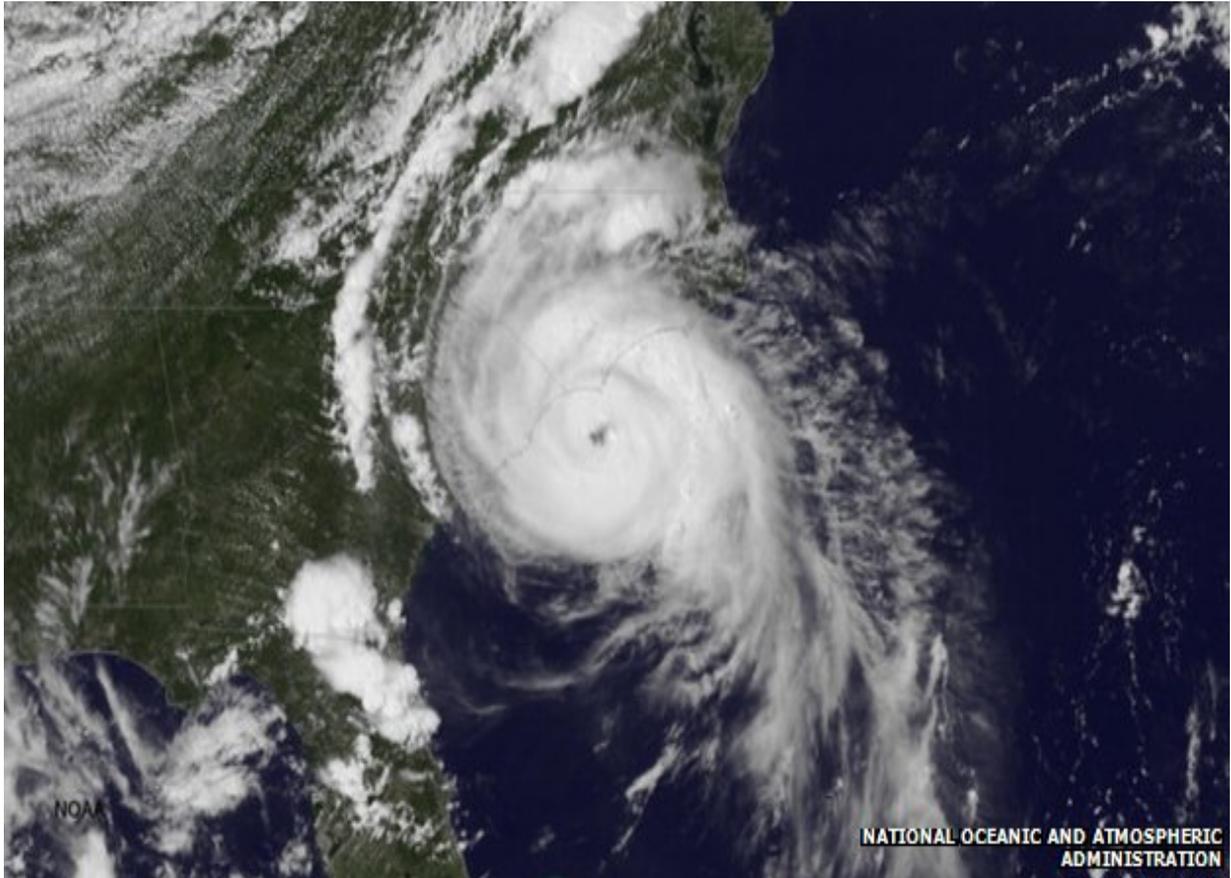


PIPING PLOVER (*Charadrius melodus*) MONITORING AT
CAPE LOOKOUT NATIONAL SEASHORE

2014 SUMMARY REPORT



Hurricane Arthur bearing down on Cape Lookout National Seashore, July 3, 2014. NOAA 2014.

NATIONAL PARK SERVICE
CAPE LOOKOUT NATIONAL SEASHORE
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Abstract

A total of 47 pairs of piping plovers were recorded at Cape Lookout National Seashore (CALO) in 2014. The birds at CALO accounted for 75% of the nesting pairs in North Carolina. Thirty-six pairs nested on North Core Banks and eleven pairs on South Core Banks. Egg-laying was initiated on April 23rd and a total of 57 nests were documented. Twenty eight nests hatched and 9 chicks fledged. Productivity was 0.19 chicks fledged per nesting pair. One brood foraged on the oceanside in 2014.

Introduction

The piping plover is listed as a federal threatened species by the U.S. Fish and Wildlife Service. Piping plover monitoring at CALO began with a baseline study in 1989 (Fraser *et al*, 1990). The park is a significant nesting area, containing 75% of the nesting pairs in the state of North Carolina (Schweitzer and Abraham 2014). CALO is also an important wintering and migratory site. There are three designated wintering critical habitat units within the seashore. Monitoring focuses on documenting reproductive success, implementing methods to increase the productivity of this threatened species, and non-breeding use surveys. This report contains a summary of monitoring results for 2014, comparisons to results from previous years and discussions based on long-term monitoring of piping plovers at CALO.

Site Description

Cape Lookout National Seashore is located in the southern Outer Banks of North Carolina between Beaufort and Ocracoke Inlets. With the natural reopening of Old Drum Inlet in August 2011 the seashore was divided into four barrier islands for the 2014 breeding season. The northernmost island, North Core Banks (NCB) was approximately 23 miles long, extending from Ocracoke Inlet to Ophelia Inlet, and includes the Middle Core Bank (MCB) section from Old Drum Inlet to Ophelia Inlet. South Core Banks (SCB) extends southward from Ophelia Inlet to almost 24 miles to Barden Inlet. The Core Banks have a northeast to southwest orientation and exhibit a low profile landscape. The third island, Shackleford Banks (SB) is nine miles long and has an east-west orientation with a higher dune system and larger areas of vegetation. All islands in the park are subject to constant and dramatic change by the actions of wind and waves.

Methods

Bird sanctuary signs were used to close all known piping plover nesting habitat to pedestrian and vehicular entry by April 1. Beginning in early April, nesting areas were surveyed daily for territorial pairs and nests. Potential habitat outside posted areas was monitored and posted as necessary with a minimum 150 foot buffer distance from scrapes and nests. Locations of nests were recorded and nests were monitored daily until they hatched or were lost. The Interim Protected species Management Plan/ Environmental Assessment, March 2006, developed for CALO provides guidance for monitoring and management (National Park Service 2006).

Nests were protected with predator exclosures if the topography of the location was suitable and monitoring was sufficient. Exclosures were circular, 10 feet in diameter, made of 4"x 2" mesh wire fence anchored with steel rebar and were topped with ¾" mesh bird netting. Because of high rates of losses to raccoons (*Procyon lotor*), nest exclosures were sometimes constructed before the clutch was complete.

After nests hatched, broods were monitored daily until the chicks fledged or were lost. Any ocean beach foraging areas were closed to vehicle traffic while the chicks were present.

Counts of wintering and migrating piping plovers were made monthly from August to March. The counts were made near the 15th of each month in the non-nesting season. The ocean beach, inlets and soundside sandy beaches were surveyed. Banded birds were searched for more frequently during the fall migration.

Results

Nesting Pairs

A total of 47 pairs of piping plovers attempted nesting at CALO in 2014 (Table 1 & 2). Thirty-six pairs nested on North Core Banks (NCB), and eleven pairs on South Core Banks (SCB), Appendix 1. Birds nested in five distinct areas (Figure 1). Appendix 1 shows the results of the June census window pair count. The four mile area around Ophelia Inlet contained the highest number of nesting pairs. The birds at CALO accounted for 75% of the nesting pairs in North Carolina in 2014.

Table 1. Number of Pairs by Occupied Nesting Areas

ISLAND	NESTING AREA	NUMBER OF PAIRS
North Core Banks	Portsmouth Flats	14
North Core Banks	Old Drum Inlet	6
North Core Banks	New Drum Inlet	13
North Core Banks	Ophelia Island	3
South Core Banks	Plover/Ophelia Inlet	11

Table 2. Piping Plover Breeding Pairs at Cape Lookout National Seashore 1989-2014

	1989	1992	1993	1994	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ocracoke Inlet	0	2	0	2	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Portsmouth Flats	14	8	9	7	8	17	15	9	11	9	8	6	4	6	8	14	14	12	13	12	19	13	14
Kathryn-Jane Flats	7	11	9	12	11	10	8	2	1	1	2	1	1	2	1	3	0	1	0	0	0	0	0
Old Drum Inlet	3	2	1	1	2	1	1	0	0	0	0	1	0	0	0	0	2	3	6	8	8	4	6
New Drum Inlet (NCB/MCB) Mile 21 to 22.29	4	5	9	10	6	3	2	3	1	2	2	2	2	3	3	5	6	5	8	8	10	12	13
New Drum Inlet (SCB)/ Ophelia Island Mile 22.3 to 23	3	3	4	5	4	2	3	3	2	3	2	2	2	2	2	2	2	2	2	2	5	5	3
Plover Inlet/ Ophelia Inlet Mile 23 to 24	0	0	0	0	0	1	1	1	1	1	1	1	4	8	15	17	18	11	11	8	8	11	11
Cape Point	0	0	0	0	0	0	0	1	0	0	0	0	0	4	3	2	3	2	2	1	0	0	0
Power Squadron Spit	3	2	3	2	2	1	2	1	0	0	0	1	0	1	1	2	1	1	1	1	0	0	0
Shackleford Banks														1	0	0	0	0	0	0	0	0	0
CALO Total	34	33	35	39	35	36	32	21	16	16	15	14	13	27	33	45	46	37	43	41	51	45	47

Nests

There were 57 nesting attempts made in 2014 (Appendix 2). The earliest nest initiation was on April 23rd and the latest was on June 29th. Forty-five nests were on NCB and twelve were on SCB. Of the 57 nests, ten were re-nests. Twenty eight nests hatched and 9 chicks fledged from 7 different broods. The average clutch size was 3.33 eggs and 88 of 190 known eggs hatched. Productivity for CALO was 0.19 chicks fledged per nesting pair (Table 3 & Appendix 3). Refer to Figures 2-5 for detailed maps of nests and nesting sites, (2012 DOQQ base layers).

Table 3. Piping Plover Nesting Success at CALO 2000-2014

Year	# Nests	# Pairs	# Eggs	Nests Hatched		Eggs Hatched		Chicks Fledged		Fledge Rate (Chicks/pair)
				#	%	#	%	#	%	
2000	18	16	65	12	67%	43	66%	8	19%	0.5
2001	19	16	64	8	42%	24	38%	5	21%	0.31
2002	20	15	65	13	65%	43	66%	4	9%	0.27
2003	15	14	55	7	47%	23	42%	6	26%	0.43
2004	13	13	44	11	85%	37	84%	12	32%	0.92
2005	31	27	105	24	77%	69	66%	23	33%	0.85
2006	37	33	125	29	78%	87	70%	29	33%	0.88
2007	58	45	173	29	50%	79	46%	11	14%	0.24
2008	57	46	179	31	54%	88	49%	9	10%	0.20
2009	45	36	145	24	53%	83	57%	30	36%	0.83
2010	58	43	204	34	59%	98	48%	31	32%	0.72
2011	48	41	157	35	73%	102	65%	37	36%	0.90
2012	66	51	207	36	54%	98	47%	29	30%	0.57
2013	52	45	173	30	58%	97	56%	47	48%	1.04
2014	57	47	190	28	49%	88	46%	9	10%	0.19

Predator Exclosures

In 2014, predator exclosures were used to protect 17 (30%) nests. Of the nests with exclosures 10 (59%) hatched. Seven nests with predator exclosures didn't hatch. Five were lost to weather (flooding/storm), one was lost to ghost crab (*Ocypode quadrata*) predation and one was lost to mink (*Neovison vison*) predation. Predator exclosures were not used on 40 (72%) nests due mainly to the inaccessibility of MCB and to birds nesting in vegetation. Of the nests without exclosures 18 hatched (45%). Twenty-two nests didn't hatch; ten were lost to unknown reasons, six were lost to weather, two were abandoned, two to ghost crabs, one nest was lost to mink, and one nest was lost to

unknown predation (Appendix 1). Table 4 shows likely causes of nest losses for all nests. The predator column includes three ghost crabs losses, two mink losses and one unknown predator loss. There were no observations of raccoons circling or digging at predator exclosures on SCB or NCB.

Table 4. Likely Causes of Piping Plover Nest Losses in 2014.

NESTING AREA	# NESTS	# LOST	PREDATORS	STORM	ABANDONED	UNKNOWN
Portsmouth Flats	19	12	1	7	2	2
Old Drum Inlet (NCB)	8	5	1	1	0	3
New Drum Inlet (NCB)	14	6	3	0	0	3
Ophelia Island (NCB)	4	3	0	2	0	1
Plover Inlet (Mile 23.6)	12	3	1	1	0	1
Total	57	29	6	11	2	10

Beach Closures and Brood Foraging

The area between Ophelia Inlet and Ramp 24, 1 mile in length, was completely closed to vehicles (except for NPS monitors) from May 24th to July 5th. A second ocean beach closure to vehicles was posted at Portsmouth Flats from mile 1.7 to mile 1.45, from June 27th to July 1st for one chick that foraged on the ocean beach. The closures began the day of hatch of the first nest at Ophelia Inlet (SCB) or when chicks were present on the ocean beach and remained in place until the last chick was fledged, confirmed lost, or moved out of area. The middle core banks section was closed to motor vehicle use from April 1st until August 31st in accordance with the Interim Protected Species Management Plan when Old Drum Inlet is open (National Park Service, 2006).

One brood foraged on the ocean beach in 2014. This brood (NCB nest 18) foraged on both the oceanside and pond area of Portsmouth Flats. All other chicks foraged on soundside beach, sand flats, mudflats and ephemeral pools in areas closed to vehicles and in most cases all entry.

Non-nesting Piping Plover Surveys

Surveys in 2014 covered the entire seashore from January to December with the exception of the three mile Middle Core Banks section. Hurricane Irene re-opened Old Drum Inlet in late August 2011 making access and monitoring difficult. We were able to census MCB during fall migration from August to November. Table 5 below list this year's counts. Appendix 4 lists non-nesting counts from 2007-2014.

Table 5. Non-Nesting Piping Plover Counts at Cape Lookout National Seashore, 2014.

	January	February	March	August	September	October	November	December
NCB	0	0	7	98*	69*	12*	13*	4
SCB	12	0	42	44	12	12	6	14
SB	0	9	4	9	1	0	4	3
Total	12	9	53	151	82	24	23	21

*Includes MCB

Banded Piping Plovers

Fifty observations of 27 individual non-breeding banded birds were made in the park in 2014, Appendix 5. Birds were re-sighted from the Great Lakes and Atlantic Coast populations. Birds were banded from Michigan, Massachusetts, New York, Georgia, Quebec, New Brunswick, Prince Edward Island, Nova Scotia, and Ontario Canada were re-sighted during migration and over wintering. One banded female (-, W:-, YL) nested in the seashore at Portsmouth Flats on NCB, nest 1 and 36. Both nests failed, the second to Hurricane Arthur. She was re-sighted after the hurricane. This bird was banded as a wintering adult in the Bahamas. This is the third year that she has nested in the seashore.

Discussion

Nesting Habitat

The habitat at New Drum Flats and Old Drum Flats/Inlet continues to provide excellent nesting and foraging opportunities in the breeding season. This high quality nesting habitat from Old Drum to Plover Inlet contained 70% (33 pairs) of the nesting pairs in 2014. Portsmouth Flats, another important area, continued to provide nesting habitat on NCB for 14 pairs (30%). The north tip of NCB at Ocracoke Inlet continues to erode and there was little nesting habitat available. There was no breeding activity documented in 2014. The habitat at Kathryn-Jane flats, Cape Point and Power Squadron spit did not attract and hold nesting pairs in 2014. Though there were two males nest scraping at Power Squadron spit during the June census they did not nest and left the site shortly after the census week.

CALO participated in the USGS “IPlover” nest data collection and sea level rise model study. The study seeks to forecast the impact of sea level rise on piping plover nesting habitat. A total of 44 of the 57 nests were uploaded into the database by using the mobile “IPlover” application on smartphones.

Pair Numbers

The number of breeding pairs in the seashore increased from 45 in 2013 to 47 in 2014. This may be the result of the relative high productivity in 2013 (Appendix 3). The pair count of 47 is the second highest breeding pair count on record at CALO, only exceeded by 51 pairs in 2012.

Nest Success

2014 brought moderate hatch success for piping plover nests in the park, only 49% of the nests and 46% of the eggs hatched successfully. Eleven (38%) nests were lost to flooding or wind, 7 were due to Hurricane Arthur. The six predator related nest losses accounted for 21% of total losses. Ghost crab predation took three nests, two were lost to mink predation and one was lost to an unknown predator. Two (7%) nests were abandoned. Ten (34%) nests losses were recorded as unknown. This unknown nest loss rate reflects the decreased monitoring ability on MCB due to inaccessibility.

In 2014, predator exclosures use was low. Only 17 nests or 30% of nests received predator exclosures. These 17 nests with predator exclosures had 10 nests hatch and a 59% hatch success. Predator exclosures were not used on MCB nests due to uncertainty of monitoring ability. MCB had 26 nests without predator exclosures and 12 nests hatched for a total hatch success of 46%.

Predator exclosures have generally been effective in increasing hatch success. From 1997-2014, 69% of the nests protected with exclosures hatched, compared with a 41% hatch rate of the nests left unprotected.

Fledging Success

The fledging success for piping plovers at CALO was 0.19 chicks fledged per nesting pair in 2014 (Appendix 3, Chart 2). The actual number of chicks fledged were 9 fledglings. This is the second lowest productivity recorded at CALO and well below average. The average fledge rate from 2000-2014 is 0.59 chicks per breeding pair (Table 3).

Hurricane Arthur caused the loss of 15 chicks. Many were near fledgling age when Arthur made landfall at Cape Lookout at 11:15pm on July 3rd. The peak wind speed of 101 mph was recorded at Cape Lookout. Hurricane Arthur was the earliest hurricane to hit North Carolina in a season since records began in 1851. All of the breeding areas were flooded and suffered wind damage. Predator exclosures were stripped off nests and posted signs were destroyed. Seven chicks fledged before the storm hit. Only two chicks were discovered to survive and fledge after the storm.

Ocracoke Inlet, Cape Point, Power Squadron Spit, and Kathryn-Jane Flats had no nests in 2014. Site by site reproductive successes for 2014 can be compared in Table 6.

Table 6. Differences in Reproductive Success between Major Nesting Areas in 2014.

Nesting Area	Hatch Success	Fledge Success
Portsmouth Flats	37%	0.00 chicks per pair
Old Drum Flats/Inlet	38%	0.00 chicks per pair
New Drum Flats	57%	0.31 chicks per pair
Ophelia Island	25%	0.33 chicks per pair
Plover Inlet	75%	0.36 chicks per pair

Predators

There were wild canine tracks on SCB in the Cape Point and Power Squadron Spit area in the summer. They appeared to be coyote (*Canis latrans*) tracks. This may partial explain the lack of piping plover pairs at these sites. Coyote predation events were recorded at other shorebird nests on SCB. Raccoon and feral cat (*Felis Catus*) tracks at nest sites continue to be a concern. Two nests were taken by mink. In 2014 no attempts were made to dig into predator exclosures by raccoons or other mammals. Numerous river otter (*Lontra canadensis*) tracks were documented at the Portsmouth Flats and New Drum Flats nesting areas. Productivity was low at these sites. An adult piping plover appeared to be taken by a river otter when the chicks were hatching (NCB nest 18). There were river otter tracks right up to the predator exclosure and a severed wing. The nesting female was not seen again. The remaining chick from nest 18 was taken by a gull-billed tern (*Gelochelidon nilotica*) a few days later.

Human Disturbance

Posted closures for bird nesting areas were not always respected by park visitors. Law enforcement rangers issued zero citations for pedestrians in bird nesting areas and zero citations for vehicles in bird areas in 2014.

Dogs were also a potential source of disturbance to nesting birds. Resource management staff did not specifically study dogs off leash in 2014, but from 2007 to 2013 79% of dogs were leashed and 21% of dogs were unleashed. Law enforcement rangers issued 1 dog off leash citation, 5 written warnings, and 35 verbal warnings on the core banks in 2014.

Non-nesting piping plovers

CALO continues to be an important migration stopover location and wintering site for piping plovers. Figure 6 illustrates non-breeding piping plover observations and critical habitat units. In 2014, 478 birds were recorded during 127 observations of piping plovers in the seashore during the non-nesting season. The area on NCB near Ocracoke Inlet again had high numbers of birds in spring and fall migrations. The area from Old Drum Inlet flats to Ophelia Inlet also had high numbers of birds counted in August and September. On NCB, 98 piping plovers were counted on the August 15th count and 69 on the September 15th count. Only 50 banded birds (10%) of the 478 non-breeding birds were recorded. There were 27 banded individuals identified. Eleven banded piping plovers from the Eastern Canada study were re-sighted. Eight banded piping plovers from the endangered Great Lakes population were re-sighted. In addition four birds banded in Massachusetts, two banded in New York, one banded in Georgia, and one banded in the Bahamas were re-sighted in 2014.

US Fish and Wildlife Service Biological Opinion

The USFWS provided CALO a biological opinion that included four performance measures for the Interim Protected Species Management Plan. Forty seven breeding pairs were found in CALO in 2014 surpassing the target of 25 or more pairs of performance measure one. Forty seven pairs produced 57 nests (1.21 nest per pair) surpassing the target of at least one nest per breeding pair of performance measure two. The 47 nesting pairs produced 9 fledglings for a fledge rate of 0.19, well below the target of 0.75 of performance measure three. The fledge rate is also below the 1996 USFWS recovery plan goal of 1.50 (USFWS 1996). Winter plover surveys at CALO were conducted at least once monthly from August until March to meet performance measure four.

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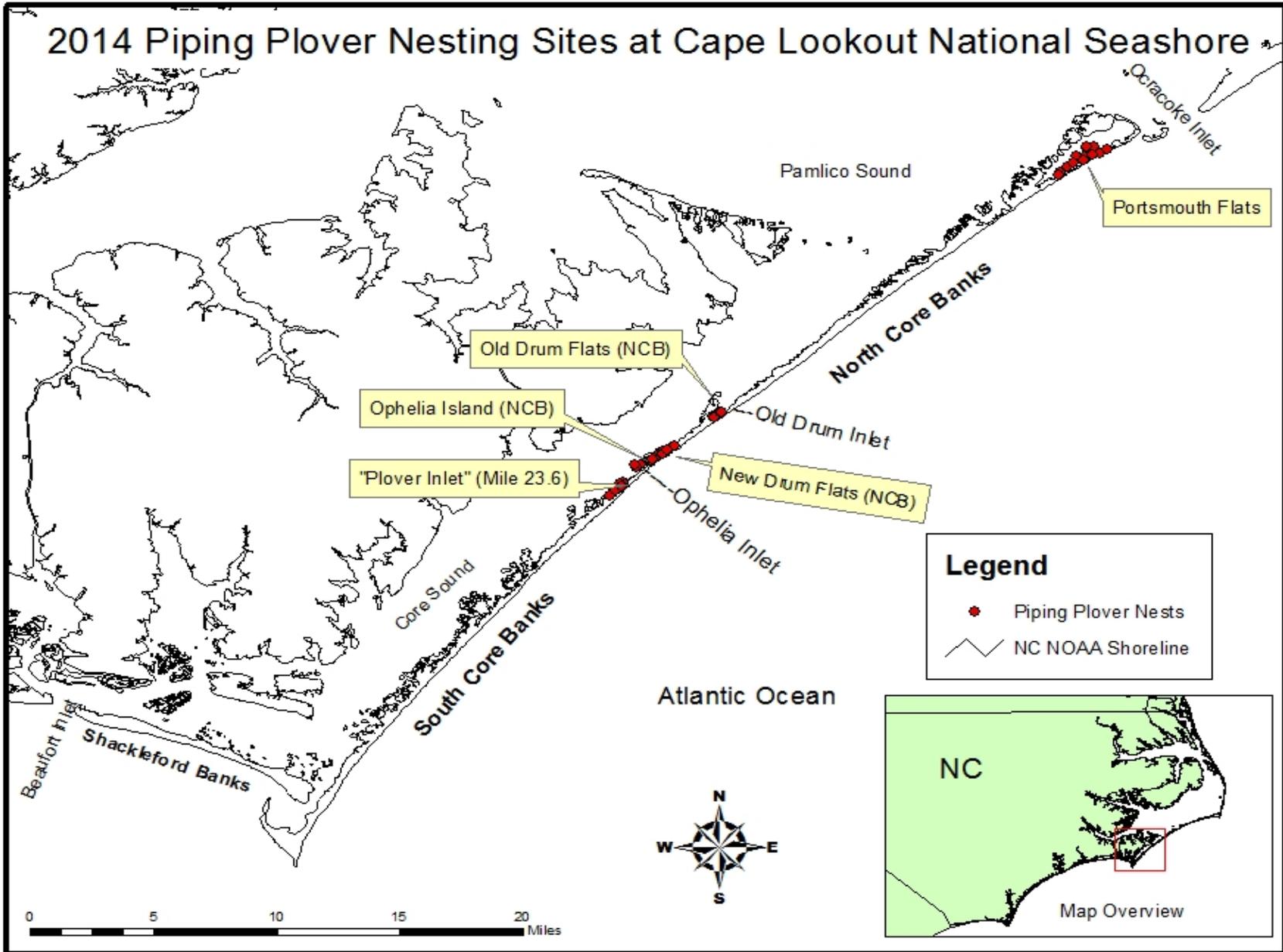


Figure 1. Map of 2014 Occupied Piping Plover Nesting Sites at Cape Lookout National Seashore.

Appendix 1- 2014 PIPING PLOVER WINDOW CENSUS

2014 Piping Plover breeding census results: June 1-9

North Core Banks: 36 pairs, 3 singles

Ocracoke Inlet	0
Portsmouth Flats	14 pairs, 1 single
Old Drum Inlet	6 pairs, 1 single
New Drum Inlet	13 pairs, 1 single male
Ophelia Island	3 pairs

South Core Banks: 11 pairs, 2 singles

Plover Inlet	11 pairs
Cape Point	0
Power Squadron Spit	2 single males

Shackleford Banks: 0 piping plovers

Cape Lookout National Seashore: 47 pairs, 5 single birds

Appendix 2- 2014 PIPING PLOVER NEST DATA

NORTH CORE BANKS 2014

Nest #	Pair #	MILE	DATE FOUND	CLUTCH SIZE	EXCLOSURE	HATCH DATE	EGGS HATCHED	# FLEDGED	COMMENTS (abbreviated)
1	1	2.45	23-Apr	3	10-May	31-May	1	0	Brood failed, unknown. Banded female adult LL-white, LR-yellow/black.
2	2	22.73	2-May	3	none	N/A	0	0	Nest failed, unknown cause. 0 eggs 5/31/14
3	3	21.56	7-May	4	none	30-May	4	1	Fledged 1 chick. Day 31 fledgling
4	4	22.23	9-May	4	none	6-Jun	4	1	Fledged 1 chick. Day 24 fledgling
5	5	21.44	9-May	2	none	N/A	0	0	Nest failed, unknown cause. 0 eggs 5/23
6	6	2.39	10-May	4	23-May	11-Jun	2	0	Brood failed, unknown. Chick last seen 6/19.
7	7	19.09	12-May	4	none	N/A	0	0	Nest failed, mink tracks at nest and 0 eggs 5/26
8	8	22.23	12-May	4	none	14-Jun	4	0	Brood failed 7/4 due to Hurricane Arthur.
9	9	3.51	13-May	3	22-May	12-Jun	3	0	Brood failed, unknown. Chicks last seen 6/17
10	10	19.35	14-May	4	none	N/A	0	0	Nest failed, unknown cause. 0 eggs 6/9
11	11	22.25	14-May	4	none	15-Jun	4	0	Brood failed 7/4, due to Hurricane Arthur.
12	12	21.71	14-May	4	none	N/A	0	0	Nest failed, unknown predation, yoke in nest cup 5/31
13	13	21.8	14-May	4	none	N/A	0	0	Nest failed, unknown cause. 0 eggs, nest cup blown over 5/23
14	14	2.91	15-May	3	23-May	10-Jun	3	0	Brood failed, unknown cause. Chicks last seen 6/13
15	15	3.22	15-May	4	22-May	N/A	0	0	Nest failed 5/28, ghost crab
16	16	2.45	17-May	4	17-May	11-Jun	4	0	Brood failed, unknown. Chicks last seen 6/17
17	17	1.95	17-May	4	none	N/A	0	0	Nest failed. Down to 2 eggs on 5/20, then abandoned
18	18	1.65	18-May	4	24-May	19-Jun	4	0	Brood failed. Severed plover wing found outside closure 6/19 with river otter tracks. Chick seen on ocean beach 6/27-6/30. RS saw chick killed by gull-billed tern on 6/30.
19	19	2.21	18-May	2	none	N/A	0	0	Nest abandoned/sanded in 5/21
20	20	21.98	23-May	3	none	14-Jun	3	2	Fledged 2 day 25 chicks. Male and 2 fledgings seen foraging and traveling together in territory 7/10, survived Hurricane Arthur
21	21	21.72	23-May	1	none	N/A	0	0	Nest failed, ghost crab hole at nest on 5/26

22	22	21.62	23-May	1	none	N/A	0	0	Nest failed, unknown cause. 0 eggs 5/26
23	23	3.61	24-May	2	none	N/A	0	0	Nest failed, unknown cause. 0 eggs 5/27
24	24	22.61	25-May	2	none	2-Jun	1	1	Fledged 1 chick, chick seen on 6/30 at 24+ days, did not see chick fly, day 25 fledge
25	25	22.18	26-May	4	none	18-Jun	4	0	Brood failed 7/4, due to Hurricane Arthur. Chicks last seen 7/2. 4 chicks seen on 6/20
26	26	21.74	26-May	4	none	25-Jun	4	0	Brood failed 7/4, due to Hurricane Arthur. Chicks last seen 7/2
27	27	19.13	26-May	4	none	9-Jun	4	0	Chicks last seen 7/2 at 23 days old. Chicks never seen after Hurricane Arthur
29	28	19.26	26-May	4	none	14-Jun	4	0	Brood failed, cause unknown, not seen after leaving nest area, heavily vegetated area.
30	29	19.0	2-Jun	3	none	N/A	0	0	Nest failed, cause unknown. 0 eggs 6/14
31	30	19.36	2-Jun	3	none	N/A	0	0	Nest cup empty 6/30- never saw any chicks
32	31	2.42	4-Jun	4	7-Jun	19-Jun	3	0	weird nest, see nest sheet for hatch/chick info
33	7	19.16	6-Jun	4	none	2-Jul	2	0	Brood failed 7/4, to Hurricane Arthur. Nest last seen hatching on 7/2, no chicks seen after that
34	32	2.04	7-Jun	4	11-Jun	N/A	0	0	flooded on 6/14. 1 egg on 6/15, abandoned
35	33	2.73	12-Jun	4	13-Jun	N/A	0	0	Nest flooded 6/14, then abandoned
36	1	2.45	15-Jun	3	19-Jun	N/A	0	0	Nest failed 7/4, Hurricane Arthur. Banded female adult LL-white, LR-yellow/black.
37	34	22.80	17-Jun	4	none	N/A	0	0	lost 1 egg 6/20, washed during hurricane 7/4
38	2	22.80	17-Jun	3	none	N/A	0	0	Nest washed out during hurricane 7/4
39	35	21.14	20-Jun	4	none	N/A	0	0	Lost 1 egg, raccoon tracks, on 6/30. 0 eggs, ghost crab hole on 7/2
40	5	21.48	20-Jun	4	none	20-Jun	3	0	Brood failed during hurricane, 7/4, last seen 7/2
41	32	2.04	21-Jun	2	none	N/A	0	0	Nest failed, cause unknown. 0 eggs 6/28
42	16	2.45	22-Jun	4	28-Jun	N/A	0	0	Nest washed out during hurricane 7/4
43	29	19.05	23-Jun	1	none	N/A	0	0	Nest washed out during hurricane 7/4
44	19	2.21	24-Jun	4	none	N/A	0	0	Nest washed out during hurricane 7/4
45	36	2.57	25-Jun	1	none	N/A	0	0	Nest flooded 6/27, 0 eggs 6/38
46	14	2.95	29-Jun	3	none	N/A	0	0	Nest washed out during hurricane 7/4

36 nesting pairs, 45* nests, 19 hatched nests, 5 chicks fledged

*Nest # 28 was a Wilson's Plover and has been omitted from this data, but the nest number sequence remains.

SOUTH CORE BANKS 2014

Nest #	Pair #	MILE	DATE FOUND	CLUTCH SIZE	EXCLOSURE	HATCH DATE	EGGS HATCHED	# FLEDGED	COMMENTS (abbreviated)
1	1	23.56	4-May	2	12-May	24-May	2	1	Iplovered, foraged on soundside
2	2	24.14	6-May	4	12-May	N/A	0	0	Iplovered, failed on 6/2, mink predation-tracks at nest and dried egg yolk in sand
3	3	23.81	14-May	4	none	13-Jun	4	0	Iplovered, chicks failed in first week, soundside foraging
4	4	23.83	14-May	3	none	12-Jun	3	0	Iplovered, chicks failed by 6/28, soundside foraging
5	5	23.86	14-May	3	none	10-Jun	2	0	Iplovered, chick last seen on day 22 on 7/2 before Hurricane on 7/4, soundside foraging
6	6	23.66	14-May	4	none	N/A	0	0	Iplovered, nest failed on 6/2 unknown
7	7	23.73	14-May	4	none	3-Jun	3	2	Iplovered, didn't see fledglings after hurricane, soundside foraging
8	8	24.27	14-May	3	22-May	9-Jun	3	0	Iplovered, chicks lost by 6/29, last seen on 6/28 at day 19, soundside foraging
9	9	23.52	19-May	4	none	6-Jun	3	1	Iplovered, day 25 fledge on 7/1, chick foraged on soundside
10	10	23.6	30-May	3	4-Jun	20-Jun	3	0	Iplovered, chicks last seen on 7/2 at 12 days old , not seen after Hurricane, chicks foraged on soundside
11	11	23.92	3-Jun	4	none	10-Jun	4	0	Iplovered, chicks last seen on 7/2 at day 22, soundside forage
12	6	23.68	23-Jun	4	25-Jun	N/A	0	0	Iplovered, nest washed away by Hurricane Arthur on 7/4

11 nesting pairs, 12 nests, 9 hatched nests, 4 chicks fledged

Appendix 3. Chart 1 Piping Plover Nesting and Chart 2 Piping Plover Productivity.

Chart 1. Piping Plover Nesting at Cape Lookout National Seashore

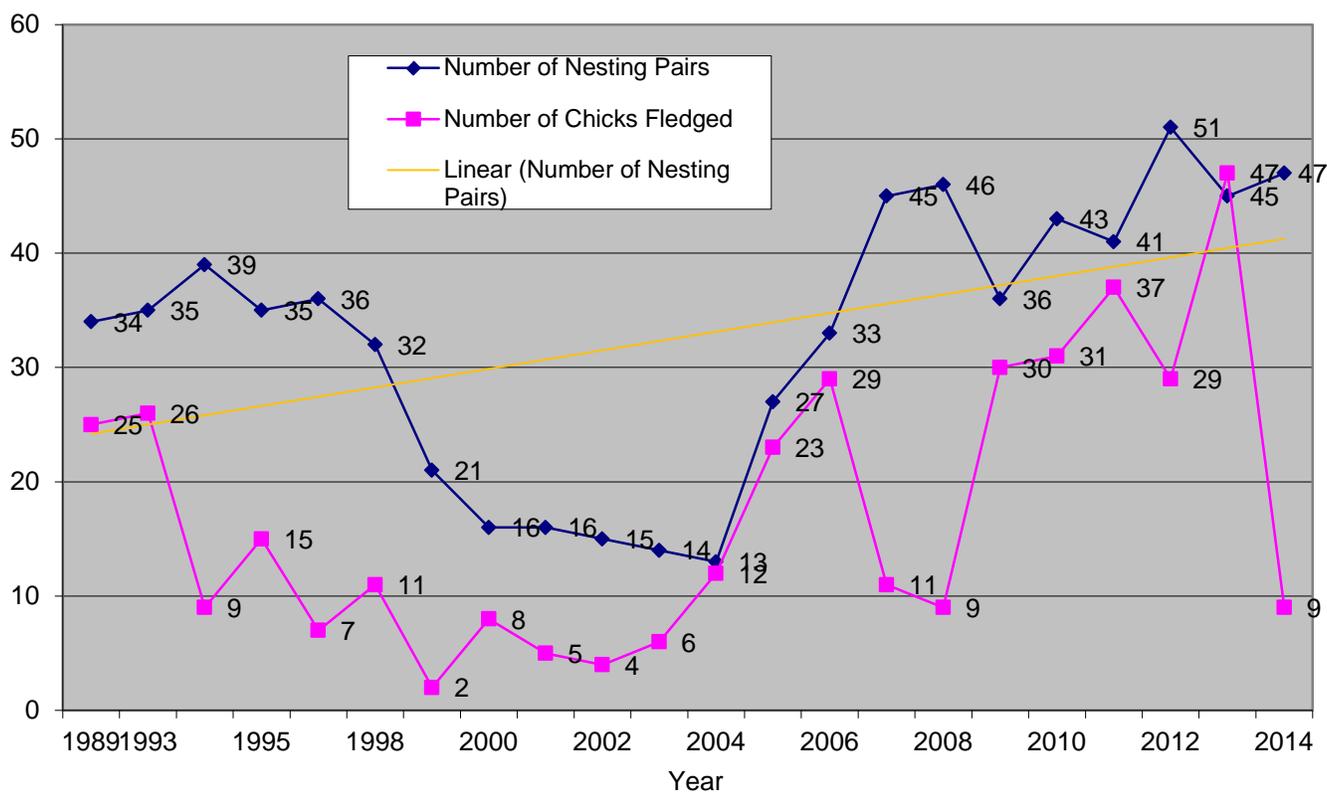


Chart 2. Piping Plover Productivity with Simple Linear Regression Line at CALO

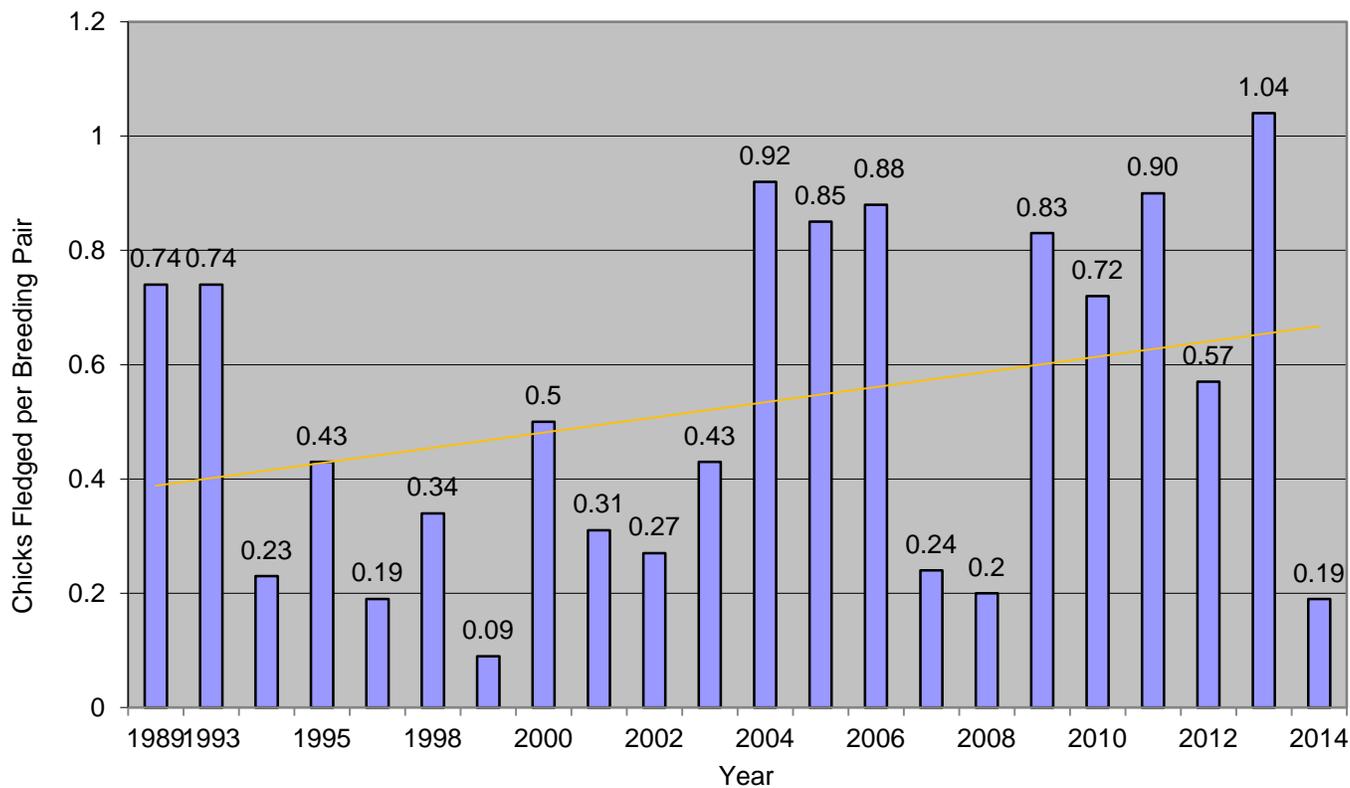
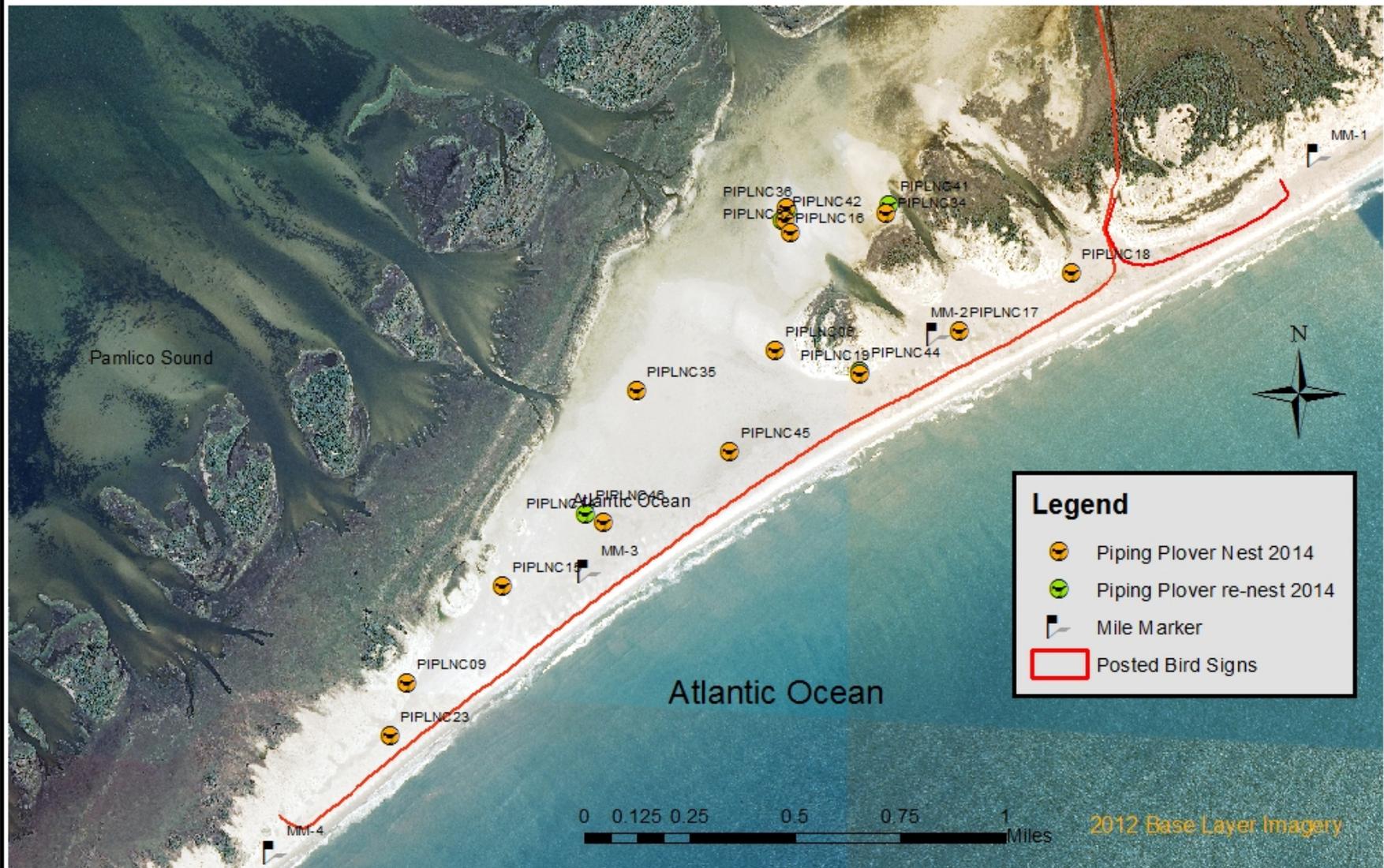




Figure 2. Portsmouth Flats Nesting Site

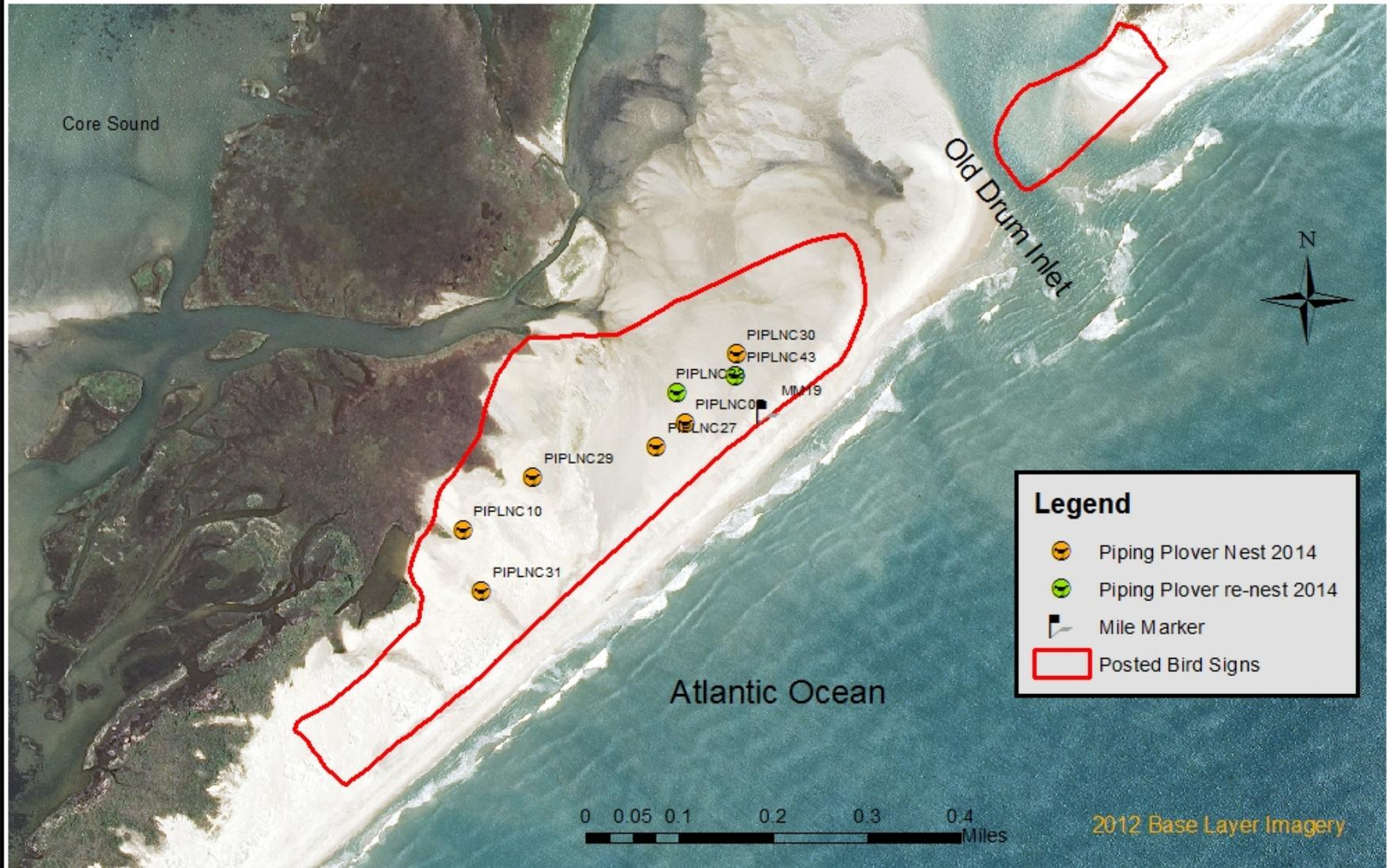


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Figure 3. Old Drum Inlet Nesting Site

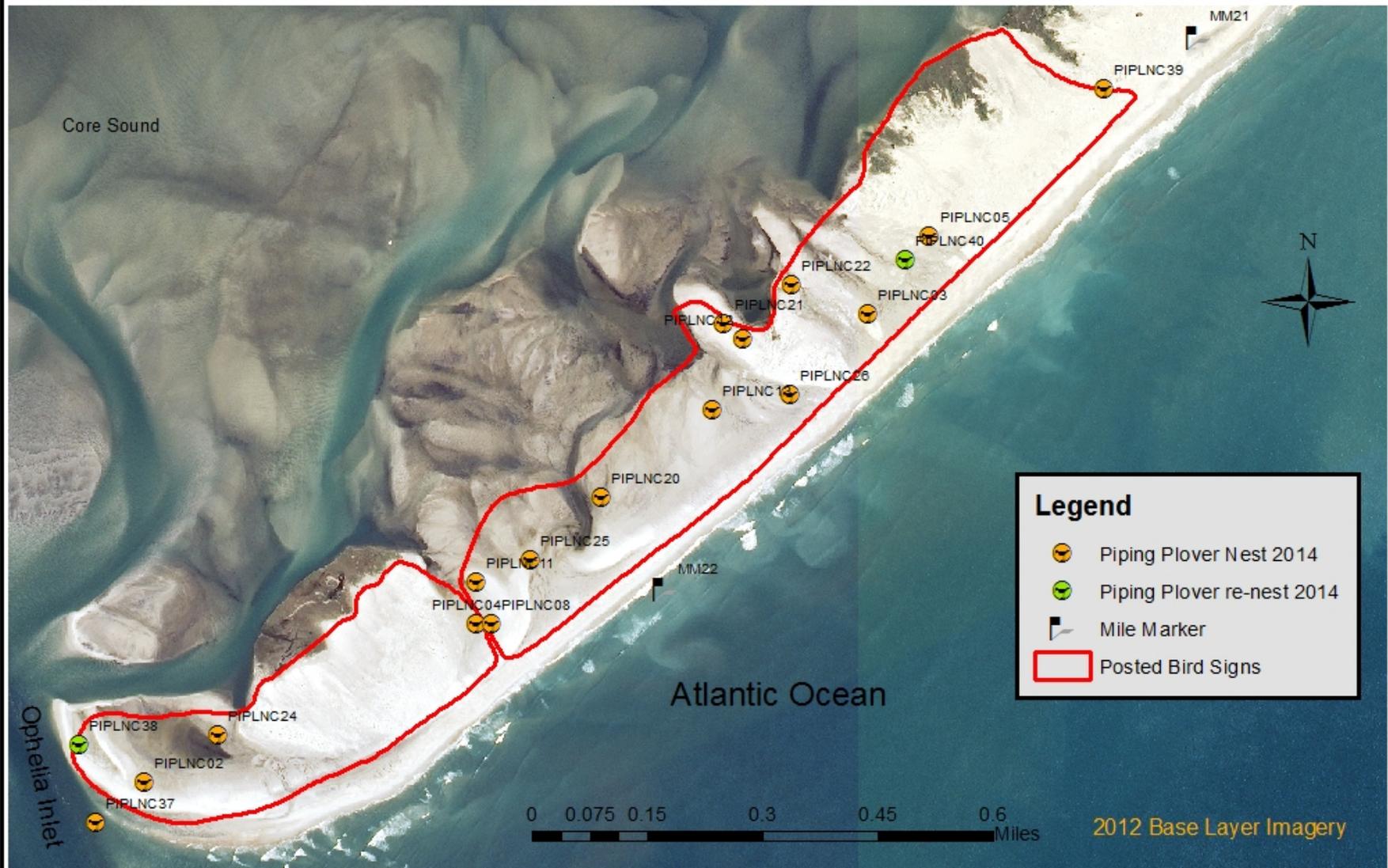


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Figure 4. New Drum Flats and Ophelia Island Nesting Sites

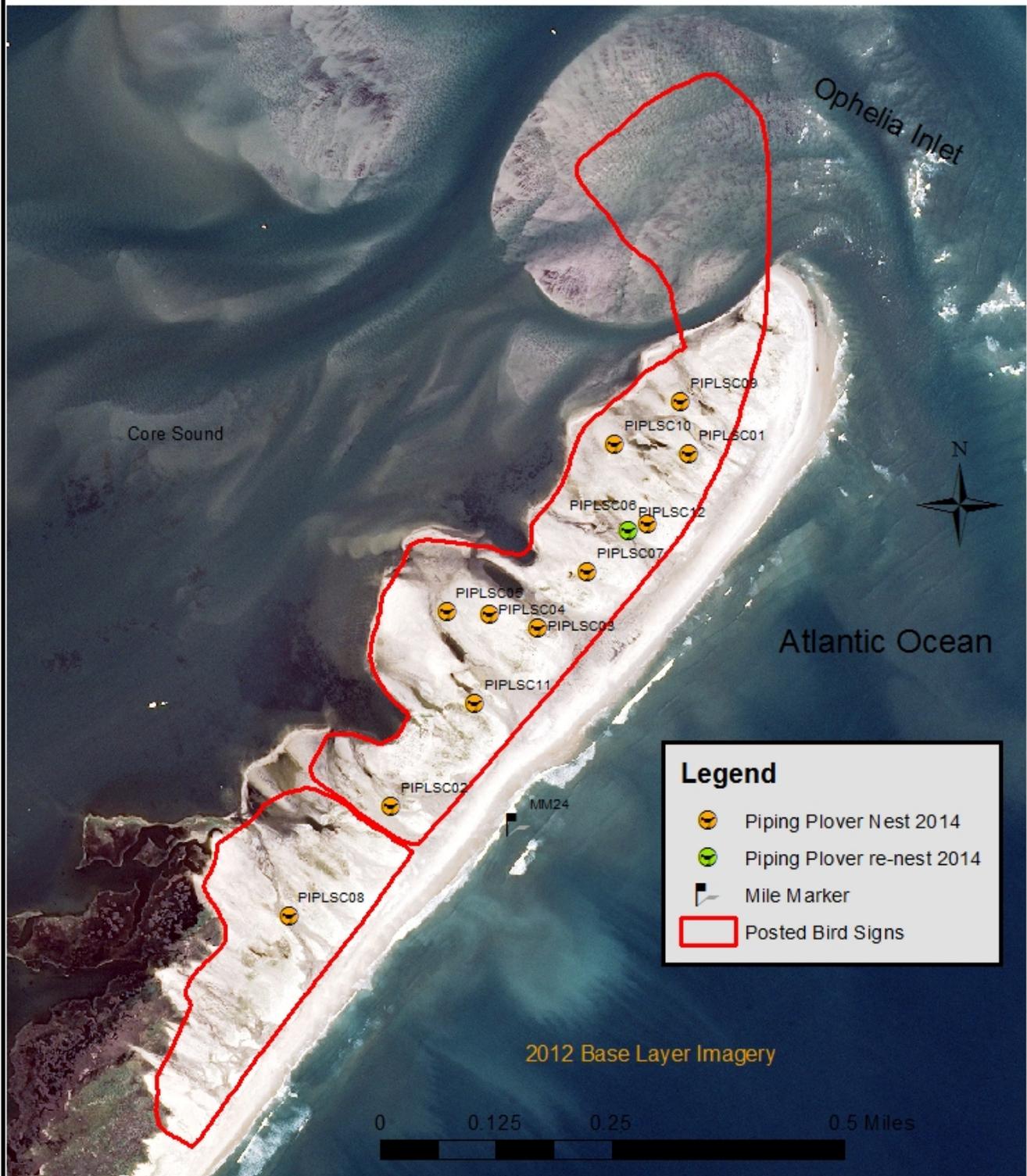


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Figure 5. Plover Inlet Nesting Site



Appendix 4. Monthly counts of non-nesting piping plovers 2008-2014

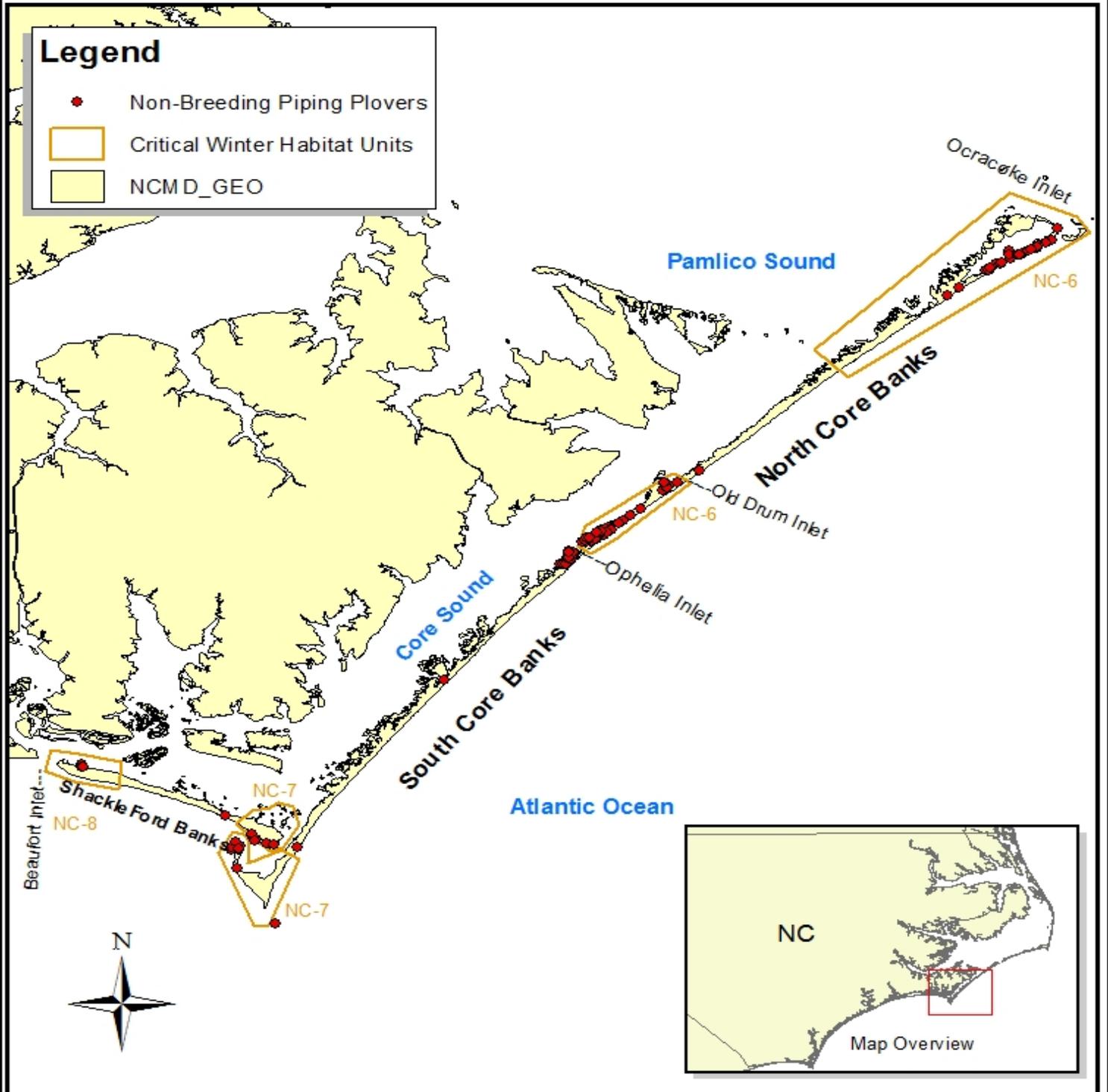
Date	North Core Banks	South Core Banks	Shackleford Banks	CALO Total
January-08	0	2	11	13
February-08	0	6	10	16
March-08	6	6	10	22
August-08	41	28	17	86
September-08	16	20	10	46
October-08	25	9	20	54
November-08	11	4	9	24
December-08	9	7	8	24
January-09	6	18	13	37
February-09	2	9	12	23
March-09	10	17	?	≥27
August-09	83	26	2	111
September-09	144	33	10	187
October-09	22	19	13	54
November-09	18	12	12	42
December-09	12	14	23	49
January-10	17	8	11	36
February-10	8	5	11	24
March-10		10	6	≥16
August-10	125	23	4	152
September-10	70	32	17	119
October-10	35	13	4	52
November-10	8	19	9	36
December-10	4	3	6	13
January-11	6	2	7	15
February-11	7	0	8	15
March-11	12	8	13	33
August-11	81	26	0	107
September-11	29	8	20	57
October-11	26	19	6	51
November-11	7	3	11	21
December-11	2	4	11	17
January-12	0	2	5	7
February-12	0	2	10	12
March-12	5	1	?	≥6
August-12	82	32	4	118
September-12	112	7	9	128
October-12	0	3	12	15
November-12	3	7	5	15
December-12	6	6	2	14
January-13	?	4	3	7
February-13	4	0	10	14
March-13	5	9	4	18
August-13	93	6	15	114
September-13	115	15	23	153
October-13	17	?	?	≥17
November-13	6	5	5	16
December-13	12	3	4	19
January-14	0	12	0	12
February-14	0	0	9	9
March-14	7	42	4	53
August-14	98	44	9	151
September-14	69	12	1	82
October-14	12	12	0	24
November-14	13	6	4	23
December-14	4*	14	3	21

Appendix 5. Banded Piping Plover Observations at CALO in 2014

Initial Date	Upper Left Leg	Lower Left Leg	Upper Right Leg	Lower Right Leg	Island	Comments: population, state, park code, (other re-sight dates at CALO)
1/15/2014	metal	light blue	orange	light blue/orange	SCB	Great Lakes, MI
1/15/2014	metal	orange/blue	none	blue	SCB	Great Lakes, Ontario Canada
4/14/2014	none	white	none	yellow black	NCB	Bahama, CALO (4/14-8/16)
7/20/2014	green flag (23)	none	yellow	none	NCB	New York, FIRE band on 7/14/14
7/30/2014	metal	none	black flag (P5)	none	NCB	Nova Scotia, Canada (7/30-9/16)
8/8/2014	black flag (LO)	none	none	metal	NCB	Quebec, Canada (8/8-8/22)
8/14/2014	metal	red	orange flag	blue blue	SCB	Great Lakes, MI, SLBE, (8/14-12/15)
8/14/2014	blue	none	orange	none	MCB	Chapin Beach, MA
8/14/2014	metal	red	orange flag	black blue	MCB	Great Lakes, MI, (8/14-12/15)
8/14/2014	green flag	green/orange	none	yellow/green	MCB	Georgia, CUIS
8/14/2014	metal	orange	orange flag	black orange	MCB	Great Lakes, MI (8/14-12/15)
8/14/2014	metal	none	white flag (C9)	none	MCB	New Brunswick, Canada
8/15/2014	black flag (M5)	none	metal	none	NCB	Nova Scotia, Canada
8/16/2014	blue	none	red	none	NCB	Sandwich, MA
8/16/2014	green	none	black	none	NCB	Barnstable, MA
8/16/2014	metal	none	black flag (TH)	none	NCB	Prince Edward Island, Canada
8/22/2014	metal	none	black flag (L5)	none	SB	Quebec, Canada (8/22-9/5)
9/10/2014	metal	none	grey flag (HU)	none	NCB	Nova Scotia, Canada
9/10/2014	black flag (PO)	none	metal	none	MCB	Nova Scotia, Canada
9/10/2014	metal	none	black flag (LL)	none	MCB	Quebec, Canada
9/10/2014	metal	none	black flag (TK)	none	MCB	Prince Edward Island, Canada(9/10-10/5)
9/18/2014	grey flag (CO)	none	metal	none	MCB	Nova Scotia, Canada
9/25/2014	metal	green/orange/green	orange	none	SCB	Great Lakes, Unk (9/25-10/13)
9/28/2014	metal	blue orange	none	none	MCB	Great Lakes, Unk
10/6/2014	green flag (97)	none	orange	none	SCB	NY, FIRE
10/10/2014	black	none	yellow	none	MCB	Sandwich, MA
11/5/2014	orange	none	metal	light blue	MCB	Great Lakes, MI, SLBE (11/5-12/15)



Figure 6. Piping Plover Non-Breeding Observations 2014



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