

**CAPE HATTERAS NATIONAL SEASHORE  
PIPING PLOVER (*CHARADRIUS MELODUS*) MONITORING  
2011 ANNUAL REPORT**



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## **ABSTRACT**

In 2011, 15 Piping Plover [*Charadrius melodus* (PIPL)] pairs and 18 nests were identified. Ten PIPL chicks successfully fledged from six broods for a fledge rate of 0.67 chicks per breeding pair. The first PIPL nest of the season was discovered on April 15, 2011. The 2011 breeding season was the fourth breeding season and third complete year that Cape Hatteras National Seashore (CAHA) was managing under the requirements of the Consent Decree (CD).

## **INTRODUCTION**

North Carolina is currently the only state on the Atlantic Coast that hosts PIPLs during all phases of their annual cycle. In addition to the federally listed PIPL, CAHA provides nesting habitat for several species of state-listed colonial waterbirds, including the common tern, least tern, gull-billed tern, and black skimmer. Solitary nesters, such as the American oystercatcher and the Wilson's plover, also use CAHA as a breeding area. Because PIPL eggs are cryptic and the nesting PIPL population at CAHA is so low, a disproportionate amount of field staff time is geared toward documenting the breeding behavior and nesting efforts of PIPL when compared to the other nesting shorebirds that occur on CAHA.

The PIPL is a small sandy-colored shorebird with a black band across the forehead and a black collar around the neck. The Atlantic Coast population typically breeds on coastal beaches from Newfoundland and southeastern Quebec to North Carolina. Nesting territories are usually established in late March or early April. PIPL lay three to four eggs in a small, shallow depression or scrape. Upon completion of a clutch, the pair incubates until the eggs hatch in 23-29 days. Both the eggs and chicks are cryptic in coloration, which makes it difficult to see them. Chicks are precocial and follow the adults to locations where they forage for invertebrates found in and on the sand. During 2011 the chicks at CAHA fledged between 25–29 days after hatching.

In 1986, the Atlantic coast population of the PIPL was listed as threatened under the Endangered Species Act. Various factors have contributed to the decline of the species including; the loss of habitat due to development; loss of habitat due to erosion; predation; intentional or unintentional disturbance by dogs, people, and vehicles; and weather (i.e. tropical storms or late nor'easters that cause extreme high tides).

PIPL monitoring at CAHA began in 1985. Monitoring has focused on identifying nesting habitat, locating and protecting PIPL breeding territories and nests, and determining nest and brood success. This report contains a summary of monitoring results for the 2011 breeding season, comparisons to results from previous years, and the resource management activities undertaken for PIPL in 2011.

## **Consent Decree**

In October 2007, a lawsuit was brought against the NPS by the Defenders of Wildlife and the National Audubon Society for failure to provide adequate protection of threatened and endangered species and species of concern from the impacts of off-road vehicle (ORV) use at CAHA. On April 30, 2008, a settlement agreement that had been reached between all parties to

the lawsuit was approved by the U.S. District Court as a consent decree (CD). The purpose of the CD was to provide additional protection measures pending the development of an ORV management plan and special regulation. Examples of changes in management as a result of the CD included earlier dates for the establishment of pre-nesting closures and larger buffer requirements for nesting birds and chicks. This was the fourth year that the CD determined the management of protected species at CAHA.

## **METHODS**

### **Closures**

While pre-nesting closures minimize disturbance in potential breeding areas, they also enable birds to establish territories and to nest in their preferred habitat. Because CAHA's shoreline is dynamic in nature, a habitat evaluation was conducted February 14-15, 2011, prior to the onset of the breeding season. This evaluation, along with maps of historic nesting locations, was used to determine the boundaries for the pre-nesting closures (Appendix A, Maps 1-7). These sites were then posted with symbolic fencing consisting of wooden posts, bird usage signs prohibiting entry, string, and flagging tape by March 15, as required by the CD. The pre-nesting closures included the upper beach, dunes, sand/mud flats, sound-side intertidal zone, overwashes, blowouts, and ocean tidal zones. Bodie Island Spit, Cape Point, South Beach, Hatteras Overwash Fans, Hatteras Inlet Spit, North Ocracoke Spit, and South Point Ocracoke (South Point) all contained potential and/or historic nesting habitat for PIPLs. The spit on north Ocracoke was accreting up until the passage of Hurricane Irene, while the historic nesting locations at Hatteras Inlet continue to disappear further into the waters of the inlet. The Hatteras Overwash Fans have no documented nesting history for PIPL but had the potential to be used as nesting habitat.

Pre-nesting closures were established by March 15, 2011 at Bodie Island Spit, Cape Point, South Beach, Hatteras Overwash Fans, Hatteras Inlet Spit, North Ocracoke Spit, and South Point (Appendix A, Maps 1-7). All pre-nesting closures were of the same general configuration, to the extent possible, as the 2008 season closures as is required by the CD.

The pre-nesting closure at Bodie Spit began at the north end of the Bait Pond over wash area (~0.6 mi south of Ramp 4) and included a 100-foot ORV corridor extended for approximately 1.9 miles of shoreline. A narrow pedestrian corridor, parallel to the Bonner Bridge, allowed access to the Bait Pond.

The pre-nesting closure at Cape Point allowed shoreline access from Ramp 44 to the Point. Due to PIPL nesting near the south end of the by-pass in 2009 and 2010, the by-pass road was closed. A full beach closure started on the east side of the Salt Pond drainage area and continued west for approximately 1 mile of shoreline. The western end of the Cape Point full beach closure terminated in the area between Salt Pond Ramp and Ramp 45 (~300 meters east of Ramp 45).

From Ramp 45 to approximately 1.5 miles west of Ramp 45, the upper section of South Beach (~100 feet above high tide) was protected by a pre-nesting closure.

A pre-nesting closure was established at the Overwash Fans near Hatteras Inlet. Although in the past the Pole Road was closed as a result of the establishment of the pre-nesting closure, this year a pass-through was established and the Pole Road remained open.

At Hatteras Inlet Spit, a full beach closure began just west of Pole Road exit (~2.2 miles WSW of Ramp 55), continued around the spit and ended where the Spur Road intersects with the sound. Approximately 0.4 miles of shoreline (including the inlet) was closed to pedestrians and ORVs.

This was the third year that a pre-nesting closure was established on North Ocracoke Spit because of the recent accretion and new potential habitat at this site. The closure began just north of Ramp 59. A 100 foot ORV corridor extended for approximately 0.9 miles of ocean and inlet shoreline and a pedestrian corridor extended for an additional 0.1 miles of shoreline.

The pre-nesting closure at South Point began 0.3 mi southwest of Ramp 72 with a 100-foot ORV and pedestrian corridor which allowed access along the ocean and part of the inlet shoreline. The full beach closure started approximately 2.5 miles southwest of Ramp 72 (or 0.3 miles southeast of where Ocracoke Inlet meets the sound).

The pre-nesting closures were modified throughout the season based on observed bird activity in order to meet the buffer requirements of the CD and to provide adequate protection for nesting birds and broods. A closure was modified when breeding behavior (territorial behavior, courtship, or mating) was observed close to the edge or outside of a closure or if a scrape, nest or chick was located with inadequate buffers. Closures were also modified if breeding adult plovers were documented foraging outside of established closures. Buffer requirements of the CD differ for each protected avian species (Table 1). When several species of nesting birds were present, the greatest applicable buffer distance was used.

Table 1. Nest and Chick Buffers Required by the CD.

Species	Breeding Behavior/ Nest Buffer (m)	Unfledged Chick Buffer (m)
Piping Plover	50	1000 (ORV only) 300 (pedestrian only)
American Oystercatcher	150	200
Least Tern	100	200
Other Colonial Waterbirds	200	200

### Monitoring

Resource management staff began monitoring for PIPL arrival and pre-nesting behavior in early March. At the spits, Cape Point, and South Beach, monitoring was conducted daily. Observations were made until July 15, as required by the CD. Monitors looked for various territorial (e.g. aerial flight displays, horizontal threat displays, and parallel runs) and breeding (e.g. high step tattoo, wing-tilt display, scraping, and copulation) behaviors in order to determine where territories were being established. Monitors took GPS waypoints for scrapes and ensured all breeding behaviors were properly buffered and modified the closures if the buffer was too small. After a nest was located, a predator enclosure was installed, generally after at least three

eggs were laid. Thereafter, the nest was briefly approached once weekly to inspect the enclosure, verify the number of eggs, and check for predator tracks. The nests were also monitored, from a distance, daily for incubation in an effort to detect nest abandonment or other potential problems. Morning and evening monitoring began five to seven days prior to when nests were expected hatch.

After hatching, broods were monitored for a few hours in the morning and a few hours in the afternoon until the chicks fledged or were lost. Monitoring was subject to occasional interruptions from unplanned demands on the monitor. During these times, chicks were never at risk of being run over by ORVs because of the size of the large buffer surrounding the chicks. Observers documented in their notes: brood status, behavior, individual bird and/or brood movements, human disturbance, predator interactions, or other significant environmental events.

### **Predator Exclosures**

Predator exclosures have been used at CAHA since 1994 to reduce impacts from predators on nesting plovers. Exclosures are circular in shape (roughly ten feet in diameter), made of two inch by four inch welded-wire fence anchored by steel rebar and topped with a three-quarter inch mesh bird netting. Exclosures were installed following the guidelines established in the USFWS' Piping Plover Recovery Plan (USFWS 1996, Appendix F). If a nest was discovered prior to clutch completion (i.e. less than four eggs), predator exclosures were, in general, installed when there were three eggs present because of the high rates of predation in the past.

### **Predator Control**

Because mammalian predation is a major factor in PIPL nest loss and chick mortality at the Seashore, predator control by trapping was conducted to target predators near nests and chicks in 2011. Trapping was conducted in all districts. When technicians walked through areas they documented and reported any signs (prints, scat, etc) of predators they observed. If predator sign was found in a closure, trapping efforts were increased in that area. Traps were installed in the vicinity of the closure with the intent of targeting the specific predator in that area.

### **Winter Closures**

Winter closures, consisting of areas marked with carsonite posts that were closed to ORV use or areas marked with symbolic fencing that were closed to all visitors activities, were established upon removal of the pre-nesting closures from August 4 through August 15 (Appendix A, Map 8) to provide relatively undisturbed areas for migratory and over-wintering PIPL. In the fall and to a lesser degree in the spring large numbers of PIPL migrate through CAHA. The winter closures were installed in preferred foraging and resting locations, which included Bodie Island Spit, Cape Point, Hatteras Overwash Fans, Hatteras Inlet Spit, North Ocracoke, and South Point. The winter closure at Bodie Spit was revised on September 15 after Hurricane Irene significantly modified the landscape in this area. The Bodie Island Spit area was separated from Bodie Island when a new sound to ocean channel was formed through "the flats" area. The new island is inaccessible to ORVs as well as pedestrians. The former winter closure was modified to protect the foraging habitat north of the new channel. All of the winter closures are closed to ORVs however many of them remain open to pedestrians.

## **Migrating and Wintering Piping Plovers**

Surveys for the Southeast Coast Inventory Monitoring Network Migratory and Wintering Shorebird Monitoring Study were conducted weekly from April 2010 through March 2011. No surveys were conducted in June when all the PIPL present are assumed to be breeders and not migrants. This was the first time that the protocols were implemented in their entirety (i.e. not just at the points and spits) by CAHA since park staff took over this responsibility from Southeast Coast Network staff. The sampling regime consisted of a two-tiered sampling approach consisting of high-intensity and low-intensity sampling units. The high-intensity sites were sampled on a weekly basis whereas all the low-intensity sampling units were sampled on a monthly basis. Semi-permanent transect locations were established along the entire ocean shoreline. The majority of transects were one mile in length and were numbered Park Mile 0 through Park Mile 74. Many of the spits and Cape Point contained more than one transect. Transects in these areas varied in length due to the constantly changing shorelines. Some of these areas also required more than one transect because of the width of the beach that needed to be surveyed (Appendix A, Maps 9-13). These transects were walked at a pre-determined pace (2 mph) to standardize data collection and allow for comparisons between the different areas. All target species including PIPL, American oystercatchers (AMOY), Wilson's Plovers (WIPL), red knots (REKN), black-necked stilts (BNST), whimbrels (WHIM), and sanderlings (SAND) were documented. Species, number observed, and habitat type were documented. Whether the species was inside or outside a resource closure (i.e. protected vs. not protected area) or in a pedestrian only area (i.e. open to pedestrians but closed to ORVs) was also documented. Pedestrians, ORVs and dogs observed outside closures but within the survey area were documented as well. The goal of these surveys is to determine areas of consistent use by the target species and to consistently and systematically collect data that park managers can utilize when making management decisions.

## **RESULTS AND DISCUSSION**

### **Productivity**

The 2011 breeding season was not as successful in terms of productivity as the 2010 season but was still considered a good year (Figure 1). Fifteen breeding pairs of PIPL were identified through field observations, matching the previous high of 15 pairs documented in 1989 (ORV Management Plan/EIS). CAHA appears to have recovered from the sharp decline in pair numbers that started in 1996 and continues to exhibit an upward trend in breeding pair numbers. In 2011, nesting occurred at five sites: Bodie Island Spit, Cape Point, South Beach, North Ocracoke Spit and South Point (Appendix A, Maps 14-18). After a two year absence from the area, two pairs nested on Bodie Island Spit. Five pairs were documented at Cape Point and two pairs were documented on South Beach. This was the second year in a row that a pair nested on North Ocracoke Spit before which the last documented nesting had occurred in 1996. The five pairs identified on South Point were the most ever recorded for that area.

The first nest of the 2011 breeding season was discovered on April 15. For the nine nests with known incubation periods that also hatched, the average incubation period was 27 days, the shortest incubation period was 23 days and the longest was 29 days. The youngest chick to fledge was 25 days old and the oldest was 29 days old. The average fledge time was 27.7 days (Table 2). Six of 12 broods produced fledglings and ten chicks fledged in 2011.

Figure 1. Fledged PIPL Chicks vs. Broods with Fledged Chicks with Means (1992-2011).

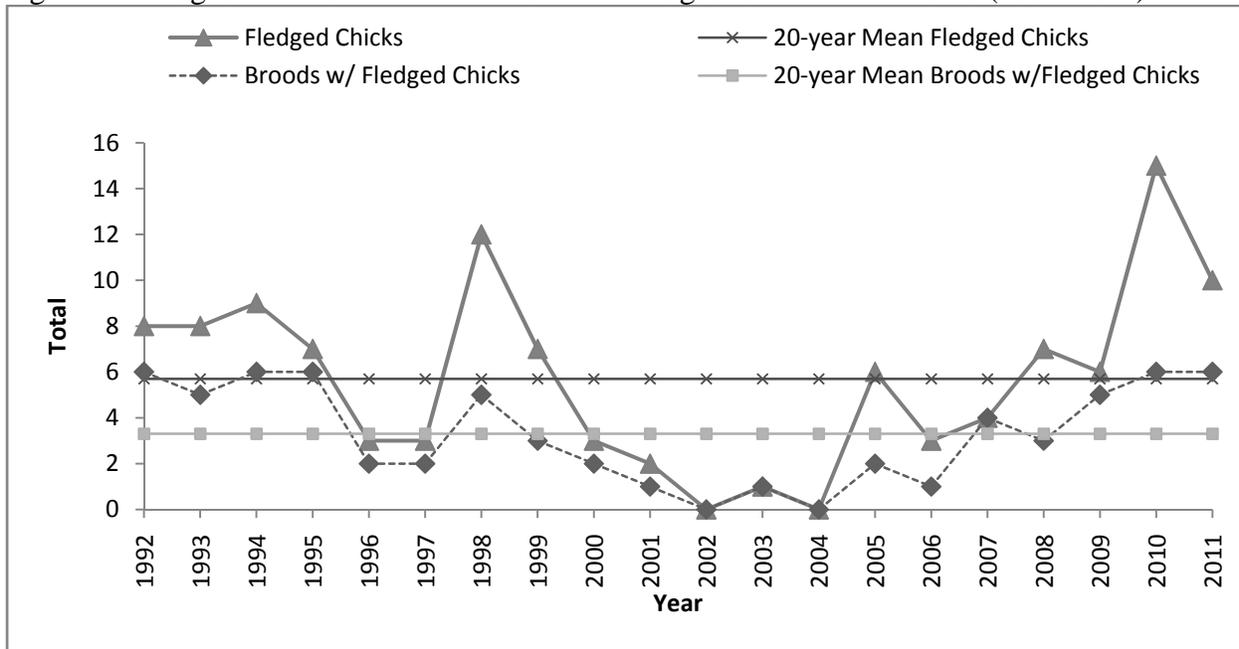


Table 2. Breeding Season at CAHA in 2011.

Nest #	Pair #	Location	Date Found	Incub Started	Incub Days	Hatch Date	Fledge Date	# Fledged	Days to Fledging
BI01	1	Bodie Spit	6/12	UNK		7/6	8/3	2	28 & 28
BI02	2	Bodie Spit	6/26	UNK		7/18	N/A	0	
HI01	1	Cape Pt.	4/15	4/22	23	5/15	6/13	1	29
HI02	2	Cape Pt.	4/18	4/22	26	5/18	6/13 6/15	3	26 & 28 & 28
HI03	3	South Beach	4/20	NA		N/A	N/A	N/A	
HI04	4	Cape Pt.	4/27	UNK		5/23	6/17	1	25
HI05	5	Cape Pt.	5/5	5/9	28	6/6	7/5	2	29 & 29
HI06	6	Cape Pt.	5/8	5/13	27	6/9	N/A	0	
HI07	7	South Beach	5/10	5/14	29	6/12	N/A	0	
OI01	1	South Pt.	4/28	5/3	24	5/27	N/A	N/A	
OI02	2	South Pt.	5/6	5/6	28	6/3	6/30	1	27
OI03	3	South Pt.	5/9	UNK		N/A	N/A		
OI04	4	North Ocracoke Spit	5/16	5/19	28	6/16	N/A	N/A	
OI05	5	South Pt.	5/29	6/1	27	6/28	N/A	N/A	
OI06	3	South Pt.	6/5	6/5		N/A	N/A	N/A	
OI07	3	South Pt.	6/23	NA		N/A	N/A	N/A	
OI08	6	South Pt.	6/25	6/26		N/A	N/A	N/A	
OI09	1	South Pt.	6/26	NA		N/A	N/A	N/A	
				Avg.	27			Avg.	27.7

The 15 PIPL pairs produced 18 known nests this season (Table 3). Twelve nests successfully hatched; two at Bodie Island Spit, five at Cape Point, one on South Beach, one on North Ocracoke Spit and three at South Point. The average clutch size for all nests was three eggs. Of the 57 eggs laid, 35 hatched, including six eggs from Bodie Island Spit, 15 eggs from Cape Point, three from South Beach, two from North Ocracoke Spit and nine eggs from South Point for a hatch rate of 61% (Tables 4, 4a).

Table 3. PIPL Nest and Chick Success in 2011.

Location	# Breeding Pairs	# Nests	# Nests Hatched	# Nests Lost	# Chicks Fledged	# Chicks Lost
Bodie Island Spit	2	2	2	0	2	4
Cape Point	5	5	5	0	7	8
South Beach	2	2	1	1	0	3
Hatteras Inlet Spit	0	0	0	0	0	0
North Ocracoke Spit	1	1	1	0	0	2
South Point	5	8	3	5	1	8
Total:	15	18	12	6	10	25

Table 4. PIPL Hatching Success in 2011.

Location	# Nests	# Eggs	Nests Lost/Abandoned		Nests Hatched		Eggs Hatched		Nests w/ Fledged Chicks	
			#	%	#	%	#	%	#	%
Bodie Island Spit	2	7	0	NA	2	100	6	86	1	50
Cape Point	5	19	0	NA	5	100	15	79	4	80
South Beach	2	5	1	50	1	50	3	60	0	0
Hatteras Inlet Spit	0	0	0	NA	0	NA	0	NA	0	NA
North Ocracoke Spit	1	4	0	NA	1	100	2	50	0	0
South Point	8	22	5	62.5	3	43	9	41	1	12
TOTAL:	18	57	6	33.3	12	66.6	35	61	6	33

Table 4a. PIPL Hatching Success from 2001-2011.

Year	# Nests	# Eggs	Nests Lost/Abandoned		Nests Hatched		Eggs Hatched		Nests w/ Fledged Chicks	
			#	%	#	%	#	% (a)	#	%
2001	3	10	2	67.0	1	33	3	30.0	1	33
2002	3	8	2	67.0	1	33	1	13.0	0	0
2003	2	5(b)	0	0.0	2	100	4(b)	100.0	1	50
2004	2	6	1	50.0	1	50	4	66.0	0	0
2005	2	8	0	0.0	2	100	8	100.0	2	100
2006	4	15	1	25.0	3	75	9	60.0	1	25
2007	10(c)	29	4	40.0	6	60	17	59.0	4	40
2008	13	43	5	38.0	8	62	22	54.0	3	23
2009	9	34	4	44.4	6	60	22	65.0	5	56
2010	15	52	4	27.0	11	73	33	63.0	6	40
2011	18	57	6	33.3	12	66.6	35	61.0	6	33
2001-2010 average	6.3	21	2.3	35.8	4.1	64.2	12.3	60.0	2.3	36.7
2011 Difference	11.7	36.0	3.7	-2.5	7.9	2.4	22.7	1.0	3.7	-3.7

(a) – of all known eggs

(b) – assumes 1 egg from a brood whose nest was not found (see 2003 report)

(c) – based on consultation with FWS it was determined Nest 1 and Nest 2 were a single nesting attempt

Ten chicks fledged from 15 breeding pairs resulting in a fledge rate of 0.67 chicks/breeding pair (Table 5). Since 1989, productivity rates have ranged from 0.0 to 2.0 chicks/pair. The average rate during the past 10 years (2001-2010) is 0.77 chicks/pair (Table 5a) with the number of chicks fledged per year showing an upward (i.e. positive) trend.

Table 5. Fledging Success of PIPL in 2011.

Location	# Pairs	# Broods	# Eggs Hatched	Avg Brood (Chicks/Brood)	Chicks Fledged		Broods w/ Fledged Chicks		Fledge Rate (chicks/pair)
					#	%	#	%	
Bodie Island Spit	2	2	6	3	2	33.3	1	50	1
Cape Point	5	5	15	3	7	46.7	4	80	1.4
South Beach	2	1	3	3	0	0	0	0	0
Hatteras Inlet Spit	0	0	0	0	0	0	0	0	0
North Ocracoke Spit	1	1	2	2	0	0	0	0	0
South Point	5	3	9	3	1	11.1	1	33	0.2
Total:	15	12	35	2.9	10	28.5	6	50	0.67

Table 5a. Fledging Success of PIPL 2001 - 2011.

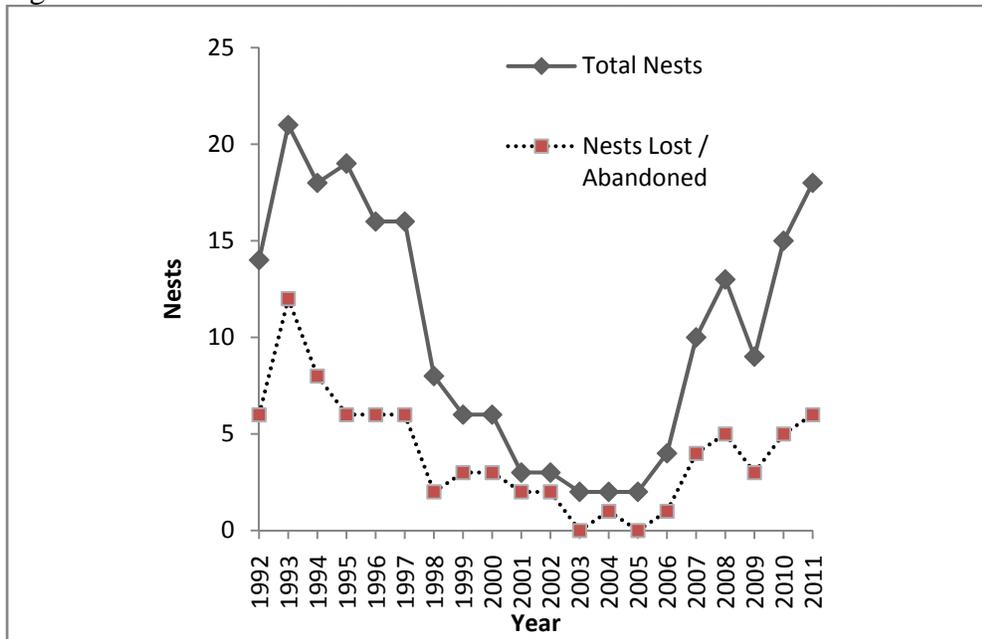
Year	# Pairs	# Broods	# Eggs Hatched	Avg Brood Size (chicks /brood)	Chicks Fledged		Broods w/ Fledged Chicks		Fledge Rate (chicks/pair)
					#	%	#	%	
2001	3	1	3	3	2	0.667	1	100.0	0.67
2002	2	1	1	1	0	0.000	0	0.0	0
2003	2	2	5	2.5	1	0.200	1	50.0	0.50
2004	3	1	4	4	0	0.000	0	0.0	0
2005	3	2	8	4	6	0.750	2	100.0	2.00
2006	6	3	9	3	3	0.333	1	33.3	0.50
2007	6	6	17	2.8	4	0.235	4	66.7	0.67
2008	11	8	22	2.75	7	0.318	3	37.5	0.64
2009	9	6	22	3.7	6	0.273	5	83.3	0.67
2010	12	11	33	3	15	0.455	6	54.5	1.25
2011	15	12	36	3	10	0.278	6	50.0	0.67
10 year avg (2001-2011)	5.7	4.1	12.4	3	4.4	0.355	2.3	56.1	0.77
2011 Difference	9.3	7.9	23.6	0.0	5.6	-0.077	3.7	-6.1	-0.1

### Nest Loss/Abandonment

Six nests were lost to predation or abandonment during the 2011 breeding season (Figure 2). Ghost crabs were the leading cause of nest predation particularly on Ocracoke.

- HI03-one egg nest found on 4/20 and determined to be abandoned on 4/27. Unknown cause.
- OI03-four egg nest found and exclosed on 5/9. Eggs disappeared on 5/25 (1 egg), 5/26 (2 eggs), and 5/27 (1 egg). Loss attributed to ghost crabs.
- OI06-one egg nest found on 6/5 and exclosed on 6/9 as a two egg nest after incubation was confirmed. Nest determined to be abandoned on 6/11. Abandonment attributed to ghost crabs.
- OI07-one egg nest found on 6/23 and determined to be abandoned on 6/25. Unknown cause.
- OI08-two egg nest found on 6/25 and exclosed on 7/2. First egg disappeared on 7/17 and second egg disappeared on 7/21. Unknown predation.
- OI09-one egg nest found on 6/26 and depredated by ghost crab on 6/28.

Figure 2. Total PIPL Nests vs. Lost /Abandoned Nests for CAHA 1992-2011.



### Chick Mortality

In the fourth breeding season of CD implementation, the 35 PIPL eggs that hatched exceeded last year's high for CAHA of 33 hatched eggs. Despite the high number of hatched eggs, this did not translate into a higher number of fledged chicks. Although we had the highest number of eggs hatched on record, a large percentage (71%) were lost prior to fledging (Table 6, Figure 3). The ten chicks that did fledge still represent the third highest year on record coming behind the 15 chicks that fledged in 2010 and the 12 that fledged in 1998.

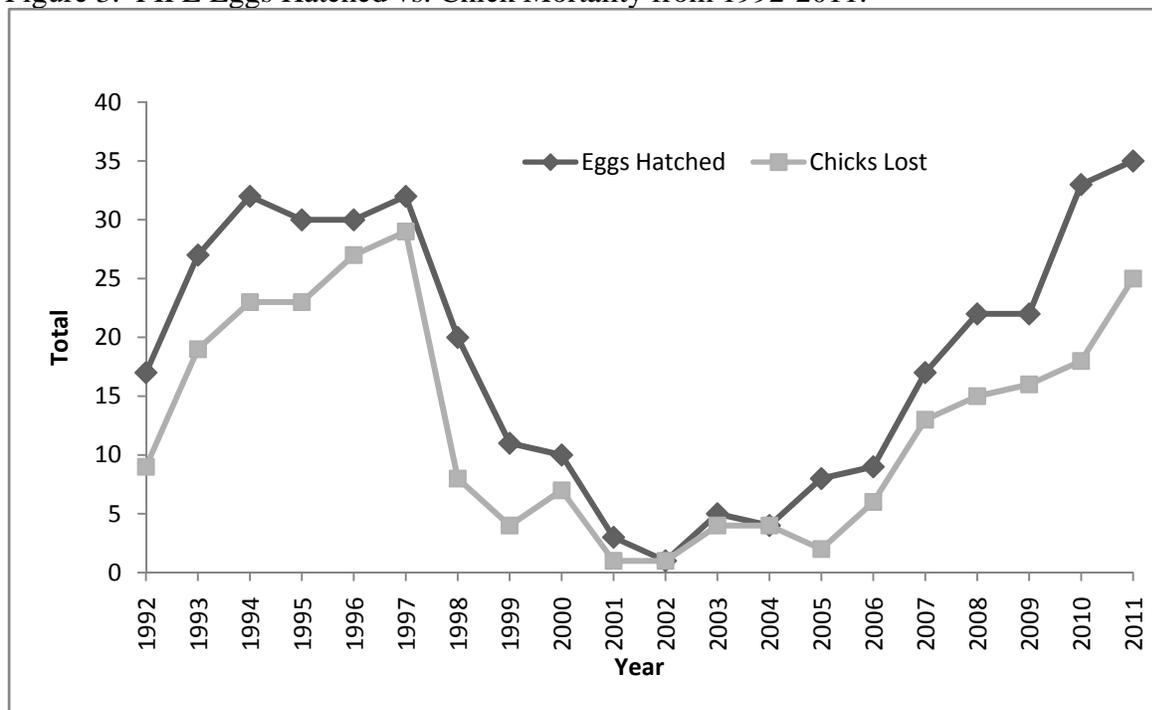
Table 6. Total PIPL Chicks Hatched and Fledged for CAHA 1992-2010.

Year	Eggs Hatched	Chicks Lost		Chicks Fledged	
		#	%	#	%
1992	17	9	52.9	8	47.1
1993	27	19	70.4	8	29.6
1994	32	23	71.9	9	28.1
1995	30	23	76.7	7	23.3
1996	30	27	90.0	3	10.0
1997	32	29	90.6	3	9.4
1998	20	8	40.0	12	60.0
1999	11	4	36.4	7	63.6
2000	10	7	70.0	3	30.0
2001	3	1	33.3	2	66.7
2002	1	1	100.0	0	0.0
2003	5	4	80.0	1	20.0
2004	4	4	100.0	0	0.0
2005	8	2	25.0	6	75.0

Year	Eggs Hatched	Chicks Lost		Chicks Fledged	
		#	%	#	%
2006	9	6	66.7	3	33.3
2007	17	13	76.5	4	23.5
2008	22	15	68.2	7	31.8
2009	22	16	72.7	6	27.3
2010	33	18	54.5	15	45.5
2011	35	25	71.4	10	28.6
10 Year Average (2001-2010)	12.4	8	67.7	4.4	32.3
2011 Difference	22.6	17	3.7	5.6	-3.7

Of the 35 eggs that hatched at CAHA, 25 chicks were lost prior to fledging. At Bodie Spit, both nests hatched and two chicks fledged and four were lost prior to fledging. At Cape Point all five nests hatched and seven chicks fledged and eight were lost. On South Beach one of the two nests hatched and none of the three chicks survived to fledge. The single nest on North Ocracoke Spit successfully hatched but both chicks were lost prior to fledging. On South Point three of the eight nests hatched with one chick surviving to fledging and eight were lost prior to fledging.

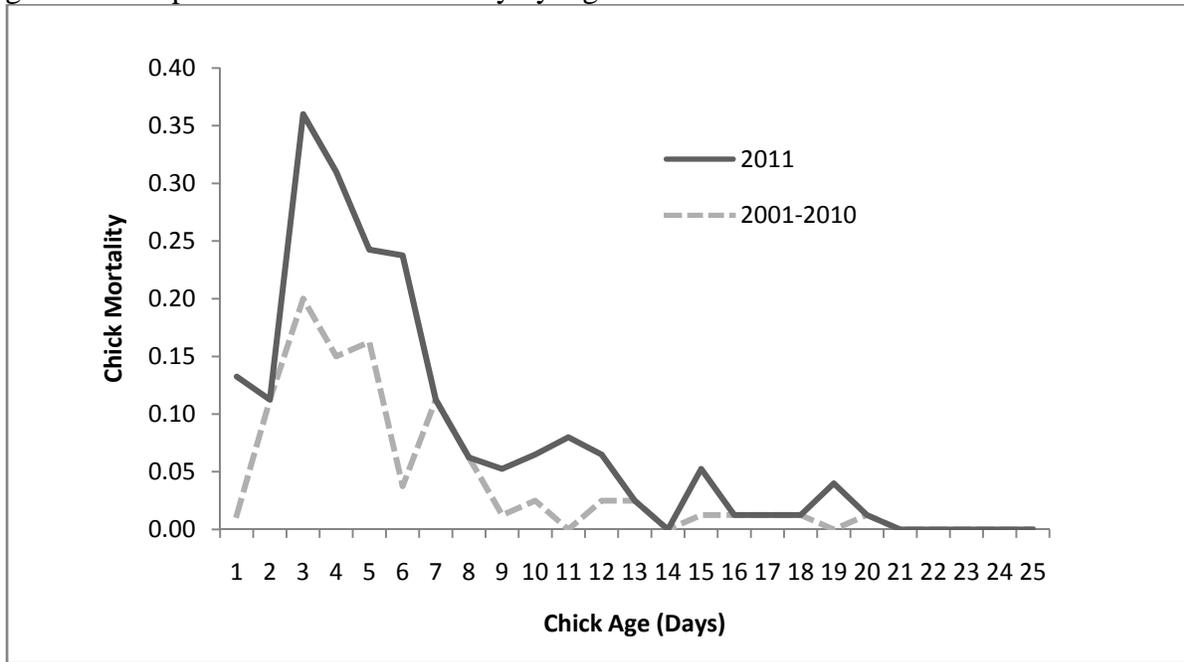
Figure 3. PIPL Eggs Hatched vs. Chick Mortality from 1992-2011.



There were no major weather events during the nesting or chick rearing season. Even though Hurricane Irene passed through the area in late August, the last PIPL chick had already fledged

on August 3. Chick loss, as in past years, was difficult to document. The majority of chick mortality occurred within the first week of hatching (Figure 4).

Figure 4. Comparison of Chick Mortality by Age in 2011 vs. Mean for CAHA 2001-2010



### Chick Movement

As a result of the frequency of observations, staff was able to document preferred foraging areas for the different broods. These maps are rough estimates of where the chicks were foraging during the observations (Appendix A, Maps 19-22). The chicks were not observed dawn to dusk nor can they be observed in the evening, so actual territories may be larger than depicted. Waypoints of the observed foraging habitats were taken after all the chicks had fledged and the chicks were not disturbed to collect the points. The brood foraging areas, in acres, designate the area in which the brood was observed on any given day until they fledged and may or may not, depending on the brood, include the area around the nest.

#### Bodie Island Spit

The chicks from Bodie Island Brood BI01 foraged primarily on the mudflats on the Bait Pond shoreline as well as along the edge of the larger dunes/dunelets and vegetation line to the south of the large flats. At 14 days of age the brood, along with two adults, was observed foraging at the ocean shoreline for a brief period of time after which they returned to the interior mudflats along the southern dunes. The furthest they were documented from their nest was 600 m and had a foraging territory of ~21 acres.

The chicks from Bodie Island Brood BI02 were very difficult to document. Immediately after hatching they were utilizing the small mudflats on the edge of the tidal pool that had formed at the tip of Bodie Spit. Sightings of this brood were sporadic as they would disappear in the vegetation and only brief glimpses of them were observed. The furthest the brood was documented from their nest was 435 m. Lack of consistent sightings did

not allow for a good estimate of foraging territory size. After not being observed for five days, one of the two chicks eventually reappeared on the southern edge of the mudflats of the large Salt Pond (Appendix A, Map 19).

### **Cape Point**

The chicks from Brood HI01 moved as far as 230 m from the nest and had a foraging territory of ~7 acres. The chicks from Brood HI02 moved as far as 400 m from the nest and had a foraging territory of ~7 acres. The chicks from Brood HI04 moved as far as 275 m from the nest and had a foraging territory of ~6 acres. The chicks from Brood HI05 moved as far as 750 m from the nest and had a foraging territory of ~4 acres. Between day 6 and day 10, the chicks moved away from their nesting area and were eventually observed along the western edge of the Large Salt Pond where their foraging territory was ~2.4. The chicks from Brood HI06 moved as far as 230 m from the nest and had a foraging territory of ~7 acres which included 180 m of shoreline in the area south of their nest (Appendix A, Map 20).

### **South Beach**

The chicks from Brood HI07 were never observed outside of their nest cup (not shown on maps).

### **North Ocracoke**

The chicks from Brood OI04 moved as far as 395 meters from their nest and had a foraging territory of 15.2 acres (Appendix A, Map 21).

### **South Point**

The chicks from Brood OI01 moved as far as 1,118 meters from their nest and had a foraging territory of ~17 acres. The chicks from Brood OI02 moved as far as 316 m and had a foraging territory of ~13 acres. The chick from Brood OI05 moved as far as 195 m and had a foraging territory of ~4.5 acres. The foraging territory for this single chick is small because it was lost on day 3 (Appendix A, Map 22).

### **Predator Exclosures**

As in previous years, predator exclosures were used to protect the nests. All of the predator exclosures were installed and accepted by pairs within 10-57 minutes of installation. Three nests were not exclosed because they were lost or abandoned prior to becoming three-egg clutches.

### **Predation of Chicks**

This year, staff observed fish crow predation of a chick from Brood OI01 on South Point. Another chick loss from Brood BI02 on Bodie Island Spit can possibly be attributed to raccoon predation as evidenced by the abundant raccoon tracks in the area where the chick had previously been consistently observed. All of the other 23 chick losses were categorized as “unknown”.

The presence or tracks of crows, ghost crabs, grackles, gulls, opossum, mink, raccoon, red fox, coyote and feral cats were documented within many of the PIPL breeding territories.

## **Weather**

No hurricanes or tropical storms occurred during the breeding season. It is unknown how many migrants may have been affected during the passage of Hurricane Irene in late August.

## **Human Disturbance**

Human disturbance, direct or indirect, can lead to the abandonment of nests or loss of chicks. Throughout the season, resource staff documented 83 pedestrian, five ORV, ten dog, one horse and five boat intrusions in the pre-nesting closures. The numbers are conservative since sites are not monitored continuously, weather erases tracks, and staff did not disturb an incubating pair or young in order to document disturbance. These numbers indicate violations to closures specifically containing nesting PIPLs or habitat protected for PIPLs. It is important to note that most of the closures contained multiple species, including least terns, American oystercatchers, and PIPLs. Most illegal entries were not witnessed, but documented based on vehicle, pedestrian, or dog tracks left in the sand. Pedestrian entry most often required visitors to lift or stoop under the string that connected all posted signs, while vehicular entry required visitors to drive through or around a sign boundary. Visitors' unleashed dogs are also a threat to protected species and continue to be a problem. Disturbance was not identified as a main cause for the loss of nests or chicks unless the direct effect of the disturbance was observed.

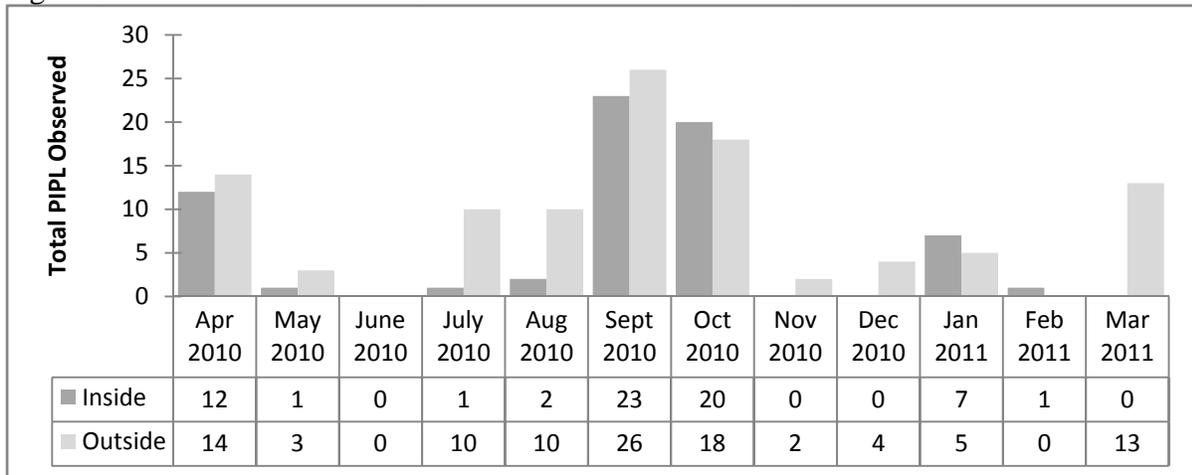
The CD defines a confirmed deliberate act as “an act that disturbs or harasses wildlife or vandalizes fencing, nests, or plants”. Deliberate violations of the established pre-nesting areas and buffers, as determined by NPS staff, were required to be automatically expanded by 50 meters. The second and third deliberate violations required an automatic expansion of 100 and 500 meters, respectively. There were no deliberate violations associated with PIPL nests or broods in 2011.

## **Non-breeding Surveys & Winter Monitoring**

The non-breeding PIPL monitoring protocol was developed to document trends over time and to document the habitat type in which PIPL and other shorebirds are most frequently found. Documenting the habitat type in which the PIPL are observed will assist CAHA staff in determining which areas need to be protected to minimize disturbance to migratory and wintering PIPL.

Staff surveyed 20-22 transects on a weekly basis for non-breeding PIPL use at CAHA. The time period covered in this report is April 2010 through March 2011 during which time a total of 172 PIPL observations were documented. Of the 172 PIPL documented, 67 occurred inside non-breeding/migratory closures and 105 occurred outside such closures (Figure 5).

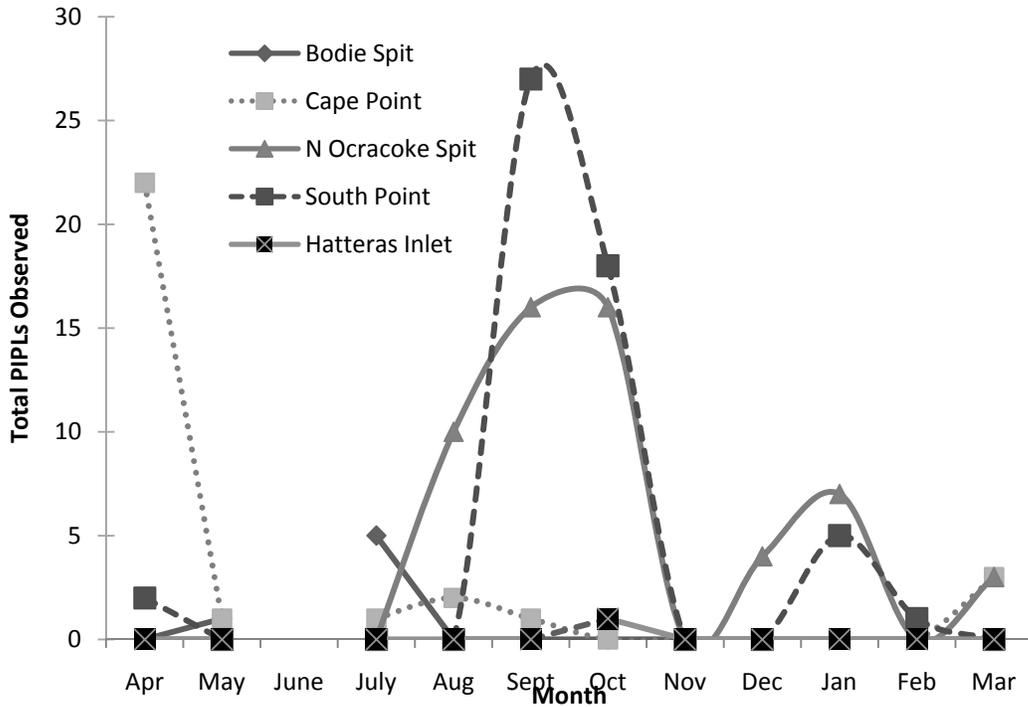
Figure 5. Total PIPL Numbers Observed Inside and Outside Closures.



As more data is accumulated CAHA will be able to make better management decisions as to which areas need protection. Although it appears that many observations are occurring outside of closures this is a result of the fact that transects are not surveyed if they fall within a pre-nesting or breeding closure. The pre-nesting and breeding closures more than likely contain migrants as well as breeding birds but in order to minimize disturbance to our breeding birds, these transects are not surveyed if pre-nesting or breeding closures are in place. During the breeding season, the emphasis is on minimizing disturbance to breeding birds. Of interest though are the areas where birds are often observed that are outside of closures. One area in particular where birds were frequently observed was in the foreshore near Ramp 45. This area will be closed to ORVs under the ORV Management Plan/EIS slated for implementation in 2012.

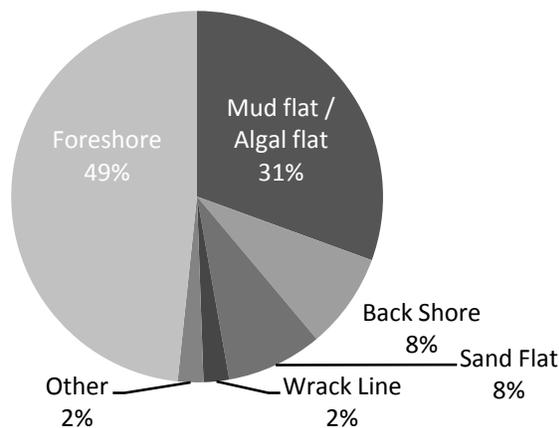
The peak migration to the south appeared to occur during September when the majority of the migrants observed were documented on Ocracoke. (Figure 6).

Figure 6. Total PIPL Observed by Month by Location, April 2010-March 2011.



CAHA staff documented the habitat type in which migratory and wintering PIPL were observed from April 2010 to March 2011. Of the 172 PIPL observations, 87 were in foreshore habitat, 55 were in mud flat/algal flat habitat, 15 were in the backshore, 7 were in sand flat habitat, 4 were in the wrack line and 4 were classified as “other” which lumped surf zone/open water (1), interdunal swale (2) and secondary dune (1) (Figure 7).

Figure 7. Habitat Usage by Migrating/Wintering PIPL at CAHA (April 2010-March 2011).



In time, the accumulated data will hopefully shed some light on the non-breeding PIPL population at CAHA. At present, the park continues to work on establishing semi-permanent transects in a constantly changing environment.

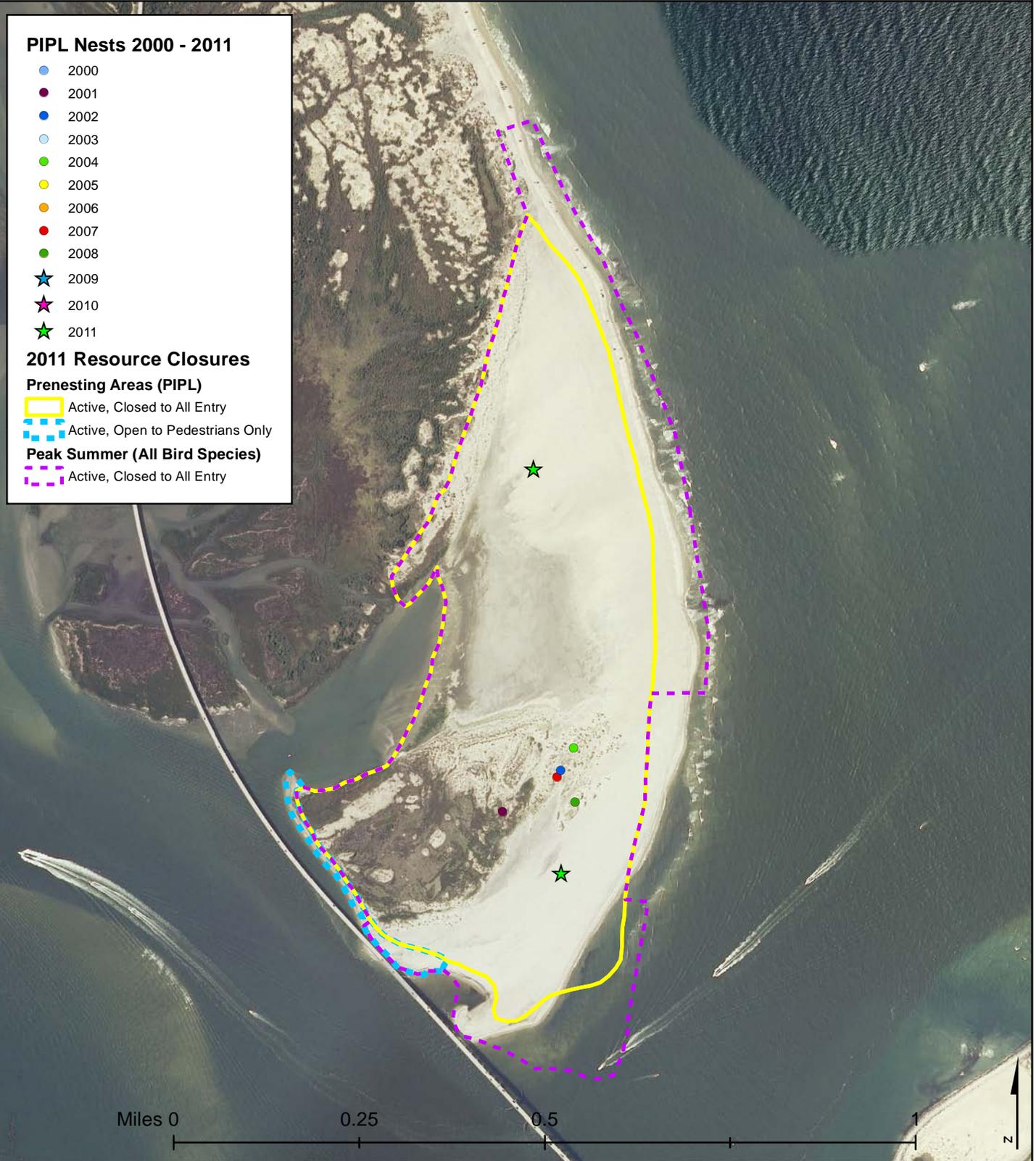
## APPENDICES

### APPENDIX A: MAPS

- Map 1: Bodie Island Spit PIPL Nesting Activity 2000-2011
- Map 2: Cape Point PIPL Nesting Activity 2000-2011
- Map 3: South Beach PIPL Nesting Activity 2000-2011
- Map 4: Hatteras Overwash Fans PIPL Nesting Activity 2000-2011
- Map 5: Hatteras Inlet Spit PIPL Nesting Activity 2000-2011
- Map 6: North Ocracoke Spit PIPL Nesting Activity 2000-2011
- Map 7: South Point Ocracoke PIPL Nesting Activity 2000-2011
- Map 8: Piping Plover Wintering and Migratory Closures 2010-2011
- Map 9: Bodie Island Wintering and Migratory PIPL Monitoring 2010-2011
- Map 10: Cape Point Wintering and Migratory PIPL Monitoring 2010-2011
- Map 11: Hatteras Inlet Wintering and Migratory PIPL Monitoring 2010-2011
- Map 12: North Ocracoke Wintering and Migratory PIPL Monitoring 2010-2011
- Map 13: South Point Ocracoke Wintering and Migratory PIPL Monitoring 2010-2011
- Map 14: Bodie Island Spit PIPL Breeding Activity 2011
- Map 15: Cape Point PIPL Breeding Activity 2011
- Map 16: South Beach PIPL Breeding Activity 2011
- Map 17: North Ocracoke PIPL Breeding Activity 2011
- Map 18: South Point Ocracoke PIPL Breeding Activity 2011
- Map 19: Bodie Island Spit Chick Foraging Areas 2011
- Map 20: Cape Point PIPL Chick Foraging Areas 2011
- Map 21: North Ocracoke Spit PIPL Chick Foraging Areas 2011
- Map 22: South Point Ocracoke PIPL Chick Foraging Areas 2011

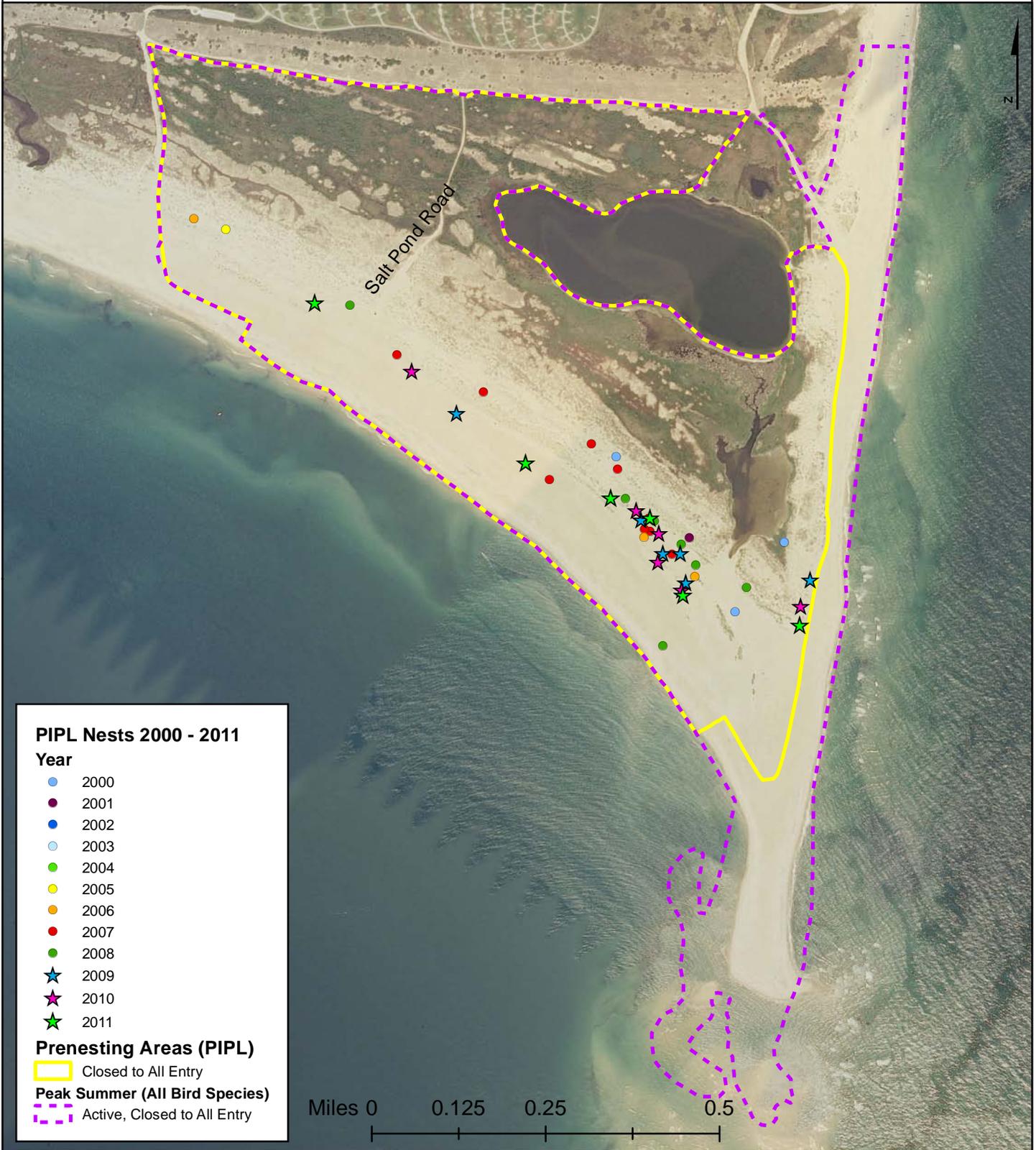


# Map 1: Bodie Island Spit PIPL Nesting Activity 2000-2011



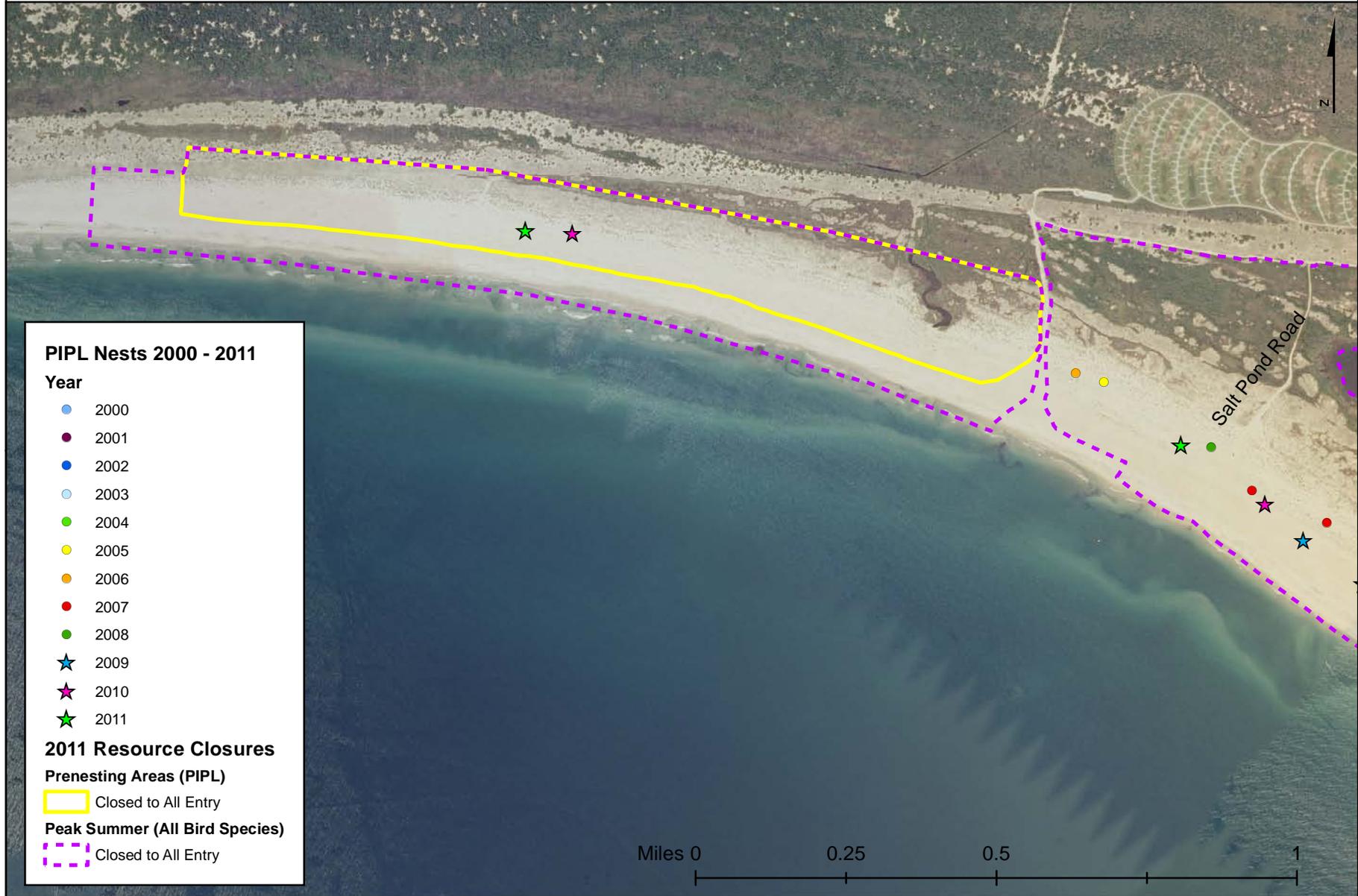


## Map 2: Cape Point PIPL Nesting Activity 2000-2011



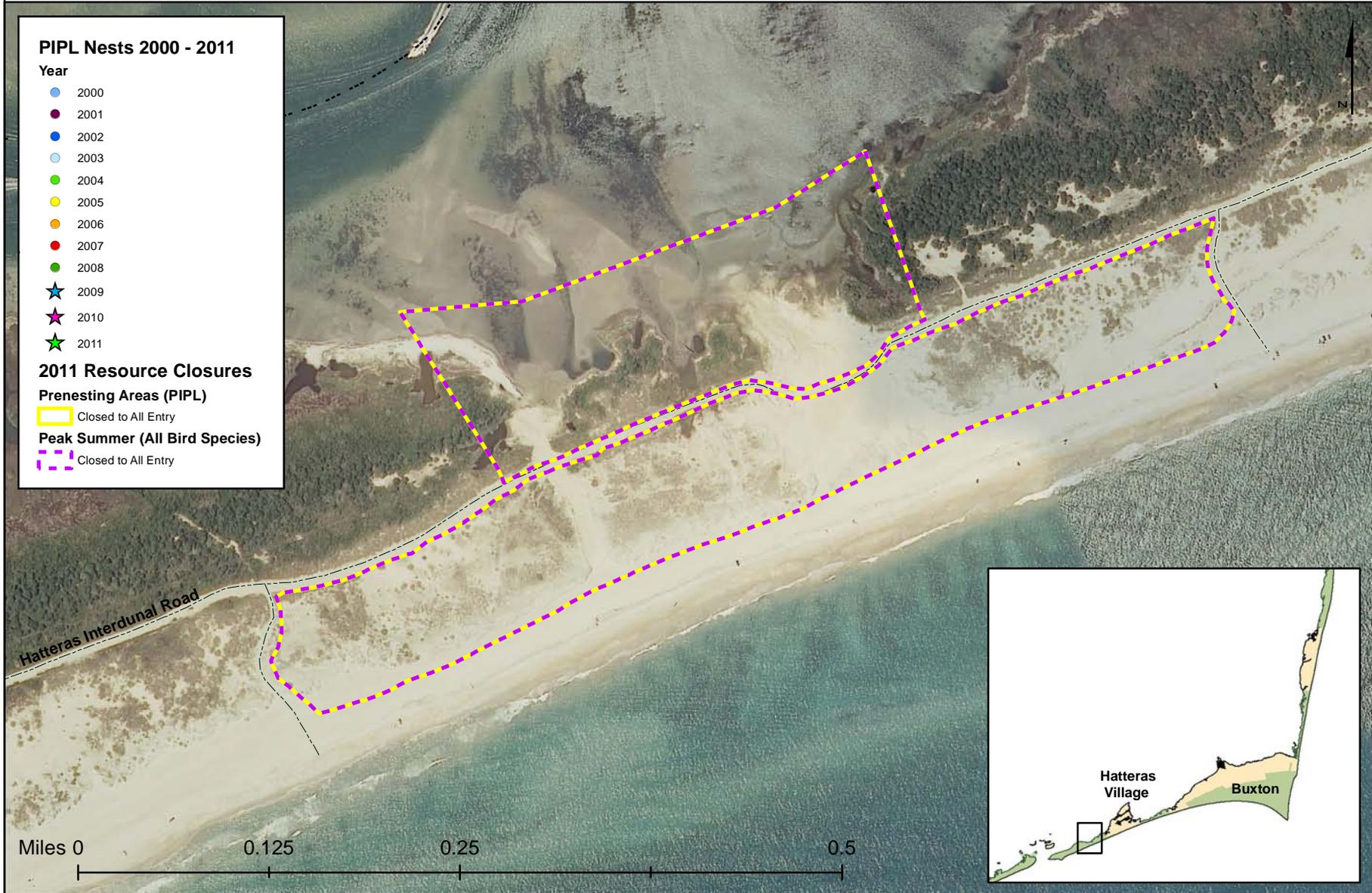


### Map 3: South Beach PIPL Nest Activity 2000 - 2011



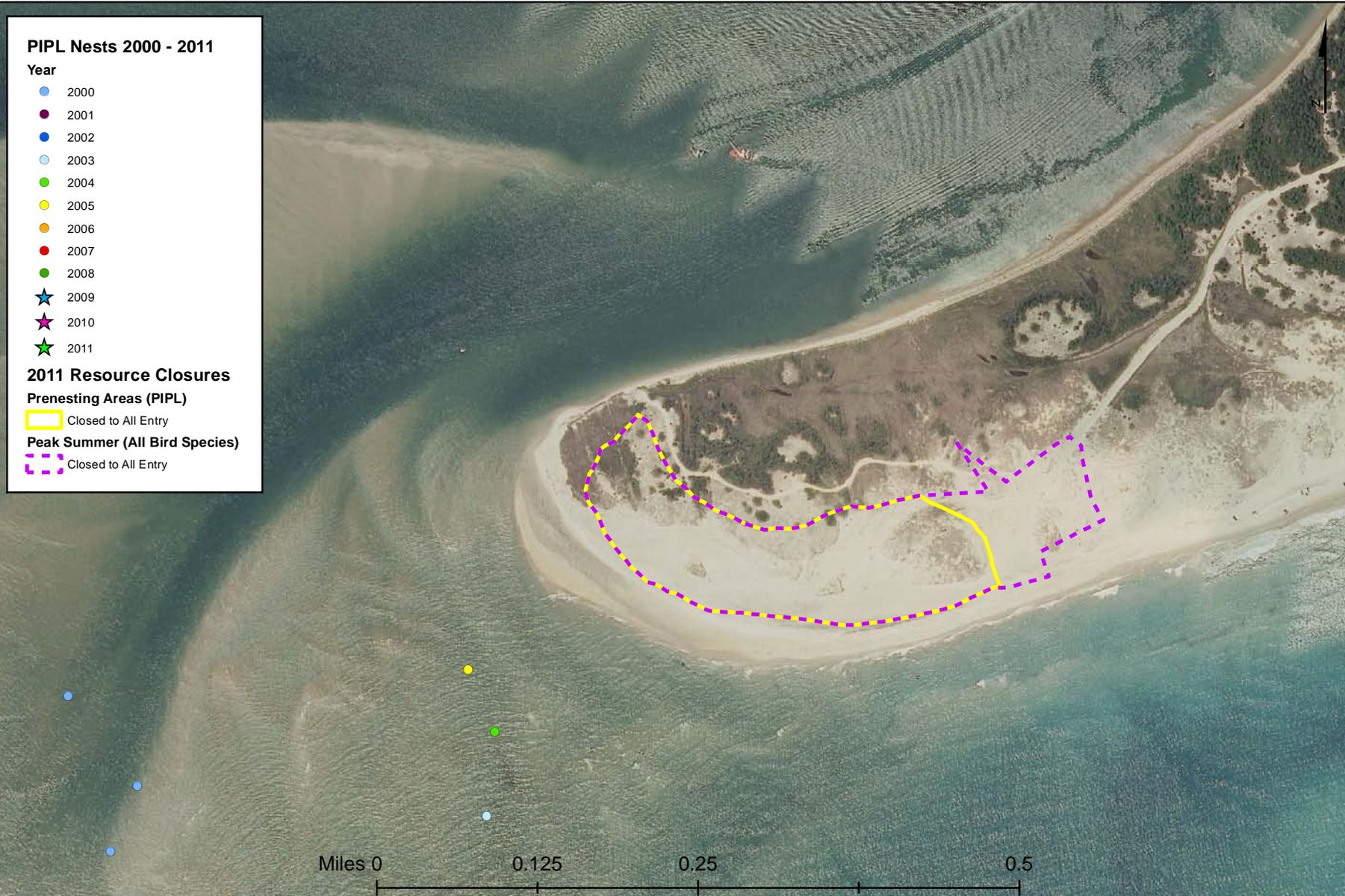


# Map 4: Hatteras Overwash Fans PIPL Nesting Activity 2000 - 2011



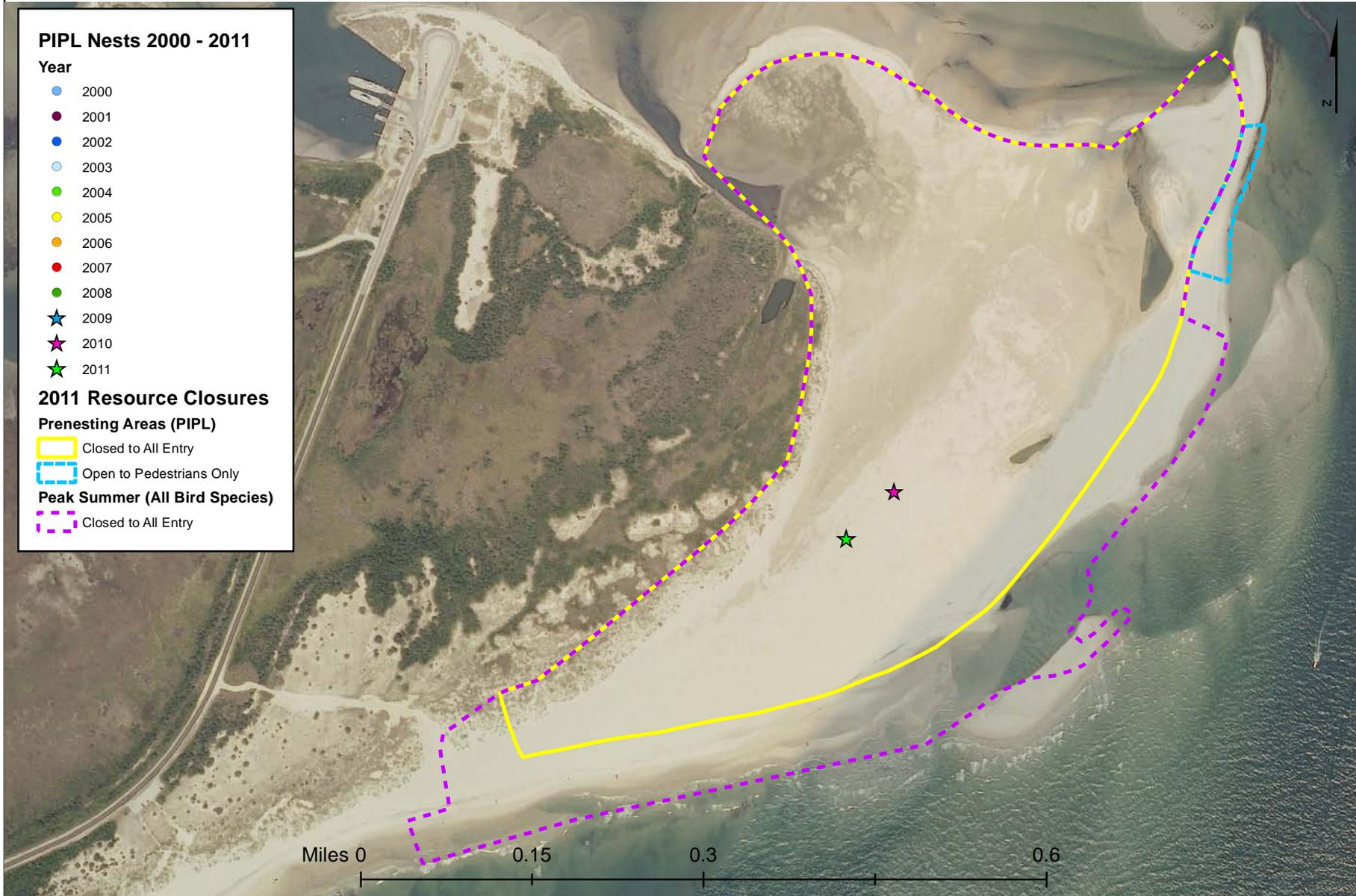


## Map 5: Hatteras Inlet Spit PIPL Nesting Activity 2000 - 2011



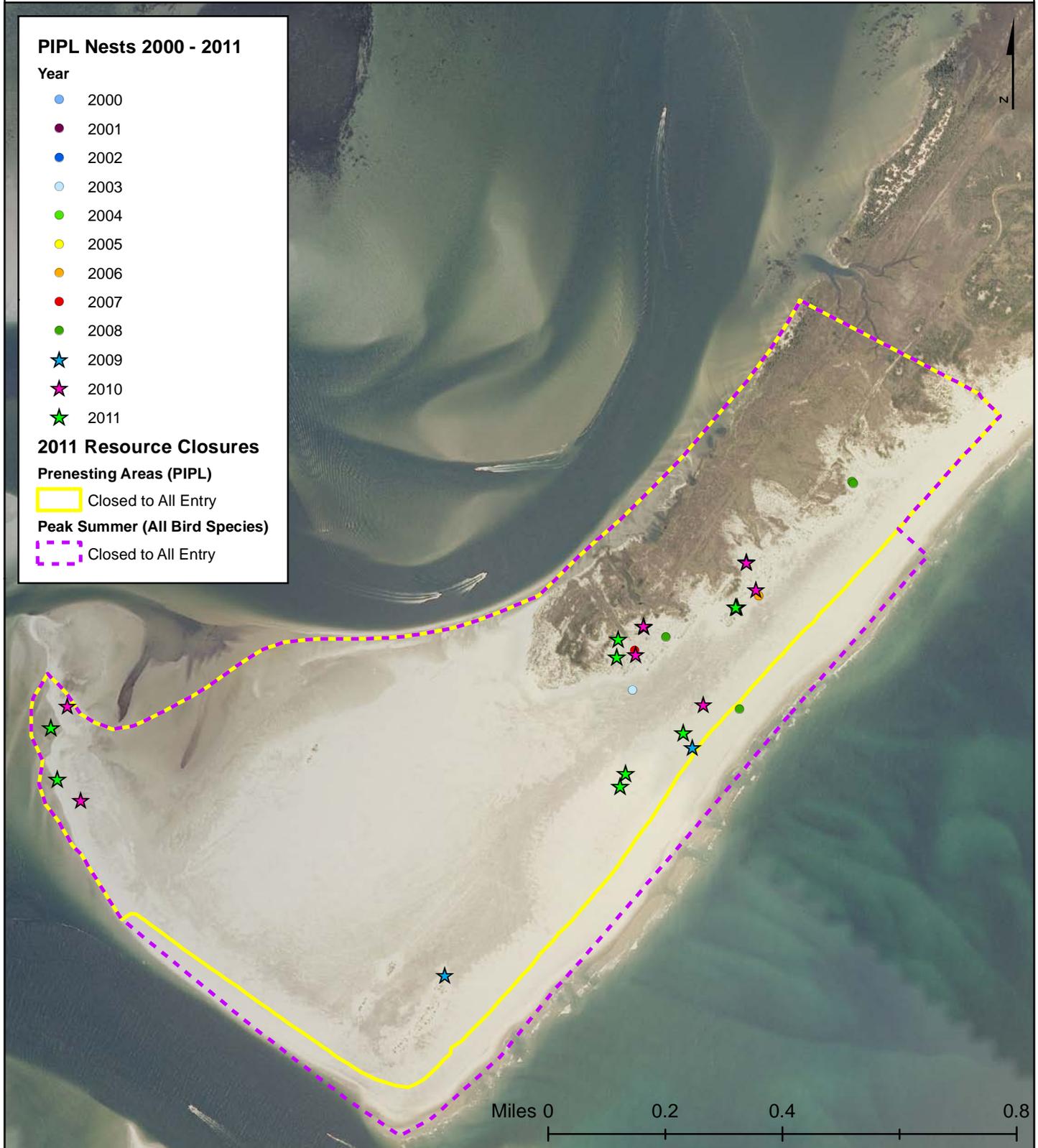


## Map 6: North Ocracoke Spit PIPL Nesting Activity 2000 - 2011



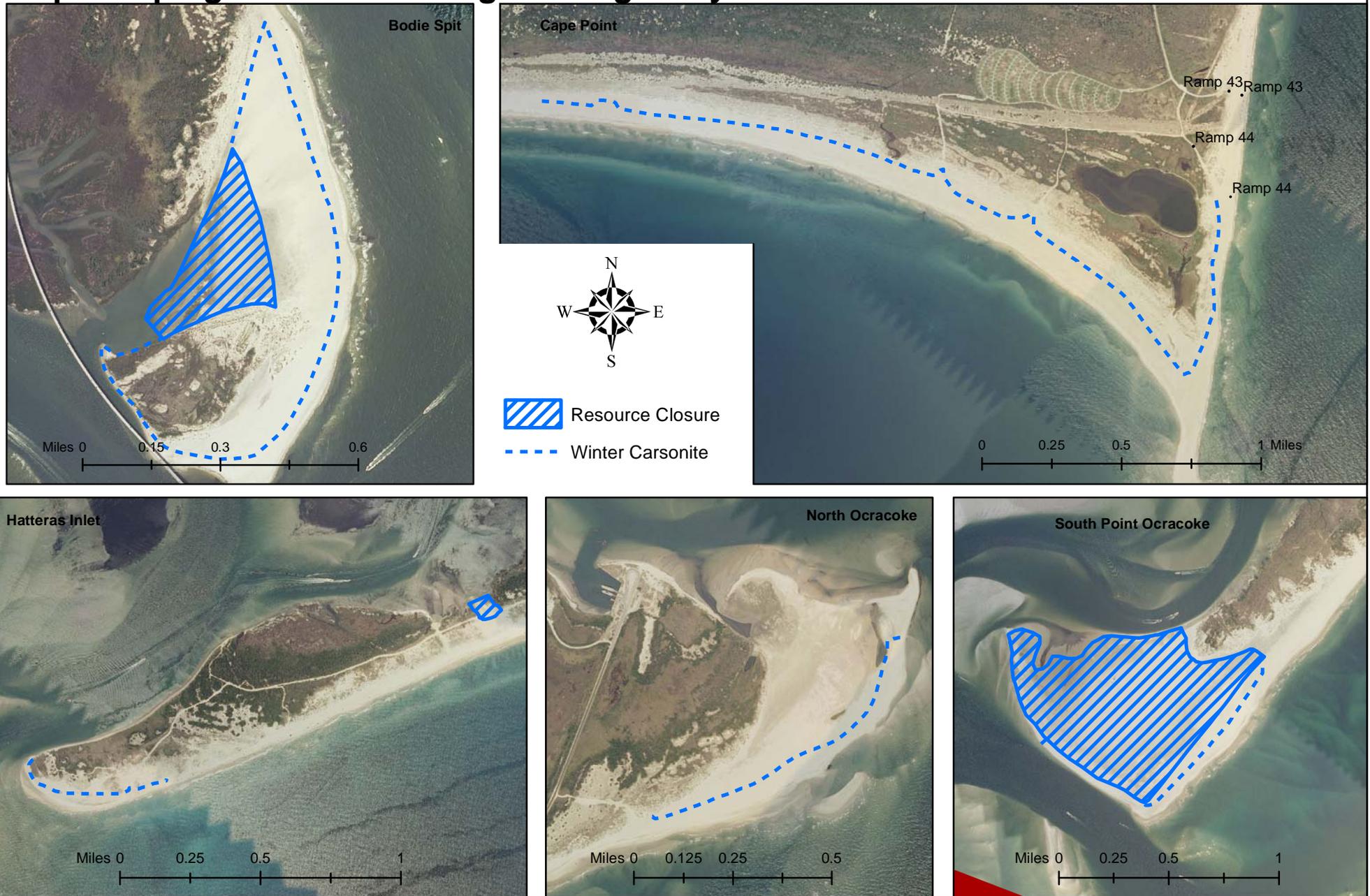


# Map 7: South Point Ocracoke PIPL Nesting Activity 2000 - 2011





# Map 8: Piping Plover Wintering and Migratory Closures 2010-2011





### Map 9: Bodie Island Wintering and Migratory PIPL Monitoring 2010-2011





## Map 10: Cape Point Wintering and Migratory PIPL Monitoring 2010-2011





## Map 11: Hatteras Inlet Wintering and Migratory PIPL Monitoring 2010-2011

### Transect Lines

— 2010-2011





## Map 12: North Ocracoke Wintering and Migratory PIPL Monitoring 2010-2011





## Map 13: South Point Ocracoke Wintering and Migratory PIPL Monitoring 2010-2011



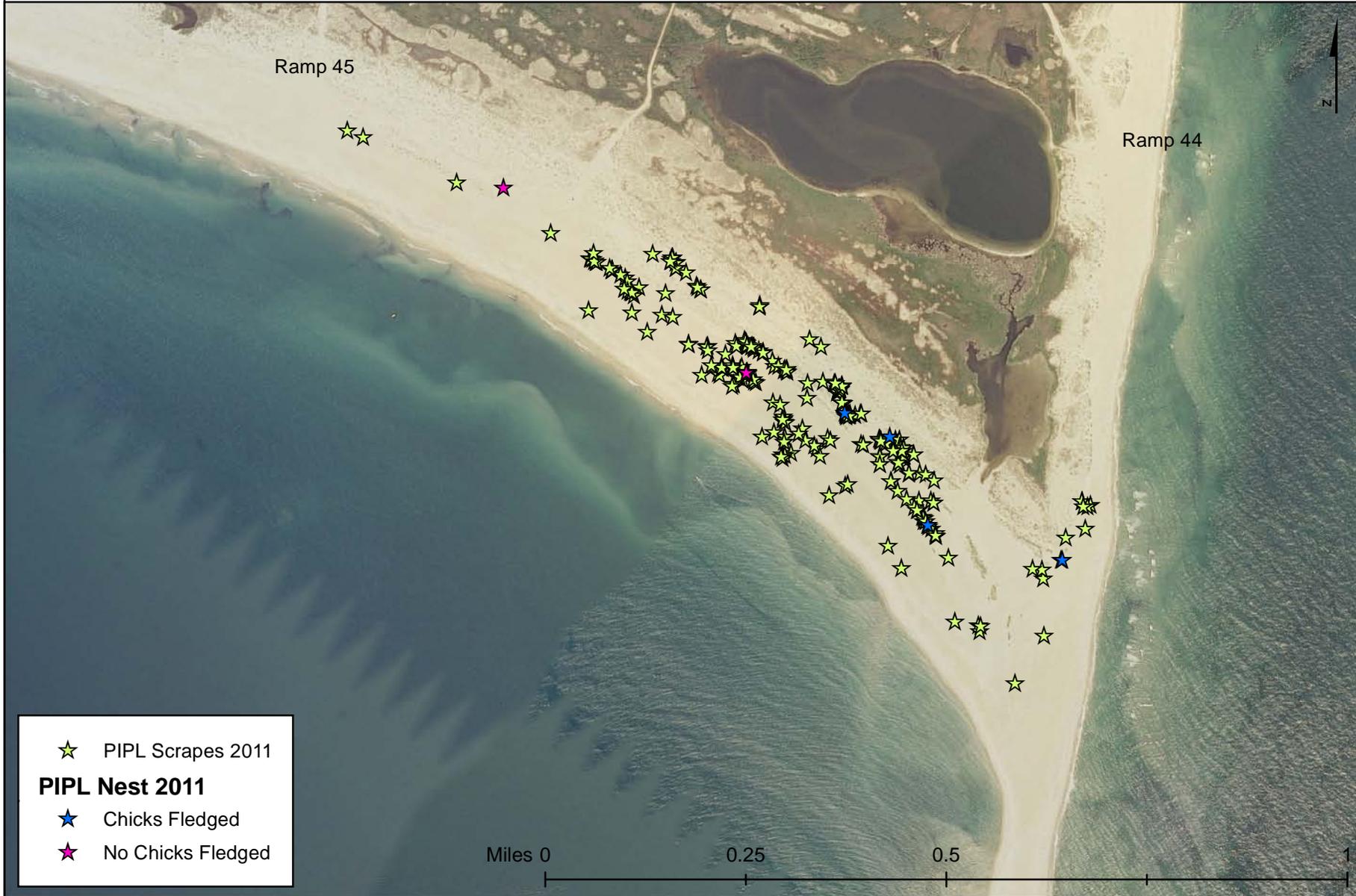


# Map 14: Bodie Island Spit PIPL Breeding Activity 2011





## Map 15: Cape Point PIPL Breeding Activity 2011





# Map 16: South Beach PIPL Breeding Activity 2011





## Map 17: North Ocracoke PIPL Breeding Activity 2011





## Map 18: South Point Ocracoke PIPL Breeding Activity 2011





# Map 19: Bodie Island Spit Chick Foraging Areas 2011





## Map 20: Cape Point PIPL Chick Foraging Areas 2011





## Map 21: North Ocracoke Spit PIPL Chick Foraging Areas 2011





## Map 22: South Point Ocracoke PIPL Chick Foraging Areas 2011

