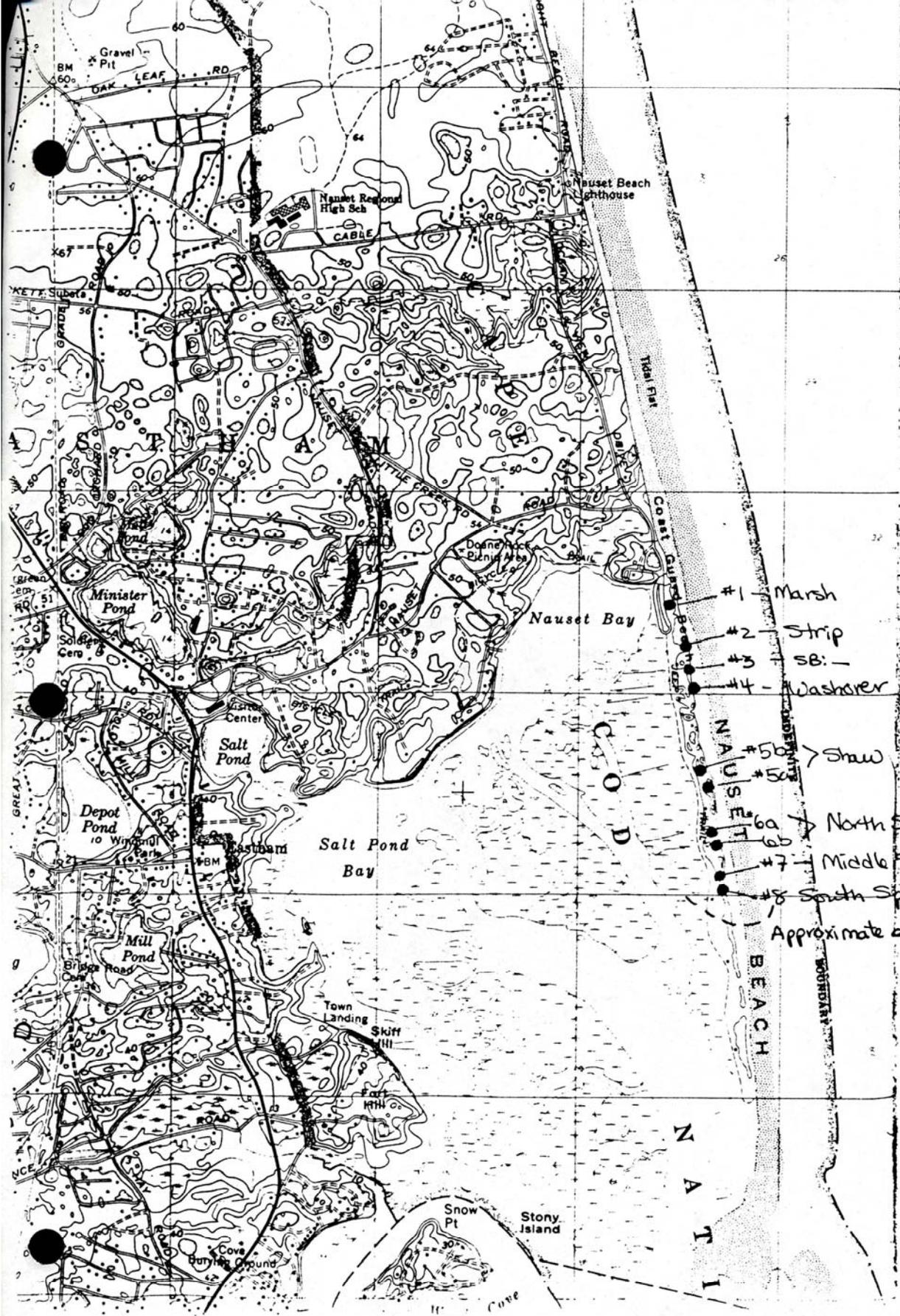
H A R B O R

USGS 15'  
Wellfleet Quad  
(sw)

1  
N  
1







- #1 Marsh
- #2 Strip
- #3 SB
- #4 Washer

#5a Show

#6a North Spit

#7 Middle Spit

#8 South Spit

Approximate end of spit.

USGS 15'  
Orleans Quar  
(NE)

N

## APPENDIX D

### Dates of ORV Corridor Openings & Closures for Race Point North & South, 1993

<b>Date</b>	<b>Beach</b>	<b>Action</b>
15 April	Both	North and South Beaches are opened, except from High Head access to 0.25 mi north of access, due to beach morphology.
27 May	North	North Entrance to North Self-Contained Area is closed. Power Line Route is opened for access to Race Point.
31 May	South	Entire beach is closed.
15 June	North	North Self-Contained Area is moved to just south of Emergency Route entrance (Approximately 1.0 mi of beach is open to ORV's).
15 July	North	All but the tip and 0.5 mi are closed. Self-contained vehicles are moved to an area that is 0.5 mi long, extending north from the North Entrance.
20 July	North	15 July's closure is re-opened.
26 July	South	Beach opens from the South Entrance to the south end of Peaked Hill (approx. 4 mi).
8 Aug	South	Remainder of South Beach is opened.
15 Aug	North	Remainder of North Beach is opened.