

**CAPE HATTERAS NATIONAL SEASHORE  
PIPING PLOVER (*CHARADRIUS MELODUS*) MONITORING  
2010 ANNUAL REPORT**



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## ABSTRACT

Piping Plover [*Charadrius melodus* (PIPL)] monitoring at Cape Hatteras National Seashore (CAHA) began in 1985. Monitoring efforts have focused on identifying nesting habitat, locating and protecting breeding plover territories and nests, and determining nest and brood success. The level of effort and man hours involved with that monitoring has also steadily increased since 2004. In 2010, 12 PIPL pairs and 15 nests were identified. Fifteen PIPL chicks successfully fledged from six broods for a fledge rate of 1.25 chicks per breeding pair – the most chicks ever fledged since record keeping began. The first nest, which was discovered 4/13/2010, was also the earliest known nest ever documented at CAHA. The 2010 breeding season was the third breeding season and second complete year that CAHA was managing under the requirements of the Consent Decree (CD) and the first year under the biological opinion for the Interim Protected Species Management Strategy (IPSMS)/CD that CAHA met the performance measures of fledging an average of at least one chick per breeding pair.

## INTRODUCTION

CAHA is located along the northern Outer Banks region of North Carolina. Consisting of more than 30,000 acres distributed along approximately 67 miles of shoreline, it is part of a dynamic barrier island system. CAHA was authorized as part of the National Park system on August 17, 1937. It was established as our nation's first national seashore on January 12, 1953. Federal ownership in CAHA extends from ocean to sound across three barrier islands-Ocracoke, Hatteras and Bodie- spanning Dare and Hyde counties. The eight village enclaves are excluded from CAHA boundaries. The villages include Rodanthe, Waves, Salvo, Avon, Buxton, Frisco, and Hatteras on Hatteras Island and Ocracoke Village on Ocracoke Island.

CAHA is home to the federally listed piping plover, and 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, much staff time and effort is geared toward documenting the breeding behavior and nesting efforts of PIPLs 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. PIPLs lay three to four eggs in a small shallow depression, or scrape. Upon completion of a clutch, the pair will incubate until the eggs hatch in about 27–30 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. The chicks usually fledge between 25–35 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 breeding plover territories and nests, and determining nest and brood success. This report contains a summary of monitoring results for the 2010 breeding season, comparisons to results from previous years, and the resource management activities undertaken for PIPLS in 2010.

## **METHODS**

### **Consent Decree**

In October 2007, a lawsuit was brought by the Defenders of Wildlife and the National Audubon Society against the National Park Service (NPS) for failure to provide adequate protection of threatened and endangered species 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 resulting from the issuance of the CD include earlier dates for the establishment of pre-nesting closures and larger buffer requirements for nesting birds and chicks. The CD will be in effect until the ORV Management Plan and special regulation are finalized and the selected alternative and regulation are implemented. This is tentatively scheduled to take place around October 2011.

### **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 in February and early March of 2010, 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, which is 16 days earlier than the April 1 date recommended in the United States Fish and Wildlife Service's (USFWS) Atlantic Coast Piping Plover Recovery Plan for managing sites used by ORVs (USFWS 1996). 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 has been accreting over the last few years and in 2010 had the first nesting pair since 1996. The Hatteras Overwash Fans have no documented nesting history for PIPLs but have the potential to be used as nesting habitat.

Pre-nesting closures were established by March 15, 2010 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 the same, to the extent possible, as the

2008 season 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 2 miles of shoreline. There was pedestrian-only access to the Bait Pond along the sound parallel with the Bonner Bridge.

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, the by-pass 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 (~0.3 miles east of Ramp 45).

From Ramp 45 to approximately 1.5 miles west of Ramp 45, the upper section of South Beach was protected by the pre-nesting closure.

A pre-nesting closure was established at the Overwash Fans near Hatteras Inlet which included the closure of approximately 0.7 miles of the Pole Road. ORV traffic was routed from the Pole Road via the spur roads onto the ocean-side shoreline.

At Hatteras Inlet Spit, a full beach closure began approximately ~200 meters east of Pole Road exit (~2 miles WSW of Ramp 55). Approximately 0.6 miles of shoreline (including the inlet) was closed to pedestrians and ORVs. Because of continuing erosion along the inlet shoreline, it was not feasible to effectively maintain a pedestrian access corridor to “the Rip” from the sound-side as occurred in 2008. In order to ensure adequate signing and compliance with the pre-nesting closure, the sound-side access corridor ended approximately 50 meters west of where the Spur Road exited at the sound.

This was the second year that a pre-nesting closure was established on North Ocracoke Spit because of the accretion and potential habitat creation that has been occurring at this site. The closure began 0.2 miles north of Ramp 59. A 100 foot ORV corridor extended for approximately 0.6 miles of shoreline. Where the beach starts to open up to form the spit, the closure extended from the duneline to the shoreline in a north-easterly direction. The pre-nesting closure at South Point was again similar to the closure installed in 2008 with a 100 foot ORV corridor starting approximately 0.3 mi southeast of Ramp 72 extending for approximately 2.3 miles.

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 exclosure was installed, generally after at least three eggs were laid. 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, 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. Depending on staff availability, some broods received dawn-to-dusk monitoring. 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 buffer distances of the closures. 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.

### Winter Closures

Winter closures were established upon removal of the pre-nesting closures during the end of August or first week of September (Appendix A, Map 22) to provide relatively undisturbed areas

for migratory and over-wintering PIPLs. In the fall and to a lesser degree in the spring large numbers of PIPLs migrate through CAHA. The winter closures were installed in preferred foraging and resting locations, which include Bodie Island Spit, Cape Point, Hatteras Overwash Fans, Hatteras Inlet Spit, North Ocracoke, and South Point. Because PIPLs have not been documented utilizing the interior of the Cape Point area during the winter months, the interior of Cape Point was open to pedestrians but remained closed to ORVs.

### **Migrating and Wintering Piping Plovers**

Surveys for the Southeast Coast Inventory Monitoring Network Migratory and Wintering Shorebird Monitoring Study were conducted on day 5, 15, and 25 of each month from August 2009 through March 2010. Semi-permanent transect locations were established along the spits and Cape Point (Appendix A, Maps 17-21). Varying length transects were walked at two mph and all target species 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 on the survey area were documented as well.

The primary objective of the original study was to determine areas of consistent use by the target species, which are PIPL, American oystercatcher (AMOY), Wilson's Plover (WIPL) and red knot (REKN). The pilot protocol was designed to systematically collect information pertaining to the target species and provide up-to-date information to park managers to aid in management decisions. Because of insufficient staff in the winter, these protocols were modified to only include Cape Point and the spits making the surveys meaningful only for documenting winter use at CAHA by PIPLs since WIPL have not been documented at CAHA in the winter and AMOYs and REKN utilize the entire shoreline. Rather than survey every mile of beach at CAHA every five days per the protocol, the protocol was modified to survey the points and spits on day 5, 15 and 25 of every month so as to coincide with the days of the International Shorebird Survey protocols other coastal areas use.

## **RESULTS AND DISCUSSION**

### **Productivity**

The 2010 breeding season met or exceeded many milestones since monitoring began on the species (Figure 1). Twelve breeding pairs of PIPLs were identified through field observations, the most pairs since 1996 when there were 14 pairs observed. This represents six more pairs than were observed in 2007, one more than was observed in 2008 and three more than were observed in 2009 under the IP/CD. In 2010, nesting occurred at four sites: Cape Point, South Beach, North Ocracoke Spit and South Point (Appendix A, Maps 8, 9). Bodie Island Spit had at least one pair from 2006-2008, however, no pairs were observed in 2009 or 2010. The six pairs at Cape Point were the most pairs documented since 1995. This was the first time since 1996 that a pair nested on North Ocracoke Spit. The four pairs identified on South Point equal 2008 and 2009 as the most ever recorded for that area.

Six of eleven broods produced fledglings in 2010, the highest number of broods producing fledglings at CAHA since 1992. Five of six broods produced at least one fledgling in 2009,

whereas three of eight broods produced fledglings in 2008 and four of six broods produced fledglings in 2007.

The first nest, discovered 4/13/2010, was the earliest known nest documented at CAHA. Six of eight nests initiated in April produced fledglings. No nest initiated after April produced fledglings. For the 11 nests which hatched, the average incubation period was 26 days, the shortest incubation period was 24 days and the longest was 29 days. The youngest chick to fledge was 21 days old and the oldest was 31 days old. The average fledge time was 26.7 days (Table 2). The 15 fledged chicks in 2010 are the most ever documented at CAHA.

Figure 1. Fledged PIPL Chicks vs. Broods with Fledged Chicks with Means (1992-2010).

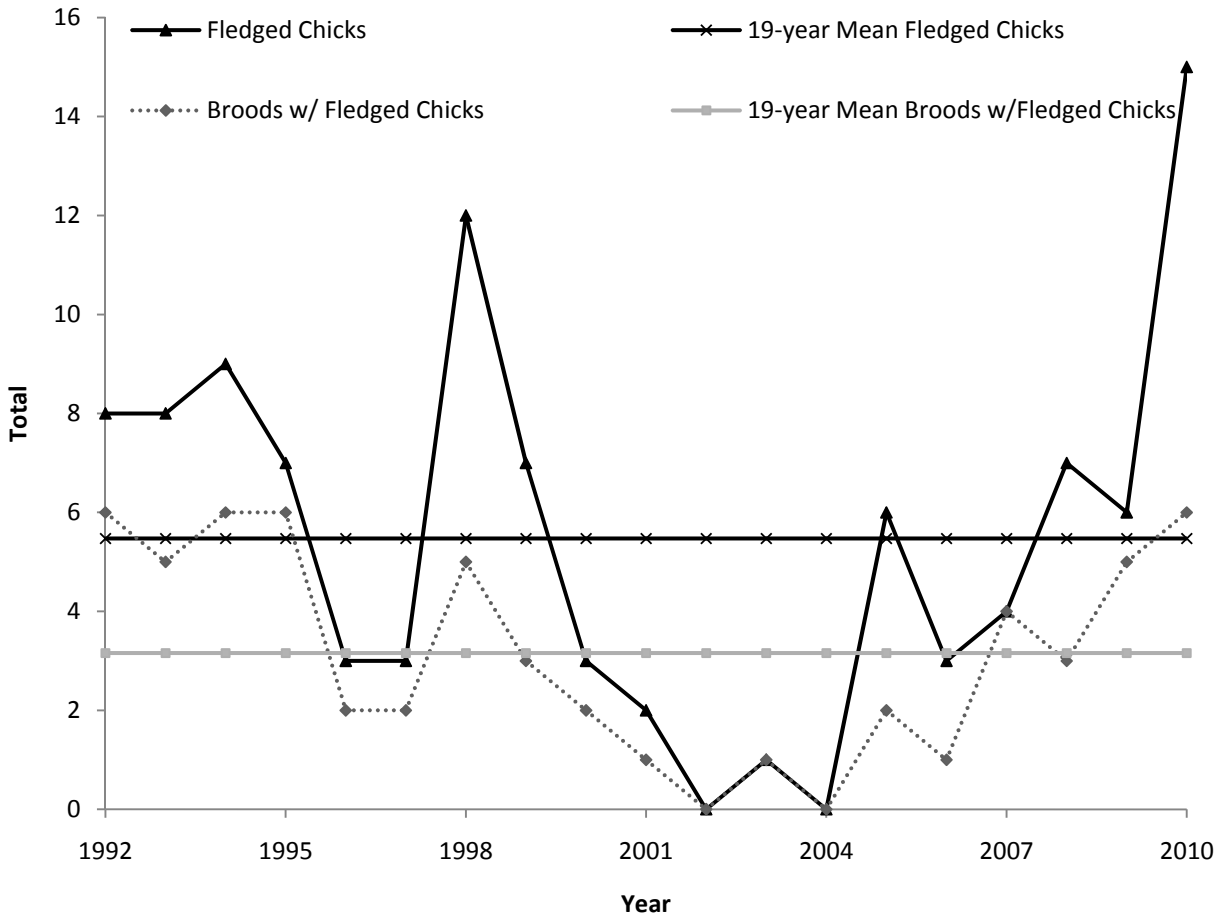


Table 2. Breeding Season at CAHA in 2010.

Nest #	Pair #	Location	Date Found	Incub started	Incub Days	Hatch Date	Fledge Date	# Fledged	Days to Fledging
HI01	1	Cape Pt	4/13/2010	4/19/2010	24	5/13/2010	6/8/2010	4	26
HI02	2	Cape Pt	4/15/2010	4/19/2010	25	5/14/2010	1st on 6/4/2010, 2nd on 6/9/2010	2	21 & 26
HI03	3	Cape Pt	4/22/2010	4/24/2010	27	5/21/2010	6/17/2010	1	27
HI04	4	Cape Pt	4/22/2010	4/24/2010	27	5/21/2010	1st 3 on 6/18/2010, 4th on 6/21/2010	4	28 & 31
HI05	5	Cape Pt	4/22/2010	4/27/2010	27	5/24/2010	6/21/2010	2	28
HI06	6	Cape Pt	4/22/2010	4/25/2010	26	5/21/2010	6/16/2010	2	26
OI07	7	South Pt	4/28/2010	N/A	N/A	N/A	N/A	N/A	N/A
OI08	8	South Pt	4/28/2010	4/30/2010	N/A	N/A	N/A	N/A	N/A
OI09	9	South Pt	5/4/2010	5/8/2010	29	6/6/2010	N/A	N/A	N/A
OI10	7	South Pt	5/16/2010	5/16/2010	N/A	N/A	N/A	N/A	N/A
OI11	8	South Pt	5/16/2010	5/16/2010	27	6/12/2010	N/A	N/A	N/A
OI12	10	North Ocracoke Spit	5/27/2010	5/31/2010	25	6/25/2010	N/A	N/A	N/A
OI13	7	South Pt	6/3/2010	6/7/2010	24	7/1/2010	N/A	N/A	N/A
HI14	11	South Beach	6/15/2010	6/16/2010	25	7/11/2010	N/A	N/A	N/A
OI15	12	South Pt	6/20/2010	N/A	N/A	N/A	N/A	N/A	N/A
OI15A	12	South Pt	6/29/2010	6/29/2010	N/A	N/A	N/A	N/A	N/A
					Avg.	26			26.7

The 12 PIPL pairs produced 15 known nests this season (Table 3). Eleven nests successfully hatched; six at Cape Point, one on South Beach, one on North Ocracoke Spit and three at South Point. Average clutch size of all nests was 3.5 eggs, with six 4-egg nests laid at Cape Point, a 3-egg nest laid at South Beach, a 3-egg nest laid on North Ocracoke Spit and three 4-egg nests, two 3-egg nests and two 2-egg nests laid at South Point. Of the 52 eggs laid, 33 hatched, including 21 eggs from Cape Point, one from South Beach, and four eggs from South Point for a hatch rate of 63.5% (Tables 4, 4a).

Table 3. PIPL Nest and Chick Success in 2010.

Location	# Breeding Pairs	# Nests	# Nests Hatched	# Nests Lost	# Chicks Fledged	# Chicks Lost
Bodie Island Spit	0	0	0	0	0	0
Cape Point	6	6	6	0	15	6
South Beach	1	1	1	0	0	1
Hatteras Inlet Spit	0	0	0	0	0	0
North Ocracoke Spit	1	1	1	0	0	3
South Point	4	7	3	4	0	8
Total:	12	15	11	4	15	18



Table 4. PIPL Hatching Success in 2010.

Location	# Nests	# Eggs	Nests Lost/Abandoned		Nests Hatched		Eggs Hatched		Nests w/ Fledged Chicks	
			#	%	#	%	#	%	#	%
Bodie Island Spit	0	0	0	0	0	0	0	0	0	0
Cape Point	6	24	0	0	6	100	21	87.5	6	100
South Beach	1	3	0	0	1	100	1	33.3	0	0
Hatteras Inlet Spit	0	0	0	0	0	0	0	0	0	0
North Ocracoke Spit	1	3	0	0	1	100	3	100	0	0
South Point	7	22	4	57.1	3	42.8	8	36.3	0	0
TOTAL:	15	52	4	26.7	11	73.3	33	63.4	6	40.0

Table 4a. PIPL Hatching Success from 1992-2010.

Year	# Nests	# Eggs	Nests Lost/Abandoned		Nests Hatched		Eggs Hatched		Nests w/ Fledged Chicks	
			#	%	#	%	#	% (a)	#	%
1992	14	49(b)	6	42.9	8	57.1	17	34.7	6	42.9
1993	21	69	12	57.1	9	42.9	27	39.1	5	23.8
1994	18	65(c)	8	44.4	10	55.6	32(d)	49.2	6	33.3
1995	19	63	6	31.6	13	68.4	30	47.6	6	31.6
1996	16	56(e)	6	37.5	10	62.5	30	53.6	2	12.5
1997	16	47(e)	6	37.5	10	62.5	32	68.1	2	12.5
1998	8	31	2	25.0	6	75.0	20	64.5	5	62.5
1999	6	23	3	50.0	3	50.0	11	47.8	3	50.0
2000	6	23	3	50.0	3	50.0	10	43.5	2	33.3
2001	3	10	2	66.7	1	33.3	3	30.0	1	33.3
2002	3	8	2	66.7	1	33.3	1	12.5	0	0
2003	2	5(e)	0	0	2	100	4(e)	80.0	1	50.0
2004	2	6	1	50.0	1	50.0	4	66.7	0	0
2005	2	8	0	0	2	100	8	100	2	100
2006	4	15	1	25.0	3	75.0	9	60.0	1	25.0
2007	10(f)	29	4	40.0	6	60.0	17	58.6	4	40.0
2008	13	43	5	38.5	8	61.5	22	51.2	3	23.1
2009	9	34	4	44.4	6	55.6	22	64.7	5	55.6
2010	15	52	4	26.7	11.0	73.3	33	63.5	6	40.0
10 Year Average (2000-2009)	5.4	18.1	2.2	38.1	3.3	61.9	10	56.7	1.9	36.0
2010 Difference	+9.6	+33.9	+1.8	-11.4	+7.7	+11.4	+23	+6.8	+4.1	+4.0

- (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
- (d) – includes those presumed hatched (see 1994) report)
- (e) – assumes 1 egg from a brood whose nest was not found (see 2003 report)
- (f) – based on consultation with FWS it was determined Nest 1 and Nest 2 were a single nesting attempt

Fifteen chicks fledged and the fledge rate was 1.25 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 18 years is 0.64 chicks/pair and 0.65 chicks/pair for the past 10 years, 2000-2009 (Table 5a). The monitoring efforts and management strategy formally changed in 2006 with the implementation of the IPSMS and then again in 2008 with the CD. From 2006 to 2010 under those management strategies the average productivity rate has been 0.80 chicks/pair.

Table 5. Fledging Success of PIPL in 2010.

Location	# Pairs	# Broods	# Eggs Hatched	Avg Brood (chicks/brood)	Chicks Fledged		Broods w/ Fledged Chicks		Fledge Rate (chicks/pair)
					#	%	#	%	
Bodie Island Spit	0	0	0	0	0	0	0	0	0.00
Cape Point	6	6	21	3.5	15	71.4	6	100	2.50
South Beach	1	1	1	1	0	0	0	0	0.00
Hatteras Inlet Spit	0	0	0	0	0	0	0	0	0.00
North Ocracoke Spit	1	1	3	3	0	0	0	0	0.00
South Point	4	3	8	2.7	0	0	0	0	0.00
Total:	12	11	33	3.0	15	45.4	6	54.5	1.25

Table 5a. Fledging Success of PIPL 1992 - 2010.

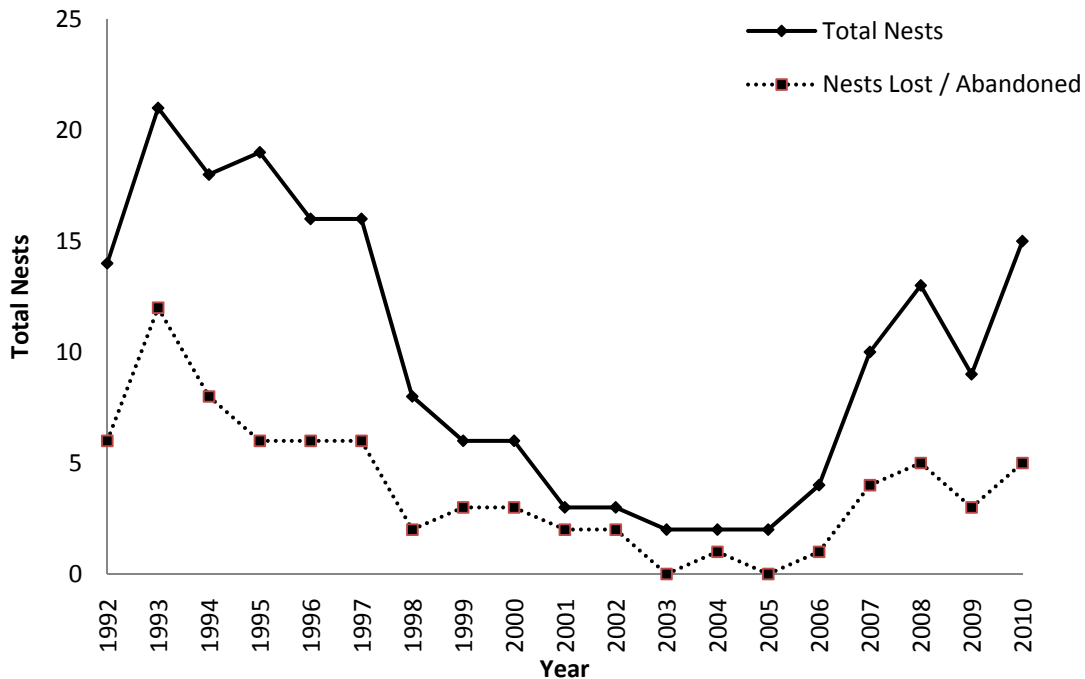
Year	# Pairs	# Broods	# Eggs Hatched	Avg Brood Size (chicks/brood)	Chicks Fledged		Broods w/ Fledged Chicks		Fledge Rate (chicks/pair)
					#	%	#	%	
1992	12	8	17	2.1	8	47.1	6	75.0	0.67
1993	12	9	27	3.0	8	29.6	5	55.5	0.67
1994	11	10	32	3.2	9	28.1	6	60.0	0.82
1995	14	13	30	2.3	7	23.3	6	46.1	0.50
1996	14	10	30	3.0	3	10.0	2	20.0	0.21
1997	11	10	32	3.3	3	9.4	2	20.0	0.27
1998	9	6	20	3.3	12	60.0	5	83.3	1.33
1999	6	3	11	3.7	7	63.6	3	100	1.17
2000	4	3	10	3.3	3	30.0	2	66.7	0.75
2001	3	1	3	3.0	2	66.7	1	100	0.67
2002	2	1	1	1.0	0	0	0	0	0.00
2003	2	2	5	2.5	1	20.0	1	50.0	0.50
2004	3	1	4	4.0	0	0	0	0	0.00
2005	3	2	8	4.0	6	75.0	2	100	2.00
2006	6	3	9	3.0	3	33.3	1	33.3	0.50
2007	6	6	17	2.8	4	23.5	4	66.7	0.67
2008	11	8	22	2.75	7	31.8	3	37.5	0.64
2009	9	6	22	3.7	6	27.3	5	83.3	0.67
2010	12	11	33	3.0	15	45.5	6	54.5	1.25
10 Year Average (2000-2009)	4.9	3.3	10.1	3.0	3.2	31.6	2.3	57.6	0.65
2010 Difference	+7.1	+7.7	+22.9	0.0	+11.8	+13.4	+3.7	-2.6	+0.60

### Nest Loss/Abandonment

Four nests were lost to various factors during the 2010 breeding seasons. Weather, infertility and predation, and abandonment were factors contributing to their loss (Figure 2).

- Nest 7, a two-egg nest discovered on South Point on April 28, was predated by ghost crabs on May 2.
- Nest 8, a two-egg nest discovered on South Point on April 28, was predated by ghost crabs on May 4 and May 7.
- Nest 10, a three-egg nest discovered on South Point on May 16, was over-washed by spring tides on May 26.
- Nest 15, a one-egg nest discovered on South Point on June 20, was predated by ghost crabs on June 21. Nest 15A, a two-egg clutch continuation from the same pair discovered on South Point on June 29, was predated by ghost crabs on July 18.

Figure 2. Total PIPL Nests vs. Lost /Abandoned Nests for CAHA 1992-2010.



### Chick Mortality

In the third breeding season of CD implementation, the number of PIPL eggs that hatched (33) exceeded the Seashore's previous highs of 32 eggs hatched in both 1994 and 1997. Although the total number of chick losses increased slightly from 15 in 2008 to 18 in 2010, the number of chicks fledged during this same time period doubled from seven to 15. Overall, the percentage of chicks lost declined and the percentage of chicks fledged increased in 2010 (Table 6, Figure 3).

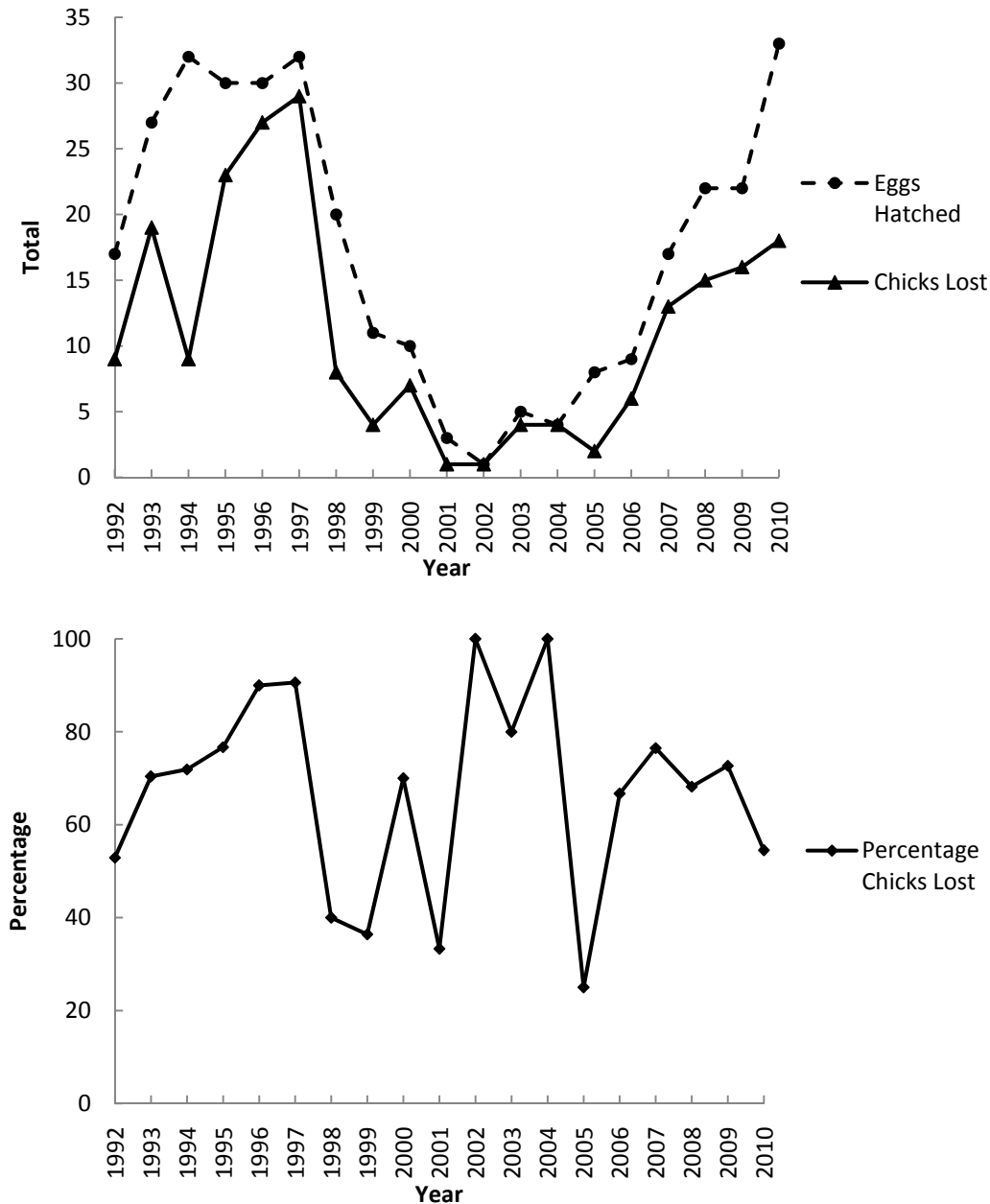
Table 6. Total PIPL Chicks Hatched and Fledged for CAHA 1992-2010.

Year	# of 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	71.8	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
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	45.4
10 Year Average (2000-2009)	17.5	12.1	68.8	5.5	31.2
2010 Difference	+15.5	+5.9	-13.8	+9.5	+14.2

Of the 33 eggs that hatched at CAHA, 18 chicks were lost prior to fledging. At Cape Point, 21 chicks hatched and six of those were lost. Brood 3, which was the third brood to hatch at Cape Point, began with three chicks on 5/21 and one chick was lost on 5/28 and another on 6/6. Brood 5 began with four chicks on 5/21 and two chicks were lost on 5/30. The two remaining chicks from Brood 5 joined Brood 3 on 6/1 and the Brood 5 adults abandoned their territory. Four chicks hatched on 5/21 from Brood 6 and one was lost on 5/22 and another on 5/28. All 10 chicks hatched from Broods 1, 2 and 4 at Cape Point survived to fledge. On South Beach one chick hatched from Nest 14 on 7/11 and was lost on 7/20. At North Ocracoke Spit, 3 chicks hatched and all were lost. Brood 12 began with three chicks on 6/25 and one was lost on 6/28. The other two chicks were lost on 7/1. At South Point, eight chicks hatched and all were lost. Brood 9 hatched three chicks which were all lost on 6/7. Brood 11 began with four chicks on 6/12 and lost two chicks on 6/14, lost the third chick on 6/15 and the fourth chick on 6/16. Brood 13 began with three chicks which hatched on 7/1, but only one chick was observed by 7/2. That chick was lost on 7/4.

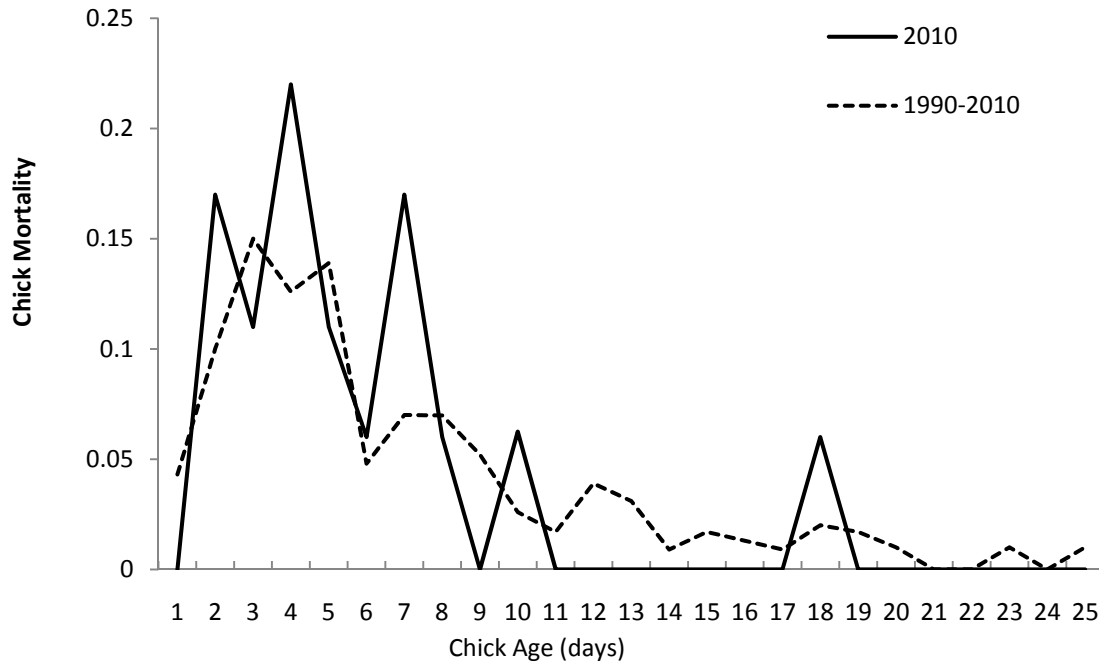
Several nests had clutch reductions at or near the time of hatching. It is unknown if those eggs hatched and the chicks were lost prior to being observed or the eggs were depredated prior to hatching. Monitors could only count the total number of chicks observed at one time for any given brood and those numbers are used as the total hatched chicks.

Figure 3. PIPL Eggs Hatched & Chick Mortality vs. Percentage Lost for CAHA 1992-2010.



Although staff has opinions with varying levels of confidence on what may have caused mortality in different situations, mortality cause was characterized as “unknown” unless specific evidence can support a cause. Potential causes are discussed in following sections of this report. As in past years, the majority of chick mortality occurred within ten days of hatching (Figure 4).

Figure 4. Comparison of Chick Mortality by Age in 2010 vs. Mean for CAHA 1990-2010.



### 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 13-16). The chicks are 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.

### Cape Point

The chicks from Brood 1 moved as far as 194 m from the nest and had an estimated foraging territory of ~5 acres. The chicks from Brood 2 moved as far as 245 m from the nest and had an estimated foraging territory of ~3.7 acres. The chicks from Brood 3 moved as far as 210 m from the nest and had an estimated foraging territory of ~5.1 acres. The chicks from Brood 4 moved as far as 330 m from the nest and had an estimated foraging territory of ~9.4 acres. The chicks from Brood 5 moved as far as 70 m from the nest and had an estimated foraging territory of ~1 acre. Two chicks from this brood were incorporated into Brood 3 and used its territory. The chicks from Brood 6 moved as far as 515 m from the nest and had an estimated foraging territory of ~14 acres which included 673m of shoreline from just west of Salt Pond Ramp towards Cape Point (Appendix A, Map 13).

### **South Beach**

The chicks from Brood 14 at moved as far as 190 m from the nest and had an estimated foraging territory of ~4.5 acres (Appendix A, Map 14).

### **North Ocracoke**

The chicks from Brood 12 at moved as far as 365 meters and had an estimated foraging territory of ~2.6 acres (Appendix A, Map 15).

### **South Point**

The chicks from Brood 9 moved no more than 15 meters around the enclosure before all were lost (not shown on maps). The chicks from Brood 11 moved as far as 800 m and had an estimated foraging territory of ~4.3 acres. The chicks from Brood 13 moved as far as 225 m and had a foraging territory of 0.5 acres (Appendix A, Map 16).

### **Predator Enclosures**

As in previous years, predator enclosures were used to protect the nests. All of the predator enclosures were installed and accepted by pairs within 30 minutes. Twelve nests were enclosed as three-egg nests. Three nests on South Point were not enclosed because they were lost prior to becoming three-egg clutches.

### **Predation of Chicks**

This year, staff observed ghost crab predation on a chick from Brood 11 on South Point. All of the other 17 chick losses are categorized as “unknown”.

The presence or tracks of crows, ghost crabs, grackles, gulls, opossum, mink, raccoon, red fox, grey fox, coyote and feral cats were documented within many of the PIPL breeding territories. The interim predator control program continued at CAHA during the 2010 breeding season.

### **Weather**

No hurricanes or tropical storms occurred during the breeding season. However, smaller localized events may have affected nesting. A high spring tide pushed by 30 mph wind gusts over-washed Nest 10 on South Point on 5/26.

### **Human Disturbance**

Human disturbance, direct or indirect, can lead to the abandonment of nests or loss of chicks. Throughout the season, resource staff documented 132 pedestrian, five ORV, five dog, one horse and three 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 cannot be specifically identified as a main cause for the loss of nests or chicks because it is difficult to document the effect on nesting birds, unless the action was directly observed or loss of eggs, chicks, or birds was specifically documented.

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; however three such violations occurred associated with pre-nesting closures established for PIPLs.

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

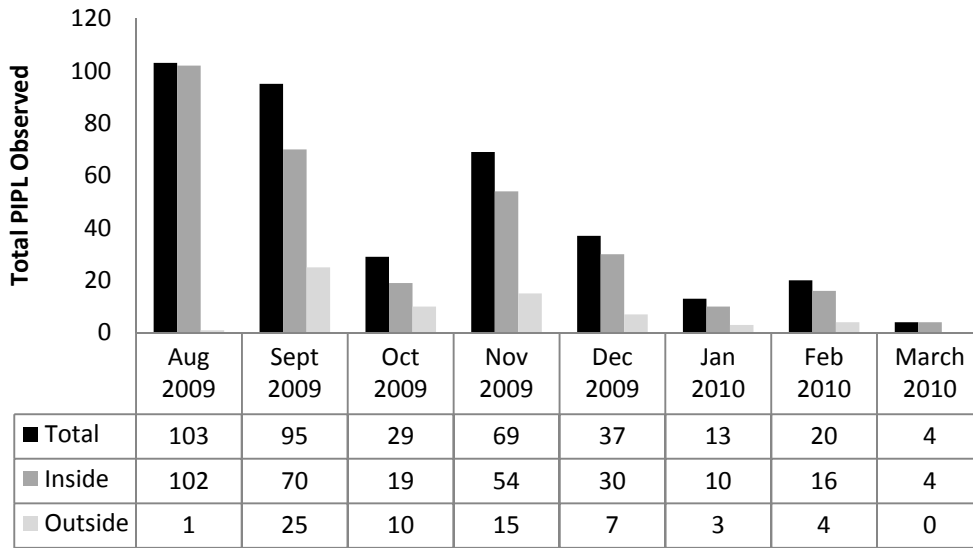
The non-breeding PIPL monitoring protocol was developed to document trends over time and to document the habitat type in which PIPLs are most frequently found. Documenting the habitat type assists CAHA staff in determining which areas need to be protected to minimize disturbance to wintering PIPLs.

From August 5, 2009 – March 5, 2010, a total of 370 PIPL observations were documented. Of the 370 PIPLs documented, 305 occurred inside non-breeding/migratory closures and 65 occurred outside such closures (Figure 5). The peak migration appeared to be during August (Figure 6). These observations allowed CAHA to make adjustments to the winter closures to include habitat types where PIPLs had been observed outside of the closures. For example, the winter closure on South Ocracoke was expanded in 2008 and replicated in 2009 and 2010 to include more of the sand flat habitat type. As more data is accumulated CAHA will be able to make better management decisions as to where the winter closures need to be placed. No PIPLs were observed at Hatteras Inlet during the surveys.

The ability of CAHA to reference the previous years’ data resulted in there being no winter closure at Cape Point and Hatteras Inlet because wintering PIPLs were not observed in the area from 2006-2009. Although there were no “official” winter closures at Cape Point and Hatteras Inlet, interior habitat remained closed to ORVs but was open to pedestrians.

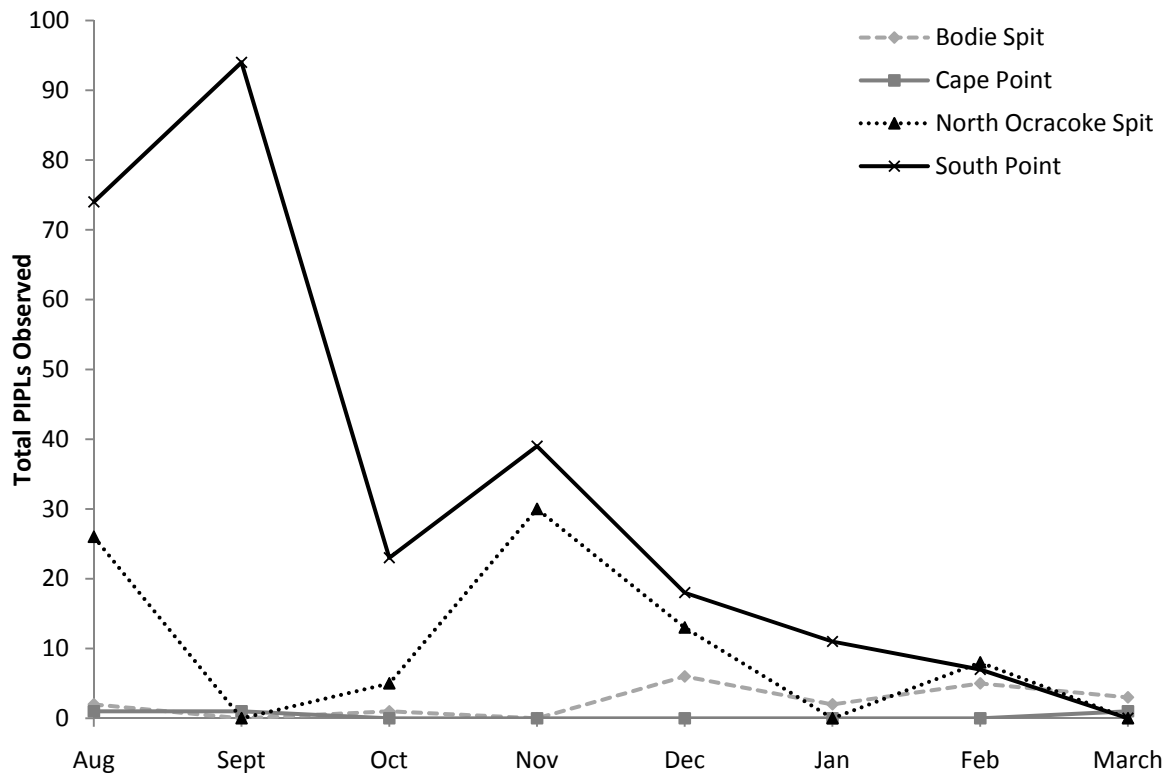


Figure 5. Total Numbers Observed vs. Inside or Outside Closure.



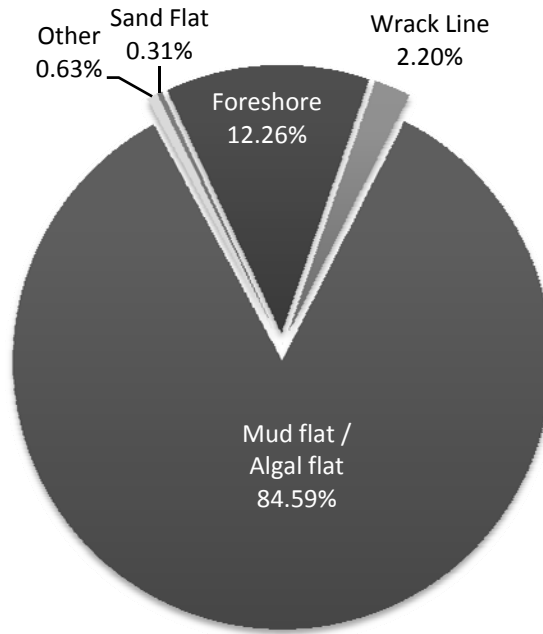
Staff surveyed 13 transects on day 5, 15, and 25 of each month for non-breeding PIPL use at CAHA beginning at the end of the PIPL breeding season from August 5, 2009 through March 5, 2010 (Figure 5 and 6).

Figure 6. Total PIPLs Observed by Month by Island, Aug. 2009-March 2010.



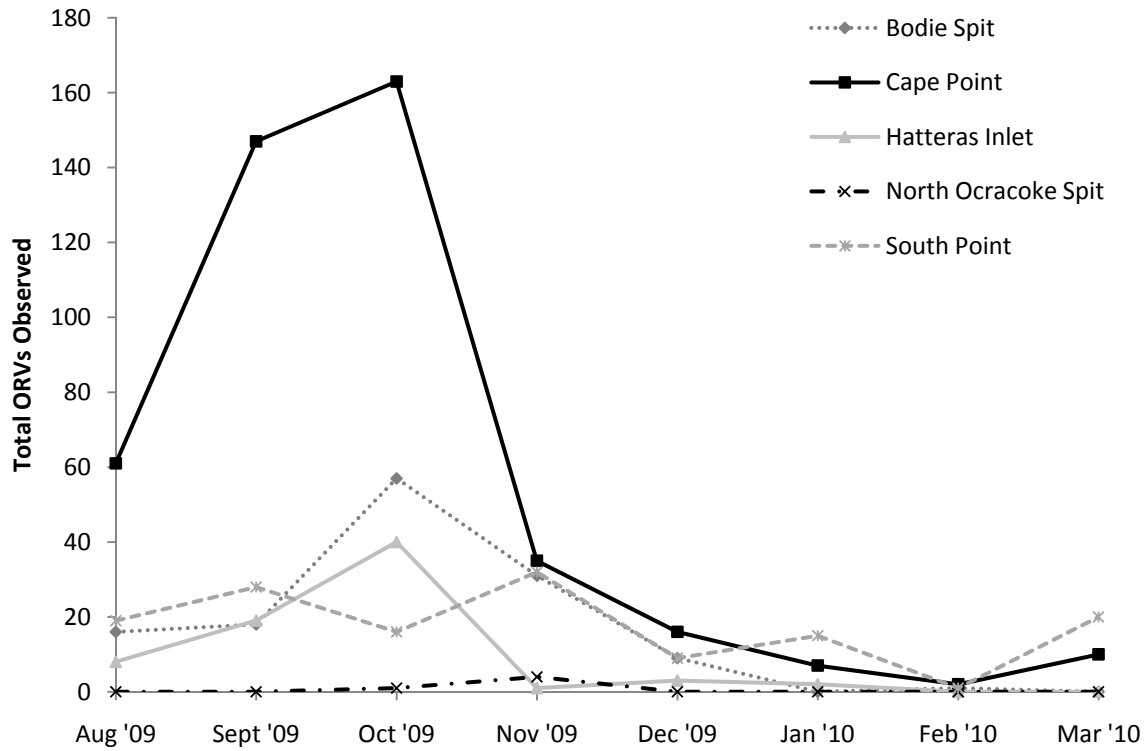
CAHA staff documented the habitat type in which migratory and wintering PIPL were observed from August 2009 to March 2010. Of the 370 PIPL observations, 320 were in mud flat/algal flat habitat, one was in sand flat habitat, 40 were in foreshore habitat, seven were in wrack line and two were classified as “other” as they were in dune habitat or flying (Figure 7).

Figure 7. Habitat Usage by Migrating/Wintering PIPL at CAHA (Aug. 5, 2009-March 5, 2010).



Peak ORV usage during migration occurred in September and October when 212 and 277 ORVs were observed, respectively, during nonbreeding surveys. The maximum number of ORVs observed for each month in one survey was at Cape Point when 147 were observed in September and 163 were observed in October. There were no more than 16 ORVs observed in the five survey locations from December 2009 to March 2010 (Figure 8).

Figure 8: ORV Usage on Survey Days by Location and Month.



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 2000-2010
- Map 2: Cape Point PIPL Nesting Activity 2000-2010
- Map 3: South Beach PIPL Nesting Activity 2000-2010
- Map 4: Hatteras Overwash Fans PIPL Nesting Activity 2000-2010
- Map 5: Hatteras Inlet Spit PIPL Nesting Activity 2000-2010
- Map 6: North Ocracoke Spit PIPL Nesting Activity 2000-2010
- Map 7: South Point Ocracoke PIPL Nesting Activity 2000-2010
- Map 8: Bodie Island Spit PIPL Nesting Activity 2010
- Map 9: Cape Point PIPL Breeding Activity 2010
- Map 10: South Beach PIPL Breeding Activity 2010
- Map 11: North Ocracoke PIPL Breeding Activity 2010
- Map 12: South Point Ocracoke PIPL Breeding Activity 2010
- Map 13: Cape Point PIPL Chick Foraging Areas 2010
- Map 14: South Beach PIPL Chick Foraging Areas 2010
- Map 15: North Ocracoke Spit PIPL Chick Foraging Areas 2010
- Map 16: South Point Ocracoke PIPL Chick Foraging Areas 2010
- Map 17: Bodie Island Wintering and Migratory PIPL Monitoring 2009-2010
- Map 18: Cape Point Wintering and Migratory PIPL Monitoring 2009-2010
- Map 19: Hatteras Inlet Wintering and Migratory PIPL Monitoring 2009-2010
- Map 20: North Ocracoke Wintering and Migratory PIPL Monitoring 2009-2010
- Map 21: South Point Ocracoke Wintering and Migratory PIPL Monitoring 2009-2010
- Map 22: Piping Plover Wintering and Migratory Closures 2009-2010