

**CAPE HATTERAS NATIONAL SEASHORE
PIPING PLOVER (*CHARADRIUS MELODUS*) MONITORING
2012 ANNUAL REPORT**



National Park Service
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ABSTRACT

In 2012, 15 Piping Plover (PIPL) pairs and 22 nests were identified. Eleven PIPL chicks successfully fledged from four broods for a fledge rate of 0.73 chicks per breeding pair. The first PIPL nest of the season was discovered on March 28, 2012. The 2012 breeding season was the first breeding season that Cape Hatteras National Seashore (CAHA) was managing under the requirements of the final Cape Hatteras National Seashore Off-Road Vehicle Management Plan and Special Regulation (ORV Management Plan).

INTRODUCTION

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 2012 breeding season, comparisons to results from previous years, and the resource management activities undertaken for PIPL in 2012.

North Carolina is currently the only state on the Atlantic Coast that hosts PIPL during all phases of their annual cycle. In 2012, territories were established in March and early April with the first nest documented on March 28, 2012. PIPL generally lay three to four eggs in a small, shallow depression or scrape. Upon completion of the clutch, the pairs incubate until the eggs hatch in 26-30 days. Both the eggs and chicks are cryptic in coloration, which makes it difficult to see/locate them. Chicks are precocial and follow the adults to locations where they forage for invertebrates found in and on the sand. During the 2012 breeding season the chicks at CAHA fledged between 21-31 days after hatching.

ORV Management Plan

On February 15, 2012 the ORV Management Plan was enacted at CAHA. It was developed from 2007-2012 and was accompanied by a special regulation detailing requirements for off-road vehicle (ORV) use at CAHA. A copy of the ORV Management Plan and other related documents are available electronically at <http://parkplanning.nps.gov/caha>. The ORV Management Plan includes establishment of pre-nesting closures and buffer requirements for nesting birds and chicks as well as the requirement for an ORV permit to drive on CAHA beaches. This was the first year the ORV Management Plan guided the management of protected species at CAHA.

The Record of Decision indicates that we will "conduct a systematic review of data, annual reports, and other information every 5 years, after a major hurricane, or if necessitated by a significant change in protected species status (e.g. listing or de-listing), in order to evaluate the effectiveness of management actions in making progress toward the accomplishment of stated

objectives". As part of the Reporting Requirements of the Biological Opinion (BO) for the Off-road Vehicle Management Plan (November 15, 2010), "an annual report detailing the monitoring and survey data collected during the preceding breeding season (as described in alternative F, in addition to the additional information required in the... Terms and Conditions) and summarizing all piping plover, seabeach amaranth, and sea turtle data must be provided to the Raleigh Field Office by January 31 of each year for review and comment".

METHODS

Closures

While pre-nesting closures minimize disturbance in potential breeding areas, they also enable birds to establish territories and nest in their preferred habitat. Because CAHA’s shoreline is dynamic in nature, a habitat evaluation was conducted from January 30 - February 7, 2012, 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 1-4). 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 ORV Management Plan. The pre-nesting closures included the upper beach, dunes, sand/mud flats, sound-side intertidal zone, overwashes, blowouts, and ocean tidal zones. Bodie Spit, Cape Point, South Beach, North Ocracoke, and South Point all contained potential and/or historic nesting habitat for PIPLs.

The pre-nesting closures were modified throughout the season in order to meet the buffer requirements of the ORV Management Plan 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. Buffer requirements of Alternative F of the ORV Management Plan 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. Shorebird/Waterbird Buffer Summary for Alternative F.

Species	Alternative F	
	Breeding Behavior/ Nest Buffer	Unfledged Chick
Piping plover	75 meters	1000 meters ORV (300 meters for pedestrians)
Wilson’s plover	75 meters	200 meters
American oystercatcher	150 meters	200 meters
Least tern	100 meters	200 meters
Other colonial waterbird species	200 meters	200 meters

Monitoring

Field staff began monitoring for PIPL arrival and breeding behavior in early March. After a nest was located, a predator exclosure was installed when the nest contained three or more eggs. Thereafter, the nest was briefly approached once weekly to inspect the exclosure, verify the number of eggs, and check for predator tracks. The nests were also monitored daily, from a distance, to document incubation, nest abandonment, and/or to detect 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 determined to be lost. Observers documented in their notes: brood status, behavior, individual bird and/or brood movements, human disturbance, predator interactions, or other significant environmental events. A grid system with points located 75 meters apart was established at the beginning of the breeding season to aid staff in obtaining more accurate locations for chicks and to document brood movements.

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 egg predation in the past.

Predator Control

Because mammalian predation is a major factor in PIPL nest loss and chick mortality at CAHA, predator control was conducted to target predators near nests and chicks. 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 are established to provide a relatively undisturbed area for migratory and over-wintering PIPL. In the fall and to a lesser degree in the spring large numbers of PIPL migrate through CAHA. Winter closures were established upon removal of the pre-nesting closures at Bodie Spit and South Point.

The winter closures are closed to ORVs however portions of them remain open to pedestrians. Permanent Vehicle Free Areas (VFAs), especially those at Cape Point/South Beach and North Ocracoke, provide relatively undisturbed areas for migratory and over-wintering PIPL in addition the winter closures at Bodie Spit and South Point.

Migrating and Wintering Piping Plovers

Surveys for the Southeast Coast Inventory Monitoring Network Migratory and Wintering Shorebird Monitoring Study were conducted weekly from April 2011 through March 2012. No

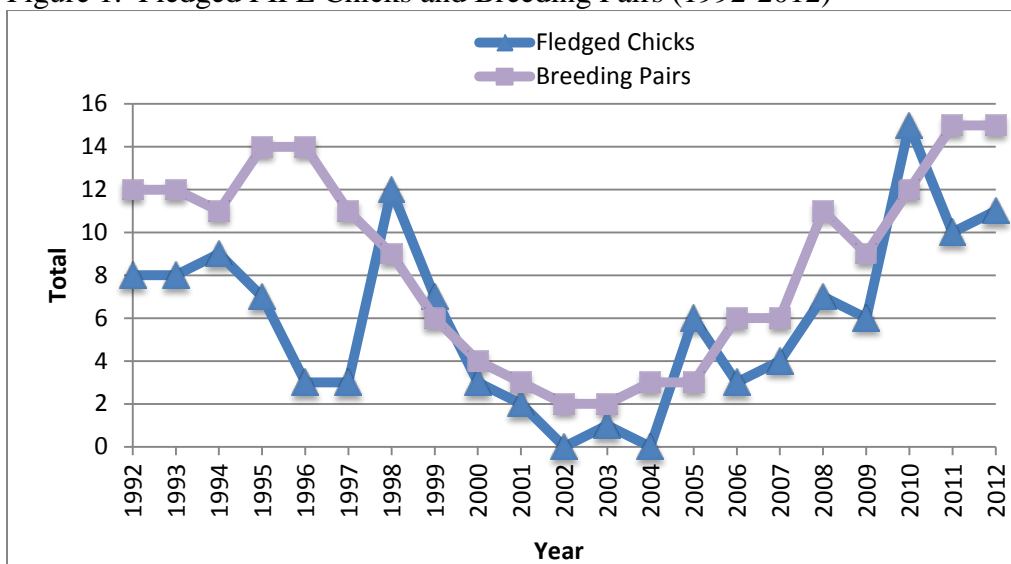
surveys were conducted in June when all the PIPL present are assumed to be breeders and not migrants. The sampling regime consisted of a two-tiered sampling approach consisting of high-intensity and low-intensity sampling units. The high-intensity sites were sampled on a weekly basis whereas the low-intensity 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. Some transects at the spits and Cape Point, varied in length due to the constantly changing shorelines. The spits and Cape Point also required more than one transect because of the width of the beach that needed to be surveyed (Appendix A, Map 5). 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, Wilson’s plovers, red knots, black-necked stilts, whimbrels, and sanderlings 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

Nest and Brood Success

The 2012 breeding season was a relatively good year in terms of productivity. Fifteen breeding pairs were identified, matching the previous highs of 15 pairs documented in 2011 and 1989 (ORV Management Plan). CAHA appears to have recovered from the sharp decline in pair numbers that started in 1996 and continues to exhibit a stable or upward trend in breeding pair numbers (Figure 1). In 2012, nesting occurred at five sites: Bodie Spit, Cape Point, South Beach, North Ocracoke and South Point (Appendix A, Maps 1-4).

Figure 1. Fledged PIPL Chicks and Breeding Pairs (1992-2012)



The first nest of the 2012 breeding season was discovered on March 28, 2013. For the ten nests with known incubation periods, the average incubation period was 28.3 days, the shortest incubation period was 26 days and the longest was 30 days. The youngest chick to fledge was 21 days old and the oldest was 31 days old. The average fledge time was 27.4 days. Only four of 11 broods produced fledglings and 11 chicks fledged in 2012 (Table 2).

Table 2. Breeding Season at CAHA in 2012.

Nest #	Pair #	Location	Date Found	Incub Started	Incub Days	Hatch Date	Fledge Date	# Fledged	Days to Fledging	
BI01	BI01	Bodie Spit	4/20/2012	4/24/2012	30	5/23/2012 (2 chicks)	---	0		
BI02	BI01	Bodie Spit	6/18/2012	UNK	---	---	---	---		
HI01	HI01	Cape Pt.	3/28/2012	---	---	---	---	---		
HI02	HI02	Cape Pt.	4/10/2012	4/15/2012	27	5/11/2012 (1 chick) 5/12/2012 (2 chicks)	6/9/2012 (1) 6/11/2012 (1)	2	30 & 31	
HI03	HI03	Cape Pt.	4/16/2012	4/23/2012	---	---	---	---		
HI04	HI04	Cape Pt.	4/16/2012	4/21/2012	32	5/22/2012 (2 chicks) 5/23/2012 (1 chick)	---	0		
HI05	HI05	Cape Pt.	4/20/2012	4/25/2012	29	5/23/02012 (2 chicks) 5/24/2012 (2 chicks)	---	0		
HI06	HI03	Cape Pt.	5/7/2012	5/12/2012	28	6/8/2012 (1 chick) 6/9/2012 (3 chicks)	7/7/2012 (4)	4	30, 29, 29, 29	
HI07	HI06	Cape Pt.	5/15/2012	5/19/2012	29	6/16/2012 (4 chicks)	7/11/2012 (1) 7/12/2012 (1)	2	26 & 27	
HI08	HI07	Cape Pt.	5/16/2012	5/24/2012	26	6/18/2012 (3 chicks) 6/19/2012 (1 chick)	7/8/2012 (1) 7/12/2012 (2)	3	21, 25, 25	
HI09	HI08	South Beach	6/6/2012	6/10/2012	27	7/6/2012 (3 chicks)	---	0		
HI10	HI09	Cape Pt.	6/9/2012	---	---	---	---	---		
HI11	HI05	Cape Pt.	6/10/2012	6/16/12 (6/14/12)	26	7/11/2012 (4 chicks)	---	0		
HI12	HI09	Cape Pt.	6/30/2012	UNK	UNK	7/22/2012 (1 chick) 7/23/2012 (1 chick)	---	0		
OI01	OI01	South Pt.	4/24/2012	4/30/2012	---	---	---	---		
OI02	OI02	South Pt.	5/9/2012	5/14/2012	---	---	---	---		
OI03	OI03	South Pt.	5/9/2012	5/12/2012	29	6/9/2012 (3 chicks) 6/10/2012 (1 chick)	---	0		
OI04	OI04	South Pt.	5/10/2012	---	---	---	---	---		
OI05	OI05	North Ocracoke	5/20/2012	5/22/2012	---	---	---	---		
OI06	OI04	South Pt.	6/2/2012	---	---	---	---	---		
OI07	OI05	North Ocracoke	6/17/2012	UNK	---	---	---	---		
OI08	OI01	South Pt.	6/20/2012	6/22/2012	---	---	---	---		
					Avg.	28.3			Avg.	27.4

In 2012 the 15 breeding pairs produced 22 known nests of which 11 nests successfully hatched. Of the 71 eggs laid, 37 hatched for a hatch rate of 52%. Half of the nests were lost prior to hatching and 26 chicks (70%) were lost prior to fledging (Table 3). Eleven chicks fledged from 15 breeding pairs for a fledge rate of 0.73 chicks per breeding pair.

Table 3. PIPL Nest and Chick Success in 2012.

Location	Breeding Pairs	Total Nests	Nests Hatched	Nests Lost/ Abandoned	Total Eggs	Total Eggs Hatched	Total Chicks Fledged	Total Chicks Lost
Bodie Island Spit	1	2	1	1	6	2	0	2
Cape Point	8	11	8	3	38	28	11	17
South Beach	1	1	1	0	3	3	0	3
North Ocracoke	1	2	0	2	8	0	0	0
South Point	4	6	1	5	16	4	0	4
TOTAL:	15	22	11	11	71	37	11	26

In 2012, 37 PIPL eggs were known to have hatched exceeding the previous highs of 2010 and 2011 of 33 and 35 hatched eggs respectively. 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 (70%) of chicks were lost prior to fledging. The 11 chicks that did fledge still represent the third highest year on record coming in behind the 15 chicks that fledged in 2010 and the 12 that fledged in 1998 (Figure 1). Although 15 breeding pairs were identified; only four pairs, all from Cape Point, successfully fledged young (Table 3).

Since 1989, fledge rates have ranged from 0.0 to 2.0 chicks/pair at CAHA. The mean rate during the previous 10 years (2002-2011) was 0.69 chicks/pair and in 2012 the fledge rate was slightly above the mean at 0.73 chicks/pair. In recent years the fledge rate has remained between 0.64 and 0.73 with the exception of 2010 when the fledge rate was 1.25 (Table 4).

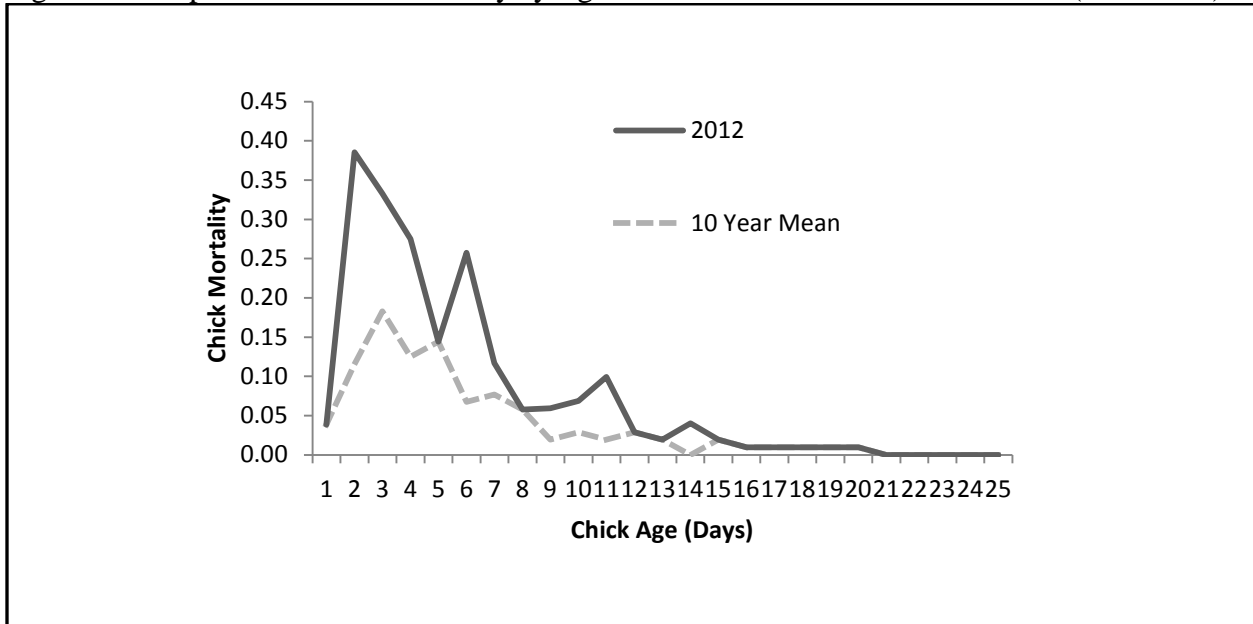
Table 4. PIPL Nest and Chick Success from 2007-2012.

Year	Breeding Pairs	Total Nests	Nests Hatched	Nests Lost/ Abandoned	Total Eggs	Total Eggs Hatched	Total Chicks Fledged	Total Chicks Lost	Fledge Rate (chicks/pr)
2007	6	10 ¹	6	4	29	17	4	13	0.67
2008	11	13	8	5	43	22	7	15	0.64
2009	9	9	6	4	34	22	6	16	0.67
2010	12	15	11	4	52	33	15	18	1.25
2011	15	18	12	6	57	35	10	25	0.67
2012	15	22	11	11	71	37	11	26	0.73

¹Based on consultation with FWS it was determined Nest 1 and Nest 2 were a single nesting attempt

Chick loss, as in past years, was difficult to document. The majority of chick mortality occurred within the first week of hatching (Figure 2). At Bodie Spit, one nest hatched and both chicks were lost prior to fledging. At Cape Point nine nests hatched and of the 28 chicks, 17 were lost prior to fledging. On South Beach one nest hatched and none of the three chicks survived to fledge. On South Point only one of the six nests hatched with none of the four chicks surviving to fledging.

Figure 2. Comparison of Chick Mortality by Age in 2012 vs. 10 Year Mean for CAHA (2002-2011)



Nest Loss/Abandonment

Out of twenty-two known nests, eleven nests were lost prior to hatching. The loss of these eleven nests was attributed to predation, overwash, and unknown causes.

- BI02-three egg nest was abandoned after fox tracks were discovered circling the enclosure.
- HI01-one egg nest was found on 3/28. First egg lost on 4/4 and second egg lost on 4/8. Nest not exclosed. Loss attributed to unknown cause.
- HI03-one egg nest found on 4/16. Three eggs lost on 4/27 and last egg abandoned on 4/28. Loss attributed to unknown cause.
- HI10-two egg nest was found on 6/9. Three egg nest was abandoned on 6/15. Loss attributed to unknown cause.
- OI01-one egg nest was found on 4/24. Two eggs predated by ghost crabs and one egg abandoned.
- OI02-one egg nest was found on 5/9. Four eggs lost on 5/27. Mink tracks inside and outside of enclosure along with eggshell fragments.
- OI04-one egg nest was found on 5/10 and egg was missing on 5/14. Loss attributed to unknown cause.
- OI05-two egg nest was found on 5/20. Four egg nest was overwashed during tropical depression Beryl on 5/31.
- OI06-one egg nest was found on 6/2. Gulls observed harassing PIPLs on 6/5 and egg missing on 6/6. Loss attributed to probable gull predation.
- OI07-four egg nest was found on 6/17. First egg disappeared on 7/9 and the remaining three eggs disappeared on 7/11. Loss attributed to ghost crab predation.
- OI08-one egg nest was found on 6/20. First egg lost on 7/5 and 2 eggs predated by ghost crabs on 7/8 (confirmed by video).

Chick Movement

During the daily observations, resource management staff documented foraging locations for all PIPL chicks after hatching (Appendix A, Map 6). Since chicks were not observed dawn to dusk nor can they be observed in the hours after dark, actual territories may be larger than depicted. A grid system with points located 75 meters apart was established at the beginning of the breeding season to aid staff in obtaining more accurate locations for chicks. When chicks were observed, their locations were documented relative to the grid points. The individual brood foraging areas designate the area in which the brood was observed on any given day until they fledged or were determined to be lost. The size of the foraging areas and distance travelled from the nest varied widely for the different broods (Table 5). When chicks were lost soon after hatching, no foraging territory outside the immediate vicinity of the nest could be established.

Table 5. Brood Foraging Area and Furthest Distance From Nest for 2012 Broods.

Nest ID	Status	Area (hectares)	Area (acres)	Distance Traveled (m)
BI01	Lost-day 14	10.2	25.2	860
HI02	Fledged	3.3	8.1	260
HI04	Lost-early	NA	NA	NA
HI05	Lost-early	NA	NA	NA
HI06	Fledged	4.9	12.1	305
HI07	Fledged	4.3	10.6	397
HI08	Fledged	4.7	11.6	241
HI09	Lost-day 11	6.8	16.7	491
HI11	Lost-day 11	7.7	19.0	520
HI12	Lost-day 10	1.2	2.9	212
OI03	Lost-early	NA	NA	NA

The brood from Bodie Island Spit (nest BI01) covered the largest area to fulfill their foraging needs with a foraging area of 10.2 hectares (or 25.2 acres). When both chicks were present, their preferred foraging habitat included the strip of mudflats directly east of the small dunes and a larger area north of the Bait Pond. On day 3, after the loss of the first chick, the remaining chick was observed much closer to the ocean shoreline and favored a strip of mudflats directly east of the Bait Pond.

In general all of the broods at Cape Point foraged in the drainage area and ephemeral pools on the upper beach south and southwest of the small Salt Pond. Although adults were observed foraging on the ocean shoreline, no chicks were ever observed on the ocean shoreline prior to fledging. Although the broods preferred the same general foraging area, no merging of the broods occurred.

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 9-103 minutes. Generally, the birds returned to the nest in less than 26 minutes after leaving the area during exclosure installation. Because not all nests are continuously incubated at the three-egg stage, longer return times can

be expected for these nests. Field staff always documented closure acceptance prior to leaving the area for the day. Three nests were not exclosed because they were lost prior to becoming three-egg clutches.

Predation of Chicks

Of the 26 chicks that were lost prior to fledging, all of the losses were attributed to unknown causes. The presence or tracks of crows, ghost crabs, grackles, gulls, opossum, mink, raccoon, red fox, gray fox, coyote and feral cats were documented within many of the brood foraging areas.

Human Disturbance

Human disturbance, direct or indirect, can lead to the abandonment of nests or loss of chicks. Throughout the season, resource management staff documented 39 pedestrians, six pedestrians with dogs, five ORVs, four boats/kayaks and one dog intrusion 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 into a closure 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.

If an individual or group of individuals was encountered inside a closure, they were either asked to leave the closure by resource management staff, escorted out of the closure by resource management staff, or a law enforcement officer was contacted to resolve the situation. Depending on the severity of the violation, a citation may or may not have been issued. Disturbance was not documented to be a major factor for the loss of nests or chicks in 2012 at CAHA.

Winter Closures

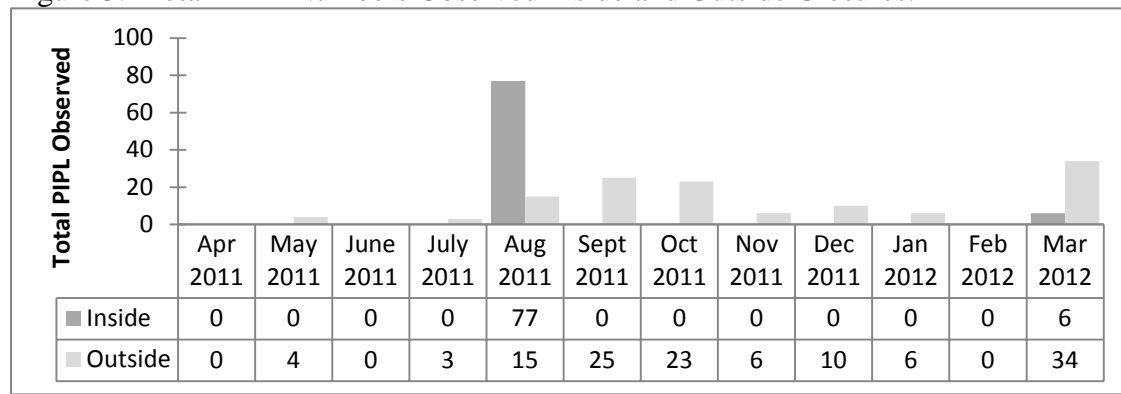
Winter closures were established upon removal of the pre-nesting closures at Bodie Spit and South Point in late August. The winter closure at Bodie Spit was revised on November 1 after Hurricane Sandy significantly modified the landscape in this area. The Bodie Spit area was separated from Bodie Island when a new sound to ocean channel was formed through “the flats” area, similar to what had occurred after the passage of Hurricane Irene in 2011. The new island was inaccessible to ORVs as well as pedestrians immediately after the hurricane. With time, the channel has slowly filled in and by the end of December of 2012, Bodie Spit had returned to its pre-storm configuration. The winter closure was successively modified back to the pre-storm configuration as the channel filled in and areas became accessible to ORVs and pedestrians again. Although signage was lost as a result of the passage of Hurricane Sandy on South Point, the closure itself did not have to be modified.

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 2011 through March 2012 during which time a total of 209 PIPL observations were documented. Of the 209 PIPL documented, 83 occurred inside non-breeding/migratory closures and 126 occurred outside such closures (Figure 3).

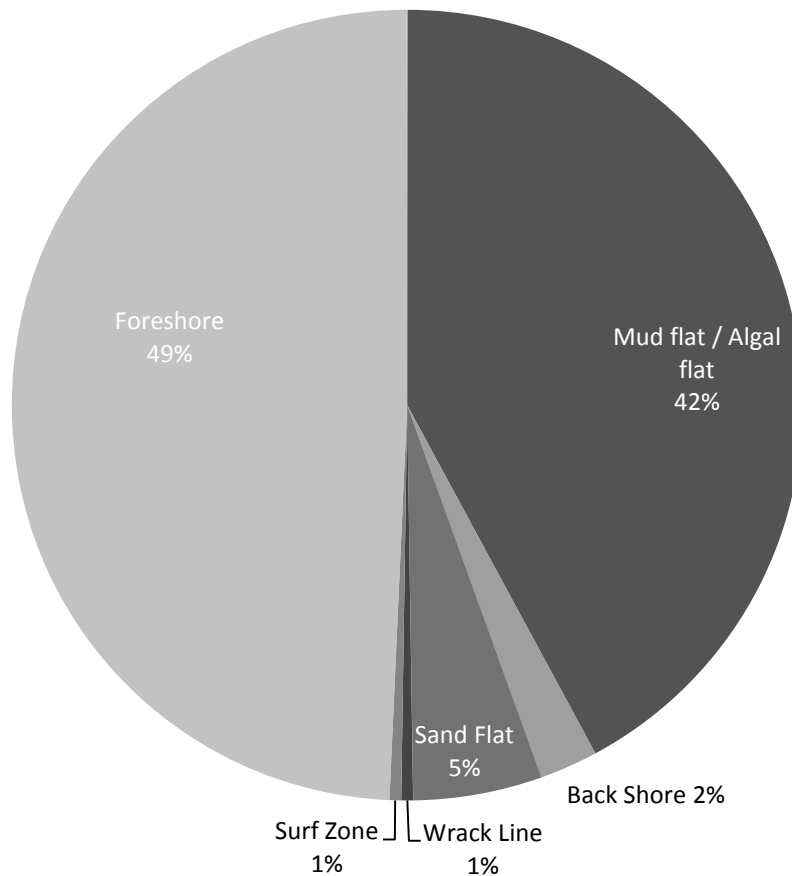
Figure 3. Total PIPL Numbers Observed Inside and Outside Closures.



As more data is accumulated CAHA will be able to make better management decisions as to which areas need additional 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. The peak migration to the south occurred during August 2011 when the majority of the migrants observed were documented on Ocracoke and the peak migration to the north occurred in March 2012.

CAHA staff documented the habitat type in which migratory and wintering PIPL were observed from April 2011 to March 2012. Of the 209 PIPL observations, 103 were in foreshore habitat, 88 were in mud flat/algal flat habitat, five were in the backshore, 11 were in sand flat habitat, one was in the wrack line and one was in the surf zone (Figure 4).

Figure 4. Habitat Usage by Migrating/Wintering PIPL at CAHA (April 2011-March 2012).



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.

U.S. Fish and Wildlife Service Biological Opinion

In the November 15, 2010 BO, the USFWS determined that the level of anticipated take is not likely to result in jeopardy to the piping plover species or destruction or adverse modification of designated critical habitat Units NC-1, NC-2, NC-4, and NC-5. Through the actions taken by the resource management staff, CAHA has complied with the reasonable and prudent measures that are necessary and appropriate to minimize the take of piping plovers at CAHA. Sufficient protected areas were provided to afford undisturbed nesting, brooding, and non-breeding habitat. Bird behavior was closely monitored for signs of disturbance. The non-discretionary terms and conditions for piping plovers were also met by providing the USFWS with this annual report. This annual report detailing the monitoring and survey data collected during the 2012 breeding season fulfills the reporting requirements of the November 15, 2010 BO.

REFERENCES

- National Park Service. 2010. Cape Hatteras National Seashore Off-Road Vehicle Management Plan and Environmental Impact Statement. U. S. Department of the Interior, National Park Service, Cape Hatteras National Seashore, North Carolina.
- U. S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. USFWS Regional Office, Hadley, Massachusetts. Appendix F.
- U. S. Fish and Wildlife Service. 2010. Biological opinion the Off-Road Vehicle Management Plan for Cape Hatteras National Seashore, Dare and Hyde Counties, North Carolina. U. S. Fish and Wildlife Service, Raleigh Field Office, Raleigh, NC. 156 pp.

APPENDICES

APPENDIX A: MAPS

Map 1: Bodie Island Spit PIPL Nesting Activity, 2007-2012

Map 2: Cape Point and South Beach PIPL Nesting Activity, 2007-2012

Map 3: North Ocracoke PIPL Nesting Activity, 2007-2012

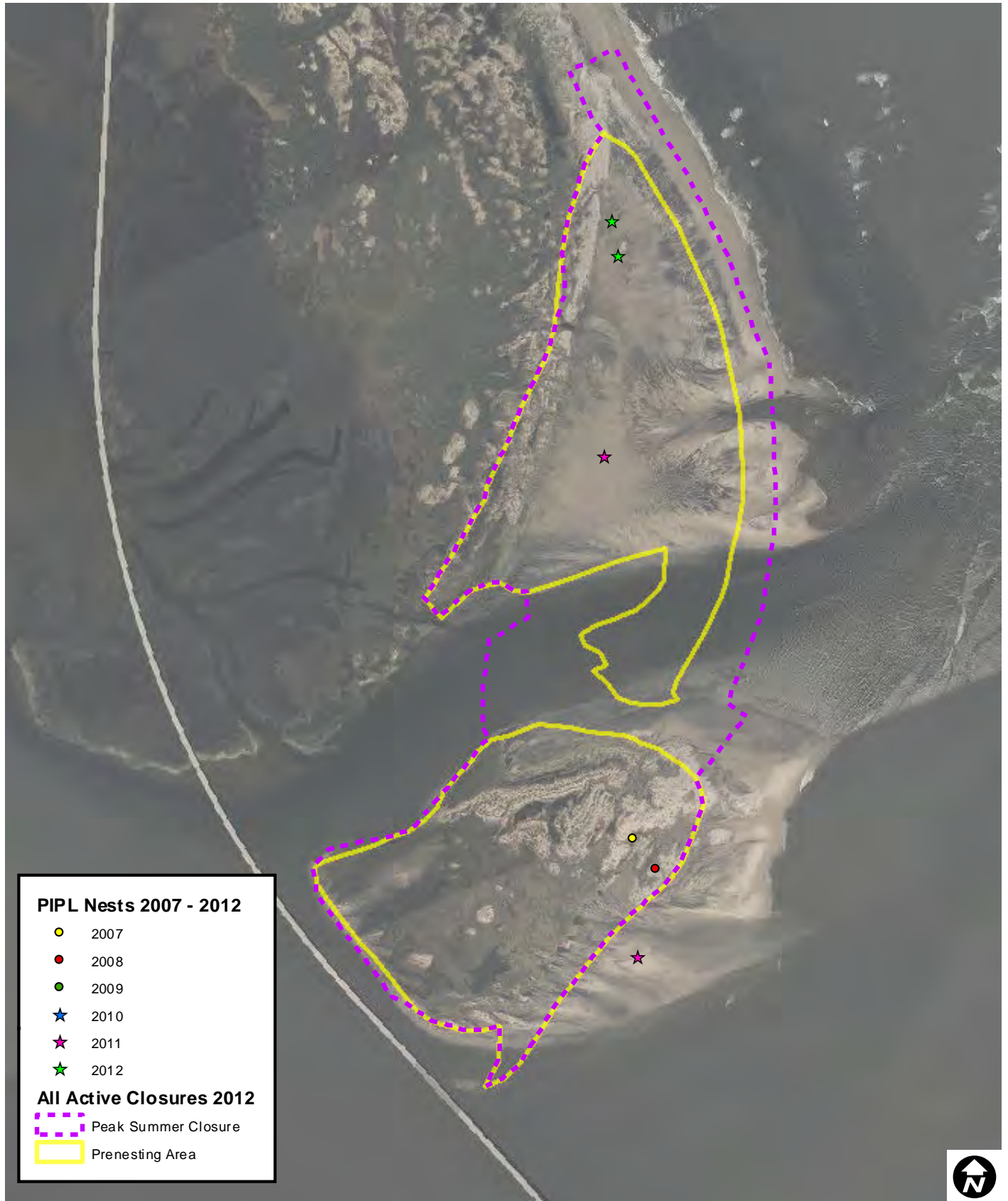
Map 4: South Point Ocracoke PIPL Nesting Activity, 2007-2012

Map 5: Wintering and Migratory PIPL Monitoring Transects, 2011-2012

Map 6: PIPL Chick Foraging Areas, 2012



Map 1: Bodie Island Spit PIPL Nesting Activity, 2007 - 2012



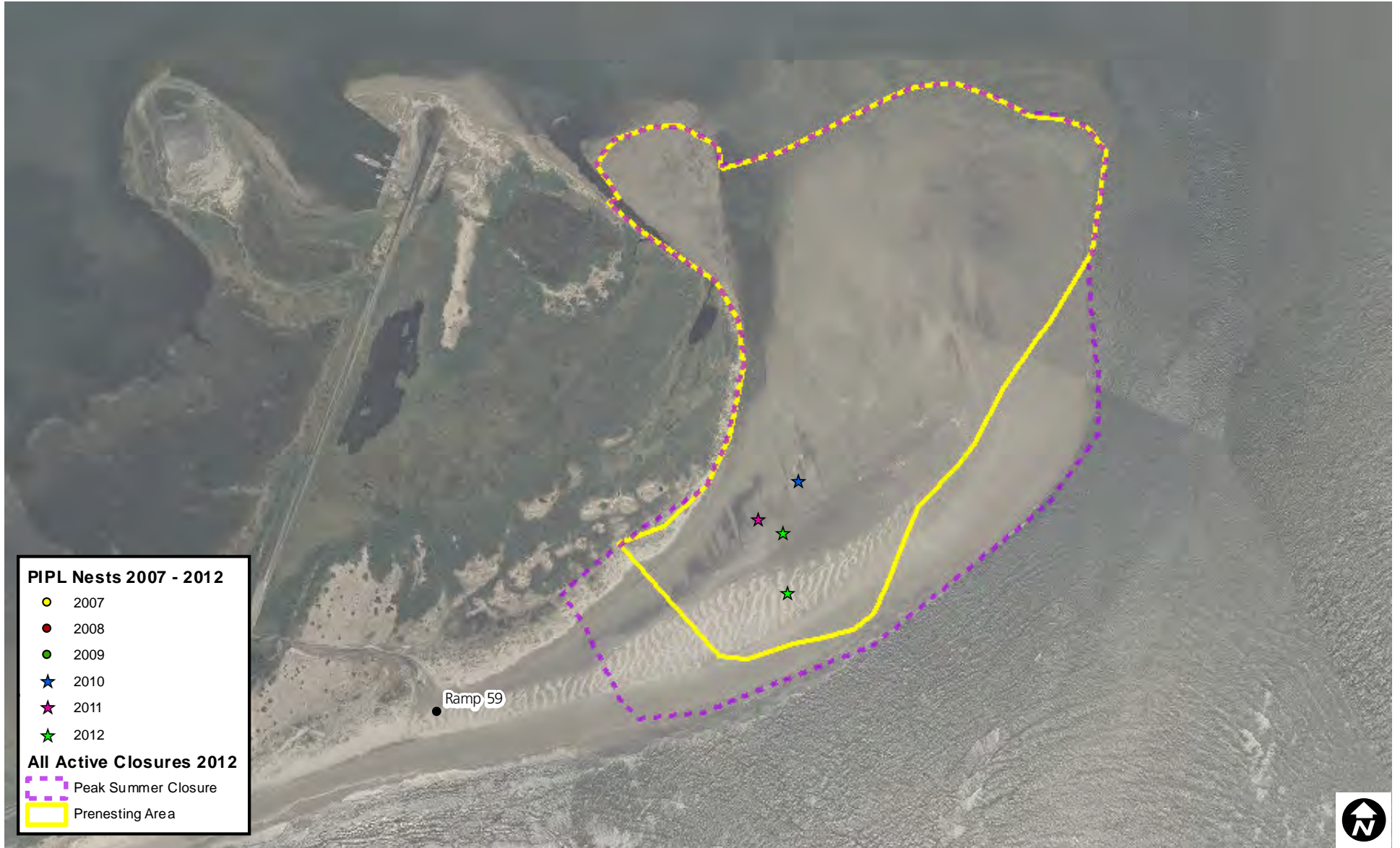


Map 2: Cape Point and South Beach PIPL Nesting Activity, 2007 - 2012





Map 3: North Ocracoke PIPL Nesting Activity, 2007 - 2012



PIPL Nests 2007 - 2012

- 2007
- 2008
- 2009
- ★ 2010
- ★ 2011
- ★ 2012

All Active Closures 2012

- ▭ Peak Summer Closure
- ▭ Prenesting Area

0 0.05 0.1 0.2 0.3 Miles



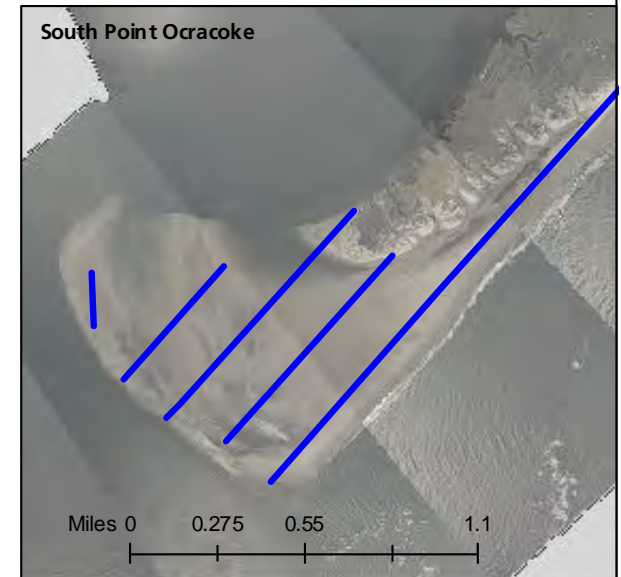
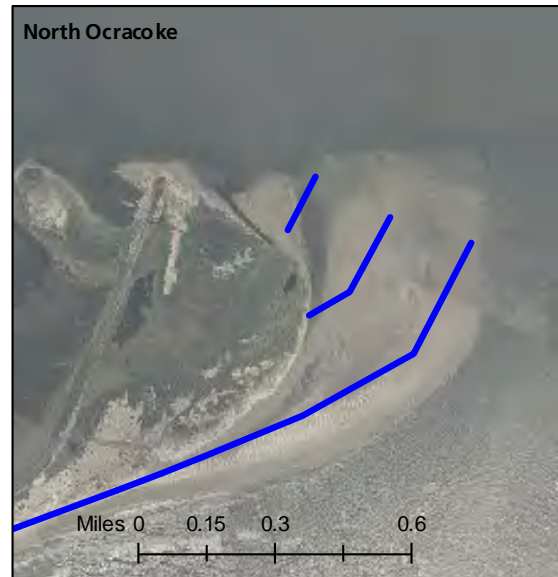
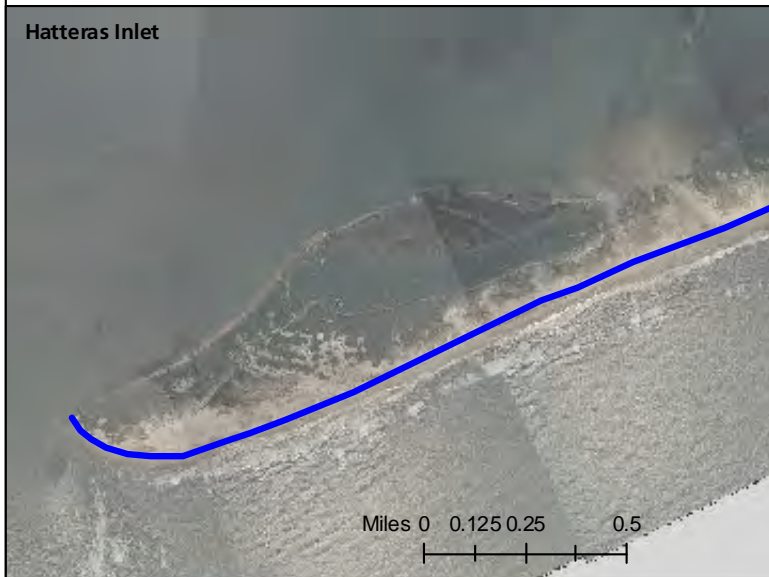
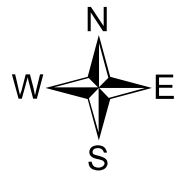
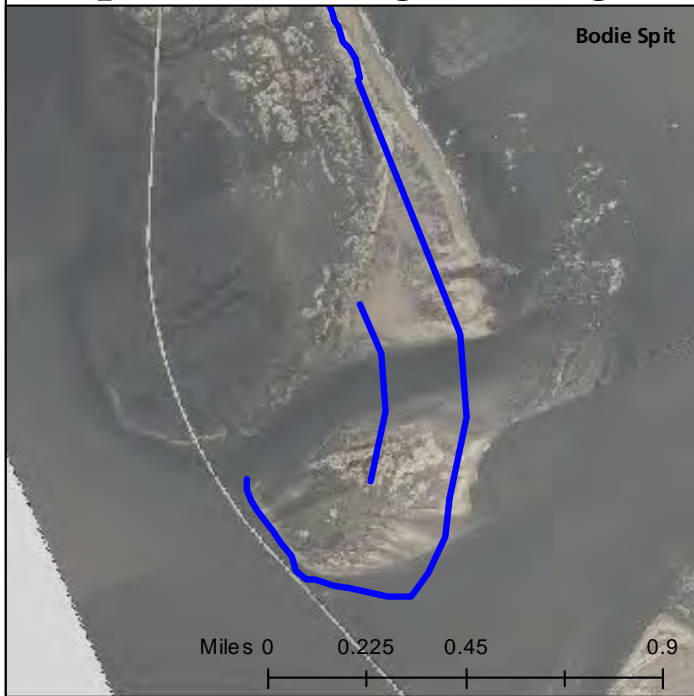


Map 4: South Ocracoke PIPL Nesting Activity, 2007 - 2012





Map 5: Wintering and Migratory PIPL Monitoring Transects, 2011 - 2012





Map 6: PIPL Chick Foraging Areas, 2012

