

South Carolina Shorebird Project

Final Report

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Cover Photograph: 19 Piping Plovers roosting at the North end of Hunting Island State Park on 5 March 2007. Copyright © 2007 Sidney Maddock.

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EXECUTIVE SUMMARY

This study focused on determining the distribution and abundance of Piping Plovers (*Charadrius melodus*) along the coast of South Carolina. Data on the abundance of Wilson's Plover (*Charadrius wilsonia*), Red Knot (*Calidris canutus rufa*), American Oystercatcher (*Haematopus palliatus*), and Marbled Godwit (*Limosa fedoa*) at the survey sites also were recorded.

Forty-seven coastal sites were visited during two non-breeding seasons between 10 July 2006 and 27 April 2008; 450 Piping Plover surveys were conducted. There were 3,272 observations of Piping Plovers, including 719 observations of birds with bands.

Of 79 banded individuals for which the breeding population could be determined, 64 were from the Great Lakes, seven were from the Canadian Great Plains, four were from the United States Great Plains, three were from Atlantic Canada, and one was from the Atlantic United States.

Overall, 63.2% of observations of Piping Plover habitat use were in intertidal habitats, while 19.4% of observations were in old wrack. For feeding birds, 93.8% of the observations were in intertidal habitats. For roosting Piping Plovers, 44.9% of the observations were in old wrack and 18% were in fresh wrack.

Through the observations of banded Piping Plovers, movements between habitats that occur on both sides of inlets were seen at multiple locations including Murrell's Inlet, North Inlet, North Santee Bay, Stono River, Captain Sam's Inlet, North Edisto River, Johnson Creek, and Trenchards Inlet. In addition, movements of adult and juvenile banded Piping Plovers during migration between several sites in South Carolina were observed.

The highest number of Piping Plovers observed was 32 at Deveaux Bank during fall migration. The highest counts for this species were recorded at Lighthouse Island, Bird Key Stono, Kiawah Island North, Kiawah Island South, Deveaux Bank, Harbor Island, Hunting Island North, Capers Island (Beaufort County), and Hilton Head. All 15 Wintering Range Critical Habitat sites had observations of Piping Plovers.

There were 3,042 observations of Wilson's Plovers, with a high count of 117 birds on Deveaux Bank during fall migration in 2006. The 2006-2007 winter count totals from 31 sites surveyed had 26 Wilson's Plovers and the 2007-2008 count totals from 38 sites surveyed had 13

Wilson's Plovers. The highest counts for this species were recorded at Deveaux Bank and Capers Island (Beaufort County), Kiawah Island, and Lighthouse Island.

There were 10,160 observations of Red Knots, with the high count of 1,500 birds that conservatively were estimated to be roosting at the north end of Kiawah Island on 6 April 2007. The 2006-2007 winter count at 31 sites had 232 Red Knots and the 2007-2008 count at 38 sites had 242 Red Knots. The highest counts for this species were recorded at Bird Key Stono, the North end of Kiawah Island, Harbor Island, Fripp Island, and Bay Point Island.

There were 2,225 observations of Marbled Godwits during the surveys, with the high count of 140 birds in February at Harbor Island. The 2006-2007 winter count at 31 sites had 232 Marbled Godwits and the 2007-2008 count at 38 sites had 87. The 2006-2007 winter count at 31 sites had 232 Marbled Godwits and the 2007-2008 count at 38 sites had 87. The highest counts for this species were recorded at Hilton Head, Harbor Island, and Hunting Island.

There were 2,998 observations of American Oystercatchers during the surveys. The highest count was 137 American Oystercatchers during February at Lighthouse Island, Cape Romain National Wildlife Refuge. The 2006-2007 winter count at 31 sites had 326 American Oystercatchers and the 2007-2008 count at 38 sites had 179. The highest counts for this species were recorded at Lighthouse Island, Cape Romain National Wildlife Refuge, DeBordieu South, and Cape Island South.

Data were collected on nine potential sources of disturbance that were observed during 398 surveys. The largest potential source of disturbance was pedestrians, with 4,256 pedestrians observed, or 10.7 people per survey, and accounted for 84.7% of all observations. There were 306 observations of dogs, or 0.8 dogs per survey. Of those observations, there were more observations off dogs of leash (169) than dogs on leash (132). There were 206 observations of bicyclists, or 0.5 observations per survey. There were 171 observations of boats, or 0.4 per survey. Potential vehicle disturbance was very limited: there were 15 off-road vehicles and 7 all-terrain vehicles observed, both under 0.1 observations per survey.

INTRODUCTION

There are 50 species of shorebirds that regularly breed or occur in the United States (Brown et al. 2001). This study focused on five species: the Piping Plover (*Charadrius melodus*), Wilson's Plover (*Charadrius wilsonia*), Red Knot (*Calidris canutus rufa*), Marbled Godwit (*Limosa fedoa*), and American Oystercatcher (*Haematopus palliatus*). These species were chosen for inclusion in this study because of their high ranking in a national shorebird prioritization score in the United States Shorebird Conservation Plan, with the Piping Plover receiving a 5 ("highly imperiled") and the other four species receiving a 4 ("Species of High Concern")(Brown et al. 2001).

Piping Plover

The Piping Plover is a small, sand colored shorebird that exists in three breeding populations: Atlantic, on beaches from North Carolina to southern Canada; Great Lakes shorelines; and Great Plains, along rivers and wetlands from Nebraska to the southern Prairie Provinces of Canada (Ferland and Haig 2002). In 1986, the U.S. Fish and Wildlife Service (USFWS) listed this species pursuant to the Endangered Species Act as a threatened species on the Atlantic Coast and Great Plains and as endangered species on the breeding grounds of the Great Lakes; on the wintering grounds, all populations were listed as threatened (USFWS 1985). After listing, considerable efforts to study this species on the breeding grounds occurred, including banding of large numbers of individuals on the Canadian and United States Great Plains and the Great Lakes. In addition, extensive management measures have been implemented to increase reproductive success including protecting breeding birds from human disturbance through the use of targeted, temporary closures at certain locations.

Piping Plovers winter in the United States from North Carolina to Texas and in northern Mexico and the Caribbean (Ferland and Haig 2002, Elliot-Smith et al. 2009). Studies to date of non-breeding Piping Plovers have been limited. Detailed studies include habitats in Texas (Drake et al. 2001), Alabama (Johnson and Baldassarre 1988), Georgia (Noel and Chandler 2008), and North Carolina (Cohen et al. 2008).

In South Carolina, there is limited early information, though recent information is more detailed. Bent (1929), in his Life Histories of North American Shore Birds, did not include South Carolina in the wintering range of the Piping Plover, indicating that its range went as far north as Georgia (Savannah and Darien). However, Sprunt (1930) noted the species was a regular winter visitor, with observations on the barrier islands from 32 kilometers north of Charleston to 48

kilometers south. Sprunt (1933) also noted an observation at Cape Island. Sprunt and Chamberlain (1949) stated the Piping Plover “appears to be a fairly common winter resident” in South Carolina.

In the winter of 1986-1987, South Carolina was included in an extensive survey of suitable Piping Plover habitat on the Atlantic Coast from Virginia to Key West (Nichols and Baldassarre 1990). There were 22 sites surveyed in South Carolina and 43 Piping Plovers were observed. In a list of “important wintering sites,” for South Carolina, Huntington Beach State Park and North Island, both with 12 birds, and Hunting Island State Park, with 8, were mentioned.

In the winters of 1990-1993, 35 sites were surveyed in South Carolina in January (Wilkinson and Spinks 1994). In the first winter, 11 Piping Plovers were found at 6 sites; 51 at 8 sites in 1991, 51 at 6 sites in 1992, and 53 at 5 sites in 1993. The 1991 effort was in conjunction with the 1991 International Census and “all potential Piping Plover wintering habitat was censused” (Wilkinson and Spinks 1994). In the 1991 – 1993 counts, the high count was at Deveaux Bank, with estimated 20 – 26 birds, and no other site had over 8 birds observed during the census effort.

The 1996 International Piping Plover Census in South Carolina included 24 sites and 78 Piping Plovers were observed (Wilkinson 1996). Of these sites, 13 were found to have wintering birds. Deveaux Bank was found to be the most important site, with 26 birds, followed by Kiawah Island with 17 and the north end of Murrells Inlet, Huntington Beach, with 9.

In 1997, 1998, and 1999, South Carolina Department of Natural Resources (SCDNR) conducted a mid-winter survey and found 103, 94, and 100 Piping Plovers, respectively (Dodd et al. 1999). Piping Plovers were observed at 26 sites, but were seen at only 9 of those sites in all three years. At most sites, Piping Plovers were seen in groups of 5 or fewer and the largest numbers were on Kiawah Island and Deveaux Bank, with between 22 - 30 birds. Dodd et al. (1999) “found no significant difference in the abundance of plover among years in sites surveyed in both international census years (1991 and 1996) and from 1997-1999, suggesting that the increase in numbers is due to greater survey effort rather than an increase in the wintering population.”

The 2001 International Piping Plover Census in South Carolina included 32 sites. Piping Plovers were recorded at 12 sites. Deveaux Bank had the largest number of birds, 21, followed by Kiawah Island North with 14 and Huntington Beach with 11. In total, 78 Piping Plovers were observed (Murphy 2002).

The 2006 International Piping Plover Census in South Carolina included 42 sites; 16 sites had Piping Plovers. The high count was Deveaux Bank, with 28, followed by Kiawah Island with 20 and North Island with 8. In total, 100 Piping Plovers were observed (Bimbi and Sanders 2009).

In the last few years, there has been increasing interest in studying and managing non-breeding Piping Plovers. This interest is based on an understanding that Piping Plovers spend the majority of the year away from the breeding grounds, and population modeling that suggests even small changes in annual survival rates can dramatically influence whether Piping Plover numbers are decreasing, stable, or increasing (USFWS 1996).

This study is the most comprehensive effort to assess the status of non-breeding Piping Plover throughout South Carolina. Not all possible Piping Plover habitat was covered; however, all the Piping Plover Winter Range Critical Habitat (WRCH) units in the state were visited at least once in the fall, winter, and spring. There are other areas in South Carolina that, with current habitat conditions, may be used occasionally during migration or by low numbers of wintering Piping Plovers. In addition, potential Piping Plover use levels may be altered by high levels of disturbance at certain locations, so management measures may affect the number of birds using an area. Most importantly, Piping Plover habitat is very dynamic. Habitat quality and quantity can change rapidly due to the effects of storms, erosion, accretion, and other factors. This report provides detailed information about the main Piping Plover locations in South Carolina during the study period, but it should not be considered a substitute for up to date, site specific information about the habitat conditions, disturbance levels, and other factors that may affect Piping Plover use of a particular site.

Wilson's Plover

The Wilson's Plover is a medium-sized plover with single breast band and a heavy black bill (Corbat and Bergstrom 2000). This species normally occurs only in coastal areas, where it breeds from Virginia south to the Gulf and Pacific coasts of Mexico, the Caribbean, and some locations in Central and South America (Corbat and Bergstrom 2000). In 2006, in conjunction with the Piping Plover Winter Census, a census was conducted of wintering Wilson's Plovers in South Carolina; 256.6 km were covered and 30 Wilson's Plovers were observed, with the high count at Deveaux Bank of 11 birds (Bimbi and Sanders 2009).

Red Knot

The Red Knot is a large, bulky *Calidris* sandpiper with a distinctive breeding plumage that is salmon-red to brick-red on the breast (Harrington 2001). There are six subspecies of Red Knot, including the *rufa* subspecies, which breeds in the central Canadian arctic and mainly winters in Tierra del Fuego, and *roselaari*, which breeds in Alaska and is presumed to include those knots that

winter on the Pacific coast of the U.S. and Mexico; there also are two other wintering populations of uncertain status: one in southeast United States (mainly Florida) of about 7,000 and one on the north coast of Brazil of about 7,500 (Niles et al. 2007). In 2006, the USFWS declared the *rufa* subspecies of Red Knot to be a candidate for listing under the Endangered Species Act (USFWS 2006).

Marbled Godwit

The Marbled Godwit is a large, long legged shorebird with very long, slightly upturned bill (Gratto-Trevor 2000). For the winter range, Marbled Godwits are found in central to south California and Mexico and locally along the Central America coast and on the Gulf of Mexico; on the Atlantic Coast, it is rare and irregular from Massachusetts to Virginia but regular and more numerous from North Carolina south to Florida (Gratto-Trevor 2000).

American Oystercatcher

The American Oystercatcher is a large shorebird with a bright red bill that is found in coastal salt marshes and sand beaches (Nol and Humphrey 1994). Through the work of Sanders et al. (2004), the wintering population of American Oystercatchers in South Carolina has been estimated and main roosts identified. Around 3,536 American Oystercatchers winter in South Carolina, with over 50% of the birds in the Cape Romain region. Approximately 89% roost on shell rakes, and 4% on barrier island beaches.

OBJECTIVES

The purpose of this project is to determine the distribution and abundance of migrating and wintering Piping Plovers on the South Carolina coast. Surveys were focused on WRCH units. Additional locations where Piping Plovers were observed or were thought to occur were added as they were identified. While conducting surveys for Piping Plovers, a secondary purpose was to gather data on the number of Wilson's Plovers, American Oystercatchers, Red Knots, and Marbled Godwits that were observed during the Piping Plover surveys. Specific objectives were:

1. Determine use by Piping Plover migrants and wintering birds at 15 WRCH units and additional locations that are not designated as critical habitat.
2. Document banded Piping Plovers at all study sites.
3. Document habitats, behaviors, disturbance and potential disturbance, additional threats, environmental data, and other site characteristics at each survey location.
4. Gather data on the number of Wilson's Plovers, American Oystercatchers, Red Knots, and Marbled Godwits present at the Piping Plover survey locations.
5. Assess management needs and actions at each site and work with local landowners and managers to implement voluntary shorebird conservation measures.

METHODS

Field work was conducted from 10 July 2006 to 27 April 2007 and 10 July 2007 to 27 April 2008 at 47 coastal sites in South Carolina. Initially, 15 areas were chosen for inclusion in the study due to their designation by the USFWS as WRCH units for the Piping Plover (USFWS 2001). WRCH units were chosen for surveys because we assumed these sites would have regular use by non-breeding Piping Plovers. A particular WRCH unit may have had one survey site or could include multiple sites where surveys had to occur. For example, the Santee River critical habitat unit included the south end of Sand Island, the entire ocean beach of South Island, and the north end of Cedar Island. In addition, select South Carolina sites that were not designated as WRCH but that had potential habitat also were surveyed on a limited basis to determine their suitability for Piping Plovers (**Figure 1**).

All 15 WRCH areas were surveyed at least once during fall migration, mid-winter, and spring migration. These surveys will be referred to as “regular surveys.” Three critical habitat sites were intensively monitored during migration with three surveys a month and one survey a month during the wintering period. During the season, an additional non-designated site was added to the intensive surveys due to observed movements across a river between the survey site and the other site.

As systematic data on the timing of Piping Plover migration in South Carolina did not exist, fall and spring migration survey dates were estimated based on unpublished data from North Carolina. Twelve critical habitat sites would be monitored once during fall migration, mid-winter, and spring migration.

The mid-winter survey timing in late January and early February was selected to minimize the chance of a migrant being counted. The survey window also overlapped in part with prior International Census efforts, to allow comparison between years. For the fall migration, mid-winter, and spring survey effort, the surveys were conducted during an approximately three week period; the length of time was due to the number of sites that were visited across the state.



Figure 1. Survey locations in South Carolina.

Four locations were chosen for more frequent surveys to obtain more detailed data on migration timing; three of the sites were WRCH and one was not designated as WRCH. These surveys will be referred to as “intensive surveys.” Deveaux Bank and Harbor Island were chosen due to the relatively high number of Piping Plovers that had been counted in prior International Census efforts (Ferland and Haig 2002). In August, after movements were found to be occurring between Harbor Island and Hunting Island, the north end of Hunting Island State Park was added as an intensive survey location to minimize that chance that birds in the Harbor/Hunting islands area would be missed. Bird Key Stono also was chosen for intensive surveys. While moderate numbers of Piping Plovers were seen in prior International Census efforts at this site, it is just north of Kiawah Island, a site that had high numbers, and Bird Key Stono could yield interesting data about movements between the two locations or between Bird Key Stono and the south end of Folly Beach.

At the intensive survey sites, migration surveys were conducted three times a month during July - November, and March - April. The first survey was conducted between 10 July and 11 July. All other migration surveys usually occurred between the 5th -7th, 15th - 17th, and 25th - 27th unless factors such as weather caused the survey to be delayed, in which case it was completed as soon as possible to the window date. During December, January, and February, surveys were conducted once a month, usually during the period of the 15th through the 17th if weather allowed and if not, as close to that period as possible.

Except as noted below, survey boundaries were determined by WRCH unit boundaries (see Appendix II). Boundaries of study sites that were not WRCH units were determined by the extent of suitable habitat for Piping Plover. In the following instances, the survey boundaries were modified from the designated WRCH boundary. At WRCH unit SC-3, on the north side of Murrell’s Inlet, the north survey boundary extended to the southernmost house on the beach. At WRCH unit SC-4, Litchfield, the north survey boundary on the ocean and bay side extended to the southern end of the developed area. At WRCH unit SC-9, Kiawah Island, the interior creek areas were not surveyed. At WRCH unit SC-13, Harbor Island, at mid and high tides, a creek blocked access to the southern 0.3 kilometer of the designated area. This area was scanned with a scope at those tides; however, due to extensive vegetative succession, most of the area that was not reachable was no longer suitable habitat and would no longer be considered WRCH because it no longer had the constituent elements. In addition, the survey area was expanded north to the house that has a stabilized seawall on the edge of the beach to include intertidal habitats that were

occasionally used. At WRCH unit SC-15, Hilton Head, the survey area was expanded north to Fish Haul Creek.

All 15 WRCH units had “complete surveys” that covered the full survey area and collected other data such as Piping Plover habitat use and behavior. Habitat was classified according to definitions that were modified from Cohen (2005) (**Table 1**). Behavior was classified according to definitions that were modified from Johnson and Baldassarre (1988) (**Table 2**).

Table 1. Piping Plover habitat types.

Habitat Type	Description
Intertidal Zone	A zone that is found between the high tide line and low tide line
Fresh Wrack	Fresh, wet lines of organic materials (usually vegetation) deposited on the seaward edge of the backshore or throughout the intertidal zone
Backshore	A zone of dry sand, shell, cobble, and beach debris (<10% vegetative cover) landward of the mean high water line and shoreward of human structures and the toe of the dune
Old Wrack	Any dry mat of organic matter, usually vegetation, deposited by tides. Typically located on the backshore or amid clumps of sparse vegetation.
Dune	Elevated areas of dry sand, landward of the backshore.
Dense vegetation	A zone of live or dead, thick or matted vegetation; typically landward of sparse vegetation on the dune or backshore. Cover > 90%.
Ephemeral Pool	A mosaic of moist sand/muddy habitats that occur in low lying backshore area or in interdunal corridors. Moisture content fluctuates reflecting changes in groundwater level or overwash
Overwash fan	An area of open sand or sparsely vegetated sand, created during a storm by sand and water washing over and modifying the backshore, dunes, or vegetated areas.

Table 2. Piping Plover behaviors.

Behavior	Definition
Aggression	horizontal threat display, gliding run, upright posture, or parallel run
Bathing	dipping of part or all of the body in a repetitive manner into the water or shaking the body in the water
Flying	any visual observation of a flying bird
Foraging	a peck at the substrate or the extraction of a prey item or foot tapping (tapping a foot on substrate while waiting to peck or extract a prey item)
Preening	using the bill to move or clean feathers
Roosting	head tucked in plumage, standing stationary on one or two legs or huddled in sand
Walking	any non-foraging, non-bathing, non-aggression movement that is either walking or running

Wilson's Plovers, American Oystercatchers, Red Knots, and Marbled Godwits were counted only during complete surveys. No specialized route or methodology was utilized to count Wilson's Plovers, American Oystercatchers, Red Knots, and Marbled Godwits; rather, these species were counted if they were observed during the Piping Plover survey. At some of the survey locations, there may have been suitable habitat for these other species that was not included in the survey route due to the habitat not being suitable for Piping Plovers. Data presented for these species should not be considered a population estimate or complete survey.

In addition to the complete surveys, a "band survey" was utilized to obtain information about banded Piping Plovers. This specialized survey did not always cover the full survey area, did not count other species, and was intended to obtain information about banded Piping Plovers. Usually, this survey utilized very high power photographic equipment to obtain the United States Geological Survey (USGS) metal band number so an individual or population identification could be made; the survey also could be to resight a banded Piping Plover to obtain correct identification of the band combination. Band surveys could be very time intensive, with up to two hours spent slowly approaching the Piping Plover and taking pictures as the bird turned in order to obtain band information without disturbance. As spending this amount of time observing a single bird could have compromised accuracy of the full surveys, band surveys were conducted as separate surveys or were conducted after a full survey was completed.

Surveys were conducted three ways: on foot, partially on foot and partially by boat, and partially by foot and partially by vehicle. Of all surveys, 90% (N=408) were conducted on foot. Surveys conducted in part by walking and driving a utility vehicle were .02% (N=10). Surveys conducted in part by walking and driving a vehicle were .06% (N=25). If a vehicle were used, the higher quality habitat near inlets or lagoons was walked and the lower quality habitats were driven at low speed. Surveys conducted in part by walking and piloting a boat were .01% (N=5), with the high quality habitats being surveyed by foot and the low quality areas by boat. In .004% (N=2) of the surveys, a boat was used; in such surveys, Piping Plover habitat was not present or existed in such limited areas that the habitat could be surveyed effectively. Due to careful consideration of existing habitat quality, the route of the vehicle relative to habitat conditions, and vehicle speed, it is believed that use of a vehicle or boat did not compromise the ability to detect the presence of shorebirds.

Surveys were conducted during all tide ranges. A high tide survey was defined as plus or minus two hours from the time of high tide as indicated by an appropriate tide chart reference. A

low tide survey was defined as two hours plus or minus low tide, and a mid-tide survey was defined as the period between low and high tides. Timing for high and low tides was determined by consulting National Oceanic and Atmospheric Administration (NOAA) tide prediction charts for the survey location or a representative location near the survey location (NOAA 2006, 2007, 2008). Survey period and tide amount were recorded to allow consideration of whether tide level may have influenced survey results. As used in this report, “H” means high tide, “L” means low tide, and “M” means the time between low and high tide. “R” means the tide was rising and “F” means the tide was falling.

For all observed Piping Plovers, an attempt was made to scan the legs for metal bands, color bands, or color flags. If bands were seen, the combination was recorded on a data sheet using an abbreviation system that is similar to that utilized for the endangered Great Lakes population (http://www.waterbirds.umn.edu/Piping_Plovers/piping2.htm), with two modifications: 1) the addition of additional colors that are used by other banders; and 2) the use of an abbreviation (“N”) to indicate when the portion of the leg is not visible (bird roosting, leg blocked by wrack, etc.) to distinguish from situations where the leg is visible but no band exists.

In the abbreviation system, the bands are recorded in the following order: left tibia, left tarsus, right tibia, right tarsus. The tibia and tarsus are separated by a comma, and the right and left legs are separated by a colon. Bands that are on the same joint are not separated by a comma, and the upper band is listed first. Letters that are used are case sensitive, with the lower case used for a light color. The abbreviations are:

X: metal band	b: light blue	C: Atlantic Canada metal color band
f: flag	G: dark green	T: other (describe)
R: red	g: light green	/: split band
Y: yellow	L: black	//: triple split band
O: orange	W: white	N: no band seen (area not visible)
B: dark blue	A: gray	–: no band
BNID: bands seen but not identified		

As an example, on 7 October 2006, a Piping Plover with the following band combination was observed at Deveaux Bank: left tibia orange flag; left tarsus light blue band over a black over orange over black triple split band; right tibia, metal band; right tarsus, light green band. The band abbreviation would read: Of,bL/O/L:X,g. A second example is a Piping Plover observed at Harbor Island on 25 October 2006. For purposes of illustrating the abbreviation system, it is assumed that

the left tibia was not visible. The left tarsus had no band; the right tibia had a metal band, and the right tarsus had a red color band. The band combination would have been recorded as: N,-:X,R.

Abbreviations are used to describe other information in this report. “GL US” means the bird is from the Great Lakes population; “GP US” means the bird is from the Great Plains population in the United States; “GP C” means the bird is from the Great Plains population in Canada; “At C” means the bird is from Atlantic Canada. “UK” means unknown.

For each Piping Plover that was observed, data was recorded on a paper datasheet on habitat type, landscape type, substrate type, and behavior. A GPS location was recorded for each individual or for multiple birds if they were very close together (less than 1 meter apart). In obtaining the GPS location, the priority was not disturbing the bird, so the recorded GPS location could be up to about 30 meters from the actual location of the bird.

Except for the Kiawah North image, the GPS locations were displayed using Arc software on satellite images from 2006 that were obtained from the South Carolina GIS Clearinghouse. The Kiawah North image was obtained from the USGS Seamless Server and a date was not available; however, based on the habitat characteristics, it is believed to be from within a few years of when the study began in 2006. Images were displayed for all locations where Piping Plovers were seen; however, for the locations where no Piping Plovers were observed, no image was included in the report. If a GPS location for a Piping Plover is shown in the water at a location, it is due to either the observation being at low tide or small variations in habitat between the date of the image and the date when the survey occurred.

Photographs were taken of habitat or banded birds with a Canon 1DsMarkII or Canon 40D using the RAW file format. A 600mm f4 lens with a 1.4X or 2X converter was used for recording color bands. A 35f1.4 lens was used to record habitat conditions. All photographs of banded birds were reviewed for sharpness, clarity, position of the bird, and other factors to determine if the photograph was helpful in identifying the band combination. Relevant photographs of the bands were retained and cataloged by location, band combination, and date.

RESULTS

General survey data for Piping Plovers, Wilson's Plovers, Red Knots, Marbled Godwits, and American Oystercatchers are summarized below in Part A. Data and detailed information about specific sites are provided below in Part B.

A. GENERAL INFORMATION

1. PIPING PLOVER

Between 10 July 2006 and 27 April 2008, there were 3,272 observations of Piping Plovers during 450 surveys. During the 2006-2007 season ("first season"), there were 1,509 observations of Piping Plovers during 203 surveys; there were 185 complete surveys with 1,361 observations and 18 band surveys with 148 observations. During the 2007-2008 season ("second season"), there were 1,763 observations during 247 surveys; there were 228 complete surveys with 1,617 observations and 19 band surveys with 146 observations.

The highest number of Piping Plovers observed during a single survey was 32 at Deveaux Bank during fall migration on 15 September 2007. On 28.6% (N=118) of the complete surveys, no Piping Plovers were observed. This represents 52 complete surveys where no Piping Plovers were seen in 2006-2007 and 66 complete surveys in 2007-2008.

Fall, Wintering, and Spring Migration Surveys

In order to be able to compare wintering Piping Plover numbers with fall and spring migration numbers, a survey was done of all 15 South Carolina WRCH sites and Hunting Island North during fall migration, winter, and spring migration periods. In total, there were 28 locations where these surveys were conducted, as a WRCH area could include multiple islands where different surveys would take place. These surveys covered the majority of high quality Piping Plover habitat in South Carolina. However, as discussed below, there were additional areas used by Piping Plovers in South Carolina that are not included in 28 sites that were surveyed six times. Thus, the total of from the 28 sites should not be interpreted as a state population.

The fall migration, winter, and spring migration survey windows occurred between 24 August and 9 September, 15 January and 8 February, and 25 March and 14 April, respectively. As the protocol called for surveys approximately every 10 days at the intensive sites during the fall and spring periods to have more detailed knowledge of migration timing, these sites were covered more

than once during the survey window. In choosing which migration survey to use for the intensive sites, the single day survey with the higher number was utilized for an area. The seasonal results for the 28 sites for fall migration, mid-winter, and spring migration surveys for the first and second seasons are presented in **Figure 2**.

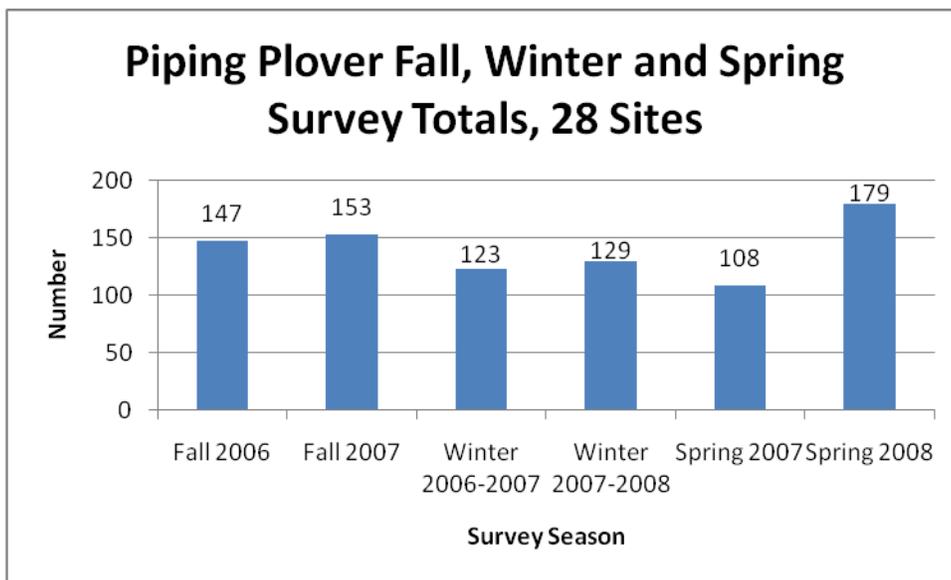


Figure 2. Total Piping Plovers recorded during the 2006-2007 and 2007-2008 survey seasons.

The mid-winter and fall migration totals for the 28 sites are similar for both seasons. However, the spring migration count totals differ considerably, with 108 in the first season and 179 in the second.

The site specific data for both seasons for the fall, winter, and spring surveys for the 28 sites are provided in **Table 3**.

Table 3. Total Piping Plovers recorded for each survey site during the 2006-2007 and 2007-2008 survey seasons.

Location	Fall 2006	Fall 2007	Winter 2006-2007	Winter 2007-2008	Spring 2007	Spring 2008	Site Total
Bird Key Stono	10	12	8	7	2	11	50
Bull Island Ebb Bar	2	0	0	0	7	0	9
Bull Island South	0	2	2	0	0	7	11
Cape Island South	1	0	1	2	0	2	6
Capers Island (Beaufort Co.)	7	12	10	10	7	11	57
Capers Island North	2	1	0	2	0	5	10
Cedar Island North	4	1	7	4	10	3	29
DeBordieu South	0	1	0	5	0	3	9
Deveaux Bank	28	29	19	21	15	21	133
Garden City Beach South	2	0	0	1	6	3	12

Harbor Island	11	11	9	20	22	23	96
Hilton Head Island North	5	11	16	9	5	14	60
Hunting Island North	20	28	10	5	0	11	74
Huntington Beach State Park	6	0	4	3	5	0	18
Joiner Bank	0	0	0	0	0	0	0
Kiawah Island North, North of Lagoon	3	10	1	14	2	11	41
Kiawah Island North, South of Lagoon	18	4	19	9	0	3	53
Kiawah Island South	2	8	0	0	15	21	46
Lighthouse Island	7	12	8	11	10	13	61
Litchfield Beach	0	0	0	1	1	0	2
North Island North	9	1	7	0	0	0	17
Otter Island	0	0	0	2	0	2	4
Raccoon Key North	1	2	2	0	1	0	6
Sand Island	0	0	0	0	0	0	0
Seabrook Island North	1	4	0	0	0	2	7
South Island	2	0	0	2	0	6	10
Waties Island North	5	3	0	1	0	5	14
Waties Island South	1	1	0	0	0	2	4
Total	147	153	123	129	108	179	839

As the survey boundaries are based largely on the WRCH boundaries, the survey locations do not always reflect jurisdictional or biological boundaries. For example, Kiawah Island was divided into three survey locations. If it were not so divided, its relative importance would increase. Likewise, Hunting Island North and Harbor Island were covered in separate surveys and are separate jurisdictionally: a public state park and a private residential development. However, these two locations are biologically connected, as they were part of the same home range of multiple banded Piping Plovers, and there were frequent movements between the two locations.

While this data from the seasonal surveys provided a helpful comparison between survey locations over two seasons to show variations, there are certain limitations. First, the migration survey data might have been influenced by either the survey window that was chosen or the ability to detect the presence of birds due to movements between adjoining areas. For example, the high count for the first season spring migration at Bird Key Stono was 17 Piping Plovers on 15 March 2007. However, as that date was outside of the spring survey window, the results from that survey are not included. For the dates during the spring window survey, two Piping Plovers were observed on Bird Key. Moreover, several of the known wintering banded birds from Bird Key were observed on nearby Folly Beach South. Based on information from more intensive surveys at the four main sites, variations in spring migration numbers were observed. For more detailed knowledge of

Piping Plover migration timing, the data from the four intensive sites in the site accounts should be considered.

Second, there were additional sites, including some with low to moderate numbers of Piping Plovers, which were not designated as WRCH and were not included in the totals from the 28 sites presented above. As these other sites were not visited all six times, a direct comparison between years is not possible for these other sites.

If these additional sites were considered, it is clear that the numbers of Piping Plovers observed at the WRCH sites and Hunting Island North do not reflect the total number of Piping Plovers wintering in South Carolina. A total of 123 Piping Plovers are listed for the 2006-2007 winter season survey from 28 sites and 129 Piping Plovers were observed at the same sites during the 2007-2008 winter survey. However, when all sites where a wintering survey was conducted during seasons are considered, the total number of Piping Plovers increased. During the 2006-2007 winter survey, a total of 31 sites were visited, and 136 Piping Plovers were observed (**Figure 3**).

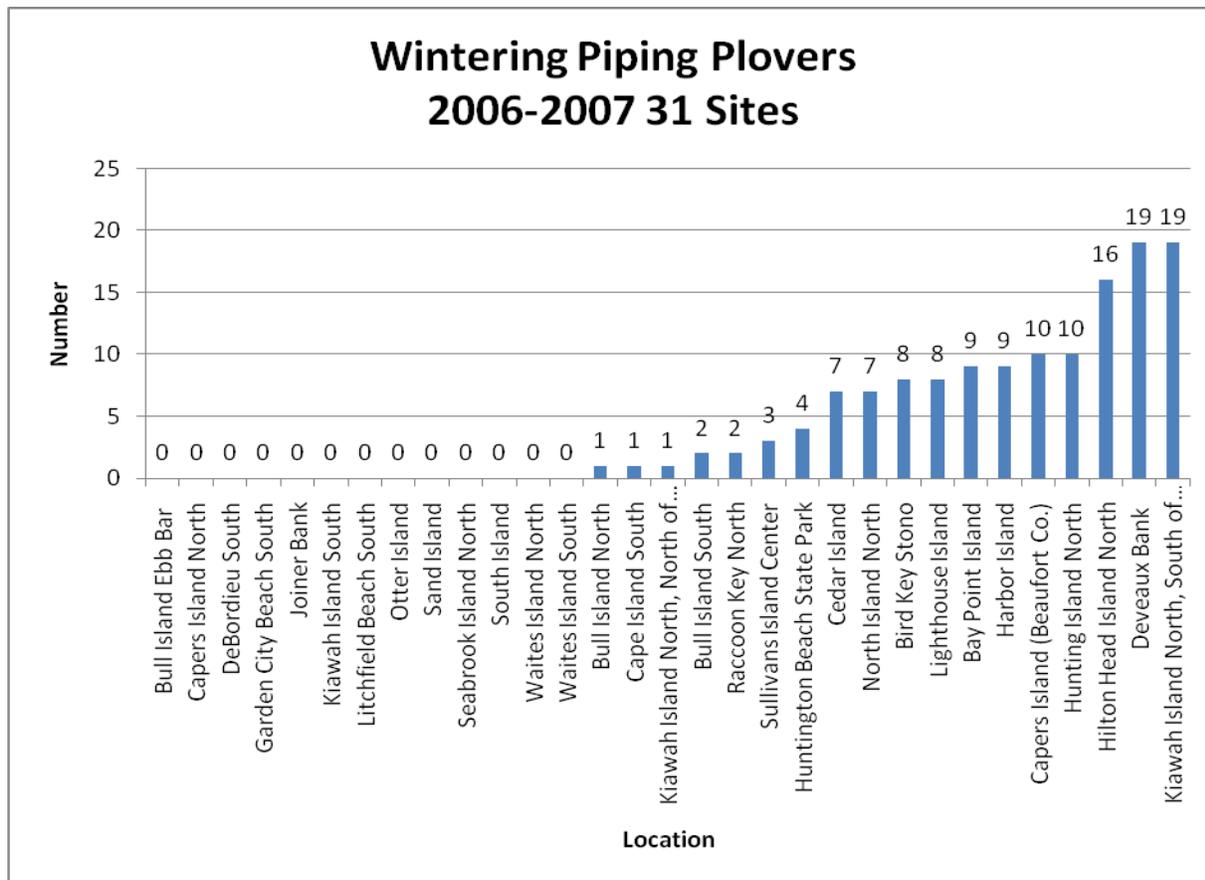


Figure 3. The number of Piping Plovers recorded per site during the winter survey period in 2006-2007.

The geographical distribution of Piping Plovers during the 2006-2007 winter survey is shown in **Figure 4**.



Figure 4. South Carolina wintering Piping Plover survey sites in 2006-2007.

As more was learned about habitat conditions in South Carolina at new sites that may contain Piping Plovers, these additional sites were added to the survey list. As a result, for the 2007-2008 winter survey, a total of 39 sites were visited, 8 more than the first season winter survey. There were 154 Piping Plovers observed (**Figure 5**).

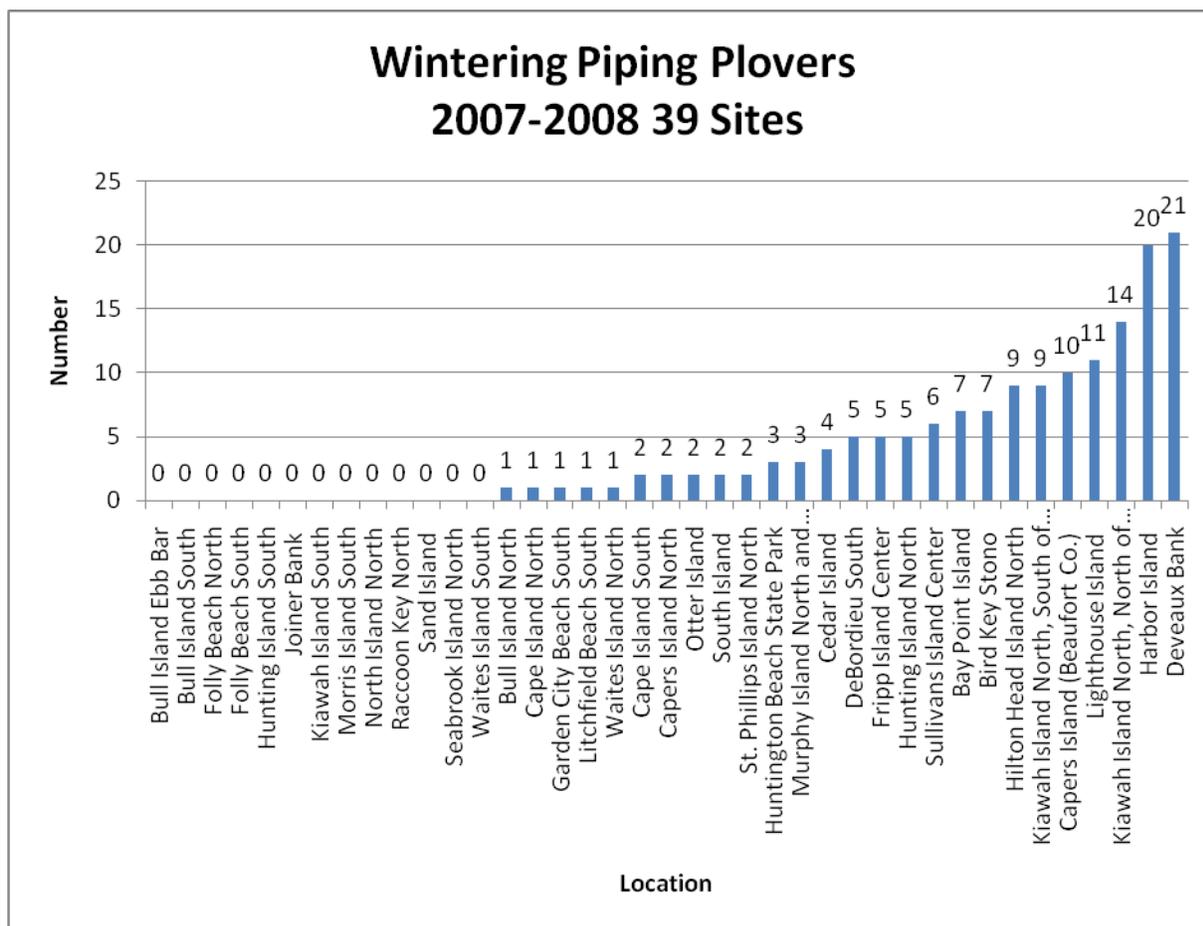


Figure 5. The number of Piping Plovers recorded per site during the winter survey period in 2007-2008.

Of the 39 locations where winter surveys were conducted in 2007-2008, 33.3% (N=13) did not have any observations of Piping Plovers. For the 26 locations where Piping Plovers were observed, 61.5% (N=16) of those locations had between one and five observations; 23.1% (N=6) had between 6 and 10 observations; 7.7% (N=2) had between 11 and 15 observations; 3.8% (N=1) had between 16 and 20 observations and 3.8% (N=1) had between 21 and 25 observations (**Figure 6**).



Figure 6. South Carolina wintering Piping Plover survey sites in 2007-2008.

The data from the 2006-2007 and 2007-2008 winter surveys should be viewed with an understanding that it is based on one visit to the location, and thus does not reflect the complex movements that occur between adjoining locations. For example, North Island North had zero Piping Plovers on the day the survey was conducted, but DeBordieu South had five Piping Plovers on the same day. From a banded Great Plains bird at this location, it is known that the Piping Plovers use both sides of North Inlet. Thus, the use of nearby locations must be considered when evaluating the importance of a specific site. Likewise, the ability to detect the presence of birds may influence the survey numbers. Because of the difficulty of detecting non-breeding Piping Plovers, specific individuals may have been present but not observed during the survey. The detailed site specific information in Part B should be considered for a more complete understanding of the importance of each location that was surveyed.

Band Information

There were 719 observations of banded Piping Plovers during both seasons, which was 22% of all birds that were observed. During the 2006-2007 season, there were 369 observations of banded birds, or 24.5% of all observations, and during the 2007-2008 season, there were 350 observations, or 19.9% of all observations.

There were at least 79 different individuals that were observed with color bands during the two seasons of this study. To be counted as an individual, the bird had to have a color band combination, metal band number, plastic band number, or, for two birds that had similar combinations without additional metal or plastic band numbers, wintering home ranges that allowed them to be distinguished. For example, there were four different individuals with the -,-:X,g color band combinations from the Great Lakes, based on photographs which showed the metal band number ended in 313, 312, 311, and 625. In one instance, a combination shared by two individuals (O,-:X,R) was counted without metal band numbers or plastic band numbers for both birds. Based on multiple observations, both birds had established wintering home ranges that were about 25 kilometers apart, which is a sufficient distance to rule out regular movements causing an incorrect identification of the individual.

The largest number of banded individuals was from the Great Lakes population (**Figure 7**). At least 64 different individuals were observed with Great Lakes bands, or approximately 81% of all banded individuals. In addition, there were two individuals that may have been from the Great Lakes, but their population could not be confirmed. There were four individuals from the United States Great Plains and seven individuals from the Canadian Great Plains.

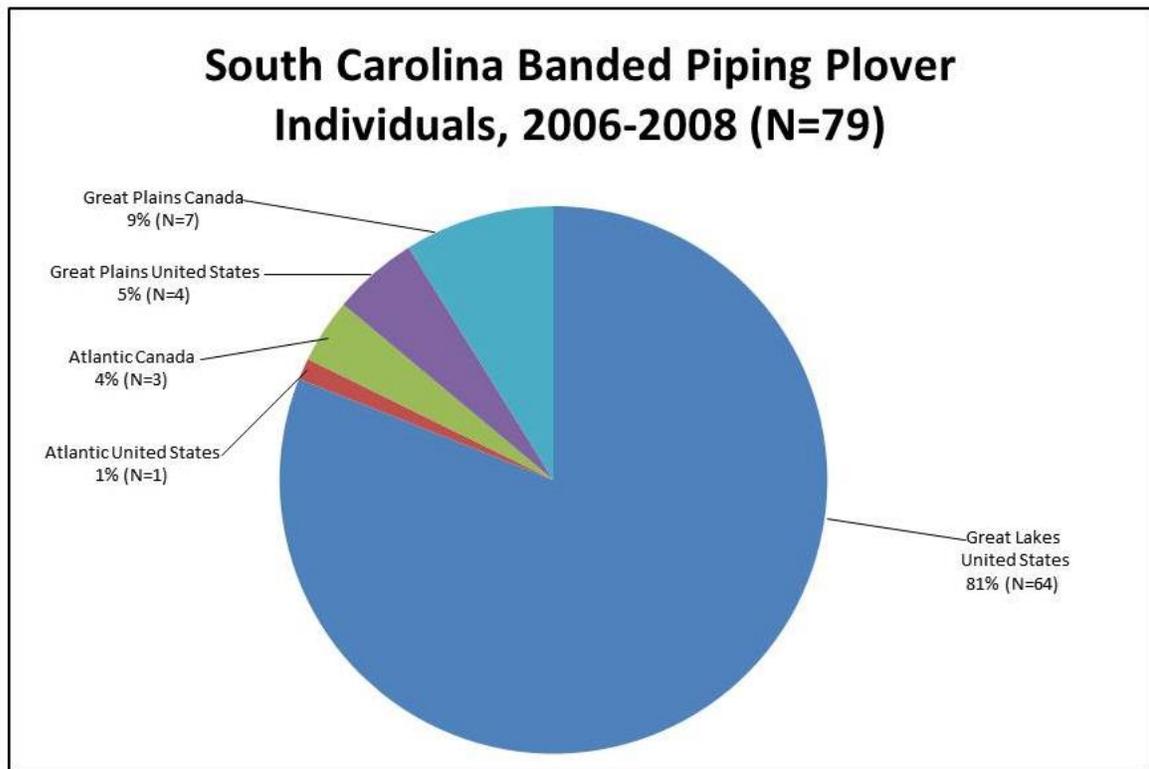


Figure 7. Population of origin for South Carolina’s banded Piping Plovers from 2006-2008.

Ages of Banded Piping Plovers

Age of banded individuals was determined when possible. The age of a banded bird was based on the number of non-breeding seasons since the bird hatched, using data provided by scientists on the breeding grounds. For example, if the bird was banded as a chick on the breeding grounds in 2007 and was seen on the wintering grounds any time between 10 July 2007 and 28 April 2008, it was considered a year one bird and was given a “1” in the table below. If a bird was seen in 2006-2007 and in 2007-2008, the age was listed for each season when it was seen.

The age distribution of South Carolina non-breeding Piping Plovers with a known age is weighted towards younger bird (**Figure 8**). The age class with the largest number of observed birds was year one (fledglings), representing 40% of all birds for which an age was known. The next largest age class was year two followed by year three.

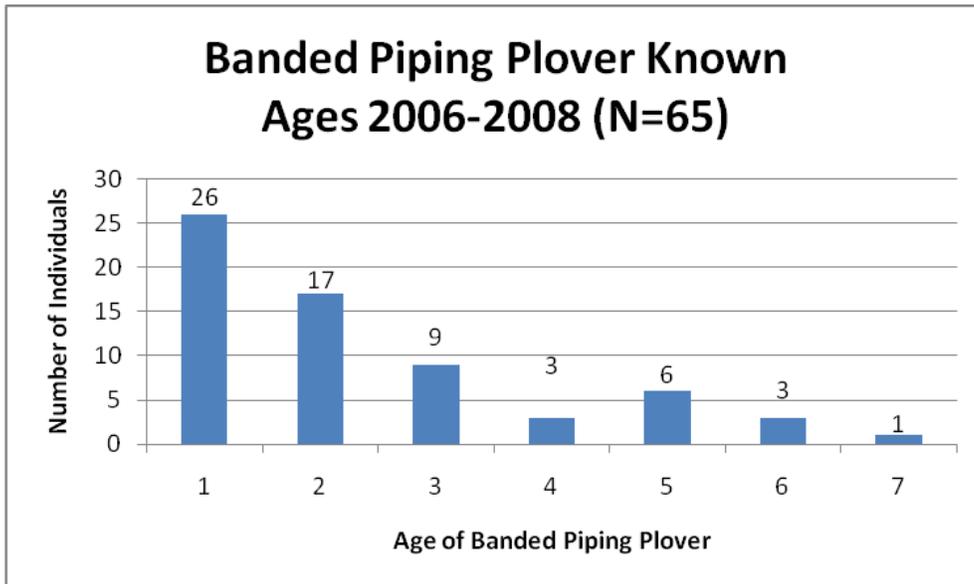


Figure 8. Confirmed ages of banded Piping Plover recorded in South Carolina during 2006-2008.

There were an additional group of birds where age data provided either a minimum age, a range of ages, or an unknown age (**Figure 9**). A piping plover banded as an adult was assigned a minimum age based on the year banded, year seen, and one additional year. For example, if a Piping Plover was first banded as an adult in 2007 and seen on the wintering grounds between 10 July 2007 and 28 April 2008, it was given a “2+” designation, meaning it could be two years old or older. For a few birds, there was a small range of years during which the band combination was used, and those birds were listed under the range, such as “1 or 2”, “2 or 3”, or “4 or 5.”

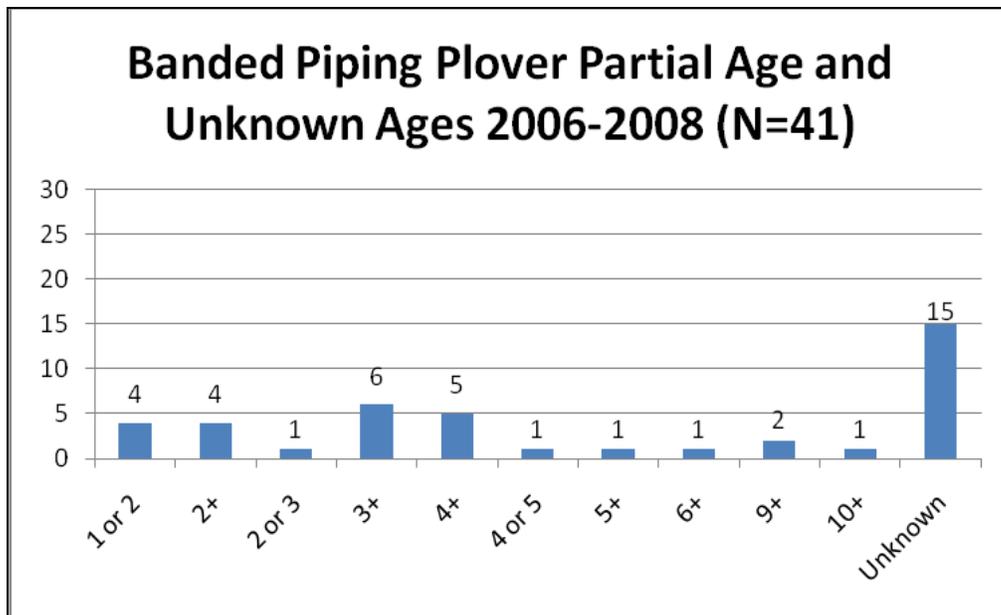


Figure 9. Minimum, range, and unconfirmed ages of banded Piping Plover during 2006-2008.

The oldest banded Piping Plover observed during this study was from Atlantic Canada. Banded as an adult, this bird was at least 10 years old.

Wintering and Migrating Birds

A review of band combinations and observation dates was conducted to determine which Piping Plovers were wintering birds and which were migrants. Classification of a bird as “wintering” was based on if a bird was seen before or after December. A migrant was defined as any bird that was not a wintering bird.

For the 2006-2007 season, 56 banded Piping Plovers were reviewed. Thirty-one were determined to be wintering birds. The data is summarized below in **Table 4**.

For the 2007-2008 season, 51 banded Piping Plovers were reviewed. Twenty-eight were determined to be wintering birds. The data is summarized below in **Table 5**.

Detectability rates likely influenced the classifications. At the four intensive sites, three surveys occurred during that winter period, but at the non-intensive sites, only one survey was conducted, so there was a higher risk that a wintering bird could be on site but not detected during the single survey. For example, at Capers Island, a first season wintering banded bird was seen during the three surveys, but during the second season, even though it was seen in November and April, it was not observed during the survey that was conducted during the wintering period.

Table 4. Migration and winter banded Piping Plovers recorded in 2006-2007.

Location	Bands	Status	Population	Notes
Hilton Head Island	-, -:X,b	W	Great Lakes	Metal band 981-76665
Capers Island (Beaufort Co.)	-, -:X,g	W	Great Lakes	Metal band ends in 312
Harbor Island	-, -:X,g	W	Great Lakes	Metal band [981-76625
Bull Island	-, BO:X,g	W	Great Lakes	
Deveaux Bank	-, bO:X,Y	W	Great Lakes	
Bird Key Stono	-, gO: -,RX	W	Great Lakes	
Kiawah Island North	-, WA:Gf,GL	W	Great Plains United States	
Bird Key Stono	Gf,RB: -, -	W	Great Plains United States	
North Island	Gf,YB: -, -	W	Great Plains United States	
Kiawah Island North	Lf,B:X,OR	W	Great Plains Canada	
Bay Point Island	O, -:X,L	W	Great Lakes	Metal band 8061-19210
Capers Island (Beaufort Co.)	O, -:X,O/R	W	Great Lakes	

Location	Bands	Status	Population	Notes
Kiawah Island North	O,-:X,R	W	Great Lakes	
Harbor Island	O,-:X,R	W	Great Lakes	Metal Band 1951-2[]356
Deveaux Bank	Of,GY:X,G	W	Great Lakes	
Harbor Island	Of,LO:X,g	W	Great Lakes	
Bay Point Island	Of,OO:X,Y	W	Great Lakes	
Harbor Island	X,-:Wf,-	W	Great Plains Canada	
Cape Island	X,B:Lf,RL	W	Great Plains Canada	
Kiawah North	X,b:Of,OG	W	Great Lakes	
Deveaux Bank	X,L/O:-,-	W	Great Lakes	Metal band ends in 6693
Cedar Island	X,L:O,-	W	Great Lakes	
Deveaux Bank	X,O:-,BY	W	Great Lakes	
Hilton Head Island	X,O:-,LR	W	Great Lakes	
Deveaux Bank	X,R:-,Ob	W	Great Lakes	
Hilton Head Island	X,R:Lf,YR	W	Great Plains Canada	
Deveaux Bank	X,R:O,-	W	Great Lakes	
Capers Island (Beaufort Co.)	X,Y:-,Ob	W	Great Lakes	
Huntington Beach State Park	X,Y:Of,YO	W	Great Lakes	
Capers Island (Beaufort Co.)	X,Y:Wf,Yg	W	Great Plains Canada	
Bird Key Stono	Y/L,X:O,RB	W	Great Plains Canada	
Huntington Beach State Park	-,-:X	M (?)		811-30737. Seen fall and spring this season and three previous season at this location including winter other years
Harbor Island	-,-:X,g/O	M	Great Lakes	While the full combination was not seen December through February, a partial matching combination of N,-:N,g/O was seen at this location in February and the full combination was seen on 5 March and twice in April.
Deveaux Bank	Of,bL/O/L:X,g	M	Great Lakes	

Table 5. Migration and winter banded Piping Plovers recorded in 2007-2008.

Location	Bands	Status	Population	Notes
Huntington Beach State Park	-,-:X	M	Atlantic Canada	Five seasons in a row at this location
Bull Island	-,-:X,b	W	Great Lakes	
Harbor Island	-,-:X,g	W	Great Lakes	Metal band: bottom row 76625
Capers Island (Beaufort Co.)	-,-:X,g	W	Great Lakes	Metal band: []951-[]6312

Location	Bands	Status	Population	Notes
Fripp Island	-, -:X,g	W	Great Lakes	Metal band: ends in 11
Bull Island	-,BO:X,g	W	Great Lakes	
Deveaux Bank	-,bO:X,Y	W	Great Lakes	
Morris Island	-,g:X,b	M	Great Lakes	
Deveaux Bank	-,g:X,g/O/g	M	Great Lakes	
Bird Key Stono	-,gO: -,RX	W	Great Lakes	
Bird Key Stono	Gf,RB: -, -	M?	Great Plains United States	Previous wintering bird not seen November or later
DeBordieu	Gf,YB: -, -	W	Great Plains United States	
Kiawah Island North	Lf,B:X,OR	W	Great Plains Canada	
Capers Island (Beaufort Co.)	O, -:X, -	W	?	Would match GL bird from that location from previous season if split fell off
Bay Point Island	O, -:X,L	W	Great Lakes	Metal band: 8061-19210
Kiawah Island North	O, -:X,R	M	Great Lakes	
Harbor Island	O,R:X,R	W	Great Lakes	
Harbor Island	Of,BG:X,R	W	Great Lakes	
Hilton Head Island	Of,GY:X,b	W	Great Lakes	
Deveaux Bank	Of,GY:X,G	W	Great Lakes	
Bay Point Island	Of,OO:X,Y	M?	Great Lakes	Previous wintering bird not seen November or later second season
Hunting Island	X, -:Wf, -	M?	Great Plains Canada	Matches wintering brood marker seen previous winter; not seen November or later second season
Lighthouse Island	X,B:Lf,RL	W	Great Lakes	
Capers Island (Beaufort Co.)	X,b:Of,LO	W	Great Lakes	
Kiawah Island North	X,b:Of,OG	W	Great Lakes	
Harbor Island	X,G:Of,LO	W	Great Lakes	
Deveaux Bank	X,G:Of,OL	W	Great Lakes	
Deveaux Bank	X,L/O: -, -	W	Great Lakes	
Cedar Island	X,L:O: -, -	W	Great Lakes	
Deveaux Bank	X,O: -,BY	W	Great Lakes	
Hilton Head Island	X,O: -,L	W	Great Lakes	
Fripp Island	X,O:O: -, -	W	Great Lakes	
Deveaux Bank	X,R: -,Ob	W	Great Lakes	
Capers Island (Beaufort Co.)	X,Y:Wf,Yg	W	Great Plains Canada	
Bird Key Stono	Y/L,X:O,RB	W	Great Plains Canada	

Piping Plover Movements

The presence of color-banded individuals allowed for the movements of some Piping Plovers to be reliably determined. For uniquely marked birds or non-uniquely marked birds for

which the individual identity was known, there were multiple individuals that moved across inlets that bisected their wintering location.

- Great Lakes Piping Plover X,Y:Of,YO, which wintered at Murrell's Inlet the first season, was seen both sides of the inlet at Garden City Beach South and Huntington Beach State Park.
- Great Plains Piping Plover Gf,YB:-,- was seen at the south end of North Inlet on North Island during the first season, and was seen at the north end of North Inlet, on DeBordieu, during the second season.
- Piping Plover X,B:Lf,RL, a Great Plains Canada bird that wintered at Cape Romain National Wildlife Refuge, was seen once at Cape Island South and four other times at the overwash fan area of Lighthouse Island, the next island south.
- Canadian Great Plains Piping Plover Y/L,X:O,RB, a wintering bird at Bird Key Stono both seasons, also was seen at Folly Beach South in the spring both seasons, the first island to the north.
- Great Lakes Piping Plover -,gO:-,RX wintered at Bird Key Stono, but also was seen both seasons, in the spring, at Folly Beach South.
- Great Lakes Piping Plover X,b:Of,OG, often was seen the first season at Bird Key Stono but also seen once at Folly Beach South and Kiawah Island North, the next island to the south; in the second season, this bird was seen at Kiawah Island North and Bird Key Stono.
- Great Lakes Piping Plover -,bO:X,Y, a bird that wintered both seasons as Deveaux Bank, was seen two islands to the north on the south end of Kiawah Island on 31 March 2008, a distance of approximately 4.5 kilometers.
- Great Plains Piping Plover -,WA:Gf,GL, a wintering bird at Kiawah Island North, also was seen on Bird Key Stono in March, before being seen again at Kiawah Island North.
- Great Lakes Piping Plovers Of,LO:X,g, seen only the first season, and X,G:Of,LO, seen only the second season, used both Harbor and Hunting Islands.

Non-uniquely marked birds that were believed to be the same individual also made movements across inlets.

- Piping Plover -,-:-,X was seen on both the Garden City Beach South and Huntington Beach State Park sides of Murrells Inlet in the first season.
- Wintering bird X,L:O,- was seen on both sides of North Santee Bay Inlet, using the north end of Cedar Island and south end of South Island.

- Piping Plover -, -:X,g, a wintering bird at Capers Island (Beaufort County), was also observed at St. Phillips Island during the second season, the next island south.
- The first season, wintering bird O, -:X,R, was seen at Bird Key Stono, Folly Beach South, and Kiawah Island North, the islands on either side or in the Stono River.
- Canadian Great Plains bird X, -:Wf,- was seen both seasons using Harbor Island and the north end of Hunting Island.
- In the second season, Great Lakes Piping Plover O,R:X,R used both Harbor and Hunting islands.

Four additional banded Piping Plovers were observed making migratory movements between different South Carolina sites and two additional birds that may have made movements that were migratory.

- Great Lakes Piping Plover X,Y:Of,YO was seen as a migrant at Deveaux Banks, stopping from at least 26 July 2006 to 16 September 2006; this bird was re-sighted as a wintering bird 2 November 2006 at Huntington Beach State Park, a very interesting movement north of approximately 151 kilometers.
- Great Lakes Piping Plover O,R:X,R (007) was seen as a fall migrant on 5 August 2007 at Deveaux Bank, at Kiawah Island South on 27 August 2007; and at the wintering location at Hunting Island on 30 August 2007.
- Great Lakes Piping Plover -, -:X,g (1951-26311) was observed as a migrant at Harbor and Hunting islands and then seen as a wintering bird at Fripp Island, the next island to the south, about 9.3 kilometers between observations.
- Great Lakes Piping Plover Of,OO:X,Y, was seen as a migrant at Hunting Island on 26 September, and then seen as a wintering bird at Bay Point Island, a distance of approximately 21 kilometers along the coast.
- Piping Plover -,g:X,g/O/g was seen as a migrant at Deveaux Bank on 26 October 2007 and 5 November 2007, and then was seen 18 November 2007 at the south end of Kiawah Island; it is unknown where this bird wintered.
- Great Lakes Piping Plover Of,bO:X,G was seen both in the fall and spring at both sides of Murrells Inlet, on the Garden City Beach side and the Huntington Beach State Park sides; it is unknown if this is a wintering bird that was not detected, or a migrant that stopped at the same location in the spring and fall.

While localized movements across inlets were common, there were three wintering birds that made long distance movements of 9 to 18 kilometers:

- Lf,B:X,OR, which wintered at the north end of Kiawah Island, was seen once at the South end of Kiawah Island, a distance of about 13 kilometers, and another time at Deveaux Bank, a distance of about 16 kilometers; after being seen at both locations, the bird was subsequently seen back at its main wintering location.
- -,WA:Gf,GL, which wintered at the north end of Kiawah Island, was seen once at the south end of Kiawah Island, a distance of about 13 kilometers; the bird subsequently was seen back at its main wintering location.
- Piping Plover -,g(010):X,b, a non-unique combination for which the plastic number was known, allowing individual identification, was seen on 5 Nov. 2007 at the south end of Morris Island, and then was observed in March for 3 surveys in a row over a 21 day period at Bird Key Stono, a distance of about 10 kilometers away from the other observation location. In April, after the Piping Plover was not observed at Bird Key Stono, a bird with the same brood marker combination was seen at Morris Island (Chris Snook, pers. comm. 2009).

Detectability

An analysis was done to determine the detectability of wintering Piping Plovers at the four intensive survey sites: Bird Key Stono, Deveaux Bank, Hunting Island, and Harbor Island. For an individual Piping Plover to be included in the detectability analysis, it had to be seen on a complete survey between December and February; thus, migrants were excluded. Also, the main wintering location had to be at an intensive site, so infrequent visits from a bird that wintered at a nearby non-intensive site did not skew the detectability calculation. Non-unique combinations were included in the analysis unless two matching non-unique combinations were seen at a site; this resulted in one brood marker wintering bird not being included in the second season. Each season was considered separately. Any resightings during band surveys are not included in the analysis except for the first survey on Harbor Island when birds were discovered there; this day was included because the main Piping Plover habitat area was surveyed fully so that survey is representative of Piping Plover use.

Due to frequent movements between Harbor and Hunting Islands, they were considered one location for the purpose of the December – February observation requirement, the main wintering location requirement, and the date of first and last observations. In addition, because of frequent

movements between Harbor and Hunting islands, the analysis also pooled the observations from both sites to create a combined Harbor and Hunting site.

To obtain a detectability rate, the number of times each individual bird was resighted was divided by the total number of surveys between the first complete survey when the bird was resighted in the fall and the last complete survey when the bird was resighted in the spring. To be considered a resight, the full band combination had to be observed; this requirement reduced the detectability rate for birds that had only partial band reads.

There was considerable variability for the detection rate for Piping Plovers depending on the site and individual Piping Plover (**Table 6**).

Table 6. The detectability rates for wintering Piping Plovers from four survey sites.

Location	Number of PIPL	Detectability Range
Bird Key Stono 2006-2007	5	52 - 100%
Bird Key Stono 2007-2008	2	93 - 95%
Deveaux Bank 2006-2007	6	55 - 95%
Deveaux Bank 2007-2008	7	80 - 94%
Harbor Island 2006-2007	5	29 - 70%
Harbor Island 2007-2008	3	39 - 55%
Harbor and Hunting Islands Combined 2006-2007	5	48 - 80%
Harbor and Hunting Islands Combined 2007-2008	3	56 - 80%

Site Fidelity

Inter-annual site fidelity was calculated by selecting wintering Piping Plovers (December through February) and reviewing whether the bird was non-uniquely or uniquely identified. A uniquely identified bird could be an individual with a unique band sequence, or a non-unique brood marker sequence for which the metal band numbers were known. If a wintering Piping Plover observed during the first season was seen during the second season at the same area, which was defined as either side of an inlet where it was seen the previous year, the bird was classified as having site fidelity.

In 2006-2007, there were 26 Piping Plovers seen between December and February that were individually identified and of those, 76.9% (N=20) were seen the second season at the same location. There were no observations of uniquely marked Piping Plovers that were known to have made a long distance shift in their wintering location between the first and second seasons. However, as discussed above in the annual mortality section, there were two unique combinations

and one non-unique combination (not individually identified) that wintered in a location the first season, returned to the same location the second season and were repeatedly seen, but then disappeared before November of that season; it is unknown if these birds died or emigrated from the survey areas.

One bird that was not included in this analysis was -,-:X (811-30737), as it was not seen between December 2006 to February 2007. However, this individual from Atlantic Canada, which was identified by photographs of the metal band numbers, was seen five seasons in a row at Huntington Beach State Park, including several previous winters and November of the second season.

Non-breeding Season Potential Mortalities

Mortality during the non-breeding season cannot be conclusively established without observing a dead bird, which would be extremely difficult for a small bird such as a Piping Plover. However, based on our review of banded individuals, there did not appear to be any mortality of banded birds during December, January, or February at the intensively studied sites (Bird Key Stono, Deveaux Banks, and Harbor/Hunting Islands).

However, there may have been mortalities during other months of the non-breeding season at the intensive sites. The first possible mortality was Piping Plover, Gf,RB:-,-, which was seen reliably during the 2006-2007 season at Bird Key Stono. This bird returned to the same location during the 2007-2008 season and was first observed on 5 September 2007. Gf,RB:-,- was seen eight surveys in a row over 9 weeks, and was last seen 16 November 2007. This bird was not seen on the breeding grounds after either season (Dan Catlin, pers. comm. 2008), nor was it seen at any other site in South Carolina in the 2007-2008 season. The second possible mortality is Piping Plover X,-:Wf,-, a non-uniquely banded Canadian Great Plains bird that used Harbor and Hunting Islands. Both seasons, the bird with this combination usually used the same general feeding location near the point at Harbor Island at mid-tide; also, no bird with this combination was seen at any of the other study sites in South Carolina during the two seasons. In the second season, X,-:Wf,- was seen first on 27 July 2007. Piping Plover X,-:Wf,- was seen for seven surveys in a row over 8 weeks including 26 September 2007, after which it was no longer observed at this location or at any other of the surveyed locations in South Carolina. As the bird was not uniquely banded, it could not be determined if it had been seen on the breeding grounds in Canada.

Piping Plover Habitat Use and Behaviors

When a Piping Plover was first seen during a survey, the habitat it was using was assigned to one of ten classifications: intertidal zone, fresh wrack, backshore, old wrack, dune, ephemeral pool, washover/blowout, dense vegetation, other, or unknown. There were 3,179 observations of habitat use by Piping Plovers, of which 3,178 were assigned to a single habitat classification.

Figure 10 provides a breakdown for overall habitat use by Piping Plovers.

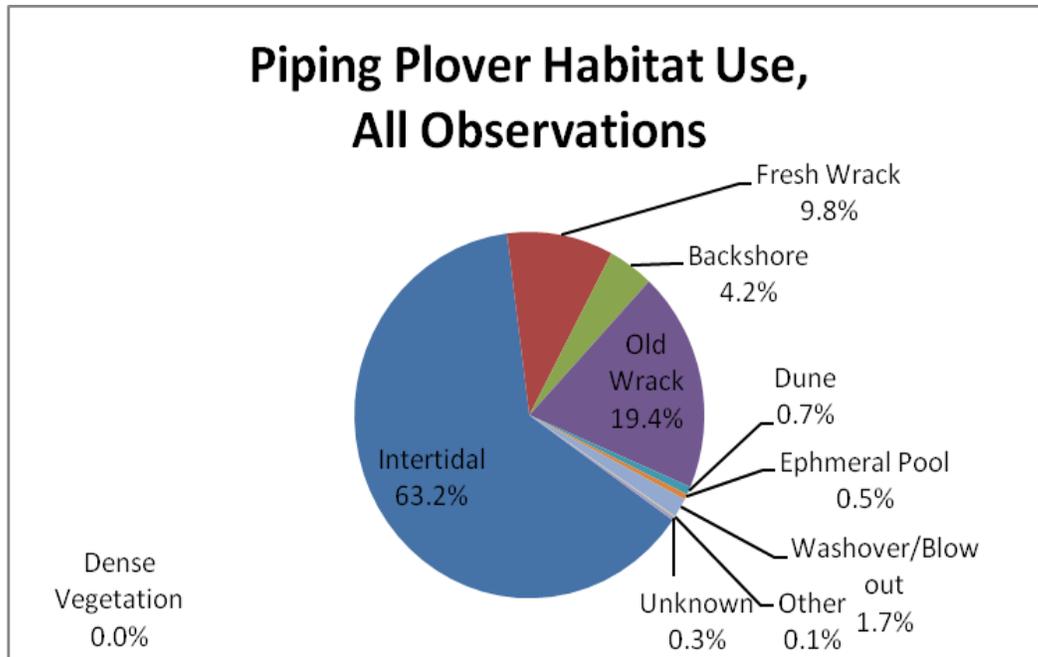


Figure 10. Habitat use by Piping Plovers recorded during 2006-2008.

If only habitat use during high tide is considered, there is a shift in habitat types. There were 972 observations of Piping Plovers at high tide that had a behavior recorded; high tide was defined as plus or minus two hours from the scheduled high tide based on NOAA tide charts. Comparing all habitat use without regard to tide to high tide habitat use, Piping Plover use of Old Wrack went from 19.4% to 32.9%, Fresh Wrack went from 9.8% to 18.7%, Backshore increased from 4.2% to 7.7%, and Intertidal decreased from 63.2% to 37.6% (**Figure 11**).

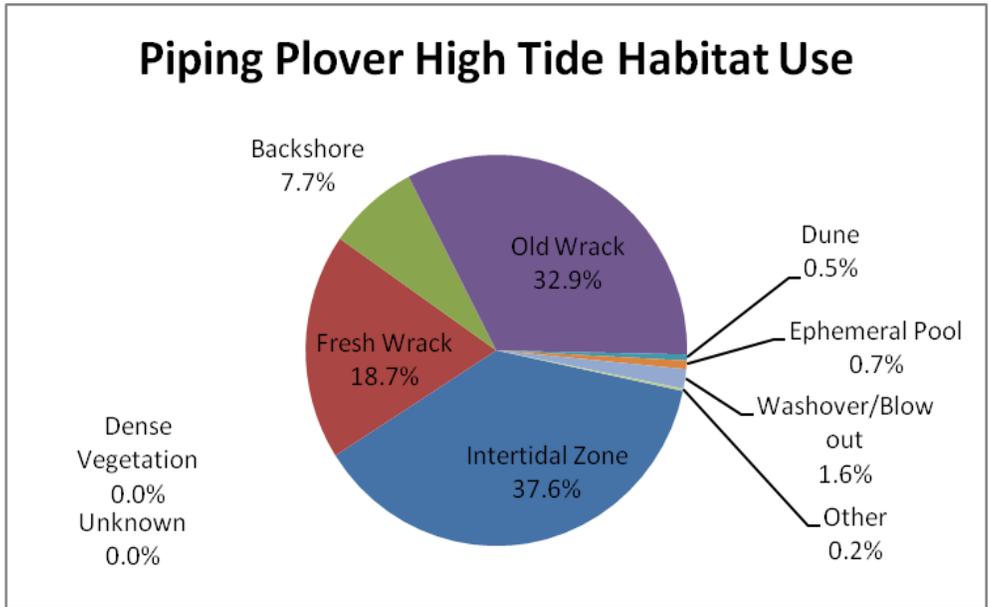


Figure 11. Habitat use by Piping Plovers during high tide surveys.

For habitat use at surveys that were conducted only mid or low tides, 93.3% of all observations were in intertidal areas (**Figure 12**).

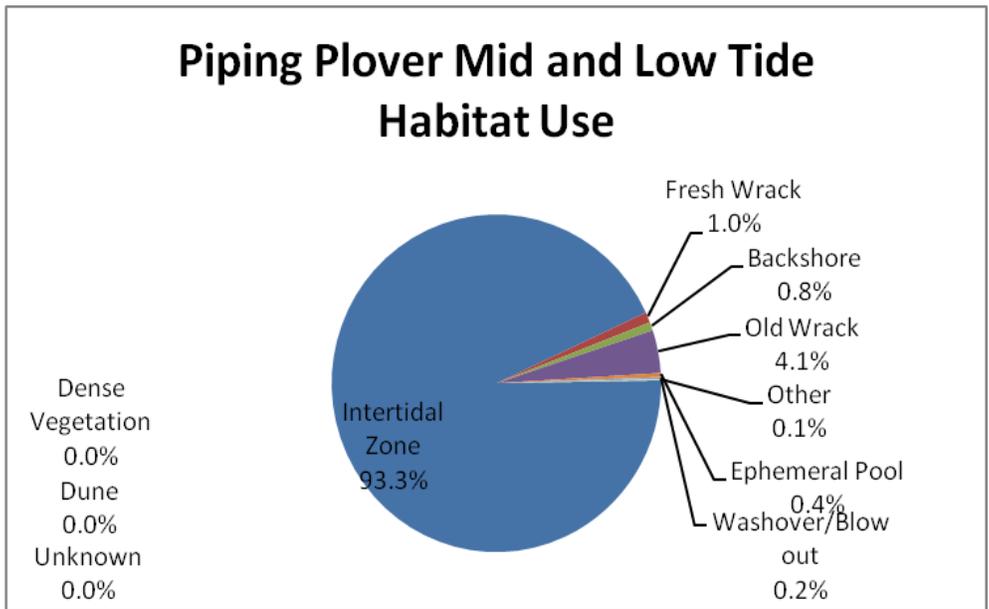


Figure 12. Habitat use by Piping Plovers during mid and low tide surveys.

When a Piping Plover was seen, it was assigned to one of seven behaviors depending on the behavior when it was first observed: foraging, roosting, preening, bathing, flying, aggression, or walking. There were 3,178 observations of Piping Plover where the behavior was classified (**Figure 13**).

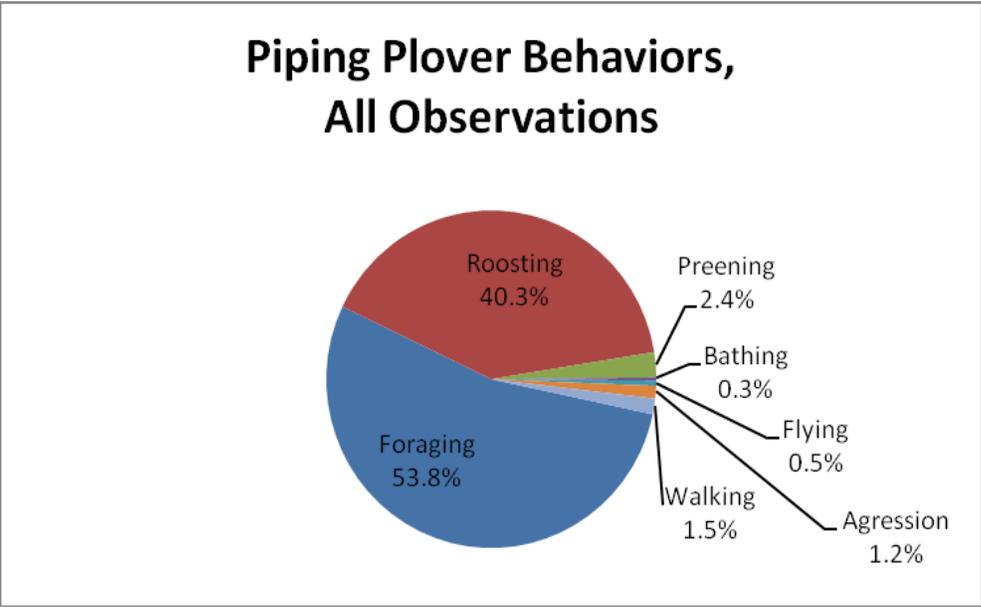


Figure 13. Behaviors of Piping Plover recorded during 2006-2008.

If the behavior at only the high tide period was considered, there was a shift in behaviors towards roosting. There were 972 observations of Piping Plovers during high tide that had a behavior assigned. **Figure 14** provides a breakdown of high tide behaviors.

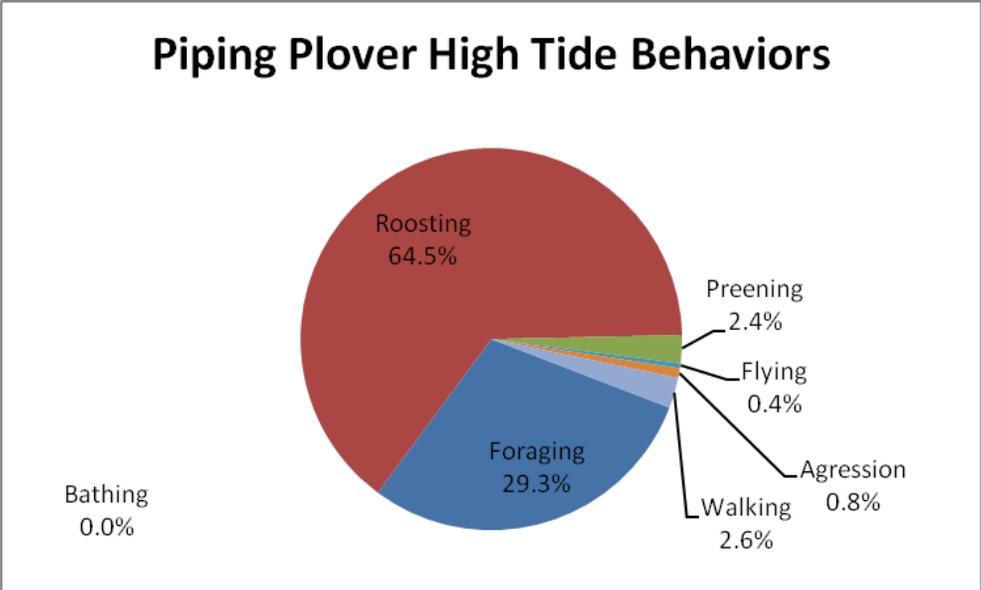


Figure 14. Behaviors of Piping Plovers recorded during high tide surveys.

Of all classified behaviors, 53.8% were foraging, but if only behavior during high tide was considered, the percent of observations for foraging dropped to 29.3%. In contrast, while 40.3% of

all behaviors were roosting, if only high tide behaviors were considered, the amount of roosting increased to 64.5% of all observations.

If Piping Plover behavior during surveys that were conducted only mid or low tides was evaluated, the percentage of feeding observations jumped significantly (**Figure 15**). There were 836 behavioral observations at mid or low tides. Of those, 84.1% of mid or low tide behaviors were foraging, compared to 29.3% of behaviors at high tide.

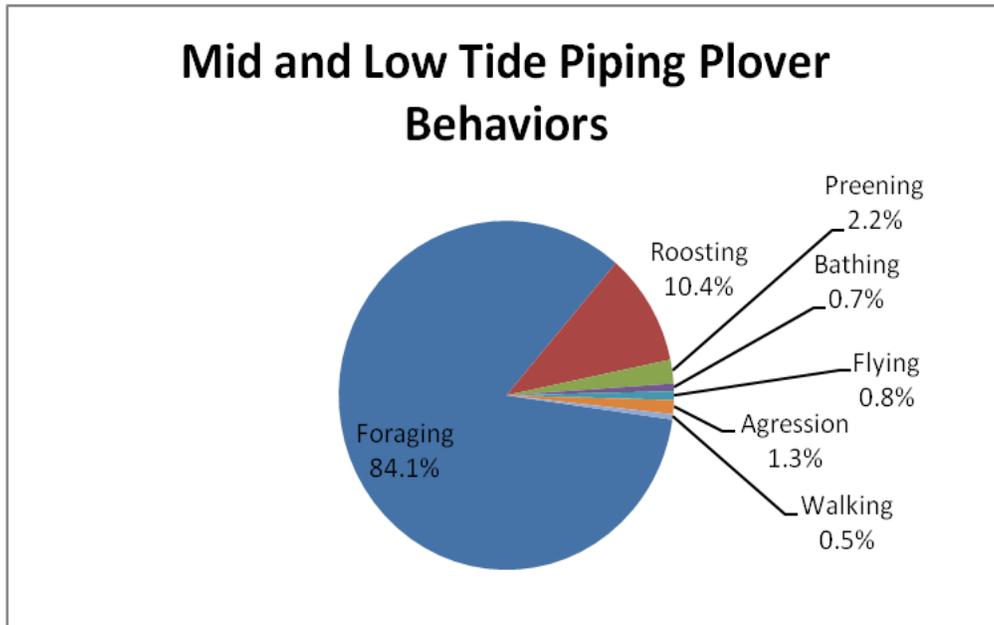


Figure 15. Behaviors of Piping Plovers recorded during mid and low tide surveys.

If habitat use during feeding was considered, the predominant habitat was the intertidal zone, with 93.8% of all observations, and the next highest was fresh wrack, with 3.5% of observations (**Figure 16**).

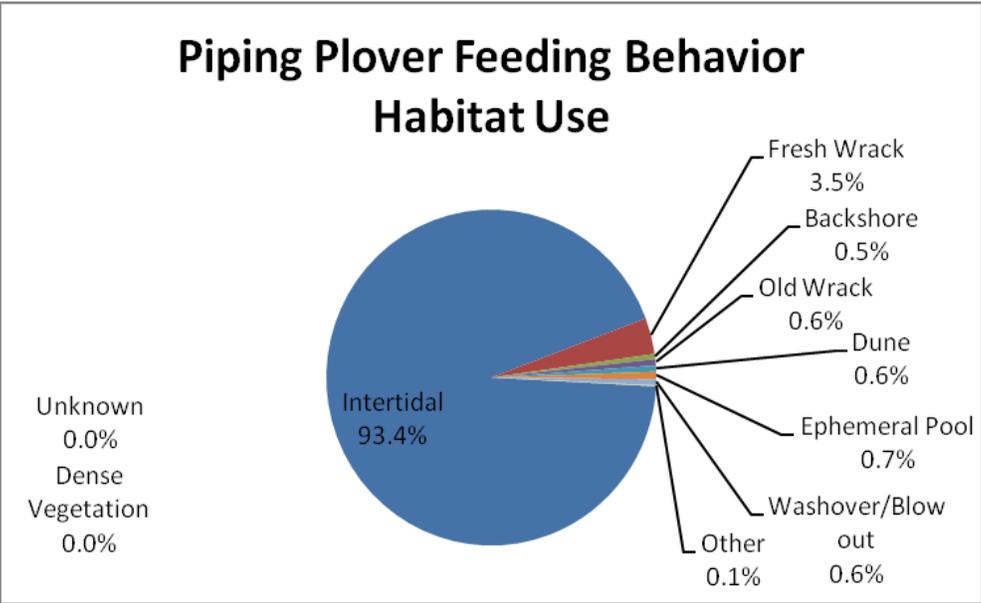


Figure 16. Habitats used by feeding Piping Plovers.

If habitat use during only resting behavior was considered, the relative use of the old wrack, fresh wrack, backshore, and washover/blowout habitats increased (**Figure 17**). There were 1,282 observations of habitat use during roosting behavior. The use of old wrack habitat type increased to 44.9% of the observations, as compared to 19.4% of all observations of habitat use without regard to behavior. The use of fresh wrack increases to 18% during roosting behavior, as compared to 9.8% of all observations without regard to behavior. The use of intertidal habitat during roosting behavior decreases to 22.3%, from 63.3% if all observations are considered.

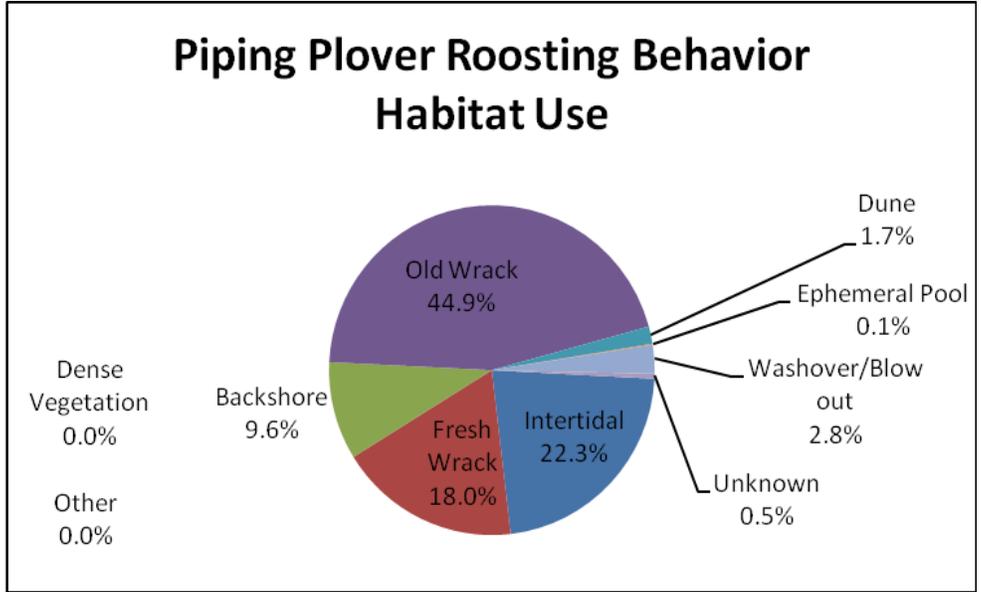


Figure 17. Habitats used by roosting Piping Plovers.

2. WILSON'S PLOVER

Wilson's Plovers detected during the Piping Plover surveys were counted at all locations. There were 409 surveys where Wilson's Plovers were counted. In total, there were 3,042 observations of Wilson's Plovers during the two seasons. The high count was 117 Wilson's Plovers on 6 August 2006 during fall migration at Deveaux Bank. Wilson's Plovers were recorded on 54.5% (N=186) of all surveys.

A survey was conducted for Wilson's Plovers at 26 South Carolina sites during the Piping Plover fall migration, winter, and spring migration counts. While these surveys covered much of the high quality Wilson's Plover beach habitat in South Carolina, there were additional areas where Wilson's Plovers might be located that were not covered, so the total from the 26 sites should not be interpreted as a state population. The fall migration, winter, and spring migration survey windows occurred between 24 August and 9 September, 15 January and 8 February, and 25 March and 14 April, respectively. As the protocol called for surveys approximately every 10 days at the intensive sites during the fall and spring periods to have more detailed knowledge of migration timing, these sites were covered more than once during the survey windows. In choosing which migration survey to use for the intensive sites, the single day survey with the higher number was used for an area. The summary of the seasonal survey results are presented in **Figure 18**.

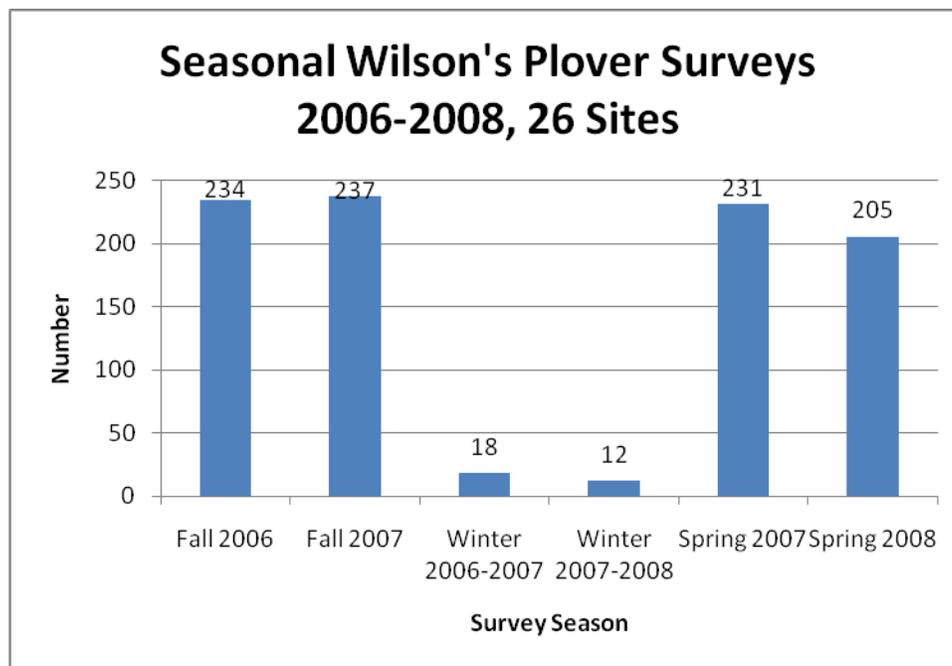


Figure 18. Total number Wilson's Plovers recorded during the 2006-2007 and 2007-2008 survey seasons.

The fall and spring migration results were similar, with between 205 and 237 Wilson’s Plovers being observed at the 26 sites. The number of wintering Wilson’s Plovers was much smaller, with 18 birds observed at the 26 sites in 2006-2007 and 12 in 2007-2008.

Combining the site specific results of the three seasonal surveys over two years, Capers Island in Beaufort County, with 207 observations, had the highest number of Wilson’s Plovers, closely followed by Deveaux Bank with 197 observations. The next highest site was Lighthouse Island, with 94 observations (**Table 7**).

Table 7. Total Wilson’s Plovers recorded for each survey site during the 2006-2007 and 2007-2008 survey seasons.

Location	Fall 2006	Fall 2007	Winter 2006-2007	Winter 2007-2008	Spring 2007	Spring 2008	Site Total
Bird Key Stono	22	17	0	0	6	7	52
Bull Island Ebb Bar	0	1	0	0	9	0	10
Bull Island South	0	0	0	0	0	0	0
Cape Island South	24	13	0	0	10	7	54
Capers Island (Beaufort Co.)	66	18	0	0	73	50	207
Capers Island North	0	0	0	0	2	0	2
Cedar Island North	0	0	0	0	18	8	26
DeBordieu South	0	0	0	0	3	6	9
Deveaux Bank	75	75	4	2	21	20	197
Garden City Beach South	0	2	0	0	4	5	11
Harbor Island	0	0	6	2	2	8	18
Hilton Head Island North	0	0	0	0	0	0	0
Hunting Island	0	2	0	0	0	1	3
Huntington Beach State Park	0	0	0	0	6	4	10
Kiawah Island North, North of Inlet	0	14	0	1	0	6	21
Kiawah Island South	1	0	1	0	3	2	7
Lighthouse Island	15	51	0	0	8	20	94
Litchfield Beach South	3	0	0	0	3	2	8
North Island North	7	8	0	0	17	22	54
Otter Island	6	2	7	7	7	5	34
Raccoon Key North	4	0	0	0	1	2	7
Sand Island	5	22	0	0	18	6	51
Seabrook Island North	0	7	0	0	0	3	10
South Island	3	4	0	0	16	19	42
Waties Island North	1	1	0	0	0	2	4
Waties Island South	2	0	0	0	4	0	6
Total	234	237	18	12	231	205	937

Three notable findings about migration observations should be mentioned. First, while **Table 7** shows two surveys of over 60 birds for Deveaux Bank for the seasonal surveys, the migration surveys approximately every 10 days at this site resulted in 10 counts, all during fall migration, where more than 60 Wilson's Plovers were counted. Second, Capers Island in Beaufort County had more than 60 Wilson's Plovers counted during one spring and one fall migration count, with another spring count at 50 birds. Third, though not included in the survey results in **Table 7** as the site was not surveyed for Wilsons' plovers both years in fall, winter, and spring, there were 68 Wilson's Plovers counted south of the lagoon inlet on the north end of Kiawah Island on 28 August 2006.

Under the National Audubon Society Important Bird Area criteria, the threshold for a site to potentially qualify as of continental significance is 60 Wilson's Plover individuals. Deveaux Bank, Capers Island (Beaufort County), and Kiawah Island merit additional review to determine if they would qualify for IBA status for Wilson's Plovers as a migratory stopover location.

As indicated above, for the 26 sites that were surveyed both years (once in fall, winter, and spring), 18 Wilson's Plovers were observed in the winter count during 2006-2007. For the 31 sites where surveys were conducted during the 2006-2007 winter survey, 26 Wilson's Plovers were observed (**Figure 19**).

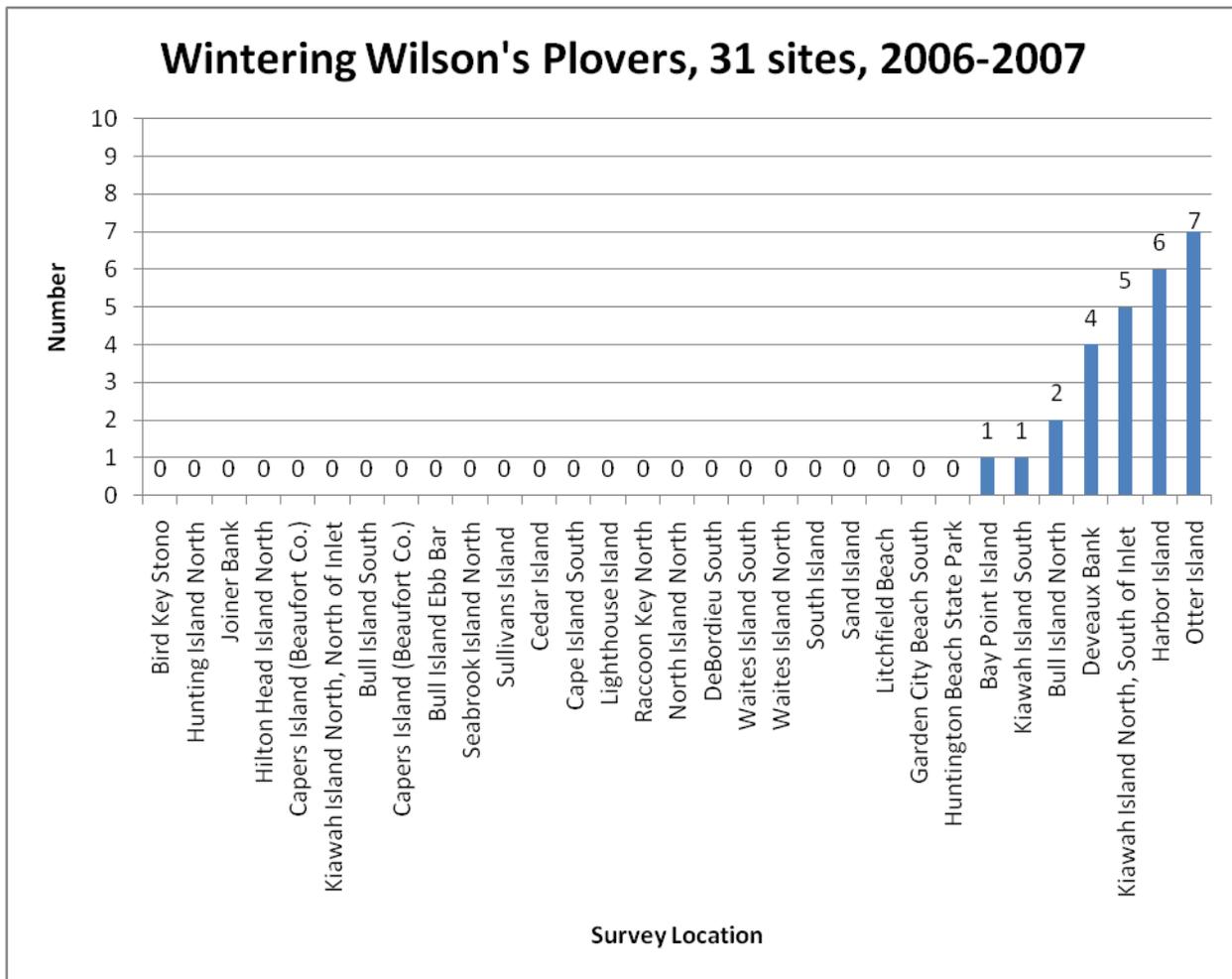


Figure 19. The number of Wilson’s Plovers recorded per site during the winter survey period in 2006-2007.

The map of all winter surveys conducted during the 2006-2007 season is presented below (Figure 20).



Figure 20. South Carolina wintering Wilson’s Plover survey sites in 2006-2007.

As indicated above, for the 26 sites that were surveyed both years (once in fall, winter, and spring), 12 Wilson’s Plovers were observed in the winter count during 2007-2008. For the 38 sites where surveys were conducted during the 2007-2008 winter survey, 13 Wilson’s Plovers were observed (**Figure 21**).

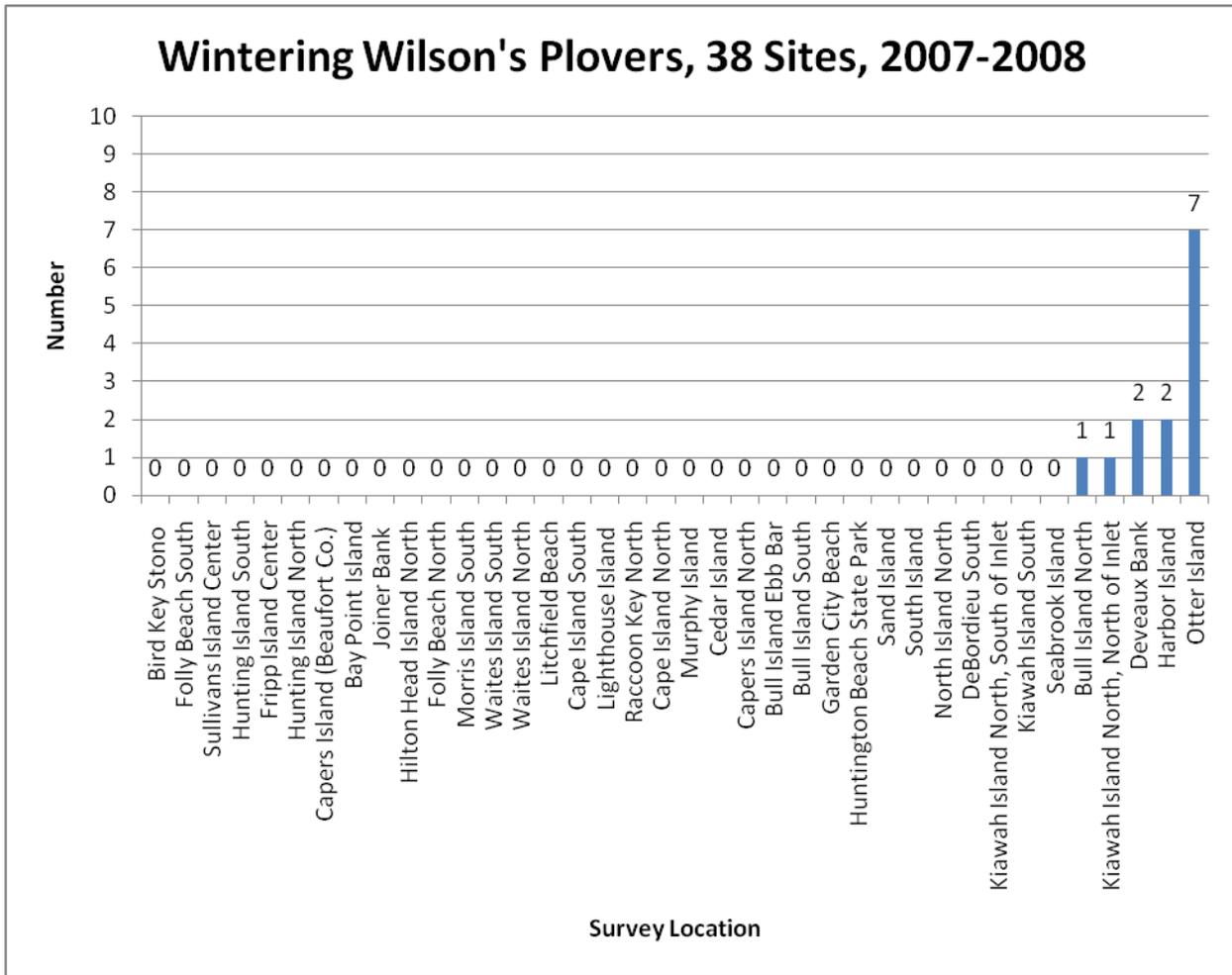


Figure 21. The number of Wilson’s Plovers recorded per site during the winter survey period in 2007-2008.

In both the 2006-2007 and 2007-2008 winter surveys, Otter Island had the high count for Wilson’s Plovers, with 7 individuals observed. All wintering sites surveyed during the 2007-2008 season are shown in **Figure 22**.



Figure 22. South Carolina wintering Wilson's Plover survey sites in 2007-2008.

3. RED KNOT

Any Red Knots detected during the Piping Plover surveys were counted. There were 407 surveys where Red Knots were counted. In total, there were 10,160 observations of Red Knots during the two seasons. The high count was 1,500 Red Knots observed on 6 April 2007, during spring migration at the south side of the lagoon inlet at the north end of Kiawah Island. This figure is an estimate based on the depth and length of a roosting flock, but is believed to be conservative. During 71.3% (N=290) of the surveys, no Red Knots were observed.

A survey was conducted for Red Knots at 26 South Carolina sites during the Piping Plover fall migration, winter, and spring migration counts. While these surveys covered much of the high quality Red Knot beach habitat in South Carolina, there were additional areas where Red Knots might be located that were not covered, so the total from the 26 sites should not be interpreted as a state population. The fall migration, winter, and spring migration survey windows occurred between 24 August and 9 September, 15 January and 8 February, and 25 March and 14 April, respectively. As the protocol called for surveys approximately every 10 days at the intensive sites during the fall and spring periods to have more detailed knowledge of migration timing, these sites were covered more than once during the survey windows. In choosing which migration survey to use for the intensive sites, the single day survey with the higher number was used for an area. The summary of the seasonal survey results are presented in **Figure 23**.

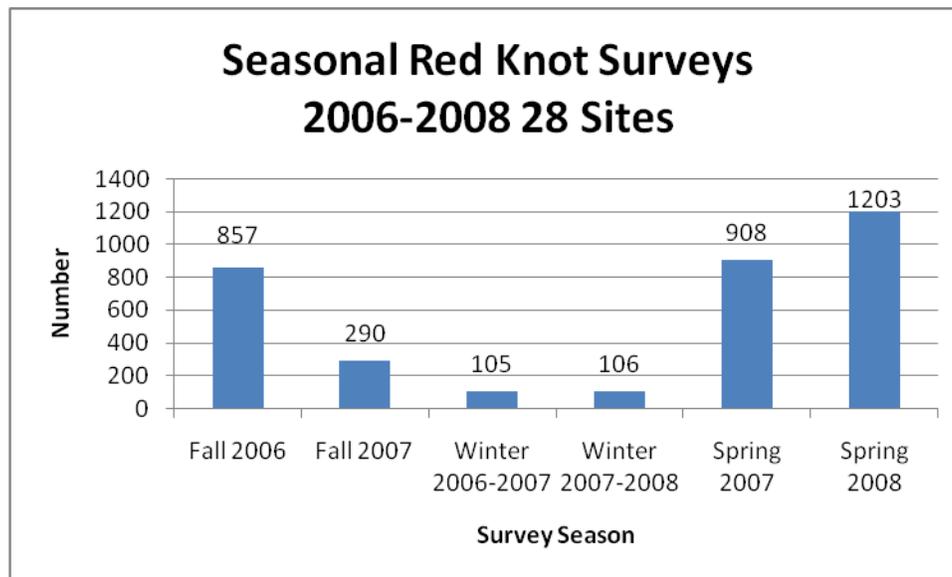


Figure 23. Total number Red Knots recorded during the 2006-2007 and 2007-2008 survey seasons.

The fall and spring migration results are quite different, with a low of 290 Red Knots observed in 2007 fall migration to a high of 1203 birds observed in spring 2008. The number of wintering Red Knots was much smaller, with 105 birds observed at the 26 sites in 2006-2007 and 106 in 2007-2008.

Combining the site specific results of the three seasonal surveys over two years, north of the lagoon inlet on the north end of Kiawah Island, with 1210 observations, was the highest of the sites for Red Knots. The second highest was Capers Island (Beaufort County), with 649 observations, and the third highest site was Harbor Island, with 287 observations (**Table 8**).

Table 8. Total Red Knots recorded for each survey site during the 2006-2007 and 2007-2008 survey seasons.

Location	Fall 2006	Fall 2007	Winter 2006-2007	Winter 2007-2008	Spring 2007	Spring 2008	Site Total
Bird Key Stono	0	0	7	0	232	2	241
Bull Island Ebb Bar	0	0	0	29	64	53	146
Bull Island South	0	0	0	0	0	0	0
Cape Island South	0	97	0	0	0	0	97
Capers Island (Beaufort Co.)	340	116	0	13	73	107	649
Capers Island North	0	2	0	0	0	6	8
Cedar Island	0	0	0	0	0	0	0
DeBordieu South	0	0	0	0	0	0	0
Deveaux Bank	4	0	1	1	0	1	7
Garden City Beach South	0	0	0	0	0	0	0
Harbor Island	38	48	0	4	17	180	287
Hilton Head Island North	0	1	0	0	12	50	63
Hunting Island North	0	0	0	0	40	0	40
Huntington Beach State Park	0	0	0	0	0	0	0
Kiawah Island North, North of Inlet	0	0	0	48	470	692	1210
Kiawah Island South	0	0	43	0	0	0	43
Lighthouse Island	257	1	0	0	0	0	258
Litchfield Beach South	0	0	27	4	0	0	31
North Island North	0	0	0	0	0	0	0
Otter Island	65	25	0	0	0	100	190
Raccoon Key North	0	0	0	0	0	0	0
Sand Island	101	0	0	0	0	0	101
Seabrook Island North	0	0	0	5	0	0	5
South Island	52	0	0	2	0	12	66
Waties Island North	0	0	0	0	0	0	0
Waties Island South	0	0	27	0	0	0	27
Total	857	290	105	106	908	1203	3469

Several additional findings should be mentioned. First, while the north end of Kiawah Island north of the lagoon inlet ranked highest in the 26 sites surveyed, the south side of the same inlet had the highest count, with 1,500 Red Knots on 6 April 2007; this site was not included in **Table 8** because it was not surveyed for Red Knots both years in fall, winter, and spring. Second, there were several additional sites that had high counts that are not included in the 26 site seasonal summary, either because these sites were not visited the requisite six times, or the high count came outside of the migration window. During fall migration, Harbor Island had 312 Red Knots on 25 October 2007. During spring migration, Deveaux Bank had 321 Red Knots on 26 April 2008, Bay Point Island had 330 knots on 14 April 2008, Fripp Island had 400 on 7 April 2008, and Bird Key Stono had 459 on 6 March 2007.

Under the National Audubon Society Important Bird Area criteria, 720 Red Knots is the threshold for a site to potentially qualify as of continental significance. Based on this information, the north end of Kiawah Island merits additional review to determine if it would qualify for IBA status for Red Knots as a migratory stopover location.

As indicated above, for the 26 sites that were surveyed both years (once in fall, winter, and spring), there were 105 Red Knots observed in the winter count during 2006-2007. For the 31 sites where surveys were conducted during the 2006-2007 winter survey, 232 Red Knots were observed (**Figure 24**).

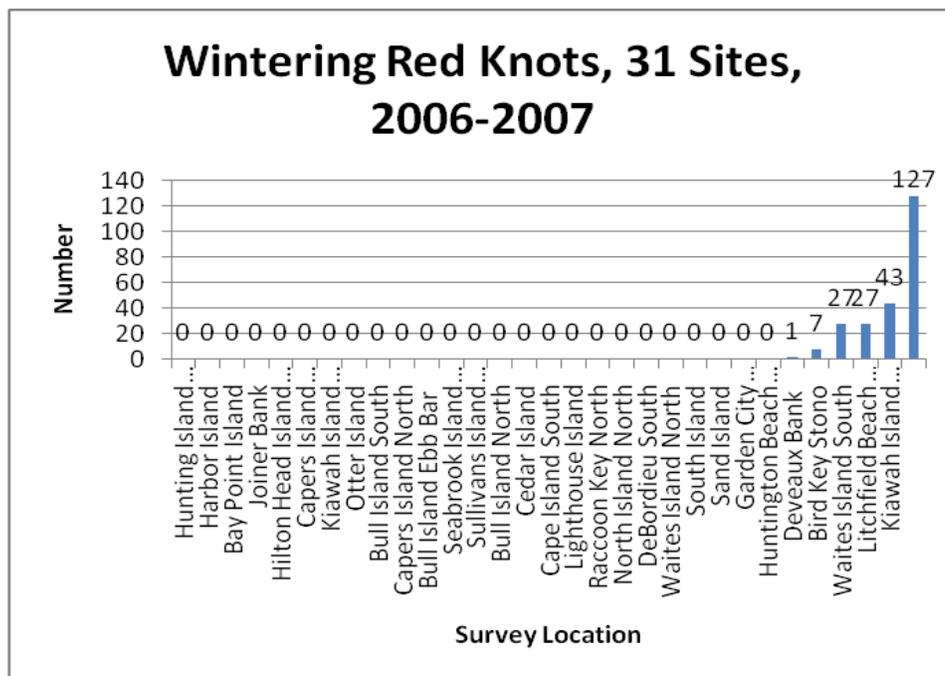


Figure 24. The number of Red Knots recorded per site during the winter survey period in 2006-2007.

Figure 25 shows the map of all winter surveys conducted during the 2006-2007 season.



Figure 25. South Carolina wintering Red Knot survey sites in 2006-2007.

As indicated above, for the 26 sites that were surveyed both years once in fall, winter, and spring, 106 Red Knots were observed in the winter count during 2007-2008. For the 38 sites where surveys were conducted during the 2007-2008 winter survey, 242 Red Knots were observed (**Figure 26**).

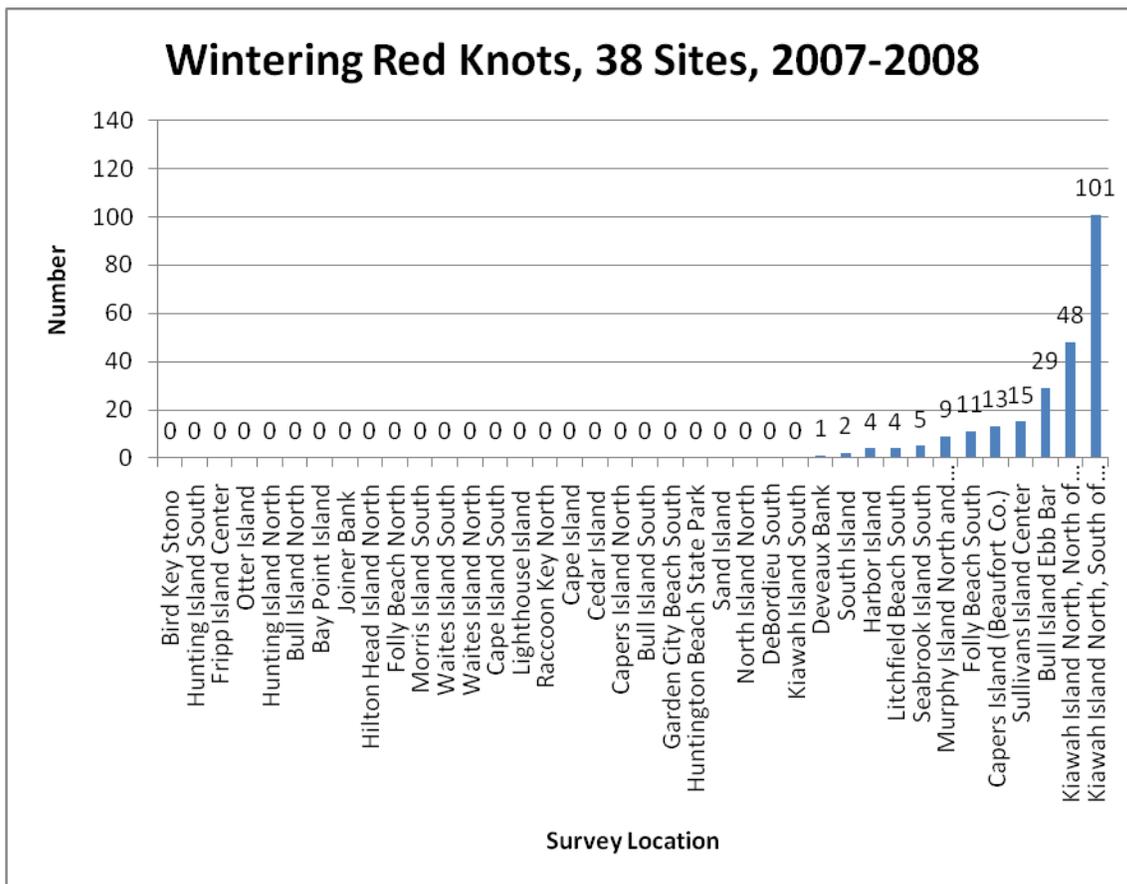


Figure 26. The number of Red Knots recorded per site during the winter survey period in 2007-2008.

In both the 2006-2007 and 2008-2009 winter surveys, the north end of Kiawah Island had the high count for Red Knots. The map all winter surveys during the 2007-2008 season is presented below (**Figure 27**).



Figure 27. South Carolina wintering Red Knot survey sites in 2007-2008.

At the more intensive sites, which were surveyed approximately every ten days during migration, there could be considerable variation in the number of Red Knots. At Harbor Island, there were 48 Red Knots observed on 30 August 2007, zero Red Knots observed on 6 September and 17 September, 218 observed on 26 September, and zero on 5 October. The fluctuation in Red Knot numbers during migration at the more intensively surveyed sites suggests a single survey at

the less intensively surveyed sites many not provide a reliable estimate of the number of Red Knots that use the site as a migratory stopover.

4. MARBLED GODWIT

Any Marbled Godwits detected during the Piping Plover surveys also were counted. There were 408 surveys where Marbled Godwits were counted. In total, there were 2,225 observations of Marbled Godwits during the two seasons, with the high count of 140 on 17 February 2008, at Harbor Island. Other than one survey at Hilton Head in January, 2007 when 139 were observed, the 27 other surveys with 30 or more Marbled Godwits were at either at Harbor Island or Hunting Island. Marbled Godwits were observed on 27.9% (N=294) of all surveys.

A survey was conducted for Marbled Godwits at 26 South Carolina sites during the Piping Plover fall migration, winter, and spring migration counts. While these surveys covered much of the high quality Marbled Godwit habitat in South Carolina, there were additional areas where Marbled Godwits might be located that were not covered, so the total from the 26 sites should not be interpreted as a state population. The fall migration, winter, and spring migration survey windows occurred between 24 August and 9 September, 15 January and 8 February, and 25 March and 14 April, respectively. As the protocol called for surveys approximately every 10 days at the intensive sites during the fall and spring periods to have more detailed knowledge of migration timing, these sites were covered more than once during the survey windows. In choosing which migration survey to use for the intensive sites, the single day survey with the higher number was utilized for an area. The summary of the seasonal survey results from 26 sites are presented in **Figure 28**.

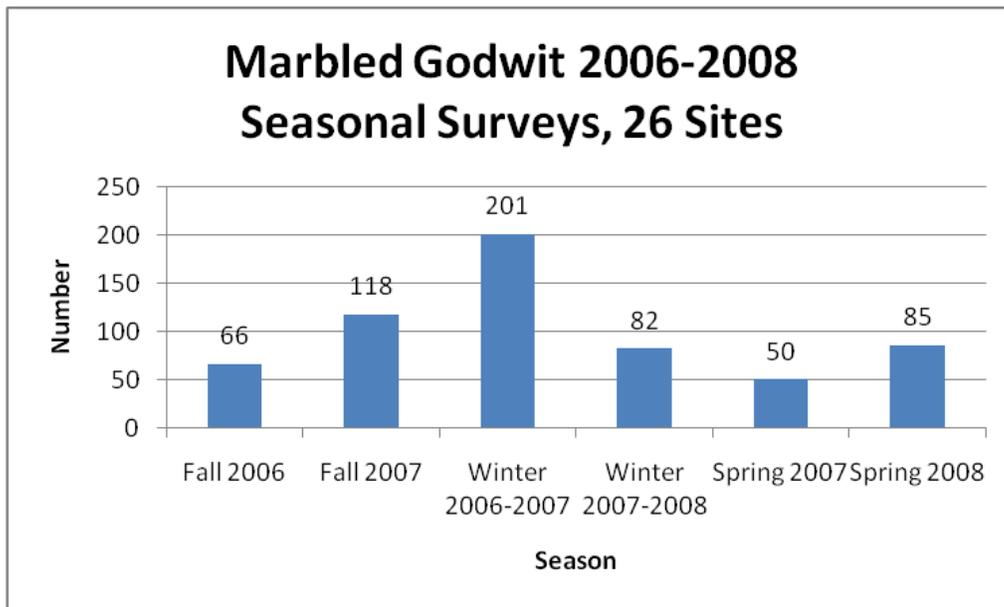


Figure 28. Total number of Marbled Godwits recorded during the 2006-2007 and 2007-2008 survey seasons.

The differences between all three seasons are quite different, with a range for the migratory period of 50 to 118, and the wintering surveys range from 201 in 2006-2007 to 82 in 2007-2008. However, as discussed below, at least for the wintering seasons, the results at one site – Hilton Head – explain most of the difference.

Combining the site specific results of the three seasonal surveys over two years, Harbor Island, with 220 observations, was the highest of the 26 sites for Marbled Godwits. The second highest was Hilton Head North, with 191 observations, and the third highest was Otter Island, with 62 observations (**Table 9**).

Table 9. Total Marbled Godwits recorded for each survey site during the 2006-2007 and 2007-2008 survey seasons.

Location	Fall 2006	Fall 2007	Winter 2006-2007	Winter 2007-2008	Spring 2007	Spring 2008	Site Total
Bird Key Stono	1	1	0	0	3	5	10
Bull Island Ebb Bar	0	0	0	0	0	0	0
Bull Island South	0	0	0	0	0	0	0
Cape Island South	0	0	0	0	0	0	0
Capers Island (Beaufort Co.)	3	2	0	2	0	0	7
Capers Island North	0	0	0	0	0	0	0
Cedar Island North	0	0	0	0	0	0	0
DeBordieu South	0	0	0	0	0	0	0
Deveaux Bank	4	10	0	0	0	20	34

Garden City Beach South	0	0	0	0	0	0	0
Harbor Island	30	58	42	33	34	23	220
Hilton Head Island North	0	0	139	23	13	16	191
Hunting Island North	0	0	18	0	0	0	18
Huntington Beach State Park	0	0	0	0	0	0	0
Kiawah Island North, North of Inlet	0	2	0	1	0	6	9
Kiawah Island South	4	2	0	0	0	3	9
Lighthouse Island	0	11	0	0	0	0	11
Litchfield Beach South	0	0	0	0	0	0	0
North Island North	2	0	0	0	0	0	2
Otter Island	8	17	2	23	0	12	62
Raccoon Key North	9	0	0	0	0	0	9
Sand Island	0	0	0	0	0	0	0
Seabrook Island North	4	15	0	0	0	0	19
South Island	1	0	0	0	0	0	1
Waties Island North	0	0	0	0	0	0	0
Waties Island South	0	0	0	0	0	0	0
Total	66	118	201	82	50	85	602

The difference between the first and second winter results are due largely to differing results between the Hilton Head winter counts, with 139 observed the first winter, and 23 observed the second winter.

As indicated above, for the 26 sites that were surveyed both years once in fall, winter, and spring, 118 Marbled Godwits observed in the winter count during 2006-2007. For the 31 sites where surveys were conducted during the 2006-2007 winter survey, 203 Marbled Godwits were observed (**Figure 29**).

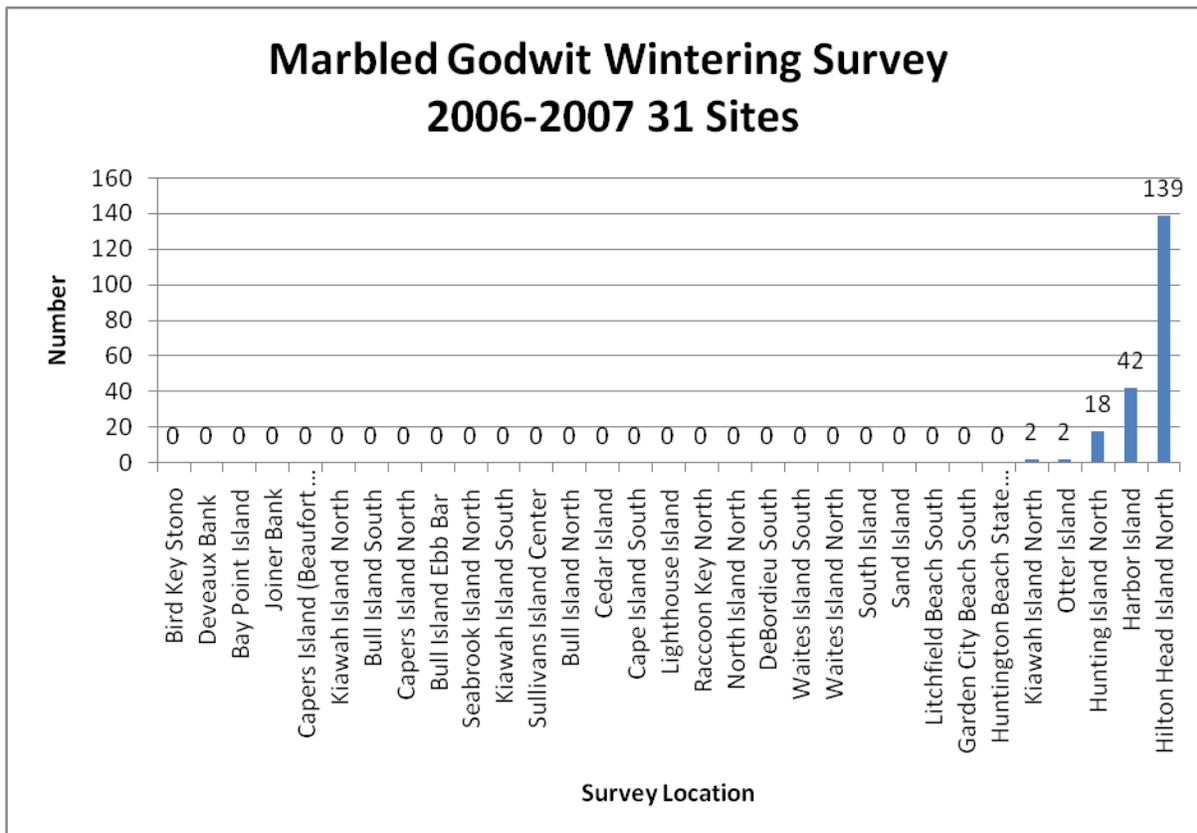


Figure 29. The number of Marbled Godwits recorded per site during the winter survey period in 2006-2007.

The wintering survey locations for Marbled Godwits are shown in **Figure 30**.

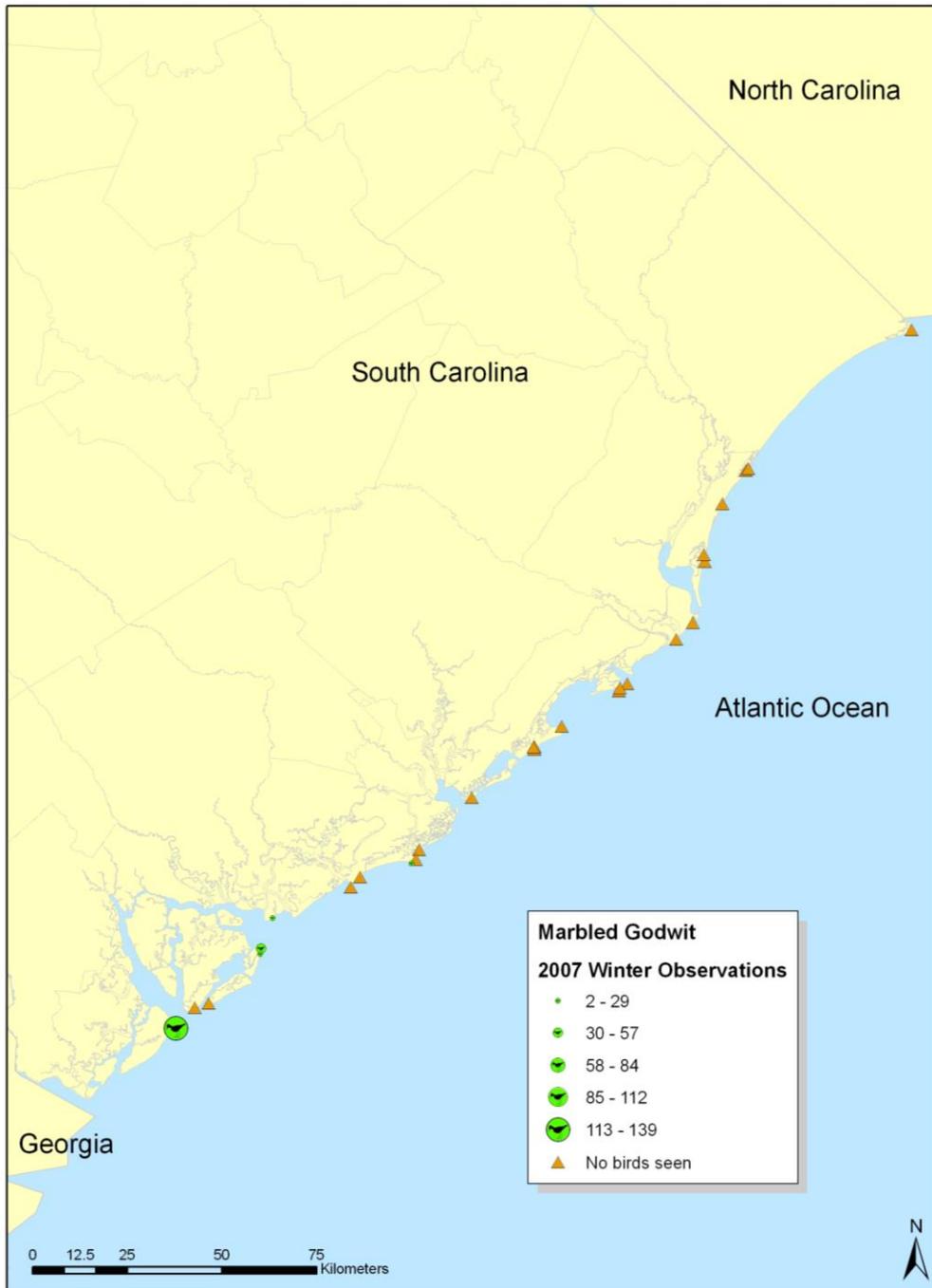


Figure 30. South Carolina wintering Marbled Godwit survey sites in 2006-2007.

As indicated above, for the 26 sites that were surveyed both years once in fall, winter, and spring, 82 Marbled Godwits were observed in the winter count during 2007-2008. For the 38 sites where surveys were conducted during the 2007-2008 winter survey, 87 Marbled Godwits were observed (**Figure 31**).

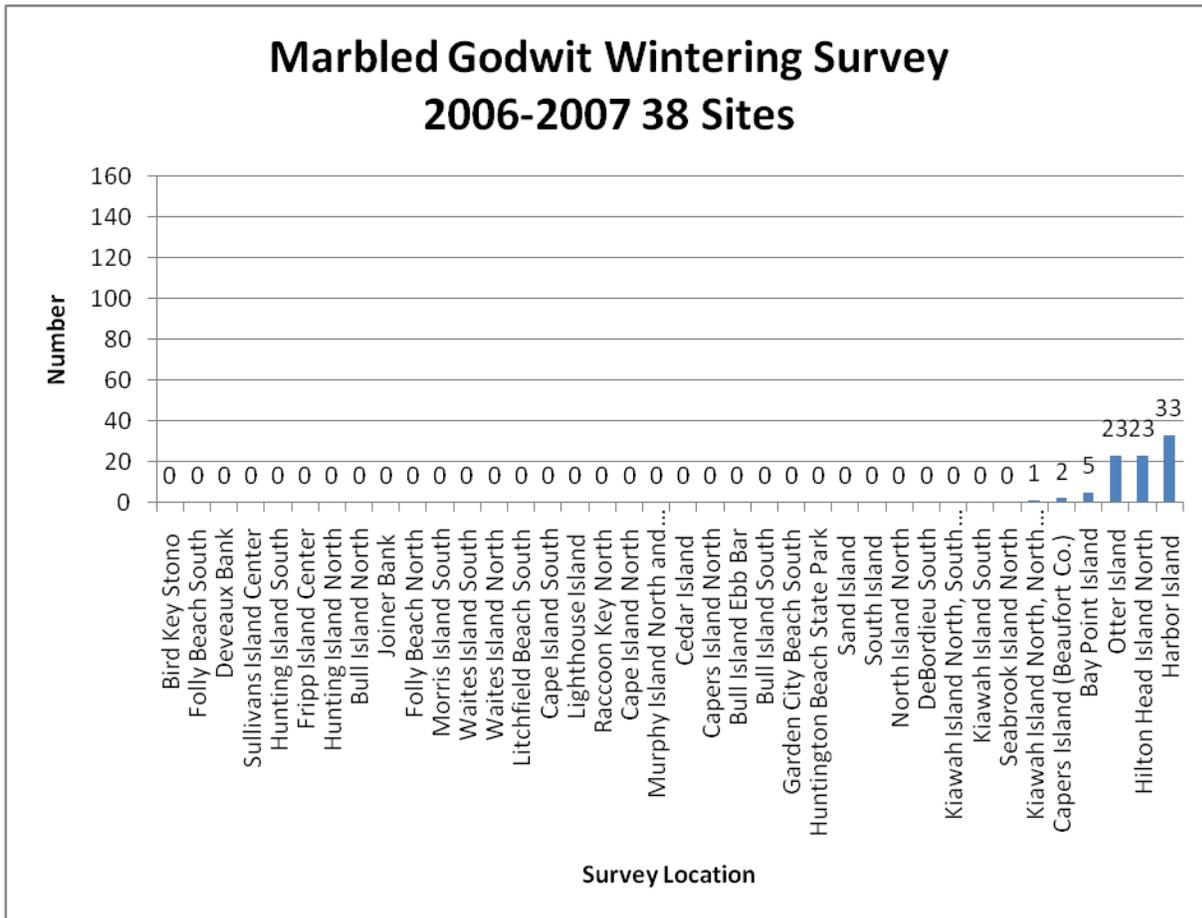


Figure 31. The number of Marbled Godwits recorded per site during the winter survey period in 2007-2008.

In both wintering seasons, Marbled Godwits were not seen at most of the sites surveyed. The two main locations appear to be Harbor Island and Hilton Head Island. The wintering survey locations are shown in **Figure 32**.



Figure 32. South Carolina wintering Marbled Godwit survey sites in 2007-2008.

5. AMERICAN OYSTERCATCHER

This study was not designed to include South Carolina's primary wintering areas for American Oystercatchers and the results presented are not representative of the state's population of wintering American Oystercatchers. Nevertheless, any American Oystercatchers detected during the Piping Plover surveys were counted. There were 409 surveys where American Oystercatchers were counted. In total, there were 2,998 observations of American Oystercatchers during the two seasons. The highest count was 137 American Oystercatchers on 4 February 2007 at Lighthouse Island; four of the five highest counts were at this location. There were no observations of American Oystercatchers on 45.7% of the surveys (N=187).

A survey was conducted for American Oystercatchers at 26 South Carolina sites during the Piping Plover fall migration, winter, and spring migration counts. While these surveys covered beach habitats, the shell rake habitats where large numbers of American Oystercatchers have been seen were not covered. The fall migration, winter, and spring migration survey windows occurred between 24 August and 9 September, 15 January and 8 February, and 25 March and 14 April, respectively. As the protocol called for surveys approximately every 10 days at the intensive sites during the fall and spring periods to have more detailed knowledge of migration timing, these sites were covered more than once during the survey windows. In choosing which migration survey to use for the intensive sites, the single day survey with the higher number was used for an area. The summary of the seasonal survey results are presented in **Figure 33**.

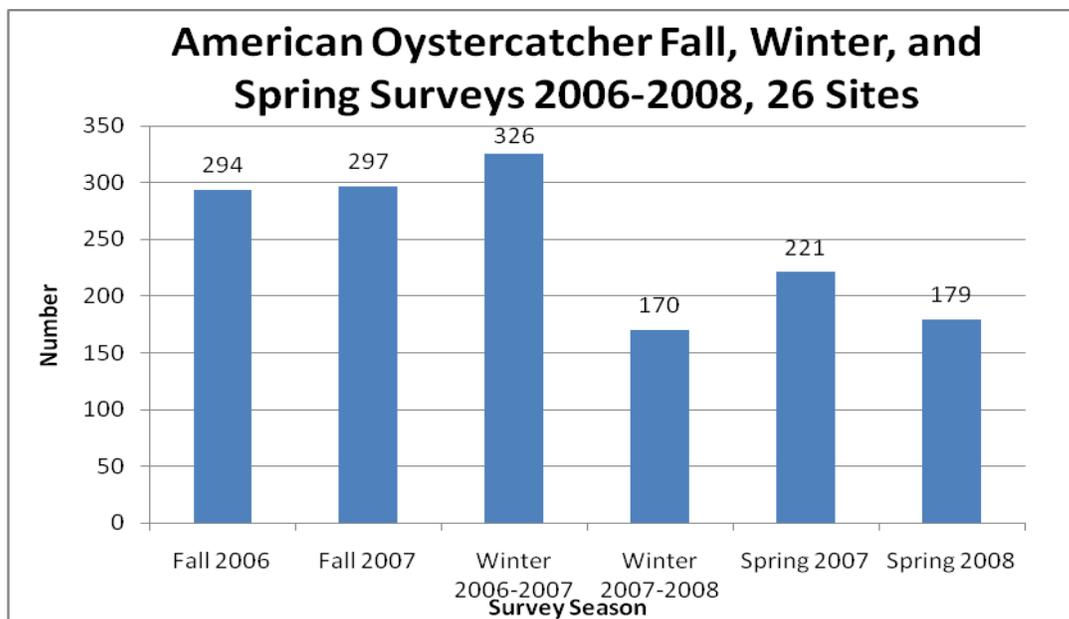


Figure 33. Total number of American Oystercatchers recorded during the 2006-2007 and 2007-2008 survey seasons.

Combining the site specific results of the three seasonal surveys over two years, Lighthouse Island, with 487 observations, was the highest of the sites for American Oystercatchers, followed by DeBordieu South with 164, and Cape Island South with 145 observations (**Table 10**).

Table 10. Total American Oystercatchers recorded for each survey site during the 2006-2007 and 2007-2008 survey seasons.

Location	Fall 2006	Fall 2007	Winter 2006-2007	Winter 2007-2008	Spring 2007	Spring 2008	Site Total
Bird Key Stono	1	16	4	2	8	10	41
Bull Island Ebb Bar	0	2	2	2	4	0	10
Bull Island South	0	0	0	2	2	2	6
Cape Island South	41	35	26	8	23	12	145
Capers Island (Beaufort Co.)	10	14	6	11	7	12	60
Capers Island North	0	0	0	4	0	2	6
Cedar Island North	6	1	1	2	2	5	17
DeBordieu South	49	0	30	59	3	23	164
Deveaux Bank	22	2	21	4	48	42	139
Garden City Beach South	0	1	0	5	1	2	9
Harbor Island	24	23	22	0	2	1	72
Hilton Head Island North	0	0	3	0	0	0	3
Hunting Island North	0	0	30	0	0	0	30
Huntington Beach State Park	0	34	0	1	4	2	41
Kiawah Island North, North of Inlet	0	4	6	9	2	4	25
Kiawah Island South	3	8	1	0	0	1	13
Lighthouse Island	82	127	137	31	88	22	487
Litchfield Beach South	0	0	0	0	0	0	0
North Island North	40	17	28	11	15	16	127
Otter Island	0	0	4	0	2	2	8
Raccoon Key North	0	2	5	12	4	8	31
Sand Island	2	0	0	5	0	4	11
Seabrook Island North	1	1	0	0	2	2	6
South Island	5	8	0	2	4	4	23
Waties Island North	5	0	0	0	0	1	6
Waties Island South	3	2	0	0	0	2	7
Total	294	297	326	170	221	179	1487

As indicated above, for the 26 sites that were surveyed both years once in fall, winter, and spring, 326 American Oystercatchers were observed in the winter count during 2006-2007. For the 31 sites where surveys were conducted during the 2006-2007 winter survey, there were 353 American Oystercatchers that were observed (**Figure 34**).

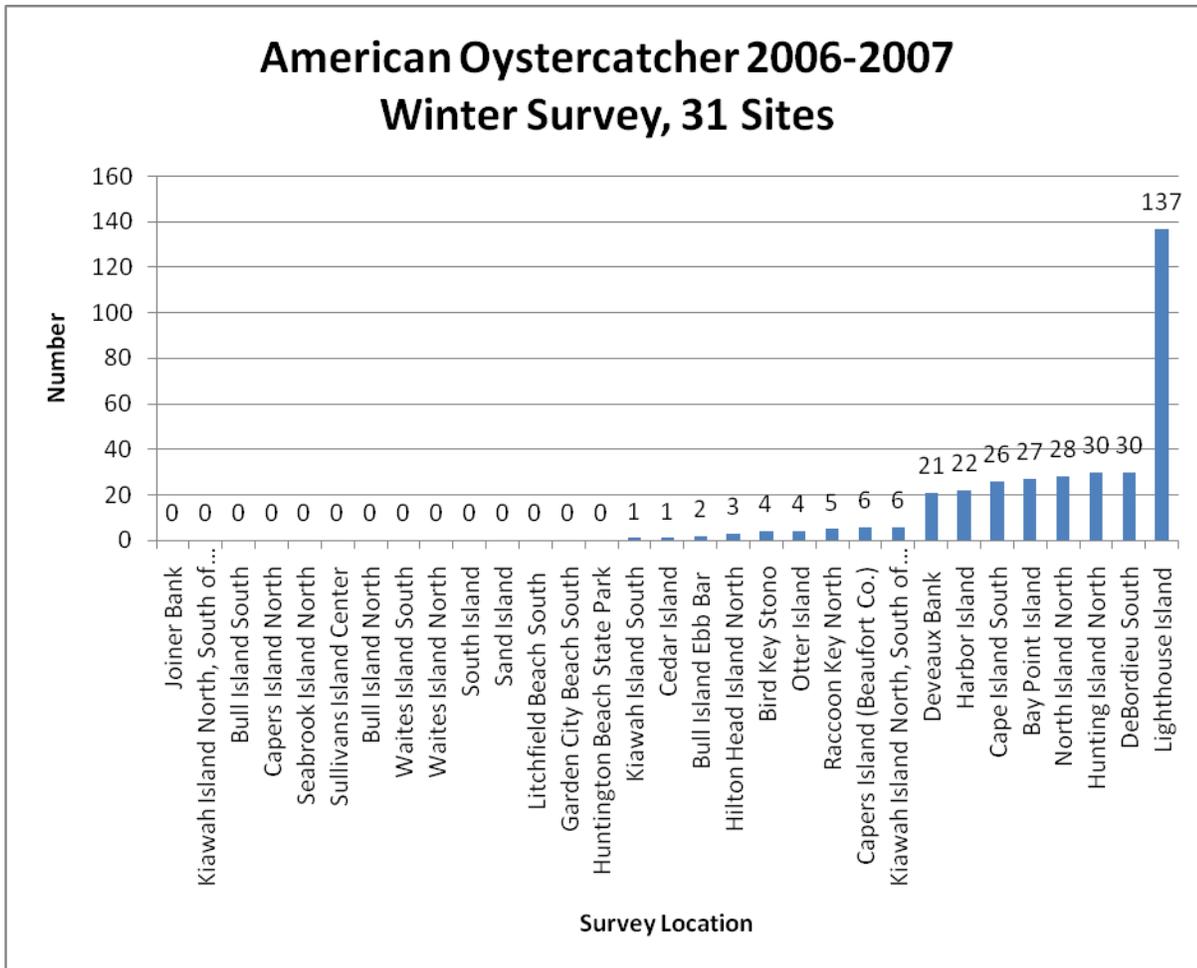


Figure 34. The number of American Oystercatchers recorded per site during the winter survey period in 2006-2007.

The map all winter surveys conducted during the 2006-2007 season is presented below (Figure 35).



Figure 35. South Carolina wintering American Oystercatcher survey sites in 2006-2007.

As indicated above, for the 26 sites that were surveyed both years once in fall, winter, and spring, there were 170 American Oystercatchers observed in the winter count during 2007-2008. For the 38 sites in total where surveys were conducted during the 2007-2008 winter survey, there were 179 American Oystercatchers that were observed (**Figure 36**).

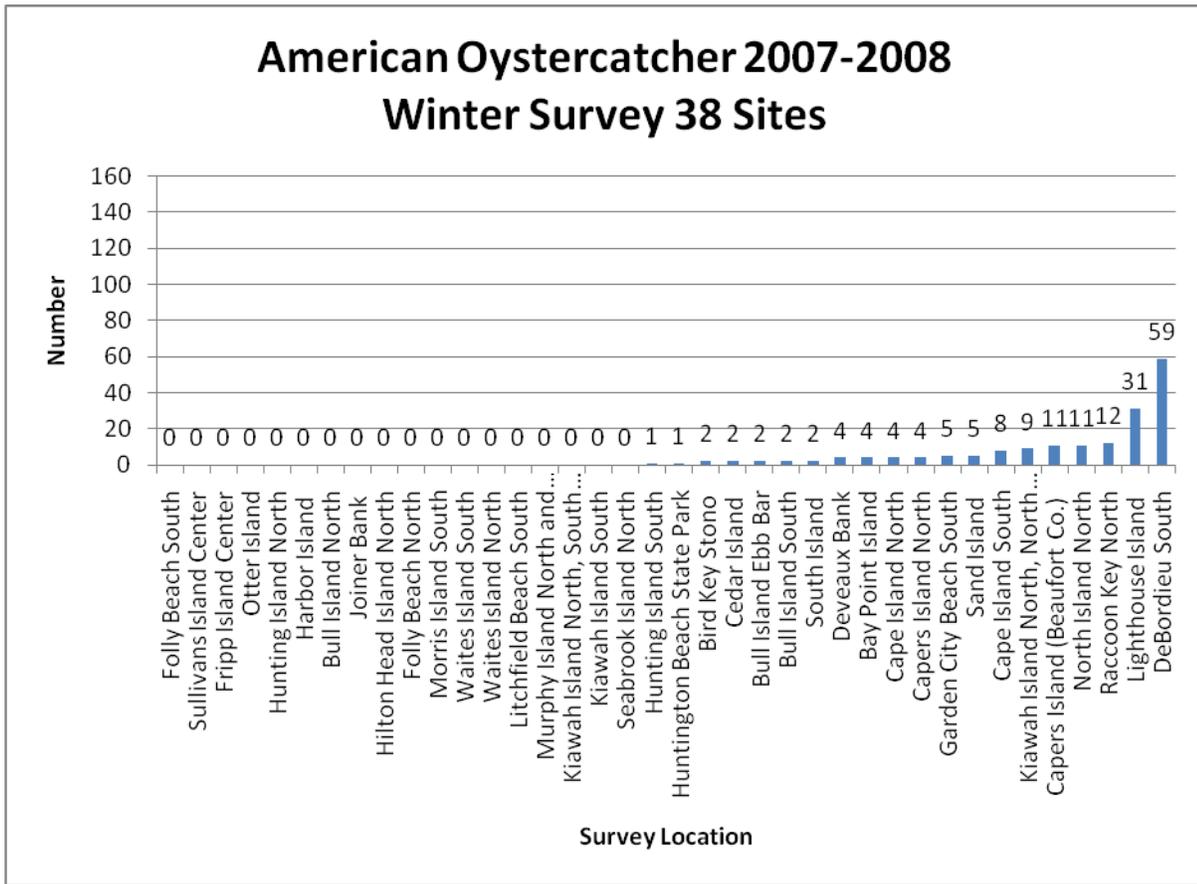


Figure 36. The number of American Oystercatchers recorded per site during the winter survey period in 2007-2008.

In the first season, Lighthouse Island had the high winter count at 137 birds, while in the second season; DeBordieu Island South had the high count, at 59 birds. The map all winter surveys during the 2007-2008 season is presented below (**Figure 37**).

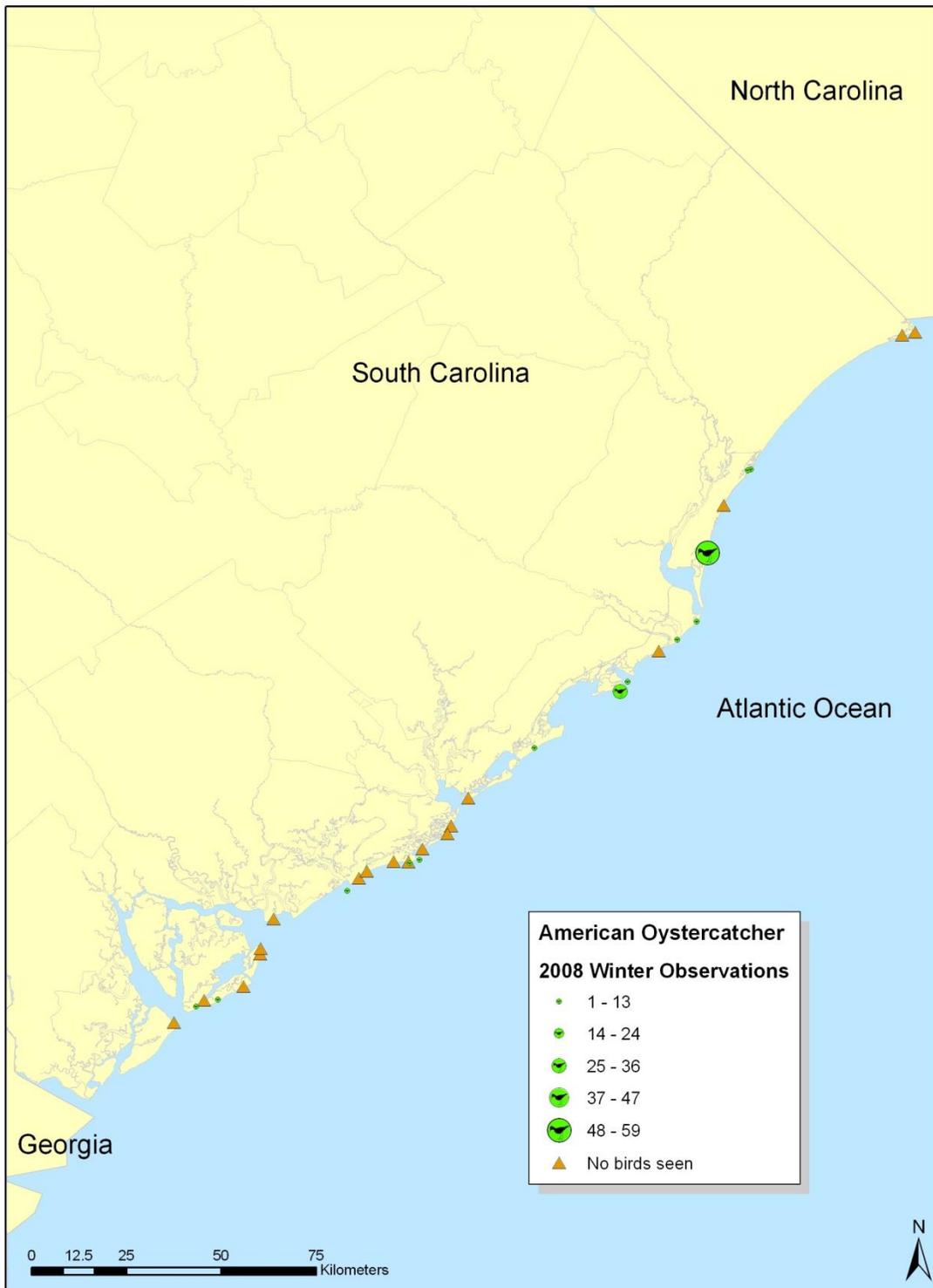


Figure 37. South Carolina wintering American Oystercatcher survey sites in 2007-2008.

These surveys suggest that Lighthouse Island is particularly important for American Oystercatchers. The highest count and four of the five highest counts were at this location. While

birds were seen across the island, the main location for American Oystercatchers was the large overwash fan near the southern part of the island, which was used as a high tide roosting area.

Under the National Audubon Society Important Bird Area criteria, 60 American Oystercatchers is the threshold for a migratory or wintering site to potentially qualify as a site of continental significance. Currently, Cape Romain National Wildlife Refuge is designated as an IBA for American Oystercatcher. This study data further supports the designation of this area as an IBA.

6. POTENTIAL RECREATIONAL DISTURBANCE

Data were collected on nine potential sources of disturbance that were observed during 398 complete surveys: pedestrians, boats that were anchored at a site or dropping people off at a site, all-terrain vehicles, off-road vehicles (i.e., pickup truck or sports utility vehicle), pull carts, bike riders, dog off leash, dog on leash, and dogs where it was unknown if they were on or off a leash. In the first season, disturbance data was collected beginning in the first survey in August, except for Hunting Island, where the data was collected on the first survey in September, due to the late start date at that location; in the second season, data was collected from the first survey in early July.

There were 5,024 observations of potential recreational disturbance observed during 398 surveys. The largest potential source of disturbance was pedestrians, with 4,256 pedestrians observed, or 10.7 people per survey. Overall, pedestrian observations accounted for 84.7% of all observations. There were 306 observations of dogs, or 0.8 dogs per survey. Of those observations, there were more observations of dogs off leash, at 169, than dogs on leash, at 132. There were 206 observations of bicyclists, or 0.5 observations per survey. There were 171 observations of boats, or 0.4 per survey. Potential vehicle disturbance was very limited: there were 15 off-road vehicles and 7 all-terrain vehicles observed, both under 0.1 observations per survey.

The data for potential sources of disturbance at the four intensive study sites are summarized below as observations per survey (**Table 11**).

Table 11. Potential recreational disturbance sources at intensive survey sites, 2006-2008.

Location	Survey (N=)	Ped.	Boat	ATV	ORV	Cart	Bike	Dog On	Dog Off	Dog UK
Bird Key Stono 2006-2007	21	0.6	0.3	0	0	0	0	0.1	0	0.1
Bird Key Stono 2007-2008	24	0.5	0.2	0	0	0	0	0	0	0
Deveaux Bank 2006-2007	21	0.4	0.1	0	0	0	0	0	0	0
Deveaux Bank 2007-2008	24	2	0.6	0	0	0	0	<0.1	0	0
Harbor Island 2006-2007	20	12.1	<0.1	0	0	0	0	0.4	0.8	<0.1
Harbor Island 2007-2008	24	16.3	0.1	0	<0.1	0.3	0.3	0.3	0.5	0
Hunting Island 2006-2007	19	10.4	0	0	0	0.4	0.8	0.5	1.1	<0.1
Hunting Island 2007-2008	24	17.7	0	<0.1	0	0.8	1	0.6	1.4	0

Bird Key Stono and Deveaux Bank are accessible by boat only, and are managed by SCDNR with measures that reduce human disturbance. In contrast, Hunting Island, which is a state park, and Harbor Island, which is a privately owned gated community, both are accessible by paved roads. Bird Key Stono and Deveaux Bank both had lower levels of pedestrians and dogs per survey than Hunting Island and Harbor Island. Despite a dog on leash requirement at Hunting Island State Park, over 1 dog per survey was seen off leash.

In addition to the intensive sites, there were 20 sites where potential recreational disturbance data were gathered the first and second seasons during fall migration, winter, and spring migration surveys. The fall migration survey occurred between 24 August and 9 September; the winter survey occurred between 15 January and 8 February; and the spring migration survey occurred between 25 March and 14 April. The potential disturbance data for the 20 non-intensive survey sites are summarized below as observations per survey (**Table 12**).

Table 12. Potential recreational disturbance sources at non-intensive survey sites, 2006-2008.

Location	Ped.	Boat	ATV	ORV	Cart	Bike	Dog On	Dog Off	Dog UK
Bull Island South	10.3	0.3	0	0	0	0	0	0	0
Bull Island/Capers Island Ebb Bar	0	0	0	0	0	0	0	0	0
Cape Island South	3.7	1.2	0	0	0	0	0	0	0
Capers Island Beaufort	1.5	0.5	0	0	0	0	0.3	0	0
Capers Island North	4.2	3	0	0	0	0	0.2	0	0
Cedar Island	1.2	0.3	0	0	0	0	0	0	0.2
DeBordieu	2.3	0.8	0	0	0	0	0.2	0	0
Garden City Beach South	7.3	0.7	0	0	0	0	0.7	0	0
Huntington Beach State Park	71.2	0.2	0	0	0.2	0.3	1.2	2.3	0
Kiawah Island South	25.2	0	0.2	0.5	0.3	3.5	2.8	0.5	0
Kiawah Island, North of Inlet	2.7	0.7	0.2	0	0	0	0.2	0.2	0
Lighthouse Island	6.8	1.7	0	0	0	0	0	0	0
Litchfield Beach	5.8	0.2	0	0	0	0	0.3	0	0
North Island	3.5	1	0	0	0	0	0	0	0
Otter Island	2.7	0.5	0	0	0	0	0	0	0
Raccoon Key North	0	0	0	0	0	0	0	0	0
Seabrook Island	15.3	0	0	0.2	0.7	0.8	1.2	0.2	0
South Island	4.2	1	0	0.2	0	0	0.6	0	0
Waties Island North	3.8	1	0	0	0	0	0	0	0
Waties Island South	1.8	0.3	0	0.2	0	0	0.2	0	0

Of these non-intensive survey locations, Huntington Beach had the highest number of pedestrians observed per survey, at 71.2, with Kiawah Island South the next highest, at 25.2. Lighthouse Island had the highest number of boats, at 1.7 per survey, with Cape Island South second at 1.2 boats per survey. The highest number of bicycles was Kiawah Island South, at 3.5 per survey. Dogs were observed at 12 of the 20 sites. The highest number of dogs on leash observed per survey was Kiawah Island South, at 2.8. Huntington Beach State Park and Seabrook Island had 1.2 dogs off leash per survey. The highest number of dogs off leash was at Huntington Beach State Park, at 2.3 per survey, with the second highest at Kiawah Island South, at 0.5 per survey.

B. SITE SPECIFIC INFORMATION

This section contains site-specific information on the 15 designated WRCH areas and any other location that was surveyed as part of the Piping Plover component of SCSP. The sites are listed in this report in order of their location from north to south. Information is presented on the county where the site is located, Piping Plover wintering range critical habitat designation (if applicable), survey area, habitat conditions, habitat modifications, observed management measures, comments, Piping Plovers observed, Piping Plover band observations, and shorebird observations.

1. Waties Island North⁴

County: Horry

Critical Habitat Designation: Unit SC-1

Survey Area: Designated critical habitat: “[t]his unit includes the northern tip of Waties Island from the MLLW at Little River Inlet and runs west along the Atlantic Ocean shoreline 2.0 km (1.25 mi) and includes land from the MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. The unit continues north and west of Little River Inlet stopping at Sheephead Creek, including land from MLLW to dense vegetation line” (USFWS 2001: 36093).

Habitat Conditions: Moderately sized intertidal feeding habitats exist at low tide inside the inlet; a smaller area of feeding habitat exists near the creek on the river; and the ocean beach has a relatively wide intertidal area. High tide roosting habitat on the ocean, inlet, and river sides is limited. A large, relatively uniform dune runs along the ocean side at or near the high tide line; this would reduce the potential for overwash in all but a large storm.

Habitat Modifications: A large jetty stabilizes the north and south sides of Little River Inlet, at the north end of the unit. It is unknown if a large, relatively uniform dune on the ocean is artificial.

Management Measures: None observed.

Comments: As there is no protection of the limited high tide roosting habitat from human disturbance, low levels of disturbance at high tide have the potential to modify shorebird use.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Waties Island North are presented in **Figure 38**; their locations are presented in **Figure 39**.

⁴ Both “Waite’s” (USFWS 2001) and “Waties” (Wilkinson and Spinks 1994) spellings are used; this paper follows the latter spelling as it is consistent with spelling used by a landowner (CCU 2010).

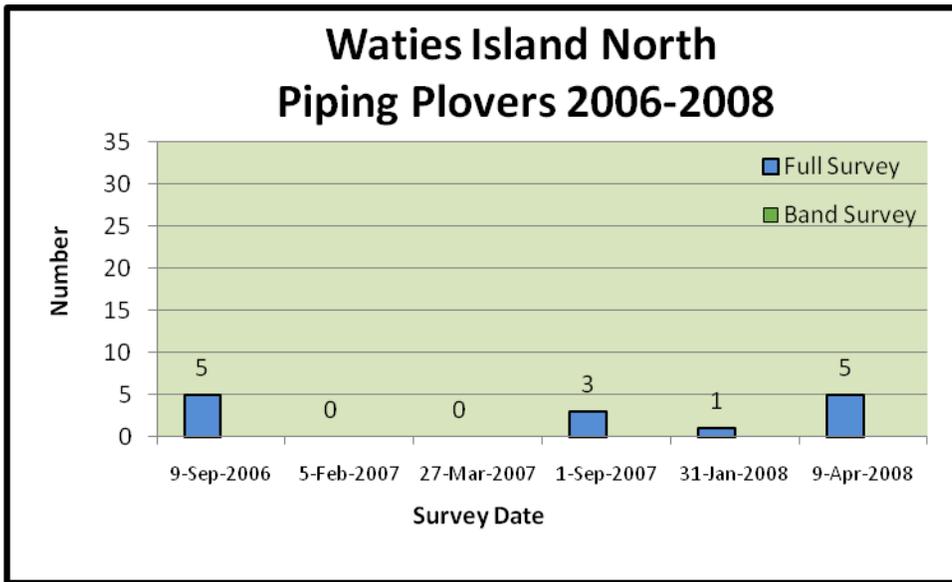


Figure 38. Waties Island North Piping Plover observations.

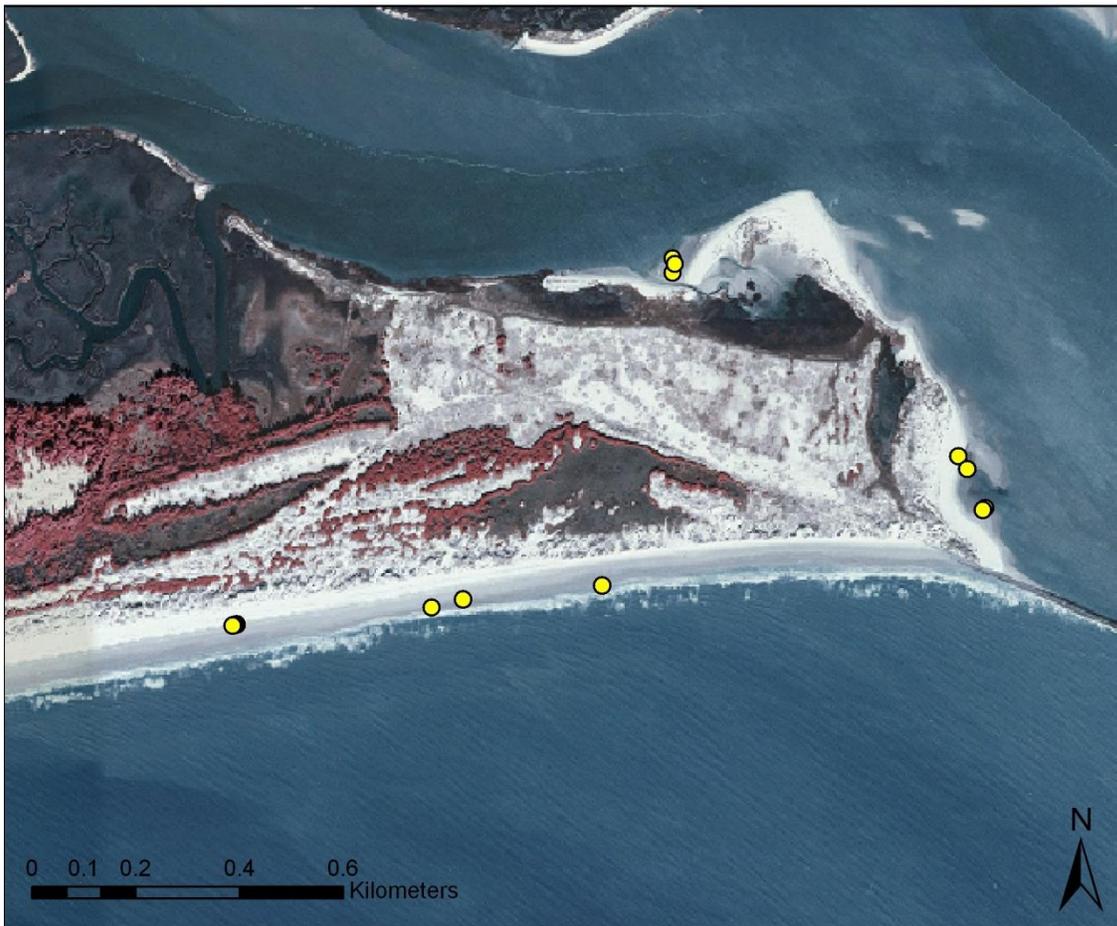


Figure 39. Waties Island North Piping Plover locations, 2006-2008.

Waties Island North Piping Plover Band Observations: None.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded on Waties Island North from 2006-2008 are presented in **Table 13**.

Table 13. Waties Island North shorebird observations 2006-2008.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
9-Sep-2006	M	F	5	1	5	0	0
5-Feb-2007	M	F	0	0	0	0	0
27-Mar-2007	H	R	0	0	0	0	0
1-Sep-2007	L	R	3	1	0	0	0
31-Jan-2008	M	F	1	0	0	0	0
9-Apr-2008	NR	NR	5	2	1	0	0

2. Waties Island South

County: Horry

Critical Habitat Designation: Unit SC-2

Survey Area: Designated critical habitat: “[t]his unit includes the southern tip of Waites Island from the MLLW at Hog Inlet and runs east along the Atlantic Ocean shoreline 0.80 km (0.50 mi) and includes MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. It continues north and west of the Hog Inlet, stopping at the first major tributary. Critical habitat includes from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. Emerging sandbars within Hog Inlet and adjacent to the tip if [sic] eastern Cherry Grove Beach are also included from MLLW to where densely vegetated habitat or developed structures, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36093).

Habitat Conditions: the ocean beach has a large, relatively flat slope intertidal area at low tide, and inside the inlet, smaller areas of low tide feeding habitat exist on the west side of the inlet. Roosting habitat on the ocean beach is limited, except where small overwash fans that have broken through the primary dune; a recurved spit inside Hog Inlet provides a larger open sand area.

Habitat Modifications: None observed.

Management Measures: None observed.

Comments: The close proximity to Cherry Grove beach can result in high levels of human disturbance during the summer months by people who swim across the inlet. An ORV was observed outside of the survey area on one of the visits.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Waites Island South are presented in **Figure 40**; their locations are presented in **Figure 41**.

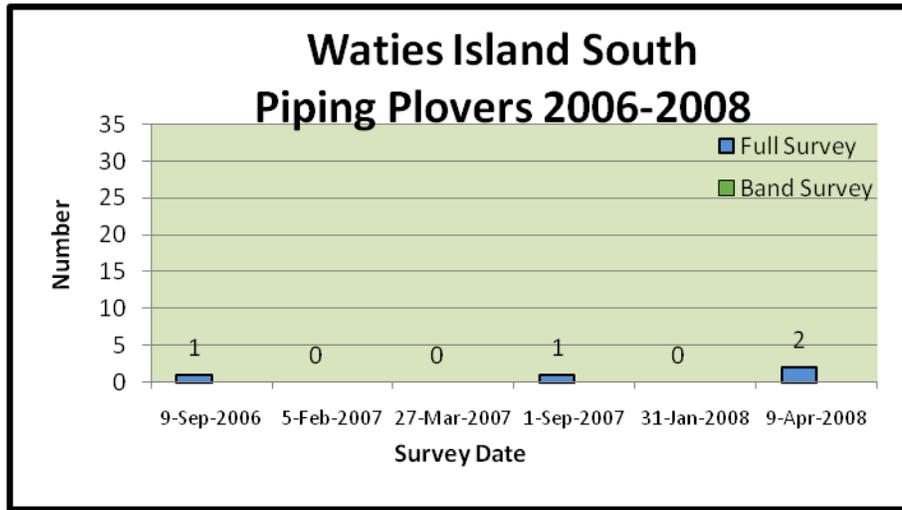


Figure 40. Waites Island South Piping Plover observations.

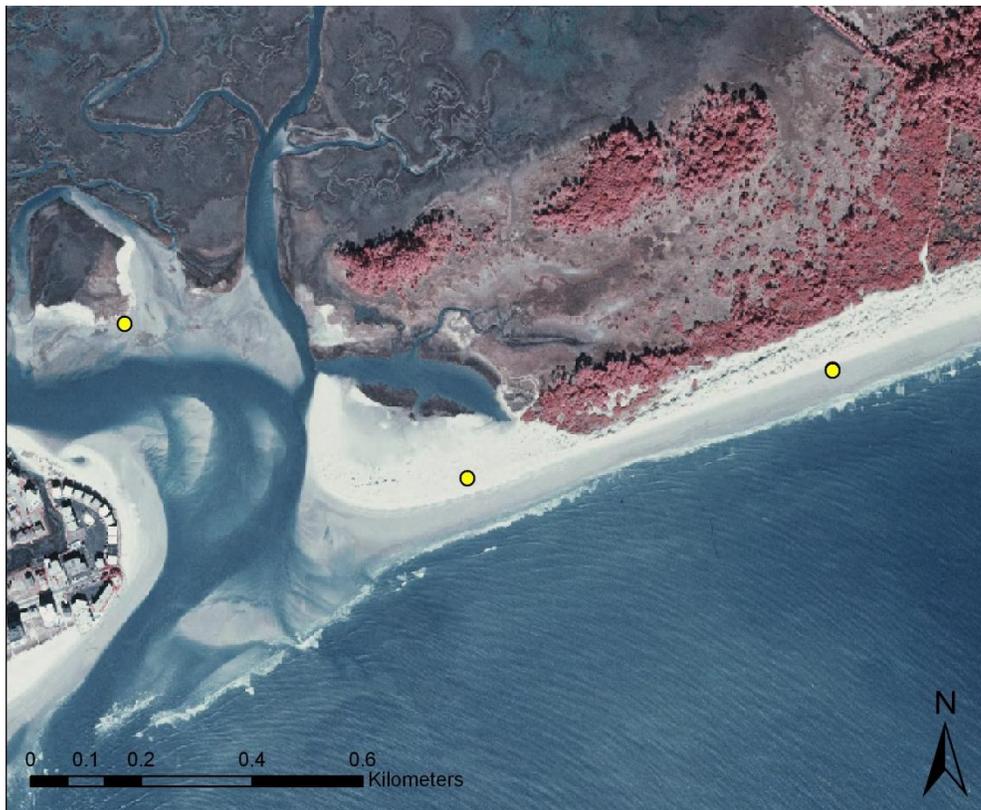


Figure 41. Waites Island South Piping Plover locations, 2006-2008.

Waites Island South Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded on Waties Island South from 2006-2008 are presented in **Table 14**.

Table 14. Waties Island South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
9-Sep-2006	H	F	1	2	3	0	0
5-Feb-2007	M	F	0	0	0	27	0
27-Mar-2007	H	R	0	4	0	0	0
1-Sep-2007	L	R	1	0	2	0	0
31-Jan-2008	H	F	0	0	0	0	0
9-Apr-2008	L	R	2	0	2	0	0

3. Cherry Grove Beach North

County: Horry.

Survey Area: West end of inlet spit to the intersection of the ocean beach and seawall.

Critical Habitat Designation: None, but the site is adjacent to SC-2.

Habitat Conditions: limited roosting habitat at high tide, with a larger intertidal feeding habitat area at low tide.

Habitat Modifications: a rip-rap seawall is in front of buildings at the ocean and inlet sides of this location.

Management Measures: none observed.

Comments: the ocean was against the rip-rap seawall during the one visit to the site. Based on observations from Waties Island, during summer months, the Cherry Grove spit area can have high levels of human disturbance.

Piping Plovers: none observed on a survey dated 9 September 2006.

Piping Plover Band Observations: none.

Shorebird Observations: zero observations of Wilson’s Plovers, American Oystercatchers, Red Knot, or Marbled Godwit on a survey dated 9 September 2006.

4. Garden City Beach South

County: Georgetown

Survey Area: Designated critical habitat: “The majority of the unit is within Huntington Beach State Park. This unit extends from the southern tip of Garden City Beach, just south of the groins (a rigid structure or structures built out from a shore to protect the shore from erosion or to trap sand) north of Murrells Inlet from MLLW to where densely vegetated habitat or developed structures, not

used by the piping plover, begins and where the constituent elements no longer occur stopping perpendicular with the southern end of Inlet Point Drive” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-3, Murrells Inlet/Huntington Beach.

Habitat conditions: high tide roosting habitat is limited on the ocean side, due to the high tide being against or close to the vegetated dune. The inlet spit provides a moderately large open sand roosting area at the inlet, while undeveloped interior areas to the north are vegetated. Intertidal feeding habitat was relatively narrow, though an ephemeral pond at the spit was seen on several visits to the site.

Habitat Modifications: a large jetty stabilizes the north and south ends of Murrells Inlet; a smaller groin is just north of the inlet on the Garden City side. While the large dune in front of the development appears to have sand fencing, it is unknown if the uniform dune further south is artificial.

Management Measures: None observed. The area is within a gated community.

Comments: During both seasons, the best high tide roosting habitat at Murrells Inlet was on the north side of the inlet, with a moderately sized area. The gated community north of the inlet somewhat limits human disturbance, but boaters do use the spit as a landing location inside Murrells Inlet, causing disturbance of roosting birds.

In the first season, on two of the three surveys at this location, individually banded Piping Plovers were observed on the same day using both sides of Murrells Inlet, so survey results may be influenced by movements across the inlet.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Garden City Beach South are presented in **Figure 42**; their locations on are presented in **Figure 43**.

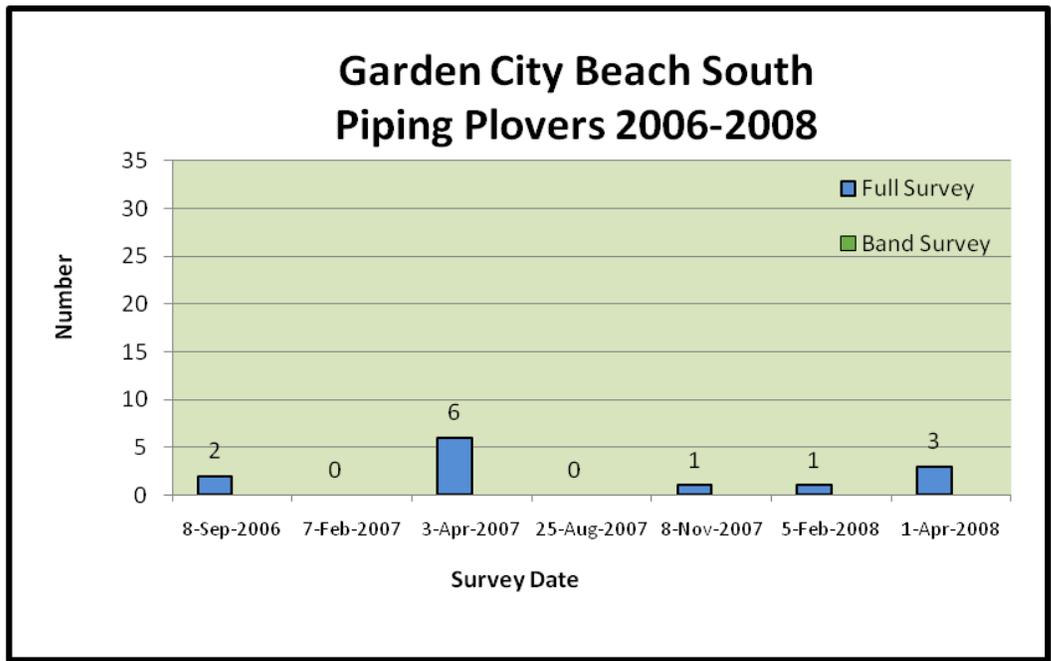


Figure 42. Garden City Beach South Piping Plover observations.

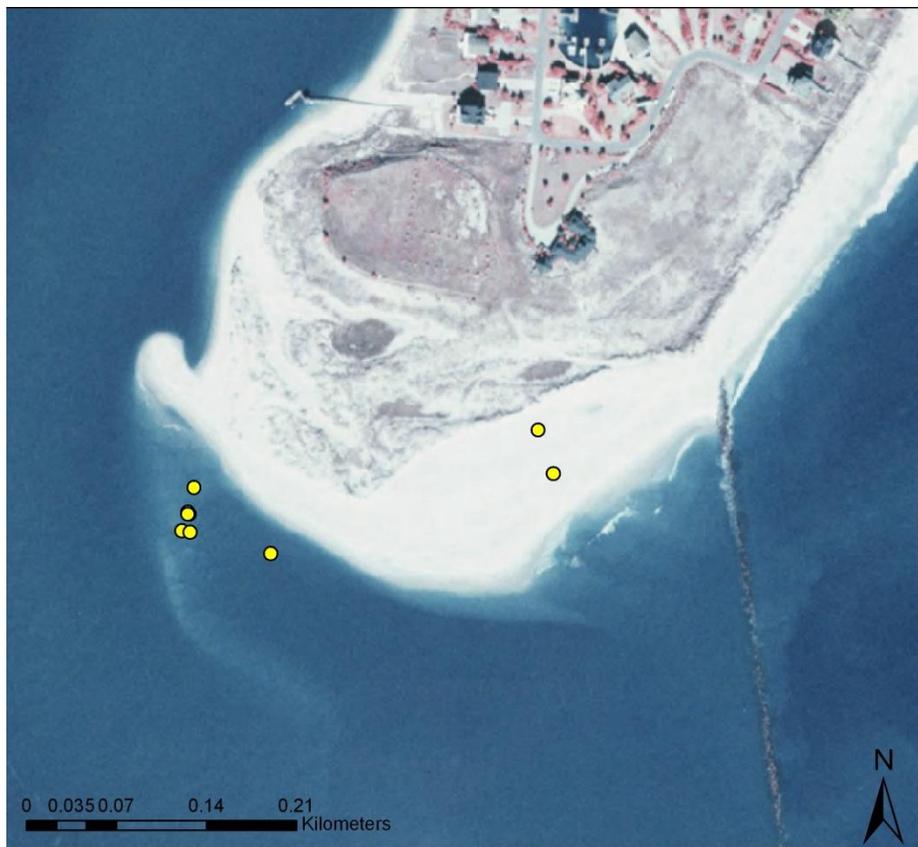


Figure 43. Garden City Beach South Piping Plover locations 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Garden City Beach South are presented in **Table 15**.

Table 15. Garden City Beach South Piping Plover band observations.

#	Date	Bands	Band #	M or W	Population	Comment
1	8-Sep-2006	Of,bO:X,G		M (?)	GL US	Used HBSP; possible wintering bird
2	3-Apr-2007	-,:-,X		M	UK	Would match Atlantic Canada bird seen at HBSP 4 previous seasons
3	3-Apr-2007	Of,bO:X,G		M	GL US	Used HBSP; possible wintering bird
4	3-Apr-2007	X,Y:Of,YO		W	GL US	Used HBSP

Shorebird Observations: The survey dates and total number of focal shorebird species recorded on Garden City Beach South from 2006-2008 are presented in **Table 16**.

Table 16. Garden City Beach South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
8-Sep-2006	M	F	2	0	0	0	0
7-Feb-2007	H	R	0	0	0	0	0
3-Apr-2007	H	R	6	4	1	0	0
25-Aug-2007	H	F	0	2	1	0	0
8-Nov-2007	H	F	1	0	0	0	0
5-Feb-2008	H	F	1	0	5	0	0
1-Apr-2008	H	F	3	5	2	0	0

5. Huntington Beach State Park

County: Georgetown

Survey Area: Designated critical habitat: “The majority of the unit is within Huntington Beach State Park. . . It includes from MLLW south of Murrells Inlet to the northern edge of North Litchfield Beach approximately 4.5 km (3.0 mi). The unit includes the MLLW from the Atlantic Ocean up to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. The lagoon at the north end of Huntington Beach State Park is also included” (USFWS 2001: 36093).

Critical Habitat: Unit SC-3, Murrells Inlet/Huntington Beach.

Habitat Conditions: a beach with limited recreational development as a public park; high tide roosting habitat is limited to an area at the north end of the unit. At low tide, there is a wide, low slope ocean beach which provides intertidal feeding habitat with additional intertidal habitat inside the lagoon and at the mouth of the creek at the inlet. Small overwash fans through the primary dune are beginning to develop at the north end of the unit.

Habitat Modifications: a large jetty stabilizes the north and south ends of Murrells Inlet; artificial dune construction and vegetation planting occurred after Hurricane Hugo; a restoration project opened up an area to Sandpiper Pond; Murrells Inlet was maintenance dredged in 2002 with some of the sand deposited on beach and some inside the inlet to create a shorebird nesting area which is fenced to keep out mammalian predators (Mike Walker, pers. comm. 2008).

Management Measures: This area is managed by SCDPRT as Huntington Beach State Park. All dogs are required to be on leash and no recreational vehicle use is allowed. An upland nesting area at the north end of the Park is closed to entry year round and overwash areas also are closed during the breeding season. There are Park Rangers (law enforcement) on site. In the 2008-2009 winter, to protect shorebirds, the Park prohibited dogs north of the northern beach walkway (Mike Walker, pers. comm. 2008).

Comments: Movements across Murrells Inlet may influence survey results; in 2006-2007, Of,bO:X,G and X,Y:Of,YO were seen on both sides of the inlet during the same or different surveys. -,:-,X is classified as a possible wintering bird due observed presence in prior winters at this location; the metal band number string seen on 3 April 2007 matches numbers observed on 2 January 2004 and 20 November 2005. In addition, while both Great Lakes birds were classified as migrants, they also may have been missed during the single mid-winter survey, as the birds were seen in November 2006 and March 2007. X,Y: Of,YO originally was seen at Deveaux Banks, and then moved north to the Murrells Inlet location, a very interesting south to north movement of about 151 kilometers during fall migration after an extended stay at one of South Carolina's best locations for Piping Plovers.

The artificial dunes that were constructed after Hurricane Hugo have facilitated vegetative succession and degradation of habitat used by Piping Plovers and other shorebirds. However, continuing erosion of those artificial dunes near the north end may improve habitat conditions in the near future due to the expected creation of additional washover fans and open sand intertidal feeding and non-tidal roosting habitats.

Dogs off leash continue to be a disturbance problem at Huntington Beach State Park, despite staffs' repeated attempts to inform visitors of the leash law and the adverse impacts to birds. In fall of 2009, the Park closed the most valuable shorebird habitats north of the northern walkway to dogs year-round to protect shorebirds.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Huntington Beach State Park are presented in **Figure 44**; their locations on are presented in **Figure 45**.

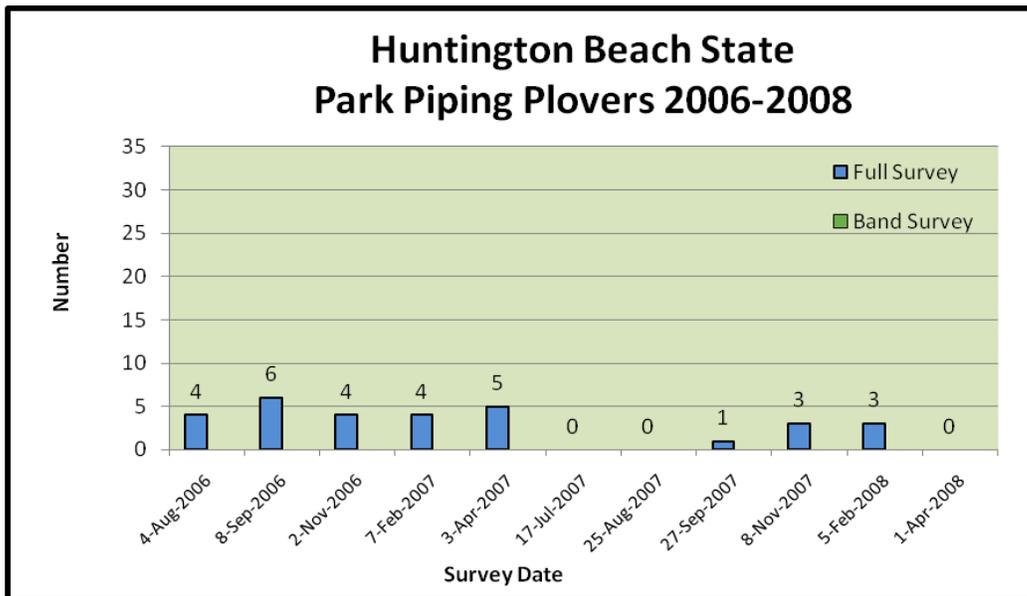


Figure 44. Huntington Beach State Park Piping Plover observations.



Figure 45. Huntington Beach State Park Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Huntington Beach State Park are presented in **Table 17**.

Table 17. Huntington Beach State Park Piping Plover band observations.

#	Date	Bands	Band #	M or W	Population	Comment
1	4-Aug-2006	-,:-,X	811-30737	M or W (?)	At C	Matches At C bird seen three previous seasons at this location
2	8-Sep-2006	Of,bO:X,G		M or W (?)	GL US	Also used Garden City Beach South
3	2-Nov-2006	X,-:Lf,-		M	GP C	
4	2-Nov-2006	X,Y:Of,YO		W	GL US	Also used Garden City Beach South
5	7-Feb-2007	X,Y:Of,YO		W	GL US	
6	3-Apr-2007	-,:-,X		M or W (?)	At C (?)	
7	3-Apr-2007	Of,bO:X,G		M or W (?)	GL US	
8	3-Apr-2007	X,Y:Of,YO		W	GL US	
9	27-Sep-2007	-,:-,X	811-30737	M or W (?)	At C	Matches At C bird seen four previous seasons at this location
10	8-Nov-2007	-,:-,X		M or W (?)	At C (?)	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded on Garden City Beach South from 2006-2008 are presented in **Table 18**.

Table 18. Shorebird observations at Huntington Beach State Park.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
4-Aug-2006	M	R	4	11	2	0	0
8-Sep-2006	L	F	6	0	0	0	0
2-Nov-2006	M	R	4	0	17	0	0
7-Feb-2007	M	F	4	0	0	0	0
3-Apr-2007	H	F	5	6	4	0	0
17-Jul-2007	M	R	0	2	1	0	0
25-Aug-2007	H	R	0	0	34	0	0
27-Sep-2007	M	R	1	0	0	0	0
8-Nov-2007	M	F	3	0	0	0	0
5-Feb-2008	M	F	3	0	1	0	0
1-Apr-2008	H	R	0	4	2	0	0

6. Litchfield Beach South

County: Georgetown

Survey Area: From the south end of the developed area to the inlet, including designated critical habitat: “the southern tip of Litchfield Beach beginning 0.50 km (0.30 mi) north of Midway Inlet and stopping at the MLLW at Midway Inlet. It includes from the MLLW on the Atlantic Ocean shoreline across and including land to the MLLW on the back bayside” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-4, Litchfield.

Habitat Conditions: The surveyed area was undeveloped but immediately north of the survey area was a gated residential development. The high tide line is near the vegetation line, but some roosting habitat exists at the inlet spit. The most of the interior area was densely vegetated. A moderate size shoal is in the inlet that provides habitat for shorebirds.

Habitat Modifications: a small jetty stabilized the south side of the inlet, across from the survey area. It is unknown if the dunes were artificially constructed.

Management Measures: None observed.

Comments: None.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Litchfield Beach South are presented in **Figure 46**; their locations on are presented in **Figure 47**.

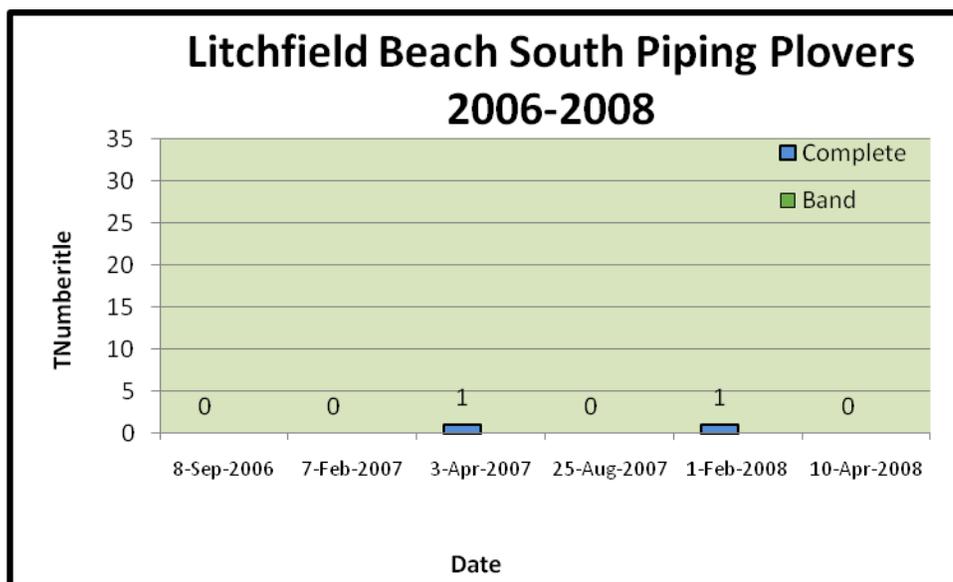


Figure 46. Litchfield Beach South Piping Plover observations.



Figure 47. Litchfield Beach South Piping Plover locations, 2006-2008.

Piping Plover Band Observations: None.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded on Litchfield Beach South from 2006-2008 are presented in **Table 19**.

Table 19. Litchfield Beach South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
8-Sep-2006	H	F	0	3	0	0	0
7-Feb-2007	H	R	0	0	0	27	0
3-Apr-2007	L	R	1	3	0	0	0
25-Aug-2007	M	F	0	0	0	0	0
1-Feb-2008	L	R	1	0	0	4	0
10-Apr-2008	L	R	0	2	0	0	0

7. Pawleys Island North

County: Georgetown

Survey Area: From the dune walk-over at the northernmost public parking area to the inlet and around the inlet shoreline until where unvegetated beach ends.

Critical Habitat Designation: None.

Habitat Conditions: A narrow unvegetated beach with a moderately wide vegetated dune area in front of a developed residential area; the inlet beach shoreline is narrow and when visited, there was limited intertidal area on the Pawley’s Island side of the inlet.

Habitat Modifications: a small jetty stabilized the south side of the inlet. It is unknown if the dunes were artificially constructed.

Management Measures: None observed.

Comments: None.

Piping Plovers: No Piping Plovers were observed on a survey dated 8 September 2006.

Piping Plover Band Observations: None.

Shorebird Observations: No Wilson’s Plovers, American Oystercatchers, Red Knots, or Marbled Godwits were observed on a survey dated 8 September 2006.

8. DeBordieu Beach South

County: Georgetown

Survey Area: The unit “extends from MLLW to 1.0 km (.62 mi) north of North Inlet on DeBordieu Beach. It includes shoreline on the Atlantic Ocean from MLLW to the MLLW on the western side of the peninsula...” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-5, North Inlet

Habitat Conditions: the survey area is undeveloped. There is a small open sand roosting area at the inlet but the interior of the spit is covered with upland or wetland vegetation.

Habitat Modifications: None observed.

Management Measures: the interior, vegetated area of the island has closure signs posted.

Comments: The north end of North Inlet does contain suitable Piping Plover roosting habitat. Limited intertidal feeding habitat is available on the north end. High human disturbance levels were observed several hours prior to the start of the 2006 fall survey. The closure of the interior of the island does not protect Piping Plovers due to the closure area being densely vegetated.

Movements across the inlet may influence survey results. The one banded bird at this location, Gf,YB:-,- was seen on both sides of the inlet. This bird, from the United States Great Plains, was seen two winters in a row at this inlet, with the first season observation on the south side and the second season observations on the north side.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at DeBordieu Beach South are presented in **Figure 48**; their locations on are presented in **Figure 49**.

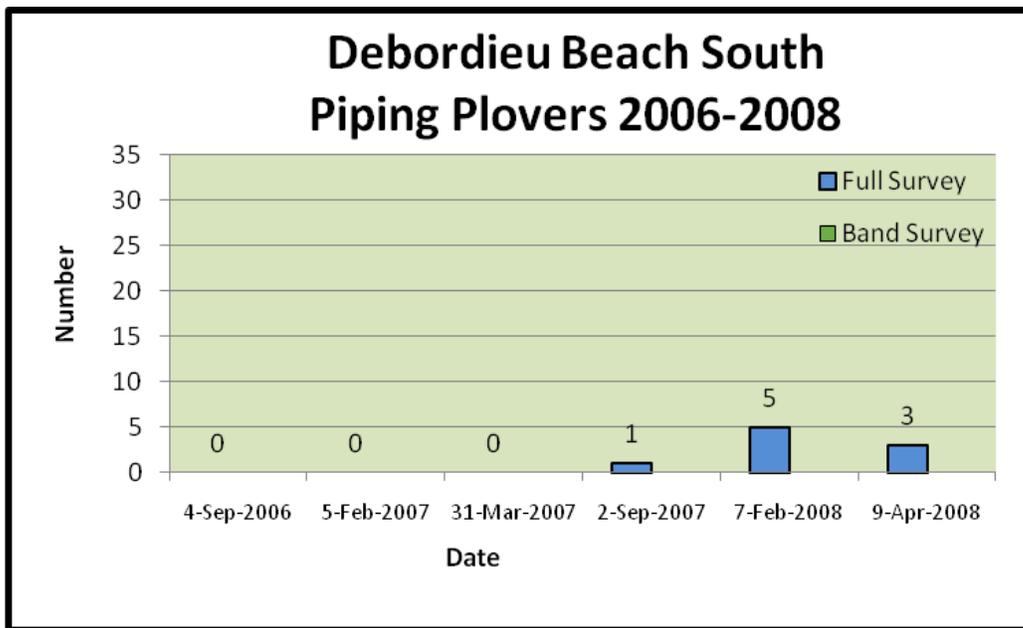


Figure 48. DeBordieu Beach South Piping Plover observations.

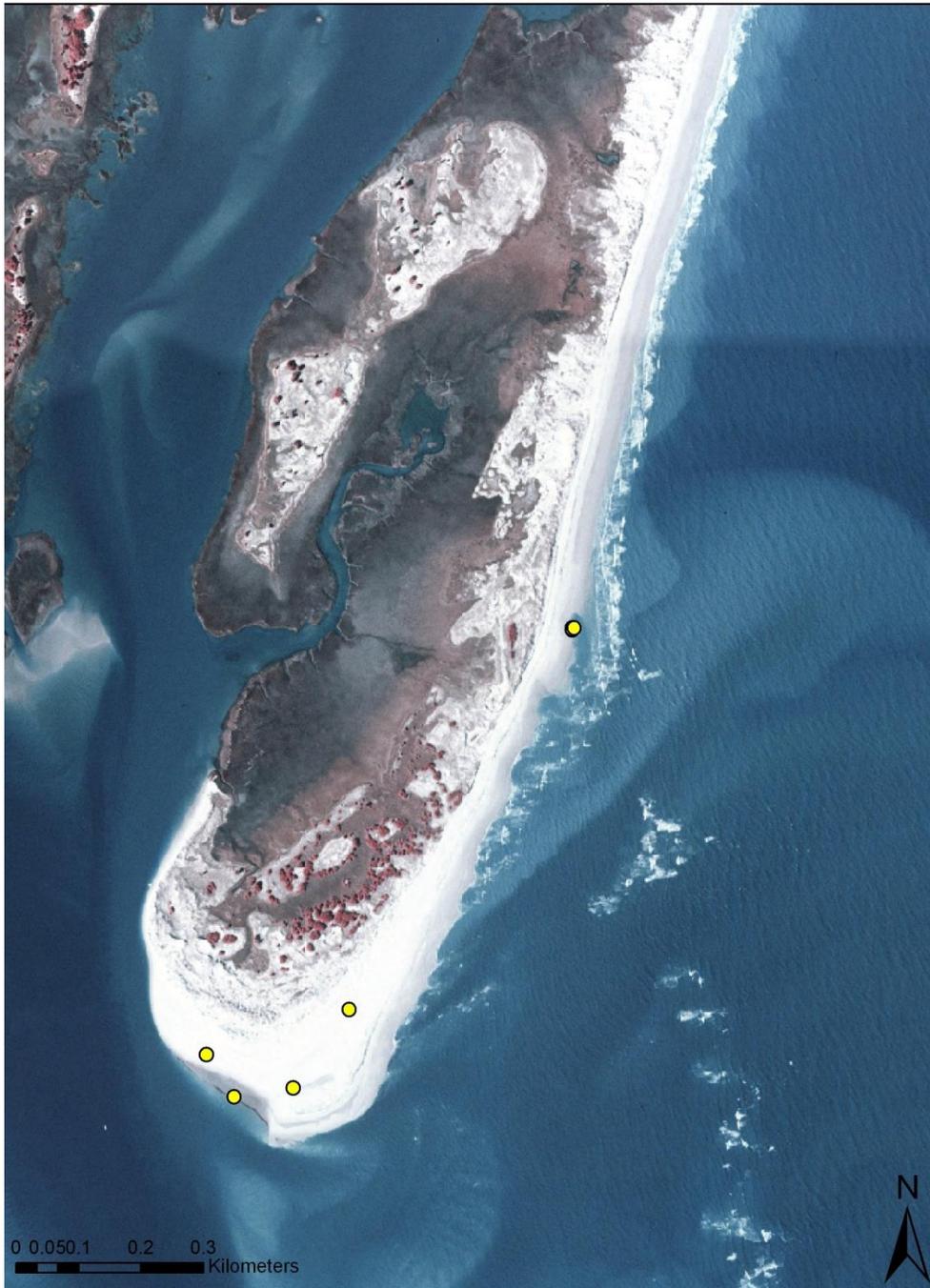


Figure 49. DeBordieu Beach South Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at DeBordieu Beach South are presented in **Table 20**.

Table 20. DeBordieu Beach South Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	7-Feb-2008	Gf,YB:-,-		W	GP US	Also used North Island; second year at same inlet
2	9-Apr-2008	Gf,YB:-,-		W	GP US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at DeBordieu Beach South from 2006-2008 are presented in **Table 21**.

Table 21. DeBordieu Beach South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
4-Sep-2006	H	R	0	0	49	0	0
5-Feb-2007	M	F	0	0	30	0	0
31-Mar-2007	M	F	0	3	3	0	0
2-Sep-2007	H	F	1	0	0	0	0
7-Feb-2008	M	F	5	0	59	0	0
9-Apr-2008	H	F	3	6	23	0	0

9. North Island North End

County: Georgetown

Survey Area: The critical habitat boundaries: “from the MLLW south of North Inlet 1.6 km (1.0 mi). It includes the shoreline on the Atlantic Ocean from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. It includes shoreline running south and west of the inlet from the MLLW stopping at the MLLW at the first large tributary (no name)” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-5, North Island

Habitat Conditions: An undeveloped island with a large recurved spit at the inlet that provides high quality roosting habitat as well as low energy intertidal feeding habitat. There are areas of the beach where overwash fans link the beach and lagoon sides, while in other areas, the ocean beach is narrow with the high tide line close to the dunes. **Habitat Modifications:** None observed.

Management Measures: This area is managed by the SCDNR as part of the Tom Yawkey Wildlife Center. <http://www.dnr.sc.gov/mlands/specregshp.html>.

Comments: The critical habitat area contains high quality shorebird habitat. The west side of the inlet is not included in the critical habitat designation and at high tide, the western area contains limited Piping Plover roosting and feeding habitat. However, at mid to low tide, this area does contain a moderately sized area of suitable feeding habitat and Piping Plovers were observed using this area in a previous winter.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at North Island North End are presented in **Figure 50**; their locations on are presented in **Figure 51**.

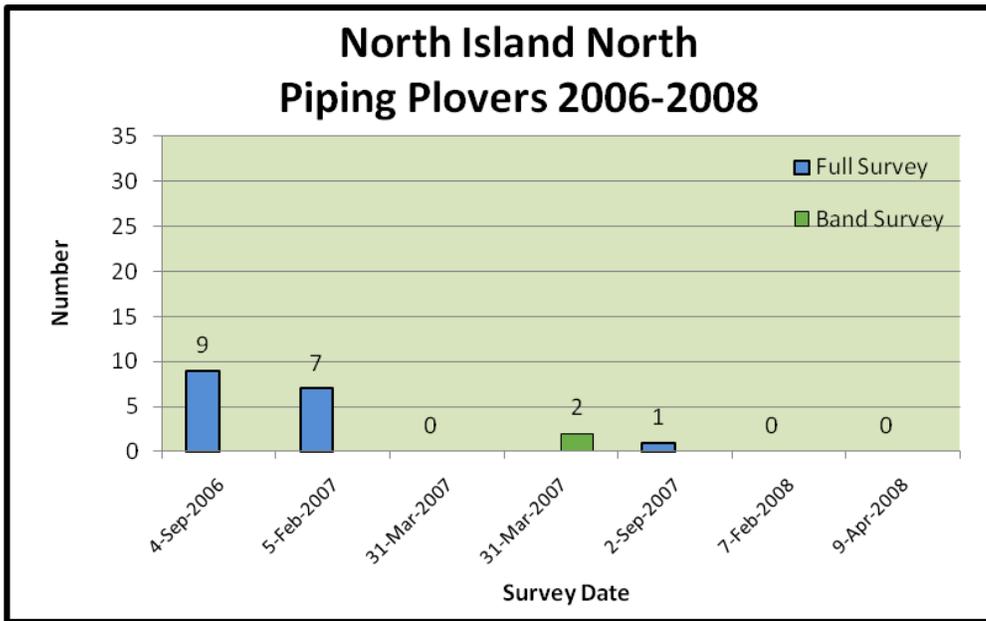


Figure 50. North Island North End Piping Plover observations.

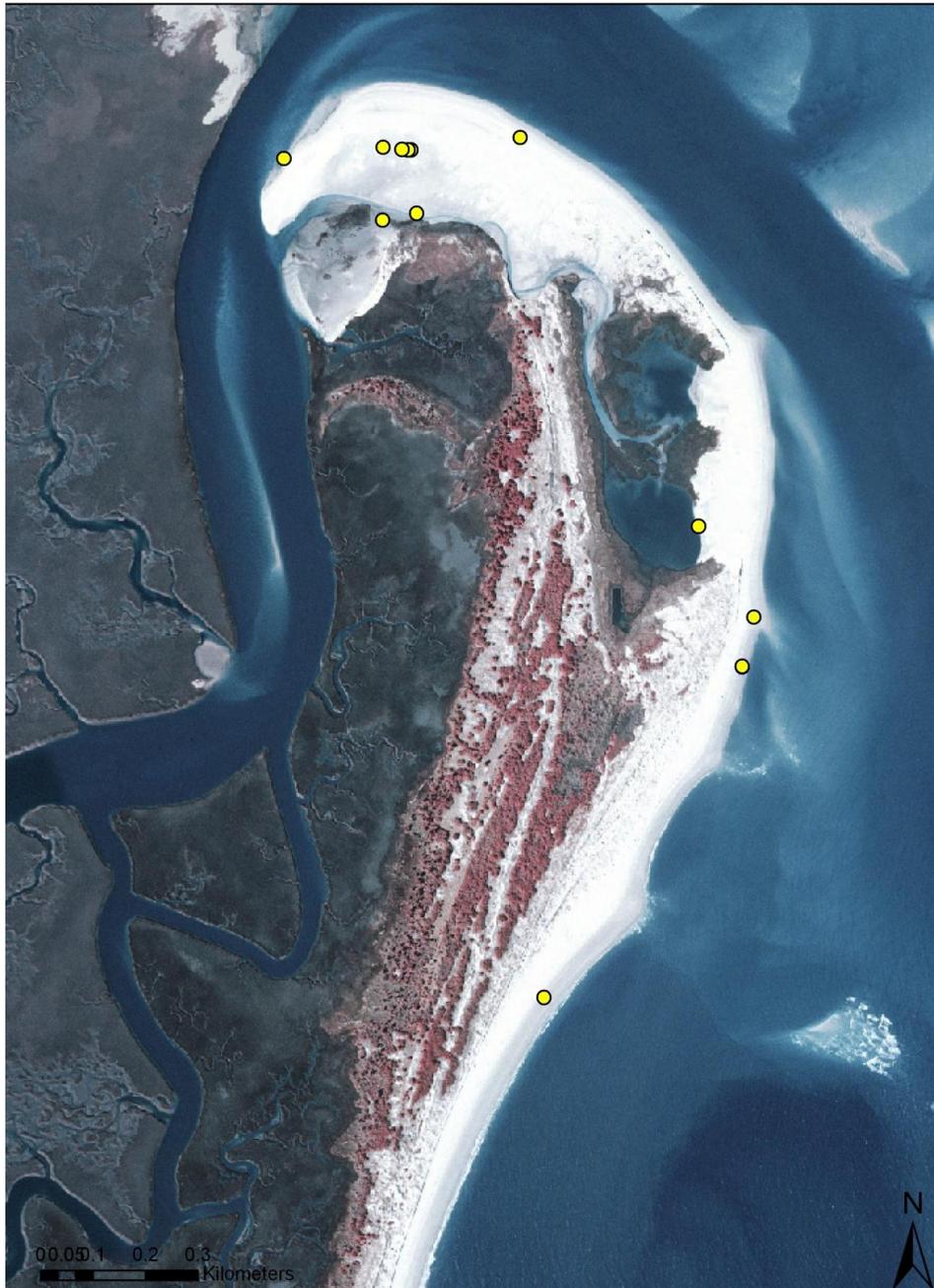


Figure 51. North Island North End Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at North Island North End are presented in **Table 22**.

Table 22. North Island North End Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	5-Feb-2007	Gf,YB:-,-		W	GP US	Also used DeBordieu

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at North Island North End from 2006-2008 are presented in **Table 23**.

Table 23. North Island North End shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
4-Sep-2006	M	R	9	7	40	0	2
5-Feb-2007	H	F	7	0	28	0	0
31-Mar-2007	H	F	0	17	15	0	0
2-Sep-2007	H	R	1	8	17	0	0
7-Feb-2008	H	F	0	0	11	0	0
9-Apr-2008	H	R	0	22	16	0	0

10. Sand Island

County: Georgetown

Survey Area: Ocean beach north of the designated critical habitat area to the jetty and the critical habitat area to the south; the critical habitat area “includes from MLLW at North Santee Bay Inlet running north along the Atlantic Ocean side of South Island 7.2 km (4.5 mi), stopping 0.60 km (0.4 mi) north of an unnamed inlet. It includes areas from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36093).

Critical Habitat Designation: Designated on the south end of Sand Island (SC Unit 6, North Santee Bay Inlet) but not on the north end.

Habitat conditions: An undeveloped island with a narrow upland area that has extensive small overwash fans, a moderately sloped ocean beach, and limited unvegetated intertidal feeding areas landward of the beach in older overwash areas.

Habitat Modifications: There is a large jetty on the north and south ends of Winyah Bay.

Management Measures: This area is managed by the SCDNR as part of the Tom Yawkey Wildlife Center. <http://www.dnr.sc.gov/mlands/specregshp.html>.

Comments: This location was one of the better in the state for Wilson’s Plovers pairs during the spring survey in 2007. However, in the second season, after extensive overwash removed much of the low dunes in the area, fewer Wilson’s Plovers were seen.

Piping Plovers: None on surveys dated 4 September 2006, 6 February 2007, 29 August 2007, 6 February 2008, and 10 April 2008.

Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Sand Island from 2006-2008 are presented in **Table 24**.

Table 24. Sand Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
4-Sep-2006	H	R	0	5	2	101	0
6-Feb-2007	NR	NR	0	0	0	0	0
4-Apr-2007	H	R	0	18	0	0	0
29-Aug-2007	H	F	0	22	0	0	0
6-Feb-2008	H	F	0	0	5	0	0
10-Apr-2008	H	F	0	6	4	0	0

11. South Island

County: Georgetown

Survey Area: Designated critical habitat: “This unit is at the North Santee Bay inlet and includes lands of South Island.... This unit includes from MLLW at North Santee Bay Inlet running north along the Atlantic Ocean side of South Island 7.2 km (4.5 mi), stopping 0.60 km (0.4 mi) north of an unnamed inlet. It includes areas from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36093).

Critical Habitat Designation: SC Unit 6, North Santee Bay Inlet

Habitat Conditions: An island with limited development; roosting habitat is limited at high tide except at the north and south ends; a large spit provides roosting and nesting habitat on the south end while on the north end, the inlet provides intertidal feeding habitat on the ebb bar and there is roosting habitat on the unvegetated upland areas adjoining the inlet.

Habitat Modifications: The north end of the island may be close enough to the jetties at the mouth of Winyah Bay to be influenced by their presence.

Management Measures: This area is managed by the SCDNR as part of the Tom Yawkey Wildlife Sanctuary. <http://www.dnr.sc.gov/mlands/specregshp.html>. In 2008, SCDNR posted the nesting habitat on the south end of the island (Felecia Sanders, pers. comm. 2008).

Comments: The south end of the island has high quality roosting and nesting habitat.

Human disturbance may be a concern at South Inlet at certain times during the summer. Numerous dogs of leash (>10), brought to the area in boats, were seen several hours prior to the 2006 fall survey, though when the survey was conducted later in the afternoon, only 3 were seen off

leash. In the fall survey on 3 September 2006, 2 Piping Plovers were observed during the survey, and afterwards, 5 were observed at the same location late in the day, after boaters had left the area.

Movements across the inlet may affect survey results. A non-uniquely banded brood marker bird from the Great Lakes was seen on both sides of the inlet on one of the survey days.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at North Island North End are presented in **Figure 52**; their locations on are presented in **Figure 53**.

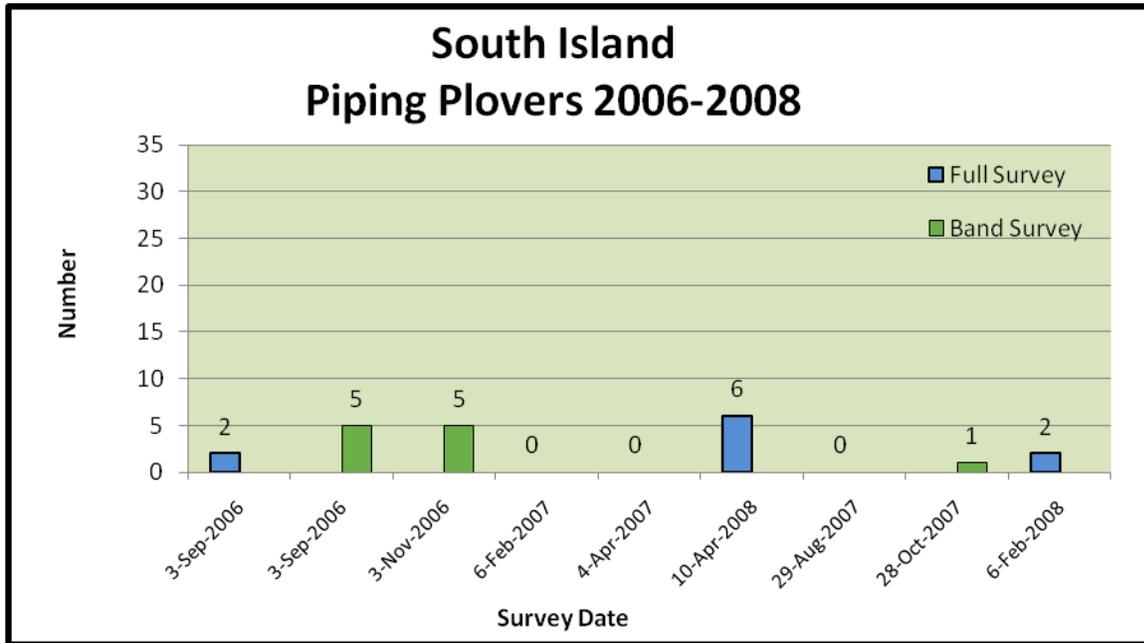


Figure 52. South Island Piping Plover observations.



Figure 53. South Island Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at South Island are presented in **Table 25**.

Table 25. South Island Banded Piping Plover observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	3-Sep-2006	X,L:O,-		W	GL US	Same combination used Cedar Island
2	3-Nov-2006	X,L:O,-		W	GL US	
3	10-Apr-2008	X,L:O,-		W	GL US	Same combination used Cedar Island; matches combination seen previous season at this inlet

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at South Island from 2006-2008 are presented in **Table 26**.

Table 26. South Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
3-Sep-2006	H	F	5	3	5	52	1
6-Feb-2007	H	F	0	0	0	0	0
4-Apr-2007	H	R	0	16	4	0	0
29-Aug-2007	H	F	0	4	8	0	0
6-Feb-2008	M	F	2	0	2	2	0
10-Apr-2008	H	R	6	19	4	12	0

12. Cedar Island North

County: Georgetown

Survey Area: The critical habitat unit: “the eastern side of Cedar Island adjacent to the North Santee Bay Inlet from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. All of North Santee Sandbar to MLLW is included” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-6, North Santee Bay Inlet

Habitat Conditions: In the first season, a small overwash area/tidal lagoon near the inlet mouth provided intertidal feeding habitat; however, in the second season, this area had decreased in size and quality due to erosion. At low tide, there are extensive ebb bars. Moderate sized roosting habitat also exists on either side of the lagoon area in the first season but in the second season, much of the roosting habitat on the ocean side had eroded away.

Habitat Modifications: None observed.

Management Measures: This area is managed by the SCDNR as part of the Santee Coastal Reserve Wildlife Management Area. <http://www.dnr.sc.gov/mlands/specregshp.html>.

Comments: Observed movements of X,L:O,- and other unbanded birds across North Santee Bay Inlet suggest both areas should be surveyed on the same day if possible to minimize the chance of undercounting or double counting. The sharp drop in numbers between the 30 March (high tide) and 4 April (low tide) surveys suggest that there may be a nearby feeding area that is outside of the survey area.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Cedar Island North are presented in **Figure 54**; their locations on are presented in **Figure 55**.

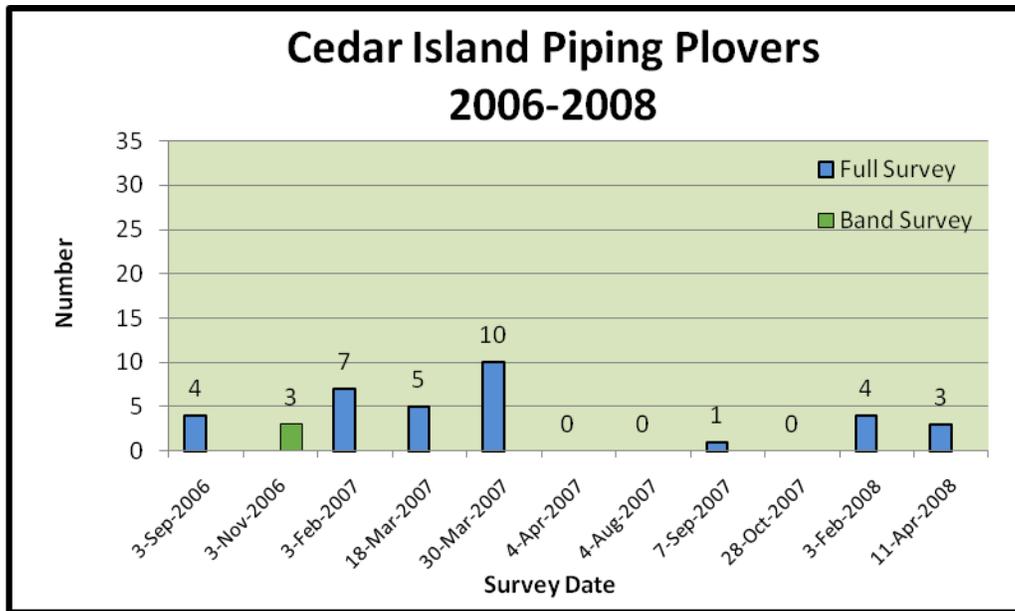


Figure 54. Cedar Island North Piping Plover observations.



Figure 55. Cedar Island North Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Cedar Island North are presented in **Table 27**.

Table 27. Cedar Island North Piping Plover band observations.

#	Date	Bands	Band #	M or W	Population	Comments
1	3-Sep-2006	X,L:O,-		W	GL US	Also used South Island
2	3-Nov-2006	X,L:O,-		W	GL US	
3	3-Feb-2007	X,L:O,-		W	GL US	
4	18-Mar-2007	X,L:O,-		W	GL US	
5	30-Mar-2007	X,b:Of,OY		M	GL US	
6	30-Mar-2007	X,L:O,-		W	GL US	
7	3-Feb-2008	X,L:O,-		W	GL US	Also used South Island; this combination seen previous winter at this inlet

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Cedar Island North from 2006-2008 are presented in **Table 28**.

Table 28. Cedar Island North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
3-Sep-2006	M	R	4	0	6	0	0
3-Feb-2007	H	F	7	0	1	0	0
18-Mar-2007	M	F	5	11	2	0	0
30-Mar-2007	M	R	10	18	2	0	0
4-Apr-2007	L	R	0	18	2	0	0
4-Aug-2007	L	F	0	0	1	11	0
7-Sep-2007	H	R	1	0	1	0	0
28-Oct-2007	M	F	0	0	9	0	0
3-Feb-2008	H	R	4	0	2	0	0
11-Apr-2008	M	R	3	8	5	0	0

13. Murphy Island.

County: Georgetown

Survey Area: From the inlet south to the southern edge of the large flats on the east side.

Critical Habitat Designation: None.

Habitat Conditions: At low tide, an extensive intertidal area exists on the middle and north end of Murphy Island. Limited roosting habitat exists between the high tide line and dense vegetation.

Habitat Modifications: None observed.

Management Measures: This area is managed by the SCDNR as part of the Santee Coastal Reserve Wildlife Management Area. <http://www.dnr.sc.gov/mlands/specregshp.html>.

Comments: Only one survey was conducted at this site.

Piping Plovers: Three Piping Plovers recorded during the 2006-2008 survey seasons at Murphy Island (**Figure 56**).



Figure 56. Murphy Island Piping Plover locations, 2007-2008.

Banded Piping Plovers Observed: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Murphy Island from 2006-2008 are presented in **Table 29**.

Table 29. Murphy Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
3-Feb-2008	M	R	3	0	0	9	0

14. Cape Island North.

County: Georgetown

Survey Area: Bayside habitats from the north end of Cape Island south approximately 1.6 kilometers.

Critical Habitat Designation: None.

Habitat Conditions: Suitable feeding habitat exists at low tide along the bay side. Roosting habitat exists at the spit.

Habitat Modifications: None observed.

Management Measures: This area is managed by USFWS as part of Cape Romain National Wildlife Refuge. Dogs are prohibited at this location.

Comments: This area was surveyed once, to see if Piping Plovers that were observed the first season but not observed the second season at other locations might have been using this location.

Piping Plovers: One Piping Plover was observed on a survey dated 3 February 2008.

Banded Piping Plovers Observed: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Murphy Island from 2006-2008 are presented in **Table 30**.

Table 30. Cape Island North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
3-Feb-2008	L	F	1	0	4	0	0

13. Cape Island South

County: Charleston

Survey Area: Designated critical habitat: the “majority of the unit is within Cape Romain National Wildlife Refuge.... This unit includes the MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur on the southern and southeastern most 1.9 km (1.2 mi) portion of Cape Island....” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-7, Cape Romain

Habitat Conditions: An undeveloped barrier island with extensive overwash fans, natural dunes, and low beach elevation; a moderately sized ephemeral pool was located just above the inlet.

Habitat Modifications: None observed.

Management Measures: This area is managed by USFWS as part of Cape Romain National Wildlife Refuge. Dogs are prohibited year-round. A nesting area was posted for breeding birds at the beginning of April (Felicia Sanders, pers. comm. 2007).

Comments: This location is accessible by boat only, but access is tricky due to low water levels at low tide. The best Piping Plover habitat is the small ephemeral pond area just above the inlet and along the bayside in the unvegetated areas.

One uniquely marked Canadian Great Plains Piping Plover, X,B:Lf,RL that wintered on Lighthouse Island also was seen at this location, so movements across the inlet may influence survey results.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Cape Island South are presented in **Figure 57**; their locations on are presented in **Figure 58**.

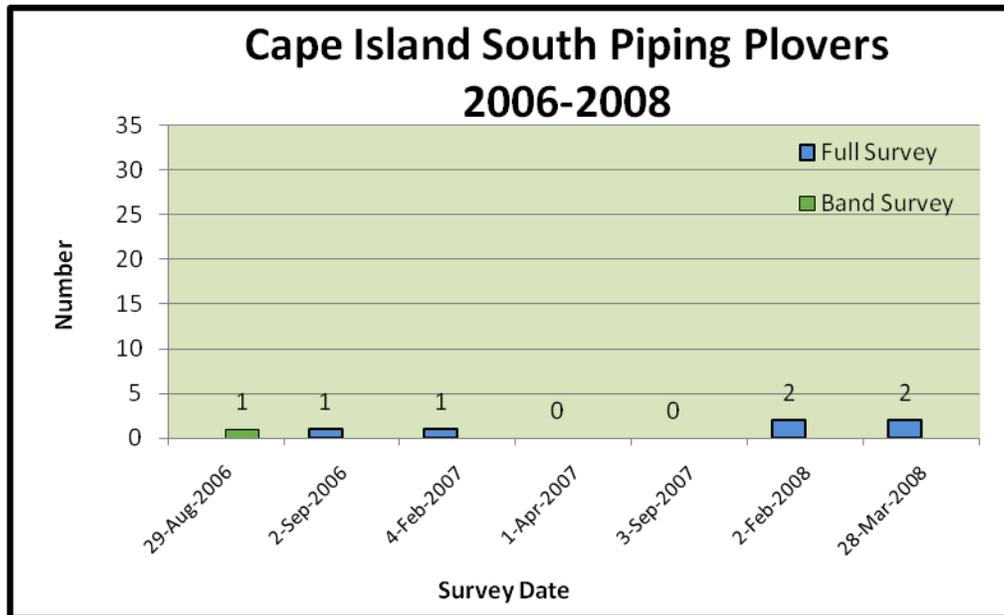


Figure 57. Cape Island South Piping Plover observations.



Figure 58. Cape Island South Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Cape Island South are presented in **Table 31**.

Table 31. Cape Island South Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comment
1	29-Aug-2006	-,WA:Gf,-		M	GP US	
2	2-Sep-2006	-,WA:Gf,-		M	GP US	
3	4-Feb-2007	X,B:Lf,RL		W	GP C	Also used Lighthouse Island

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Cape Island South from 2006-2008 are presented in **Table 32**.

Table 32. Cape Island South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
2-Sep-2006	H	F	1	24	41	0	0
4-Feb-2007	H	R	1	0	26	0	0
1-Apr-2007	H	F	0	10	23	0	0
3-Sep-2007	M	R	0	13	35	97	0
2-Feb-2008	H	R	2	0	8	0	0
28-Mar-2008	H	R	2	7	12	0	0

16. Lighthouse Island**County:** Charleston

Survey Area: “This unit includes the MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur on ... all of Lighthouse Island South to MLLW....” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-7, Cape Romain

Habitat Conditions: Other than two lighthouses, the island is undeveloped. The east end is wider, with extensive *Spartina* marshes, but the island narrows towards the west. There are moderately narrow sand beach areas in certain locations though much of the island contains extensive overwash fans. There is a large overwash fan on the western half of the island and an ephemeral pond near the west end.

Habitat Modifications: None observed.

Management Measures: This area is managed by USFWS as part of Cape Romain National Wildlife Refuge. Dogs are prohibited year-round. A nesting area was posted for breeding shorebirds at the beginning of April (Felicia Sanders, pers. comm. 2007).

Comments: Of the locations surveyed in the refuge, this location has the highest concentration of Piping Plovers, and is one of the best areas in South Carolina. While disturbance is limited in the winter months at this location, disturbance during fall migration is a concern.

A Canadian Great Plains Piping Plover, X,B:Lf,RL, was seen both winters at this location. This bird also was observed at Cape Island. Also, there may be movements between Lighthouse Island and Raccoon Key.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Lighthouse Island are presented in **Figure 59**; their locations on are presented in **Figure 60**.

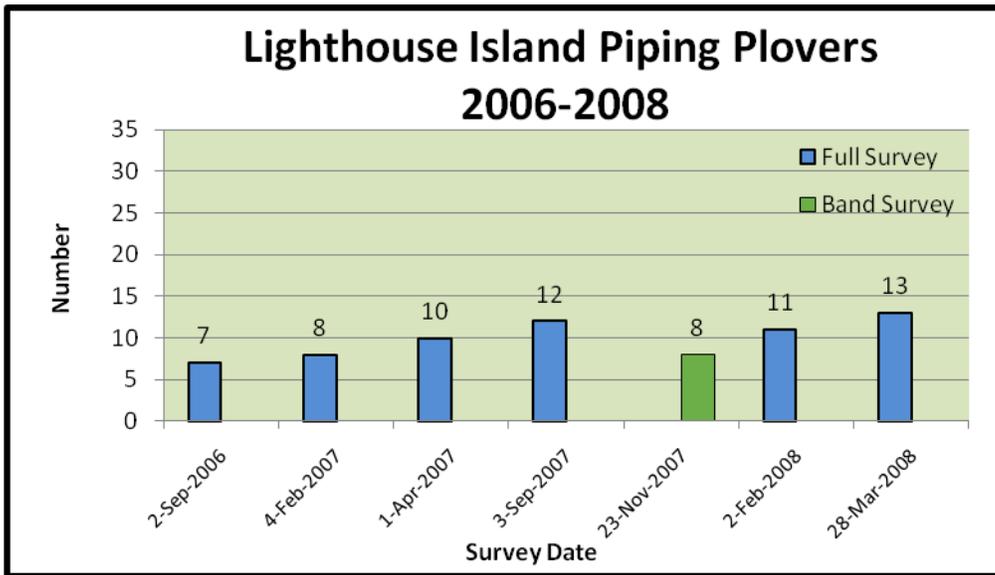


Figure 59. Lighthouse Island Piping Plover observations.



Figure 60. Lighthouse Island Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Lighthouse Island are presented in **Table 31**.

Table 33. Lighthouse Island Piping Plover band observations.

#	Date	Bands	Band #	M or W	Population	Comments
1	1-Apr-2007	-, -:b,-	M	M	UK	Appears to be no band on upper left; saw bottom 1/3 of tibia
2	1-Apr-2007	X,B:Lf,RL	W	W	GP C	Also used Cape Island
3	23-Nov-2007	X,B:Lf,RL	W	W	GP C	Second season at same location
4	2-Feb-2008	X,B:Lf,RL	W	W	GP C	
5	28-Mar-2008	X,B:Lf,RL	W	W	GP C	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Lighthouse Island from 2006-2008 are presented in **Table 34**.

Table 34. Lighthouse Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
2-Sep-2006	M	R	7	15	82	257	0
4-Feb-2007	H	F	8	0	137	0	0
1-Apr-2007	H	F	10	8	88	0	0
3-Sep-2007	H	R	12	51	127	1	11
2-Feb-2008	H	R	11	0	31	0	0
28-Mar-2008	H	F	13	20	22	0	0

17. Raccoon Key North

County: Charleston

Survey Area: “This unit includes the MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur on ... the southern side of the far eastern tip of Raccoon Key from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36093).

Critical Habitat Designation: Unit SC-7, Cape Romain

Habitat conditions: There are limited high tide roosting and feeding habitats at this location, though as the tide drops, a moderately sized intertidal feeding area with a mud/sand substrate emerges.

Habitat Modifications: None observed.

Management Measures: This area is managed by USFWS as part of Cape Romain National Wildlife Refuge. Dogs are prohibited year-round.

Comments: Movements of Piping Plovers between Lighthouse and Cape islands would not be surprising, due to the close proximity of the two locations and the availability of feeding habitat at Raccoon Key.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Raccoon Key North are presented in **Figure 61**; their locations on are presented in **Figure 62**.

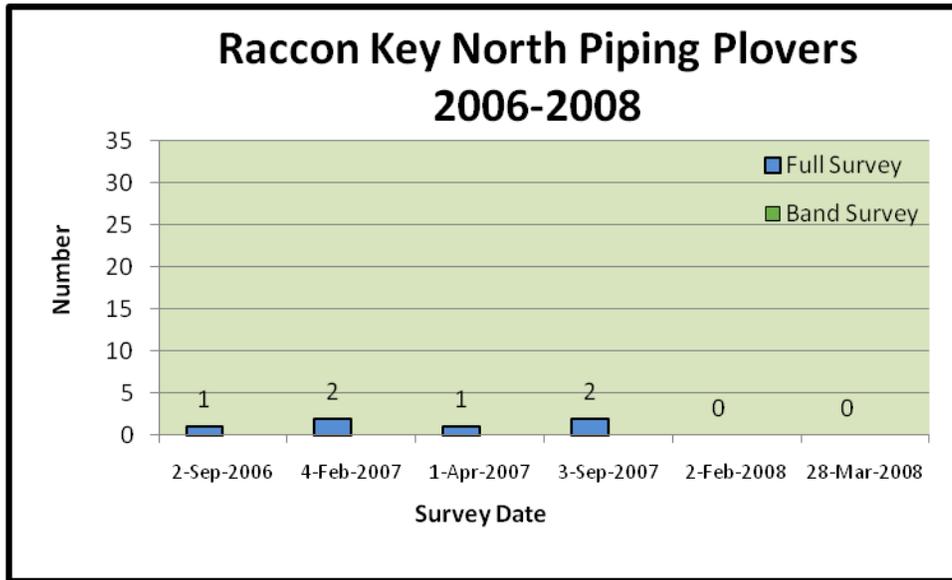


Figure 61. Raccoon Key North Piping Plover observations.

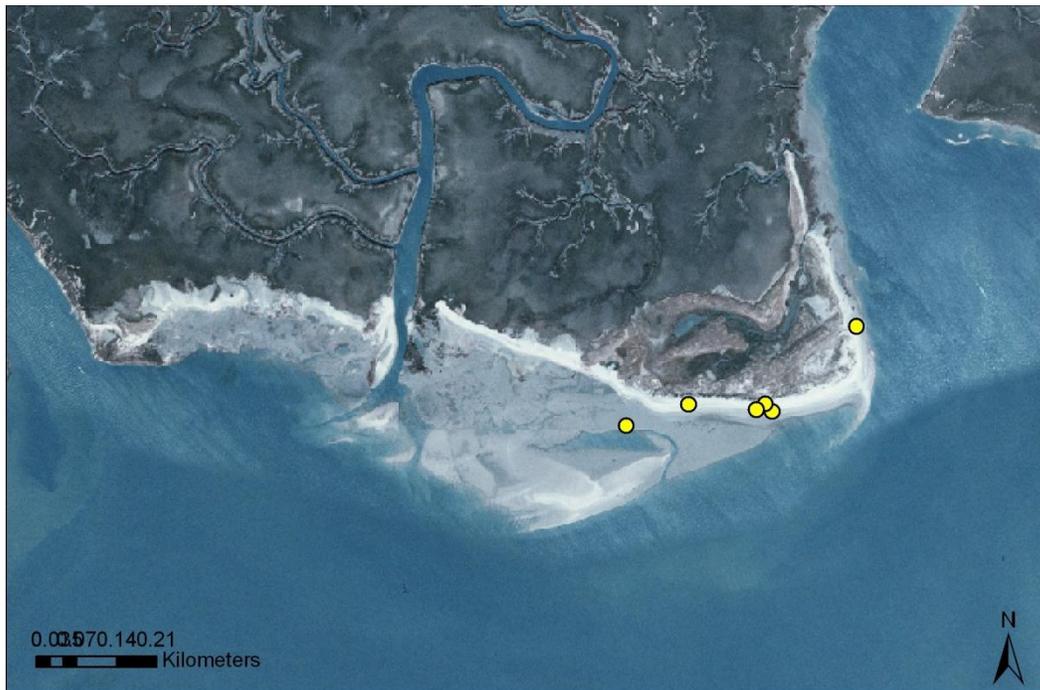


Figure 62. Raccoon Key North Piping Plover locations, 2006-2008.

Raccoon Key North Piping Plover Band Observations: None.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Raccoon Key North from 2006-2008 are presented in **Table 35**.

Table 35. Raccoon Key North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
2-Sep-2006	H	R	1	4	0	0	9
4-Feb-2007	M	F	2	0	5	0	0
1-Apr-2007	M	F	1	1	4	0	0
28-Mar-2008	M	R	2	2	8	0	0
3-Sep-2007	M	F	0	0	2	0	0
2-Feb-2008	H	F	0	0	12	0	0

18. Raccoon Island Central and South

County: Charleston

Survey Area: The central area was the beach between the first and second inlets; the south area was the beach between the second and third inlets.

Critical Habitat Designation: None.

Habitat conditions: High tide roosting habitat is limited in certain areas although overwash fans provide such habitat in some locations. At low tide, there is a wide intertidal beach in certain areas.

Habitat Modifications: None observed.

Management Measures: This area is managed by USFWS as part of Cape Romain National Wildlife Refuge. Dogs are prohibited year-round.

Comments: Both locations were visited once to observe habitat conditions and look for banded Piping Plovers. Areas of suitable Piping Plover habitat exist on both islands. Based on habitat characteristics, movements of Piping Plovers between Center Raccoon Key and Lighthouse Island may occur.

Piping Plovers: None.

Banded Piping Plovers Observed: None.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Raccoon Island Center and South from 2006-2008 are presented in **Table 36**.

Table 36. Raccoon Island Central and South shorebird observations.

Date	Location	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
29-Aug-2006	Raccoon Key Center	H	R	0	43	12	1	0
23-Nov-2007	Raccoon Key South	L	R	0	5	2	0	0

19. Bull Island North

County: Charleston

Survey Area: Beginning on the bay side at the first tributary south from the point that drains into the bay, then north around the point and then south along the ocean beach until the beach narrows and trees are on the beach, approximately 1.6 kilometers south of the point.

Critical Habitat Designation: None.

Habitat conditions: Large island with extensive roosting habitat on the north end and moderate beach-side intertidal feeding habitat; areas of feeding habitat also exist along the north end of the island as well as on the bay side.

Habitat Modifications: None observed to the survey area, though there is a raised roadbed in the interior of the island that could impede overwash in a moderate storm.

Management Measures: This area is managed by USFWS as part of Cape Romain National Wildlife Refuge. Dogs are prohibited year-round.

Comments: Piping Plovers were observed feeding at a peat outcrop at this location.

A uniquely marked Great Lakes Piping Plover -,BO:X,g was seen two winters in a row at this location, and also seen here during the 2005-2006 season.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Bull Island North are presented in **Figure 63**; their locations on are presented in **Figure 64**.

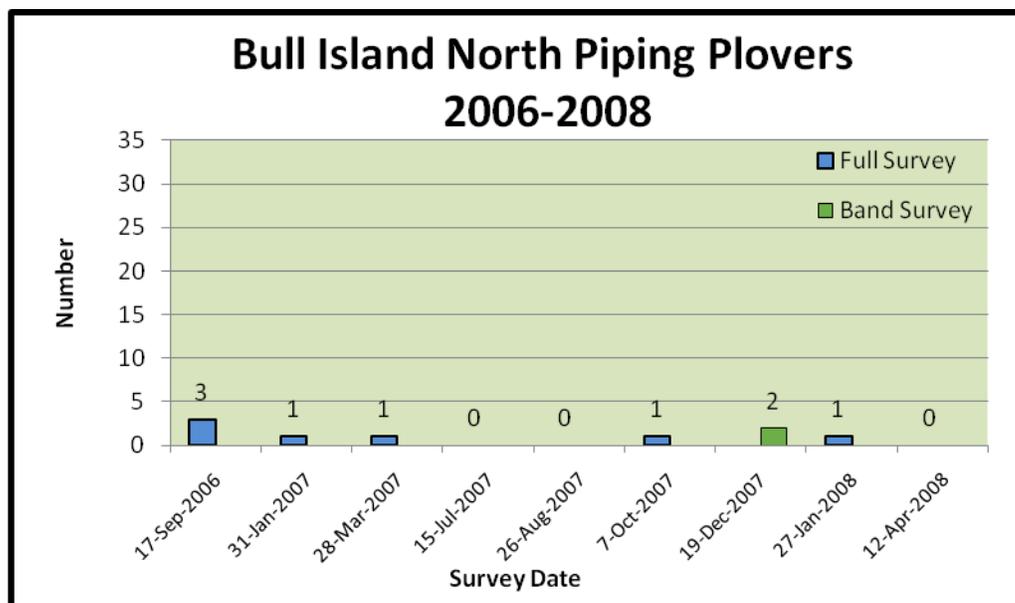


Figure 63. Bull Island North Piping Plover observations.

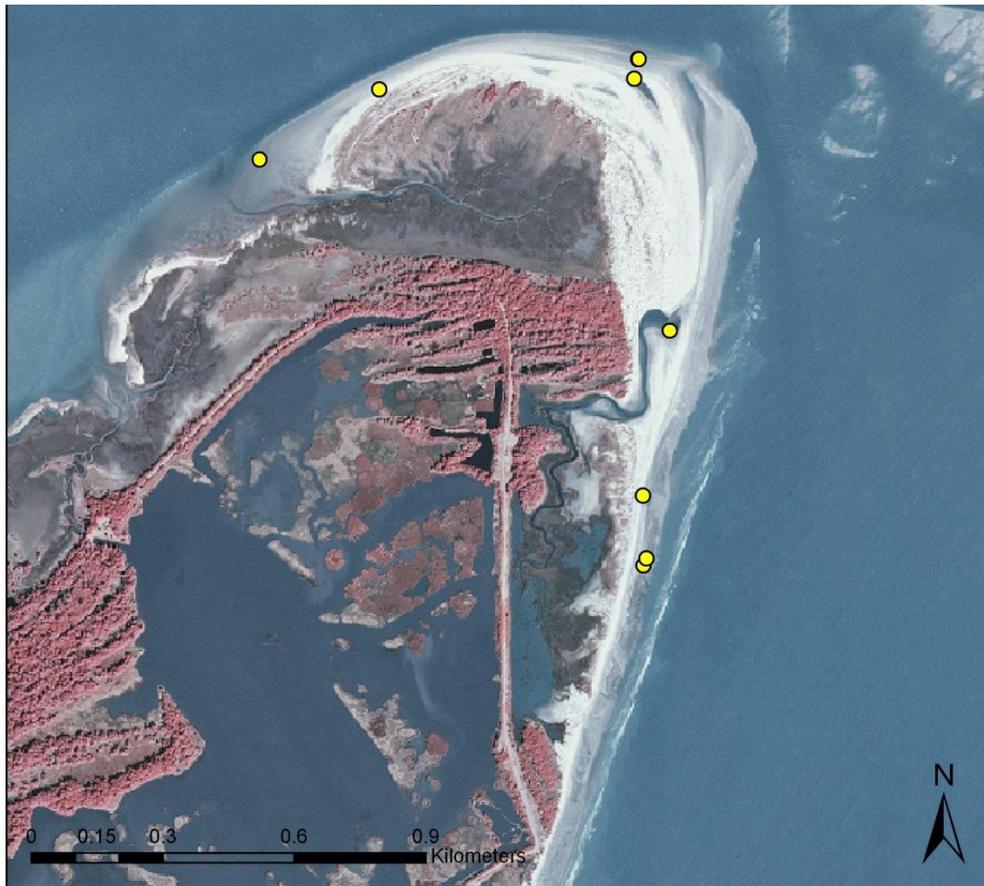


Figure 64. Bull Island North Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Bull Island North are presented in **Table 37**.

Table 37. Bull Island North Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	17-Sep-2006	-,BO:X,g		W	GL US	Using eroded marsh substrate on beach; seen previous winter at this location.
2	31-Jan-2007	-,BO:X,g		W	GL US	
3	28-Mar-2007	-,BO:X,g		W	GL US	
4	7-Oct-2007	-,BO:X,g		W	GL US	Third winter at this location
5	19-Dec-2007	-, -:X,b	b015	W	GL US	
6	19-Dec-2007	-,BO:X,g		W	GL US	
7	27-Jan-2008	-,BO:X,g		W	GL US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Bull Island North from 2006-2008 are presented in **Table 38**.

Table 38. Bull Island North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
17-Sep-2006	L	R	3	0	0	116	0
31-Jan-2007	M	R	1	2	0	0	0
28-Mar-2007	L	R	1	2	5	0	0
15-Jul-2007	M	R	0	6	3	0	
26-Aug-2007	M	F	0	0	12	174	0
7-Oct-2007	M	R	1	0	6	48	0
27-Jan-2008	H	R	1	1	0	0	0
12-Apr-2008	M	R	0	8	6	0	0

20. Bull Island South

County: Charleston

Survey Area: “This unit includes from Schooner Creek on north and south of the river to north of Price’s Inlet on the southern portion of Bull Island along the Atlantic Ocean 1.6 km (1.0 mi).... All areas begin at MLLW and extend to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur.”

Critical Habitat Designation: Unit SC-8, Bull Island

Habitat Conditions: The critical habitat area is undeveloped; there is good roosting habitat. Feeding habitat exists along the ocean beach and a limited strip along the inlet shoreline.

Habitat Modifications: None observed.

Management Measures: This area is managed by USFWS as part of Cape Romain National Wildlife Refuge. Dogs are prohibited year-round.

Comments: High disturbance was observed on the first season fall migration visit due to a tour boat operation, but low or no disturbance was seen on the other visits.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Bull Island North are presented in **Figure 65**; their locations on are presented in **Figure 66**.

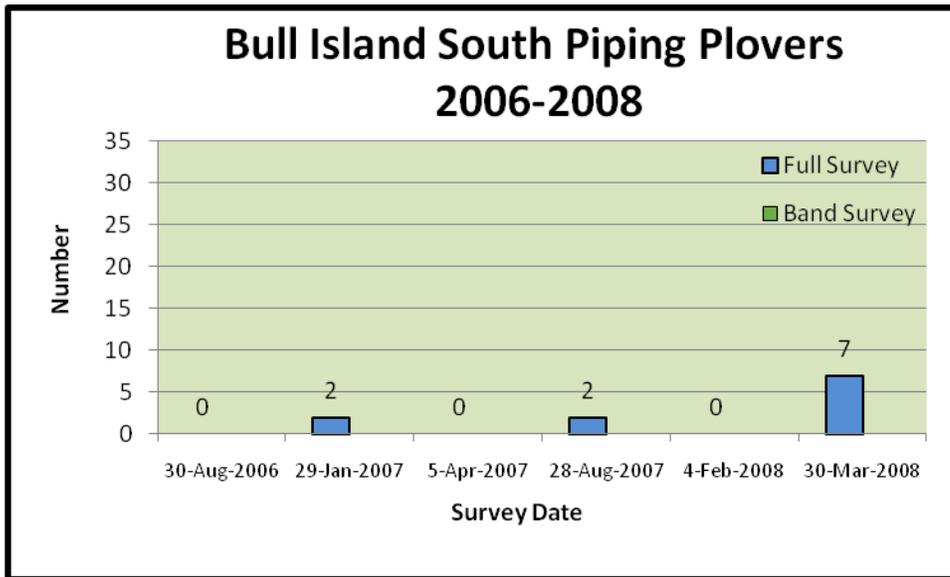


Figure 65. Bull Island South Piping Plover observations.

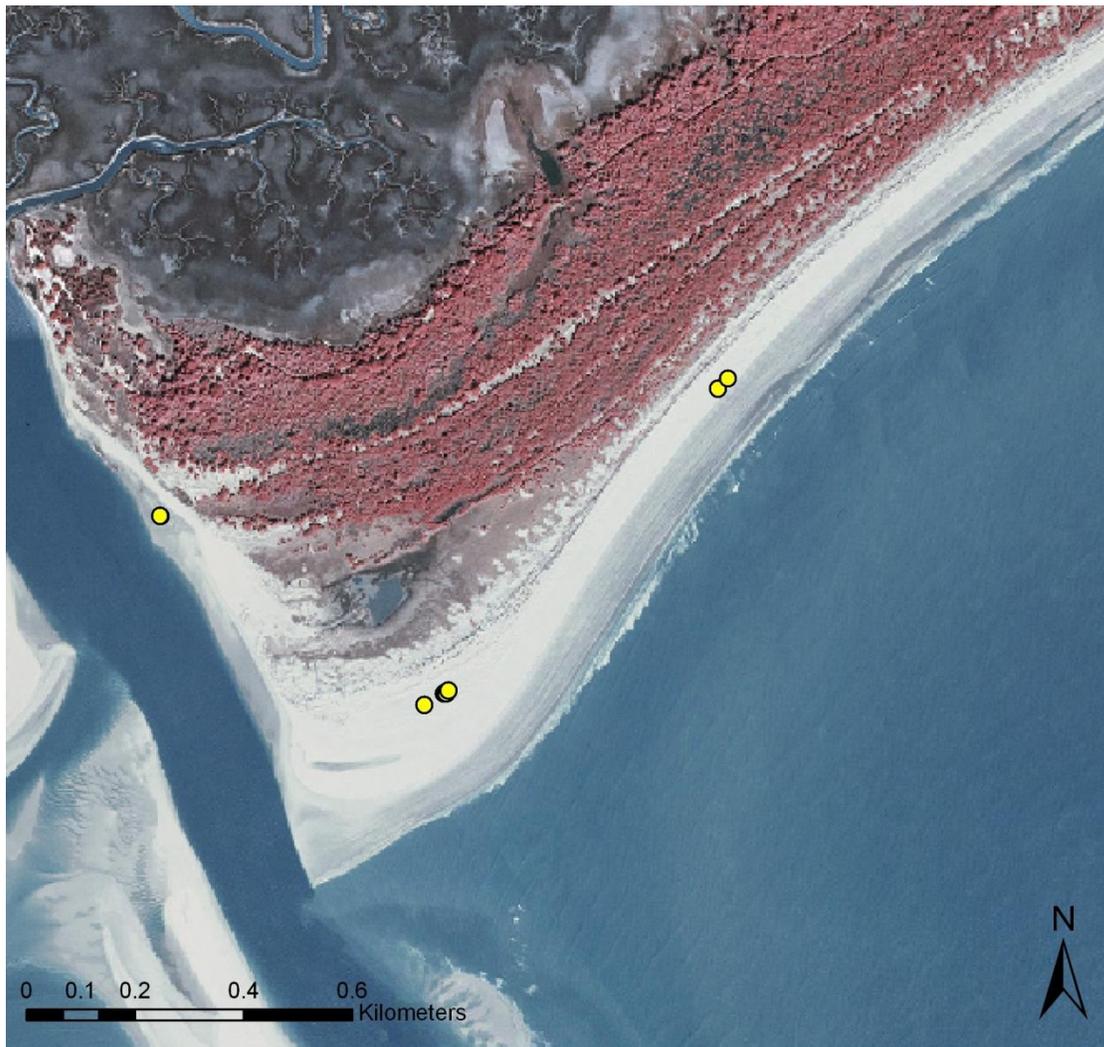


Figure 66. Bull Island South Piping Plover locations, 2006-2008.

Bull Island South Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Bull Island South from 2006-2008 are presented in **Table 39**.

Table 39. Bull Island South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
30-Aug-2006	H	R	0	0	0	0	0
29-Jan-2007	M	R	2	0	0	0	0
5-Apr-2007	M	R	0	0	2	0	0
28-Aug-2007	M	F	2	0	0	0	0
4-Feb-2008	M	F	0	0	2	0	0
30-Mar-2008	H	R	7	0	2	0	0

21. Bull Island/Capers Island Ebb Bar

County: Charleston

Survey Area: The entire ebb bar.

Critical Habitat Designation: Unit SC-8 Bull Island

Habitat Conditions: A small ebb bar that can be above or below the high tide level.

Habitat Modifications: None observed.

Management Measures: part of the ebb bar on the south side of the inlet was posted during the 2006 breeding season to protect colonial waterbirds (Felicia Sanders, pers. comm. 2007).

Comments: In the first season, this area contained high quality roosting habitat, but in the second season, the bar had eroded and was not above water at high tide. Two banded birds were observed at this location the first season but flew before their band combinations could be determined.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Bull Island/Capers Island Ebb Bar are presented in **Figure 67**; their locations on are presented in **Figure 68**.

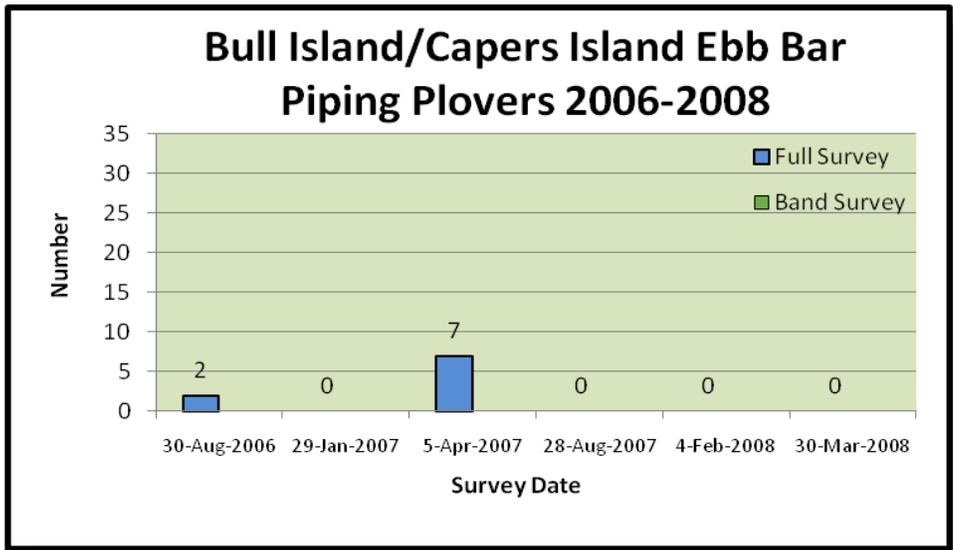


Figure 67. Bull Island/Capers Island Ebb Bar Piping Plover observations.

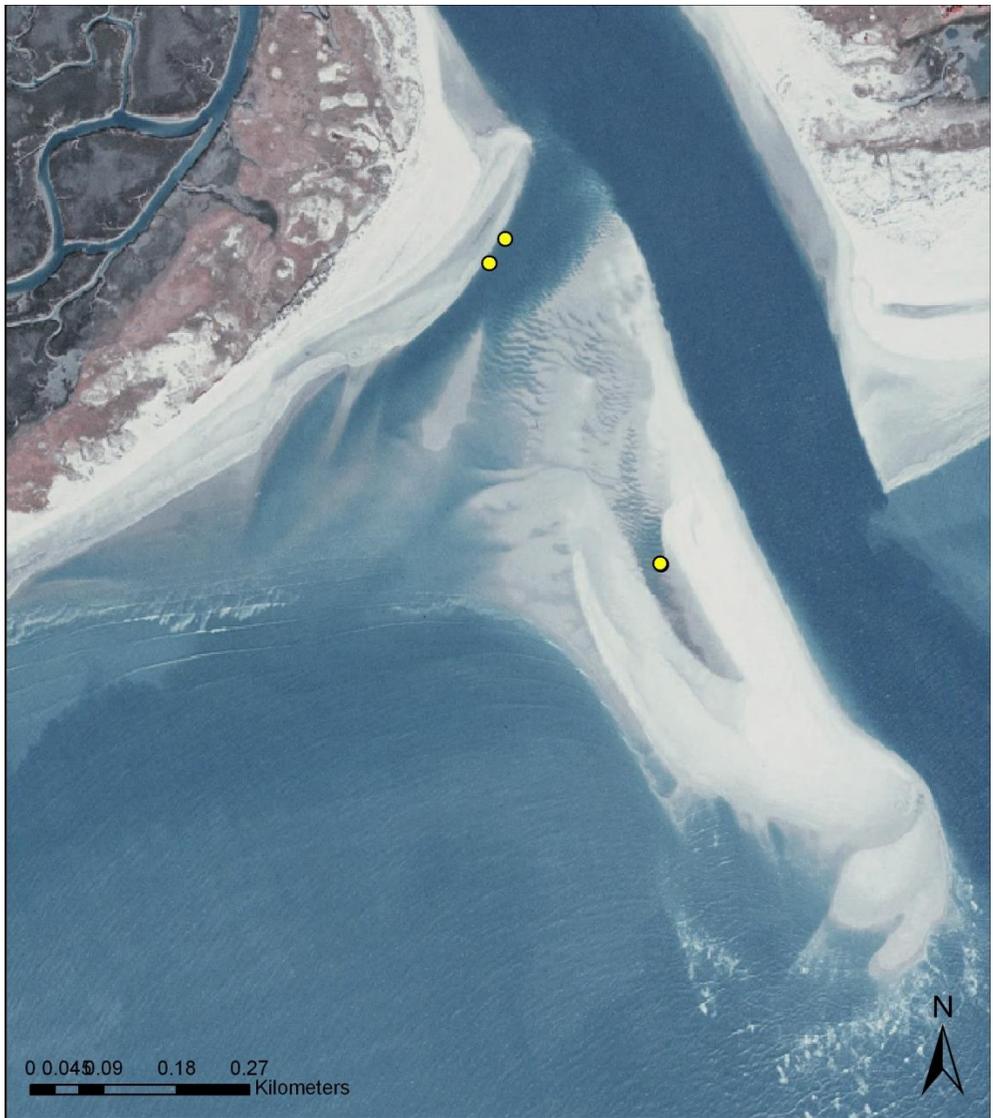


Figure 68. Bull Island/Capers Island Ebb Bar Piping Plover locations, 2006-2008.

Piping Plover Band Observations: two on 30 August 2007, population unknown.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Bull Island/Capers Island Ebb Bar from 2006-2008 are presented in **Table 40**.

Table 40. Bull Island/Capers Island Ebb Bar shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
30-Aug-2006	M	R	2	0	0	0	0
29-Jan-2007	H	R	0	0	2	0	0
5-Apr-2007	H	R	7	9	4	64	0
28-Aug-2007	H	F	0	1	2	0	0
4-Feb-2008	M	F	0	0	2	29	0
30-Mar-2008	M	R	0	0	0	53	0

22. Capers Island North

County: Charleston

Survey Area: Designated critical habitat, which “includes... south of Price’s Inlet on the northeast tip of Capers Island Heritage Preserve 1.4 km (.86 mi) along the Atlantic Ocean. All areas begin at MLLW and extend to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur.”

Critical Habitat Designation: Unit SC-8 Bull Island

Habitat Conditions: An undeveloped island with a relatively narrow beach at high tide; several overwash fans into marsh; moderate slope on beach with area of exposed marsh on the intertidal ocean beach.

Habitat Modifications: None observed.

Management Measures: This area is managed by SCDNR as Caper’s Island Heritage Preserve. A sign is posted listing regulations. No motor vehicles are allowed.

<http://www.dnr.sc.gov/mlands/specregshp.html>.

Comments: Piping Plovers were observed using the eroded marsh on the ocean beach to feed. While there were no wintering banded Piping Plovers observed, unbanded Piping Plovers were observed flying across the inlet, so movements between Capers Island and Bull Island may influence survey results.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Capers Island North are presented in **Figure 69**; their locations on are presented in **Figure 70**.

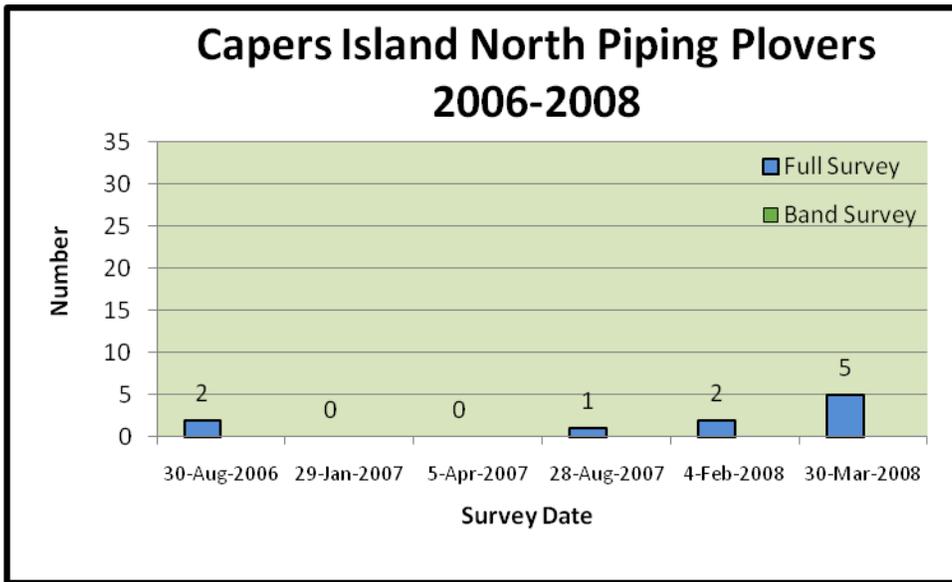


Figure 69. Capers Island North Piping Plover observations.

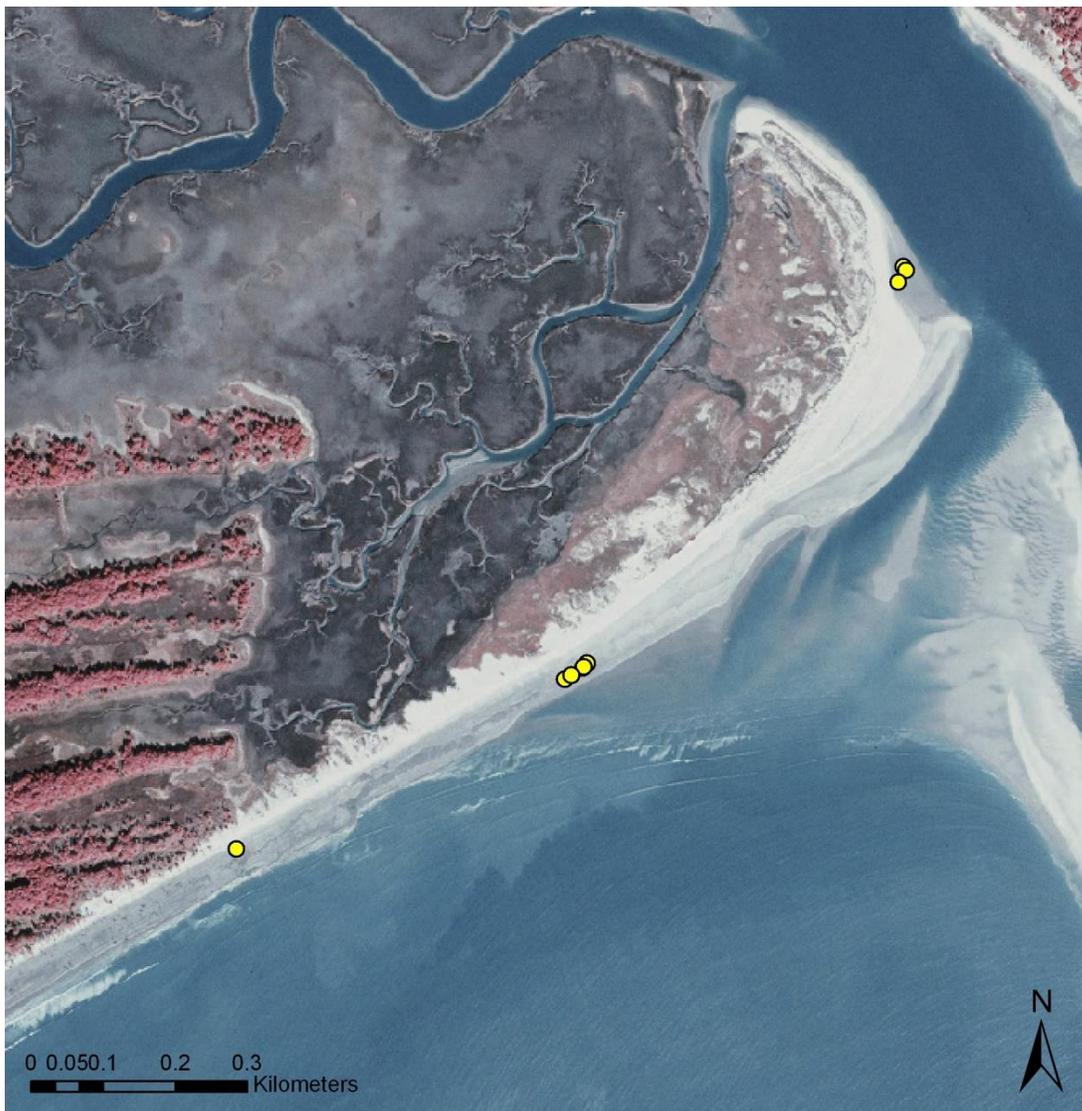


Figure 70. Capers Island North Piping Plover locations, 2006-2008.

Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Capers Island North from 2006-2008 are presented in **Table 41**.

Table 41. Capers Island North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
30-Aug-2006	M	R	2	0	0	0	0
29-Jan-2007	M	R	0	0	0	0	0
5-Apr-2007	H	R	0	2	0	0	0
28-Aug-2007	M	F	1	0	0	2	0
4-Feb-2008	M	F	2	0	4	0	0
30-Mar-2008	M	R	5	0	2	6	0

23. Capers Island South

County: Charleston

Survey Area: Unvegetated inlet shoreline and north along the ocean beach approximately .8 kilometers.

Critical Habitat Designation: None.

Habitat conditions: Suitable feeding and roosting habitat exists at the inlet, though north of the inlet has limited high tide habitat. Disturbance was high on the 6 April 2008 visit.

Habitat Modifications: None observed.

Management Measures: This area is managed by SCDNR as Caper's Island Heritage Preserve. No motor vehicles are allowed. <http://www.dnr.sc.gov/mlands/specregshp.html>.

Comments: The area contains suitable shorebird habitat but disturbance from boaters can be high. A tour boat operator let his dog out on the beach off leash and then piloted his boat back and forth along the inlet, having the dog chase the boat along the shoreline.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Capers Island South are presented in **Figure 71**; their locations on are presented in **Figure 72**.

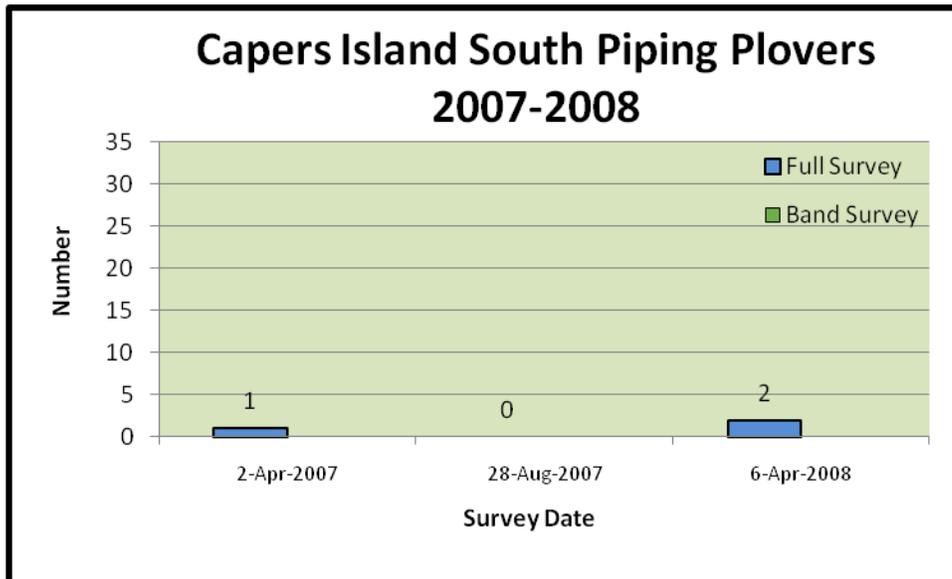


Figure 71. Capers Island South Piping Plover observations.

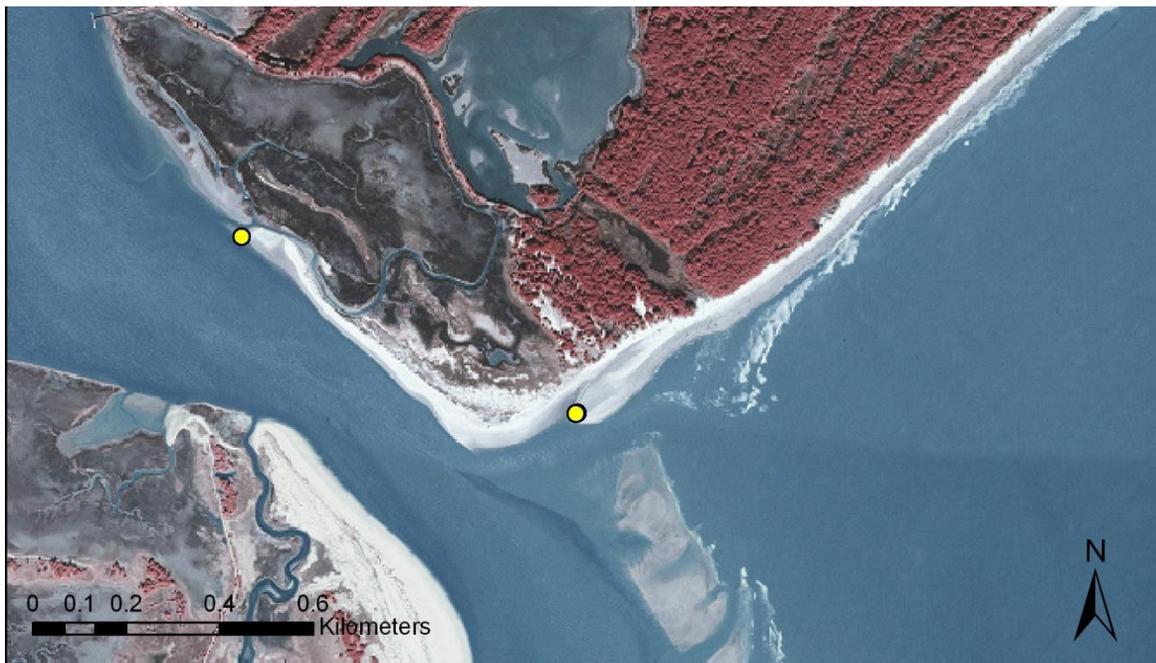


Figure 72. Capers Island South Piping Plover locations, 2006-2008.

Capers Island-South Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Capers Island South from 2006-2008 are presented in **Table 42**.

Table 42. Capers Island South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
2-Apr-2007	M	R	1	0	0	0	0
28-Aug-2007	M	R	0	0	0	0	0
6-Apr-2008	L	F	2	0	0	0	0

24. Dewees Island

County: Charleston

Survey Area: The ocean beach and vegetated inlet areas on the north and south ends of the island.

Critical Habitat Designation: none.

Habitat Conditions: A developed residential island without road access from the mainland. The ocean beach has a large roosting area at the north end and a moderately sized roosting area at the south end and a moderately wide intertidal feeding area at low tide. The mouth of a creek near the north inlet also may be suitable.

Habitat Modifications: Multiple rows of sand fencing exist on the ocean beach.

Management Measures: There are closures for beach nesting birds on the north and south ends of the island.

Comments: The nesting closures on the north and south ends of the island have suitable habitat for Wilson’s Plovers and territorial behavior was seen in both locations in an April 2008 visit.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Dewees Island are presented in **Figure 73**; their locations on are presented in **Figure 74**.

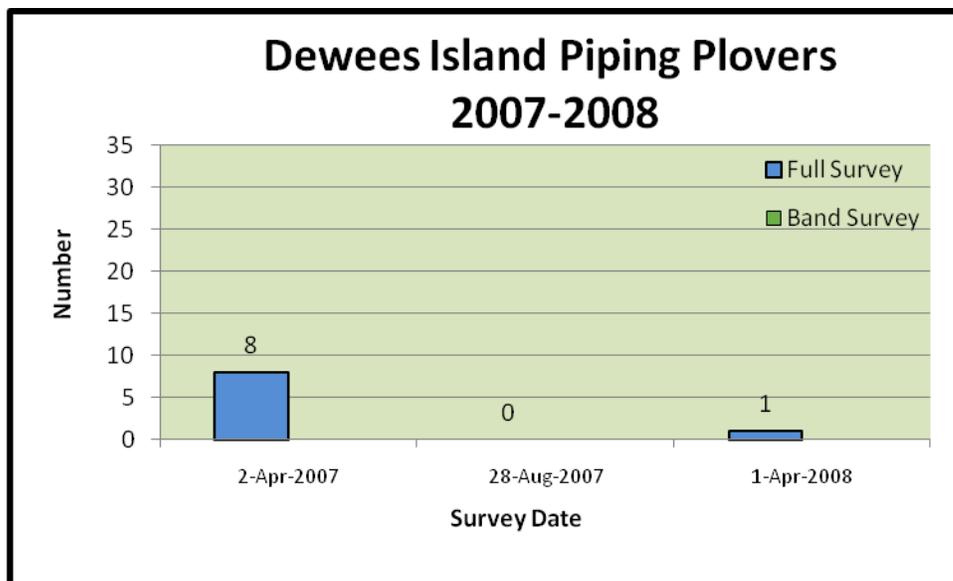


Figure 73. Dewees Island Piping Plover observations.



Figure 74. Dewees Island Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Dewees Island are presented in **Table 31**.

Table 43. Dewees Island Piping Plover band observations.

#	Date	Bands	Band #	M or W	Population	Comments
1	2-Apr-2007	-,-,-,X		M	UK	Band ends in 9

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Dewees Island from 2006-2008 are presented in **Table 44**.

Table 44. Dewees Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
2-Apr-2007	M	R	8	1	0	0	0
28-Aug-2007	M	R	0	0	0	0	0
1-Apr-2008	L	F	1	12	0	0	0

25. Sullivan’s Island

County: Charleston

Survey Area: The center section of the island on the ocean beach, from just south of the seawall south to the turn in the shoreline for the Charleston Harbor.

Critical Habitat Designation: None.

Ownership: Private.

Habitat Conditions: An island with residential and commercial development. In roughly the center of the island beach, there is a lagoon area that drains into the ocean that provides good quality Piping Plover intertidal feeding habitat and an adjoining upland roosting area.

Habitat Modifications: A large jetty exists on the south end of the island for Charleston Harbor and on the north end of the island, there is a seawall protecting houses.

Management Measures: None observed.

Comments: This beach was one of the worst in the state for dogs off leash. One dog walker was observed encouraging his dog to chase feeding Piping Plovers. Human disturbance can be high.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Sullivan’s Island are presented in **Figure 75**; their locations on are presented in **Figure 76**.

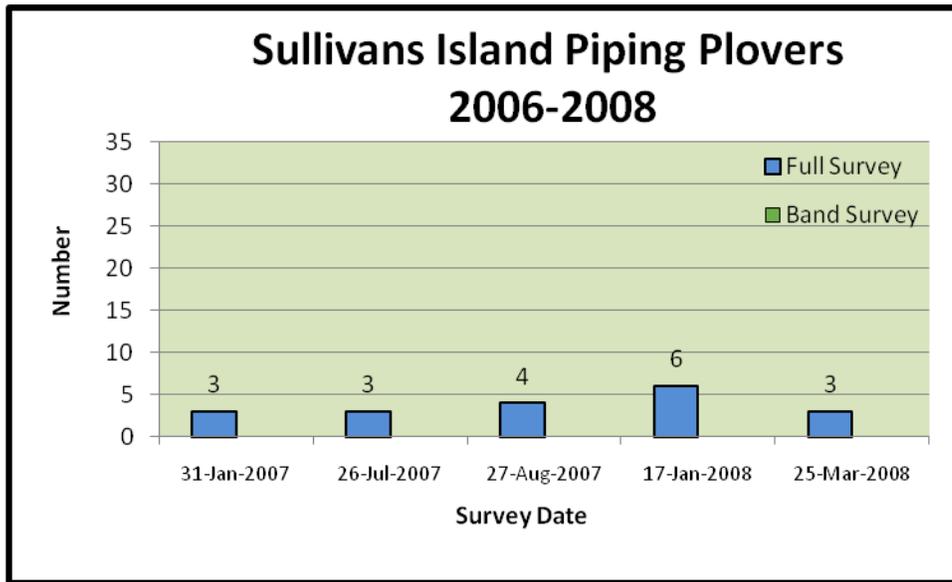


Figure 75. Sullivan’s Island Piping Plover observations.

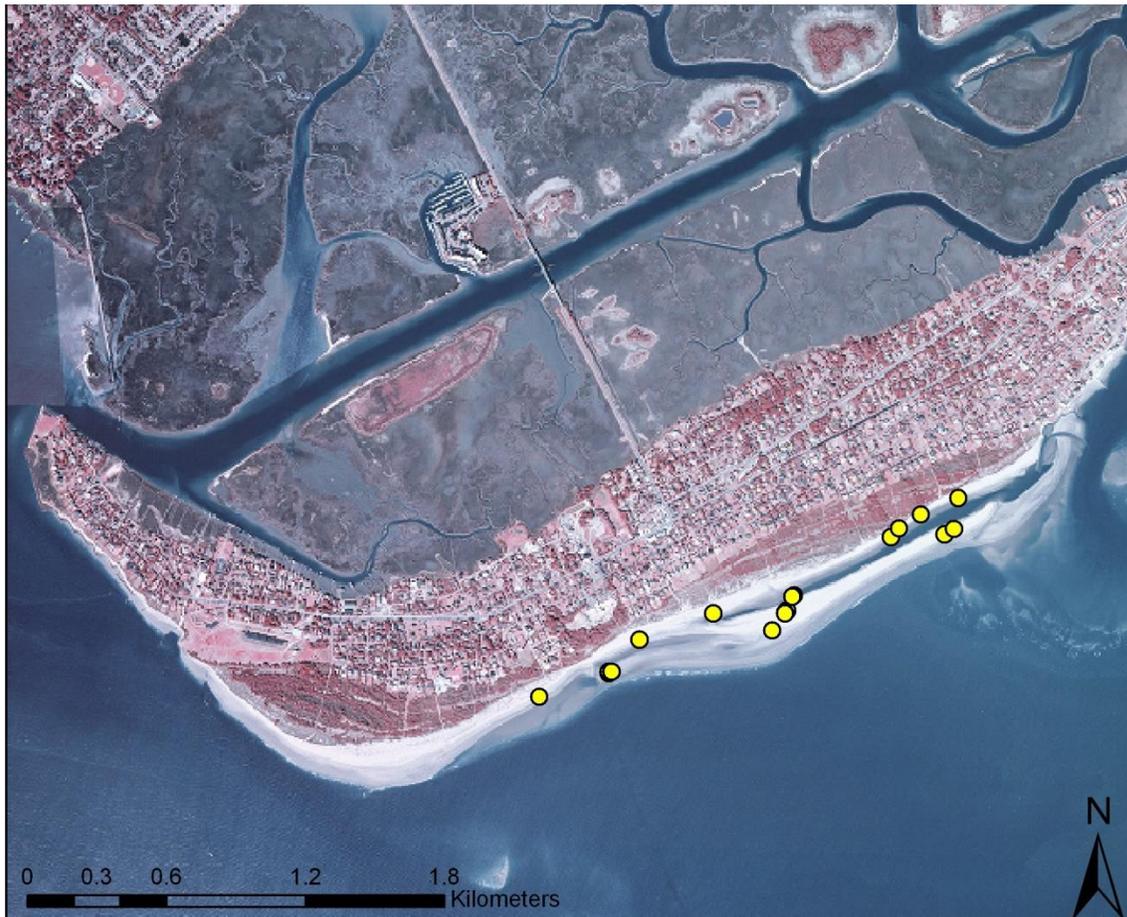


Figure 76. Sullivan’s Island Piping Plover locations, 2006-2008.

Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Sullivan’s Island from 2006-2008 are presented in **Table 45**.

Table 45. Sullivan’s Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
31-Jan-2007	M	F	3	0	0	0	0
26-Jul-2007	L	R	3	9	0	0	0
27-Aug-2007	M	R	4	0	0	0	0
17-Jan-2008	H	F	6	0	0	15	0
25-Mar-2008	L	R	3	2	0	21	0

26. Morris Island South

County: Charleston

Survey Area: Approximately the southern .8 kilometers of ocean beach and adjoining habitat in the inlet.

Critical Habitat Designation: None.

Habitat Conditions: There is suitable feeding habitat in a small lagoon and recurved spit at the inlet, extensive low tide flats, and an area of roosting and nesting habitat in the unvegetated upland areas.

Habitat Modifications: None observed in the survey area, though to the north, a large berm exists.

Management Measures: a sign is posted listing regulations.

Comments: This area was first visited to observe a banded Piping Plover. The banded Piping Plover that was seen at this location in November 2007 was later observed at Bird Key Stono in March 2008, an interesting long distance movement. In April, a bird with the same brood marker combination again was observed at Morris Island (Chris Snook, pers. comm. 2009).

High disturbance was observed on several visits, including dogs off-leash and campers who had set up a tent within a few yards of multiple Wilson’s Plover scrapes. ATVs were observed driving over the dunes on one visit.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Morris Island are presented in **Figure 77**; their locations on are presented in **Figure 78**.

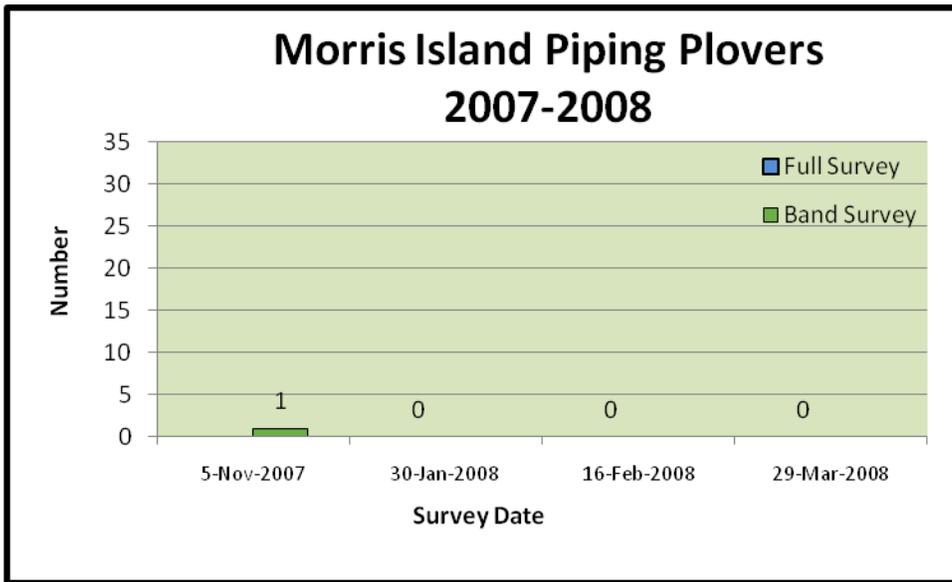


Figure 77. Morris Island Piping Plover observations.

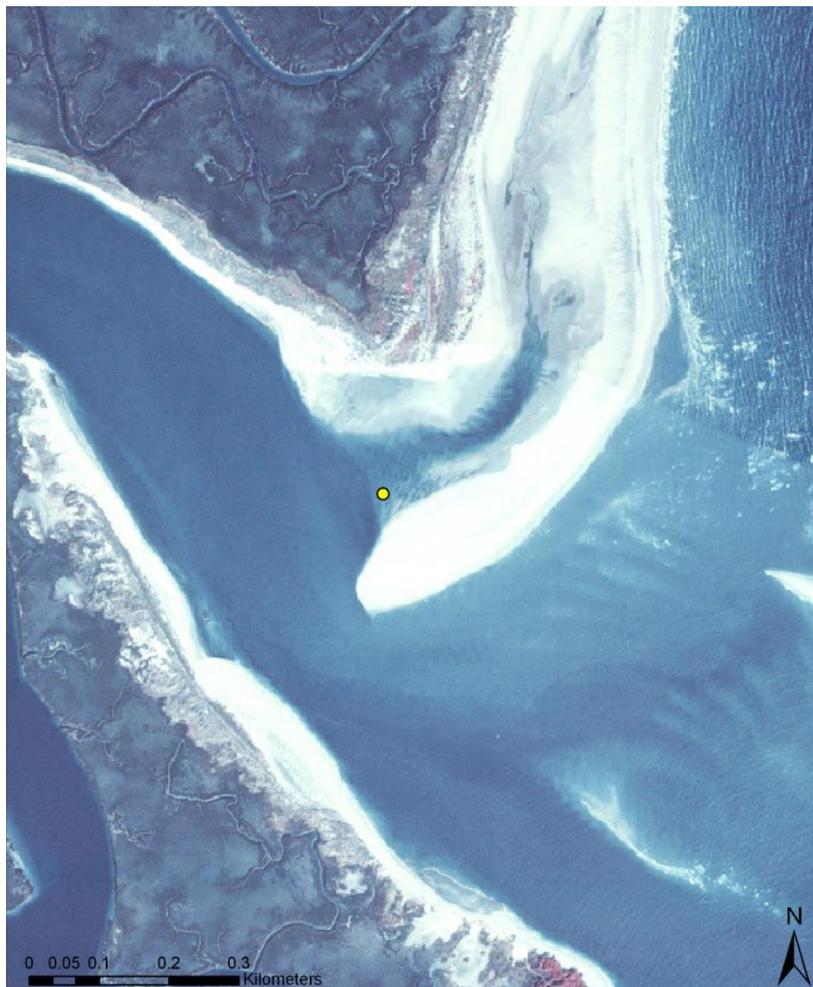


Figure78. Morris Island Piping Plover locations, 2007-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Morris Island are presented in **Table 46**.

Table 46. Morris Island Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	5-Nov-2007	-,g:X,b	g010	M or W (?)	GL US	Wintering bird if November is considered wintering; migrant if December is wintering. Also used Bird Key Stono in March.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Bull Island North from 2006-2008 are presented in **Table 47**.

Table 47. Morris Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
30-Jan-2008	H	F	0	0	0	0	0
16-Feb-2008	L	R	0	0	4	95	0
29-Mar-2008	M	R	0	12	4	0	0

27. Folly Beach North

County: Charleston

Survey Area: North from the jetty to the interior of the inlet.

Critical Habitat Designation: None.

Habitat Conditions: North of the jetty, the island is undeveloped; there is a relatively narrow beach at high tide, several overwash fans into the marsh, and a moderate slope beach with an area of exposed marsh.

Habitat Modifications: Old sand fencing that has been covered with sand.

Management Measures: None observed in the first surveys; however, nesting habitat in this area was posted to protect breeding Wilson’s Plovers in the second season.

Comments: this area can have high levels of human disturbance, including numerous dogs off leash.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Folly Beach North are presented in **Figure 79**; their locations on are presented in **Figure 80**.

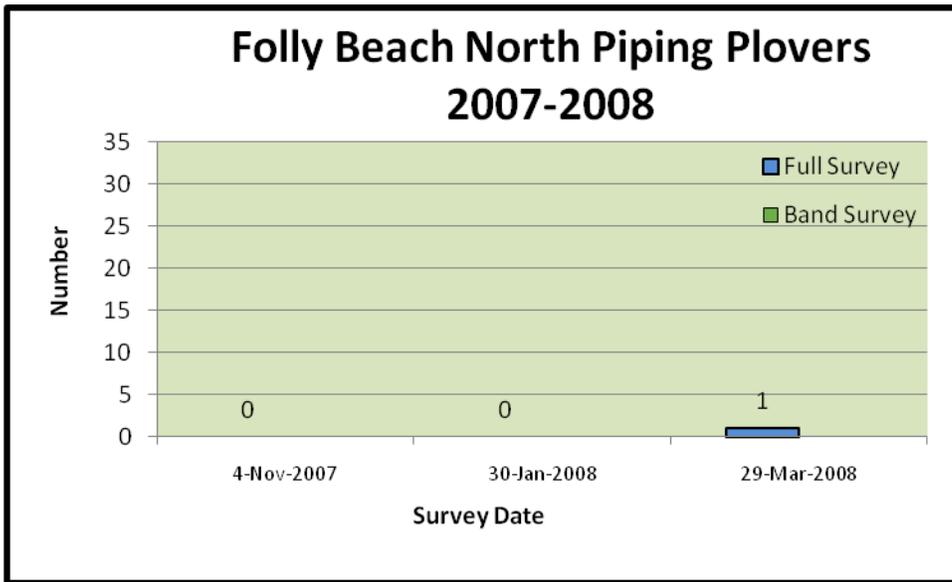


Figure 79. Folly Beach North Piping Plover observations.

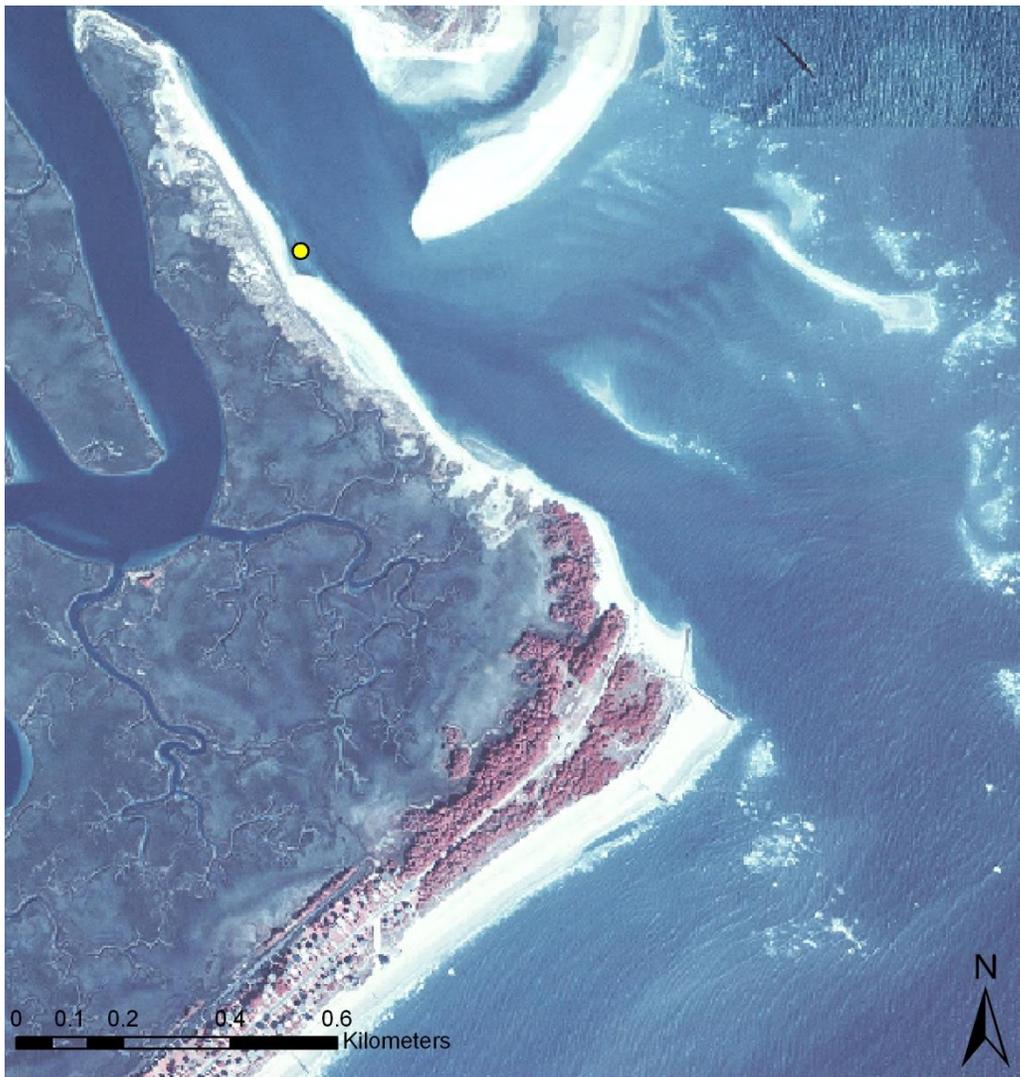


Figure 80. Folly Beach North Piping Plover locations, 2007-2008.

Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Folly Beach North from 2006-2008 are presented in **Table 48**.

Table 48. Folly Beach North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
4-Nov-2007	M	R	0	0	0	0	0
30-Jan-2008	H	R	0	0	0	0	0
29-Mar-2008	L	R	1	18	1	0	0

28. Folly Beach South

County: Charleston

Survey Area: Unvegetated ocean, inlet, and bay side beach south of the southern parking area.

Critical Habitat Designation: None.

Habitat conditions: A developed area of the city park is just above the survey area. The south end of the island contains a wide area of suitable roosting habitat and also moderately sized intertidal feeding habitat on the ocean; an area of eroded marsh on the inlet also provides feeding habitat.

Habitat Modifications: Artificial dune construction, planted dune grass, and sand fencing on the ocean beach.

Management Measures: Dogs off leash are prohibited on the beach, and dogs are prohibited on the beach from 10:00 AM to 6:00 PM from 1 May until 20 September.

Comments: This area was first selected for a survey after a zero count during a high tide survey at Bird Key Stono on 28 March 2007 suggested that Piping Plovers had moved to a nearby area. The habitat value of the beach has been reduced due to stabilization efforts. Human disturbance is a concern and the dog off-leash prohibition is routinely violated at this location. However, in the second season, areas of Wilson's Plover nesting habitat were posted with symbolic fencing. Observations of banded Piping Plovers indicate that movements occurred between wintering birds that used Bird Key Stono and Folly Beach South.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Folly Beach South are presented in **Figure 81**; their locations on are presented in **Figure 82**.

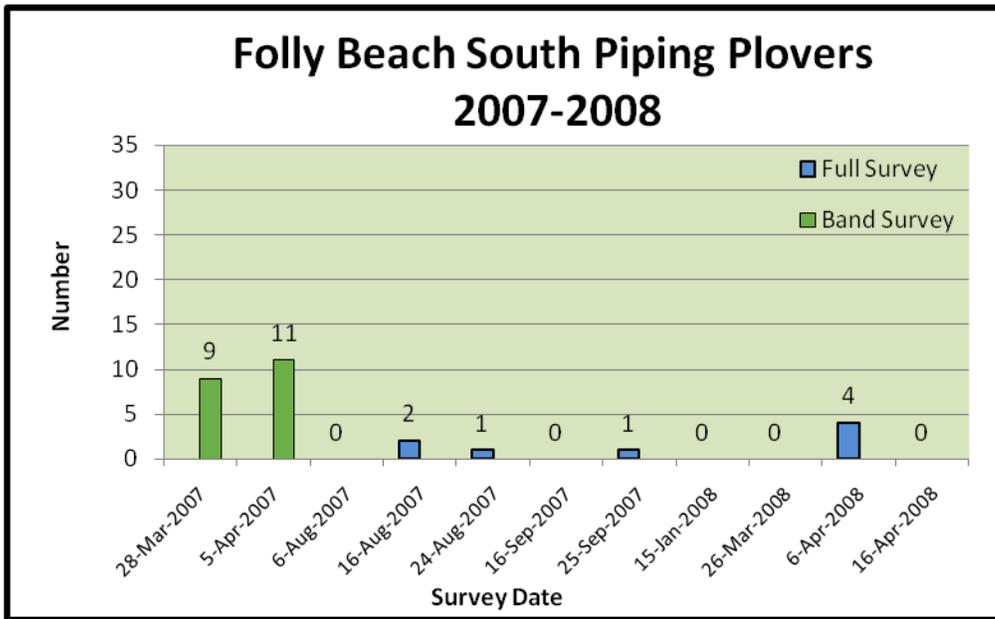


Figure 81. Folly Beach South Piping Plover observations, 2007-2008.



Figure 82. Folly Beach South Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Folly Beach South are presented in **Table 49**.

Table 49. Folly Beach South Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	28-Mar-2007	-,gO:-,RX		W	GL US	Also used Bird Key Stono
2	28-Mar-2007	Gf,RB:-,-		W	GP US	Also used Bird Key Stono
3	28-Mar-2007	O,-:X,R		W	GL US	Same combination seen at the north end of Kiawah Island
4	28-Mar-2007	Y/L,X:O,RB		W	GP C	Also used Bird Key Stono; seen in a previous winter at the north end of Kiawah Island
5	5-Apr-2007	-,gO:-,RX		W	GL US	
6	5-Apr-2007	Gf,RB:-,-		W	GP US	
7	5-Apr-2007	O,-:X,R		W	GL US	
8	5-Apr-2007	X,b:Of,OG		W	GL US	Also used Bird Key Stono and the north end of Kiawah Island
9	5-Apr-2007	Y/L,X:O,RB		W	GP C	
10	25-Sep-2007	Y/L,X:O,RB		W	GP C	
11	6-Apr-2008	-,gO:-,RX		W	GL US	
12	6-Apr-2008	Y/L,X:O,RB		W	GP C	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Folly Beach South from 2006-2008 are presented in **Table 50**.

Table 50. Folly Beach South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
6-Aug-2007	H	R	0	1	0	0	0
16-Aug-2007	L	R	2	3	0	0	0
24-Aug-2007	H	F	1	3	2	0	0
16-Sep-2007	H	R	0	0	0	0	0
25-Sep-2007	H	R	1	1	0	0	0
15-Jan-2008	M	F	0	0	0	11	0
26-Mar-2008	M	R	0	7	0	0	0
6-Apr-2008	H	F	4	10	2	0	0
16-Apr-2008	H	F	0	11	0	0	0

29. Bird Key Stono

County: Charleston

Survey Area: The unvegetated areas of the entire island, though the nesting areas were avoided during the breeding season to avoid impacts to nesting shorebirds and colonial waterbirds.

Critical Habitat Designation: Unit SC-9, Stono Inlet

Habitat Conditions: A large area of low energy substrate exists on the west side of the island, providing excellent intertidal feeding habitat in the first season. During the second season, the small area of *Spartina* had expanded and a much larger area of feeding habitat was covered. Extensive sand flats exist on the ocean side of the island at low tide. A large area of roosting habitat is just north of the feeding habitat of the on the west side; however, at very high tides this area can be overwashed. On north wind days, birds were also observed roosting on the ocean side of the island, in the lee afforded by the large dune and upland vegetation.

Habitat Modifications: In 2006, dredged sand was placed in the north end of the interior of the island to create an open sand nesting area for colonial waterbirds; the sand was dredged from the Folly River.

Management Measures: This area is managed by SCDNR as Bird Key Stono Heritage Preserve. Dogs are prohibited on the island year-round; from 15 April – 15 October, the island is closed to the public and boat landings are prohibited. From 16 October – 14 April, the area above the high tide line is closed to the public. The island is well posted with multiple large and small signs indicating the restrictions.

Comments: This location was one of the four intensive survey sites.

Vegetative succession is occurring in the low energy intertidal feeding areas on the west side of the island; this may result in the loss of feeding habitats over time. While the placement of sand in the interior of the island has provided suitable nesting habitat, the large dunes may reduce the frequency of overwash and thus influence the rate of vegetation succession in the intertidal areas.

Movements of Piping Plovers between Bird Key and Folly Beach or Kiawah Island may influence survey results. -,gO:-,RX was seen at this location at least two previous seasons, on 25 November 2005 and 27 August 2004; Y/L,X:O,RB was seen on the N end of Kiawah on 25 November 2005.

While compliance with the closure was good in the upland areas, there were observations of several illegal boat landings on the island.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Bird Key Stono are presented in **Figures 83 and 84**; their locations on are presented in **Figure 85**.

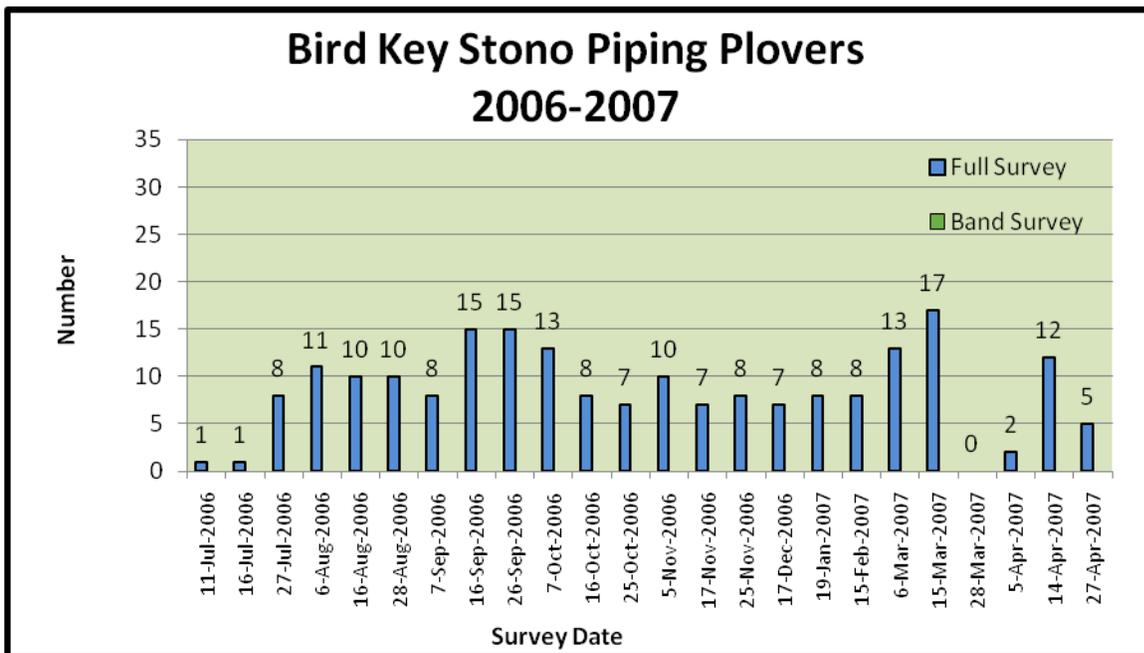


Figure 8346. Bird Key Stono Piping Plover observations, 2006-2007.

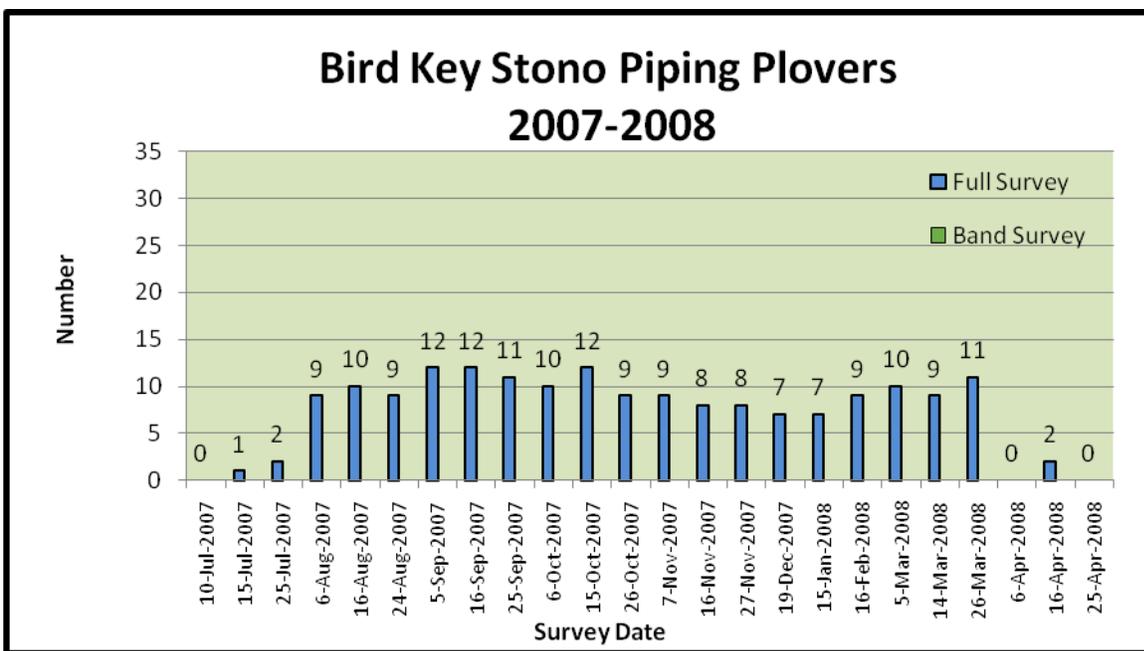


Figure 84. Bird Key Stono Piping Plover observations, 2007-2008.

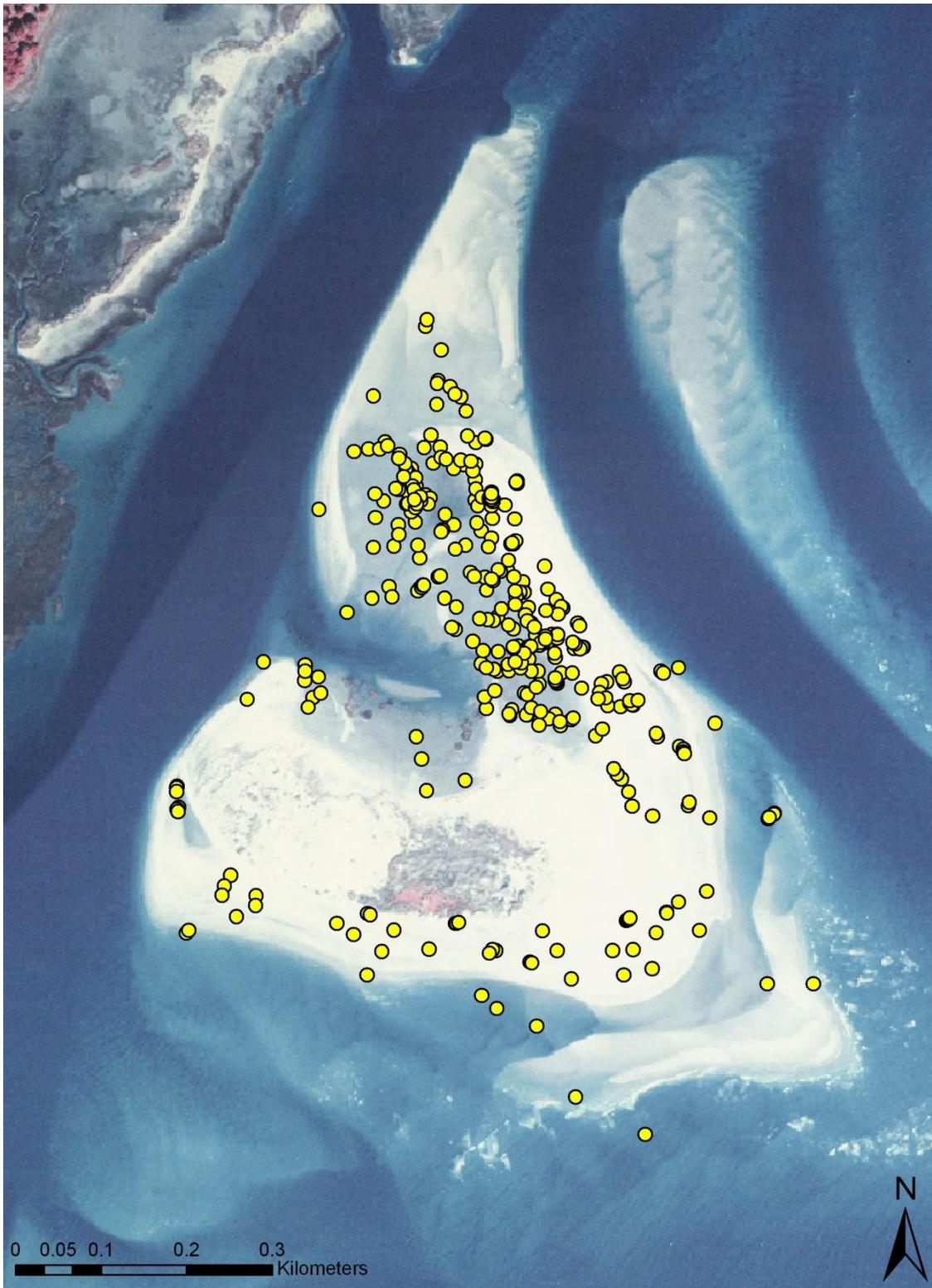


Figure 85. Bird Key Stono Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Bird Key Stono are presented in **Table 51**.

Table 51. Bird Key Stono Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	11-Jul-2006	-,gO:-,RX		W	GL US	
2	16-Jul-2006	-,gO:-,RX		W	GL US	
3	27-Jul-2006	-, -:X,g	1951-26313	M	GL US	fledgling
4	27-Jul-2006	-,gO:-,RX		W	GL US	
5	27-Jul-2006	Of,GB/O:X,g		M	GL US	captive reared
6	27-Jul-2006	X,b:Of,OG		W	GL US	
7	6-Aug-2006	-,gO:-,RX		W	GL US	
8	6-Aug-2006	X,b:Of,OG		W	GL US	
9	16-Aug-2006	-,gO:-,RX		W	GL US	
10	16-Aug-2006	X,b:Of,OG		W	GL US	
11	28-Aug-2006	-,gO:-,RX		W	GL US	
12	28-Aug-2006	X,b:Of,OG		W	GL US	
13	7-Sep-2006	Y/L,X:O,RB		W	GP C	
14	7-Sep-2006	-,gO:-,RX		W	GL US	
15	7-Sep-2006	O, -:X,R		W	GL US	
16	7-Sep-2006	X,b:Of,OG		W	GL US	
17	16-Sep-2006	Y/L,X:O,RB		W	GP C	
18	16-Sep-2006	-, -: ,O/Y		M	GL US	
19	16-Sep-2006	-,gO:-,RX		W	GL US	
20	16-Sep-2006	O, -:X,R		W	GL US	
21	16-Sep-2006	X,b:Of,OG		W	GL US	
22	26-Sep-2006	Y/L,X:O,RB		W	GP C	
23	26-Sep-2006	Gf,RB:-,-		W	GP US	
24	26-Sep-2006	-,gO:-,RX		W	GL US	
25	26-Sep-2006	X,b:Of,OG		W	GL US	
26	7-Oct-2006	Y/L,X:O,RB		W	GP C	
27	7-Oct-2006	Gf,RB:-,-		W	GP US	
28	7-Oct-2006	-,gO:-,RX		W	GL US	
29	7-Oct-2006	X,b:Of,OG		W	GL US	
30	16-Oct-2006	Y/L,X:O,RB		W	GP C	
31	16-Oct-2006	Gf,RB:-,-		W	GP US	
32	16-Oct-2006	-,gO:-,RX		W	GL US	
33	16-Oct-2006	X,b:Of,OG		W	GL US	
34	25-Oct-2006	Y/L,X:O,RB		W	GP C	
35	25-Oct-2006	Gf,RB:-,-		W	GP US	
36	25-Oct-2006	-,gO:-,RX		W	GL US	
37	5-Nov-2006	Y/L,X:O,RB		W	GP C	
38	5-Nov-2006	Gf,RB:-,-		W	GP US	
39	5-Nov-2006	-,gO:-,RX		W	GL US	
40	5-Nov-2006	X,b/O:O,-		M	GL US	
41	17-Nov-2006	Y/L,X:O,RB		W	GP C	
42	17-Nov-2006	Gf,RB:-,-		W	GP US	
43	17-Nov-2006	-,gO:-,RX		W	GL US	
44	25-Nov-2006	Gf,RB:-,-		W	GP US	
45	25-Nov-2006	-,gO:-,RX		W	GL US	
46	17-Dec-2006	Y/L,X:O,RB		W	GP C	
47	17-Dec-2006	Gf,RB:-,-		W	GP US	
48	17-Dec-2006	-,gO:-,RX		W	GL US	
49	19-Jan-2007	Y/L,X:O,RB		W	GP C	

#	Date	Bands	Band #	M or W	Pop.	Comments
50	19-Jan-2007	Gf,RB:-,-		W	GP US	
51	19-Jan-2007	-,gO:-,RX		W	GL US	
52	15-Feb-2007	Y/L,X:O,RB		W	GP C	
53	15-Feb-2007	Gf,RB:-,-		W	GP US	
54	15-Feb-2007	-,gO:-,RX		W	GL US	
55	6-Mar-2007	Y/L,X:O,RB		W	GP C	
56	6-Mar-2007	Gf,RB:-,-		W	GP US	
57	6-Mar-2007	-,gO:-,RX		W	GL US	
58	6-Mar-2007	O,-:X,R		W	GL US	
59	15-Mar-2007	Y/L,X:O,RB		W	GP C	
60	15-Mar-2007	-,WA:Gf,GL		W	GP US	
61	15-Mar-2007	Gf,RB:-,-		W	GP US	
62	15-Mar-2007	-,gO:-,RX		W	GL US	
63	15-Mar-2007	X,b:Of,OG		W	GL US	
64	14-Apr-2007	Y/L,X:O,RB		W	GP C	
65	14-Apr-2007	Gf,RB:-,-		W	GP US	
66	14-Apr-2007	O,-:X,R		W	GL US	
67	14-Apr-2007	X,b:Of,OG		W	GL US	
68	27-Apr-2007	Y/L,X:O,RB		W	GP C	
69	27-Apr-2007	Gf,RB:-,-		W	GP US	
70	15-Jul-2007	-,gO:-,RX		W	GL US	
71	25-Jul-2007	-,gO:-,RX		W	GL US	
72	6-Aug-2007	-,gO:-,RX		W	GL US	
73	16-Aug-2007	-,gO:-,RX		W	GL US	
						not seen during winter period, but wintered here first season and returned second season; possible mortality
74	5-Sep-2007	Gf,RB:-,-		M or W (?)	GP US	
75	5-Sep-2007	-,gO:-,RX		W	GL US	
76	16-Sep-2007	Gf,RB:-,-		M or W (?)	GP US	
77	16-Sep-2007	-,gO:-,RX		W	GL US	
78	25-Sep-2007	Gf,RB:-,-		M or W (?)	GP US	
79	25-Sep-2007	-,gO:-,RX		W	GL US	
80	6-Oct-2007	Y/L,X:O,RB		W	GP C	
81	6-Oct-2007	Gf,RB:-,-		M or W (?)	GP US	
82	6-Oct-2007	-,gO:-,RX		W	GL US	
83	15-Oct-2007	Y/L,X:O,RB		W	GP C	
84	15-Oct-2007	Gf,RB:-,-		M or W (?)	GP US	
85	15-Oct-2007	-,gO:-,RX		W	GL US	
86	26-Oct-2007	Y/L,X:O,RB		W	GP C	
87	26-Oct-2007	Gf,RB:-,-		M or W (?)	GP US	
88	26-Oct-2007	-,gO:-,RX		W	GL US	
89	7-Nov-2007	Y/L,X:O,RB		W	GP C	
90	7-Nov-2007	Gf,RB:-,-		M or W (?)	GP US	
91	7-Nov-2007	-,gO:-,RX		W	GL US	
92	16-Nov-2007	Y/L,X:O,RB		W	GP C	

#	Date	Bands	Band #	M or W	Pop.	Comments
93	16-Nov-2007	Gf,RB:-,-		M or W (?)	GP US	
94	16-Nov-2007	-,gO:-,RX		W	GL US	
95	27-Nov-2007	Y/L,X:O,RB		W	GP C	
96	27-Nov-2007	-,gO:-,RX		W	GL US	
97	19-Dec-2007	Y/L,X:O,RB		W	GP C	
98	19-Dec-2007	-,gO:-,RX		W	GL US	
99	15-Jan-2008	Y/L,X:O,RB		W	GP C	
100	15-Jan-2008	-,gO:-,RX		W	GL US	
101	16-Feb-2008	Y/L,X:O,RB		W	GP C	
102	16-Feb-2008	-,gO:-,RX		W	GL US	
103	16-Feb-2008	X,b:Of,OG		W	GL US	
104	5-Mar-2008	[Y/L],X:O,RB		W	GP C	missing Y/L band
105	5-Mar-2008	O,-:b,-		M	At US	
106	5-Mar-2008	-,g:X,b	g010	M or W (?)	GL US	also used Morris Island; wintering bird if November is considered wintering
107	5-Mar-2008	-,gO:-,RX		W	GL US	
108	14-Mar-2008	[Y/L],X:O,RB		W	GP C	missing Y/L band
109	14-Mar-2008	-,g:X,b		M or W (?)	GL US	numbers on plastic band
110	14-Mar-2008	-,gO:-,RX		W	GL US	
111	26-Mar-2008	[Y/L],X:O,RB		W	GP C	missing Y/L band
112	26-Mar-2008	-,g:X,b	g010	M or W (?)	GL US	010 visible in scope
113	26-Mar-2008	-,gO:-,RX		W	GL US	
114	26-Mar-2008	X,b:Of,OG		W	GL US	
115	16-Apr-2008	[Y/L],X:O,RB		W	GP C	missing Y/L band

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Bird Key Stono from 2006-2008 are presented in **Table 52**.

Table 52. Bird Key Stono shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
11-Jul-2006	L	F	1	17	6	0	0
16-Jul-2006	L	R	1	16	7	0	0
27-Jul-2006	H	R	8	30	0	0	1
6-Aug-2006	H	F	11	33	1	0	0
16-Aug-2006	M	F	10	25	10	0	1
28-Aug-2006	L	R	10	22	1	0	0
7-Sep-2006	L	R	8	5	0	0	1
16-Sep-2006	H	R	15	1	27	0	0
26-Sep-2006	L	F	15	0	0	0	0
7-Oct-2006	H	F	13	0	1	0	0
16-Oct-2006	L	R	8	0	0	5	0
25-Oct-2006	L	R	7	0	0	0	0
5-Nov-2006	M	R	10	0	0	28	0
17-Nov-2006	M	F	7	0	0	39	0
25-Nov-2006	H	R	8	0	1	28	0
17-Dec-2006	M	F	7	0	4	13	0
19-Jan-2007	H	F	8	0	4	7	0
15-Feb-2007	M	R	8	0	2	11	0
6-Mar-2007	L	R	13	3	4	459	0
15-Mar-2007	H	F	17	7	8	264	0
28-Mar-2007	H	R	0	6	8	152	0
5-Apr-2007	H	R	2	3	8	232	3
14-Apr-2007	H	F	12	5	8	148	0
27-Apr-2007	H	F	5	3	8	222	1
10-Jul-2007	H	F	0	43	10	3	7
15-Jul-2007	H	R	1	15	9	8	4
25-Jul-2007	H	R	2	57	15	5	3
6-Aug-2007	H	R	9	43	4	0	3
16-Aug-2007	M	R	10	47	2	0	3
24-Aug-2007	H	R	9	17	16	0	1
5-Sep-2007	L	F	12	7	0	0	0
16-Sep-2007	M	R	12	5	0	0	0
25-Sep-2007	M	R	11	6	23	0	0
6-Oct-2007	M	R	10	1	0	0	0
15-Oct-2007	M	F	12	0	0	11	0
26-Oct-2007	M	R	9	0	0	16	0
7-Nov-2007	H	R	9	1	0	14	0
16-Nov-2007	M	R	8	0	0	5	0
27-Nov-2007	H	R	8	0	0	50	1
19-Dec-2007	L	F	7	1	0	12	0
15-Jan-2008	M	F	7	0	2	0	0
16-Feb-2008	H	F	9	4	6	11	0
5-Mar-2008	M	F	10	4	0	45	0
14-Mar-2008	H	F	9	11	7	189	0
26-Mar-2008	H	R	11	7	6	2	0
6-Apr-2008	H	R	0	6	10	0	5
16-Apr-2008	H	R	2	6	10	0	0
25-Apr-2008	L	F	0	10	8	11	0

30. Kiawah Island North

County: Charleston

Survey Area: Designated critical habitat unit on the river, lagoon, and ocean beaches; interior tidal creek areas of the unit were not surveyed.

Critical Habitat Designation: Unit SC-9, Stono Inlet.

Habitat Conditions: A developed island, though north of the golf course is undeveloped. A large tidal lagoon provides high quality feeding habitat in the interior. A roosting area exists between the lagoon and the ocean beach.

Habitat Modifications: In 2006, the lagoon inlet was artificially closed and a new inlet opened to the north; sand was placed where the old inlet had been and to the south, widening the beach in front of the new club house. Small dunes also were constructed.

Management Measures: A large sign is posted at the south end of the unit indicating the area is critical habitat and multiple smaller signs are posted indicating the dog restriction. Recreational off road vehicles are prohibited from the critical habitat area. Dogs are prohibited from the lagoon area year-round and allowed on the ocean front beach only on a leash (Jim Jordan, pers. comm. 2007).

Comments: Due to the location of the inlet for the lagoon, the area had to be surveyed in two sections, with the southern part accessed by vehicle from the south for a foot survey of the lagoon area and a vehicle survey for the southern part of the unit; the northern part of the unit was accessed by boat from the Stono River or the lagoon inlet (depending on conditions) for a foot survey. Survey results are listed by whether the observation was on the north or south side of the inlet.

Due to movements across the inlet, it is possible that shorebirds may have been double counted or under counted at this location; for example, one banded Piping Plover was seen on one day at surveys on both sides of the inlet.

During the 2006-2007 survey season, the lagoon provided high quality feeding habitat for Piping Plovers and this location is one of the top four in the state for Piping Plover. In addition, artificially closing the lagoon inlet created a large area of open sand habitat that provides nesting habitat for colonial waterbirds. However, it is unclear whether the modifications will result in changes to total area of intertidal feeding habitat or the low energy substrates that are available for Piping Plovers and other shorebirds.

Banded birds utilizing this area also use Bird Key Stono; two banded birds that wintered at the north end of Kiawah also were observed on the south end of the island in one survey and one banded bird was observed once on Deveaux Bank but then returned.

The imagery for the GIS map of Kiawah Island North was taken before the inlet was artificially moved east; thus, the inlet location on the GIS map does not represent the location at the time of the surveys.

The count for Red Knots on 6 April 2007 represents a conservative estimate based on the size of two separate, similarly sized flocks. This area was the most important in the state for Red Knots, based on winter and spring migration numbers.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Kiawah Island North, North of Inlet are presented in **Figure 86 and 87**; their locations on are presented in **Figure 88**.

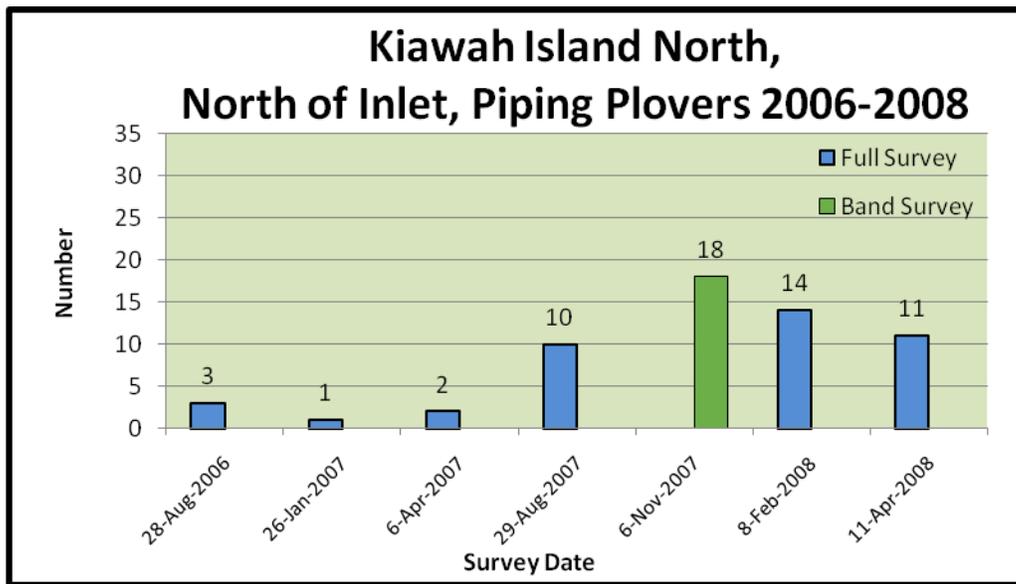


Figure 86. Kiawah Island North, North of Inlet, Piping Plover observations.

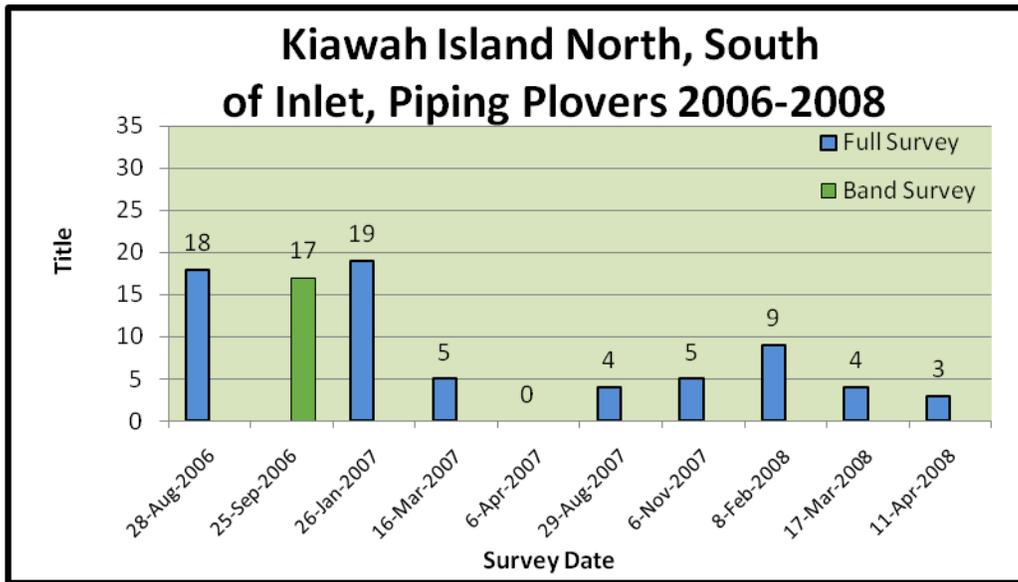


Figure 8747. Kiawah Island North, South of Inlet, Piping Plover observations.

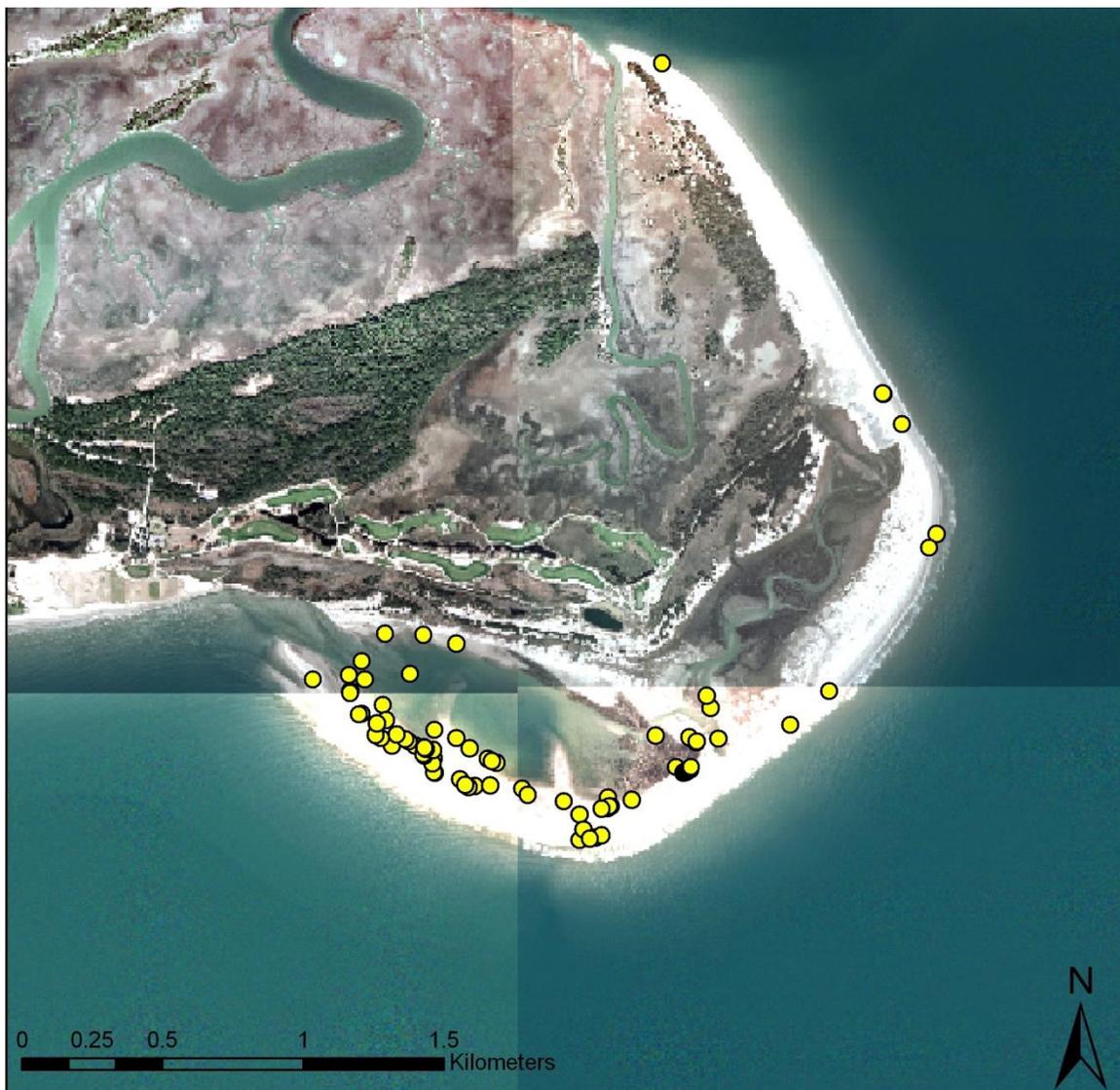


Figure 48. Kiawah Island North all Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Kiawah Island North are presented in **Table 53**.

Table 53. Kiawah Island North all Piping Plover band observations.

#	Date	Location	Bands	Band #	M or W	Pop.	Comments
1	28-Aug-2006	S of Inlet	- ,WA:Gf,GL		W	GP US	Also used Kiawah S
2	28-Aug-2006	S of Inlet	Lf,B:X,OR		W	GP C	Also used Kiawah S and Deveaux
3	28-Aug-2006	S of Inlet	O,-:X,R		W	GL US	Also used Bird Key Stono and Folly South
4	28-Aug-2006	N of Inlet	O,-:X,R		W	GL US	
5	25-Sep-2006	S of Inlet	- ,WA:Gf,GL		W	GP US	
6	25-Sep-2006	S of Inlet	Lf,B:X,OR		W	GP C	
7	26-Jan-2007	N of Inlet	O,-:X,R		W	GL US	
8	26-Jan-2007	S of Inlet	- ,WA:Gf,GL		W	GP US	
9	26-Jan-2007	S of Inlet	Lf,B:X,OR		W	GP C	
10	26-Jan-2007	S of Inlet	X,b:Of,OG		W	GL US	Also used Bird Key Stono and Folly Beach South
11	29-Aug-2007	N of Inlet	Lf,B:X,OR		W	GP C	
12	29-Aug-2007	N of Inlet	X,b:Of,OG		W	GL US	
13	29-Aug-2007	S of Inlet	X,L:O,L	L001	M	GL US	
14	6-Nov-2007	N of Inlet	Lf,B:X,OR		W	GP C	
15	6-Nov-2007	N of Inlet	O,-:X,R		M or W?	GL US	Matches non- unique combination of wintering bird from first season but combination seen once second season (multiple first season observations); migrant if December is used and wintering if November is used
16	6-Nov-2007	N of Inlet	X,b:Of,OG		W	GL US	
17	8-Feb-2008	N of Inlet	Lf,B:X,OR		W	GP C	
18	8-Feb-2008	N of Inlet	X,b:Of,OG		W	GL US	
19	17-Mar-2008	S of Inlet	-,Ob:X,b		M	GL US	
20	17-Mar-2008	S of Inlet	Lf,B:X,OR		W	GP C	
21	11-Apr-2008	N of Inlet	Lf,B:X,OR		W	GP C	
22	11-Apr-2008	N of Inlet	X,b:Of,OG		W	GL US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Kiawah Island North from 2006-2008 are presented in **Table 54**.

Table 54. Kiawah Island North all shorebird observations.

Date	Location	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
28-Aug-2006	N of Inlet	L	F	3	0	0	0	0
26-Jan-2007	N of Inlet	H	R	1	0	6	0	0
6-Apr-2007	N of Inlet	M	F	2	0	2	470	0
29-Aug-2007	N of Inlet	H	F	10	14	4	0	2
8-Feb-2008	N of Inlet	M	F	14	1	9	48	1
11-Apr-2008	N of Inlet	M	F	11	6	4	692	6
28-Aug-2007	S of Inlet	H	F	18	68	0	0	1
26-Jan-2007	S of Inlet	H	F	19	5	0	127	2
16-Mar-2007	S of Inlet	M	R	5	14	0	NC	0
6-Apr-2007	S of Inlet	H	R	0	21	8	1500	0
6-Nov-2007	S of Inlet	L	R	5	2	0	0	0
8-Feb-2008	S of Inlet	H	R	9	0	0	101	0
17-Mar-2008	S of Inlet	L	R	4	7	1	0	1
11-Apr-2008	S of Inlet	L	F	3	6	1	0	9

31. Kiawah Island Center

County: Charleston

Survey Area: Ocean beach between the critical habitat units SC-9 and SC-10.

Critical Habitat Designation: None.

Habitat Conditions: An island with residential and commercial development; the ocean beach is relatively flat providing feeding habitat at low tide; roosting habitat exists but is limited in width in certain areas.

Habitat Modifications: Artificial dune construction in certain areas.

Management Measures: Dogs are allowed off leash year-round in a 0.9 kilometer area at the south end and a 2.1 kilometer area at the north end (Jim Jordan, pers. comm. 2007).

Comments: While the ends of the island are higher quality habitat and receive the majority of use during the wintering period, the ocean beach can have moderately high levels of use during spring migration, as shown by the result of 22 birds on 16 March 2007. Areas of this beach can have high human disturbance levels.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Kiawah Island Center are presented in **Figure 89**; their locations on are presented in **Figure 90**.

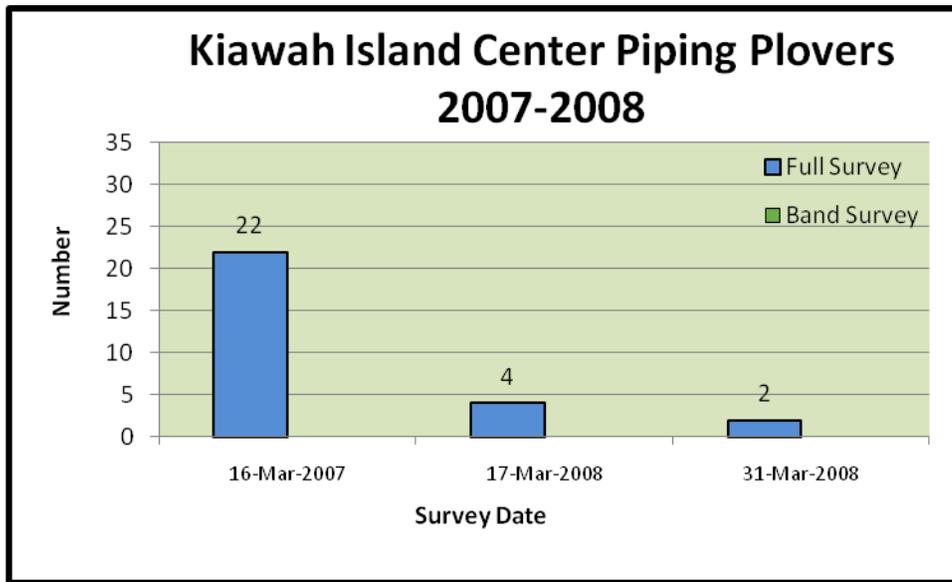


Figure 49. Kiawah Island Center Piping Plover observations, 2007-2008.

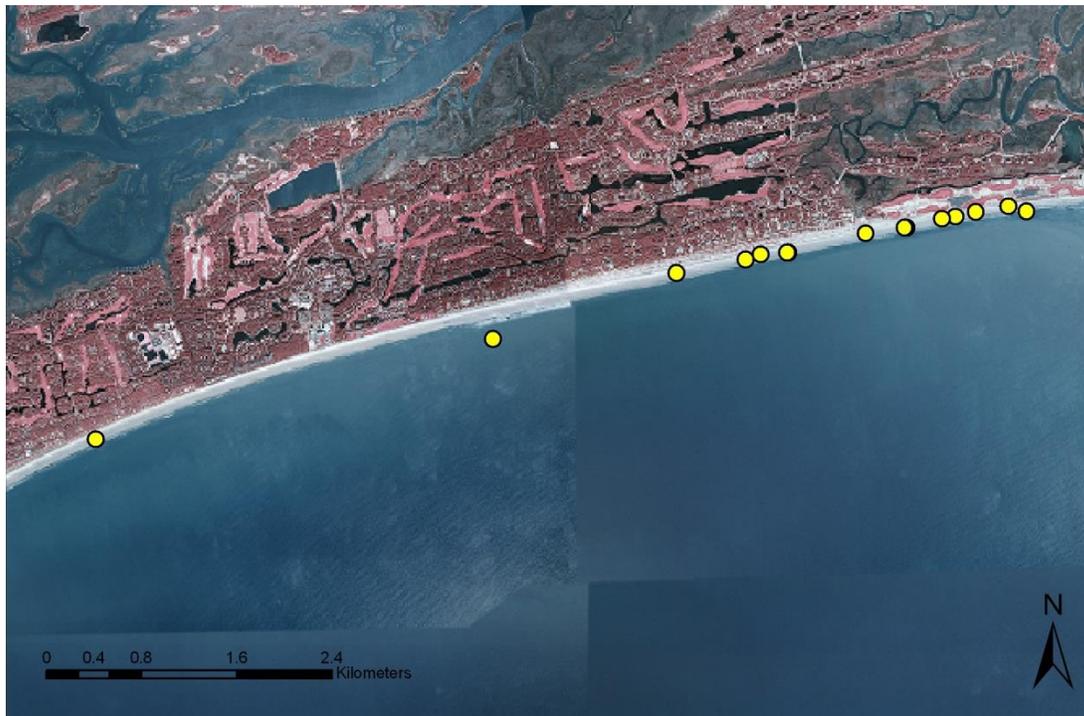


Figure 90. Kiawah Island Center Piping Plover locations, 2007-2008.

Kiawah Island Center Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Kiawah Island Center from 2006-2008 are presented in **Table 55**.

Table 55. Kiawah Island Center shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
16-Mar-2007	NR	NR	22	0	0	0	0
17-Mar-2008	L	R	4	0	0	0	0
31-Mar-2008	M	R	2	0	0	0	0

32. Kiawah Island South

County: Charleston

Survey Area: The designated critical habitat unit, which “runs from just 0.16 km (0.10 mi) north of Captain Sams Inlet to the southwest approximately 3.4 km (2.1 mi) along the Atlantic Ocean shoreline. It includes land areas from the MLLW on the Atlantic Ocean to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36093-36094). Note: this verbal description of the critical habitat boundary appears to be based on the old location of Captain Sams Inlet; based on the USFWS DDQ maps, the survey started just north of the County Park and ended on the river side at the existing inlet location.

Critical Habitat Designation: Unit SC-10, Seabrook Island.

Habitat Modifications: Captain Sam’s Inlet was relocated to the north and the inlet was closed in 1996 (Jim Jordan, pers. comm. 2007).

Management Measures: A large sign indicates the critical habitat area and that dogs are required to be on leash; a leash is required for approximately the southern 1.6 kilometers of beach. Recreational vehicle use is not allowed. There is a 0.9 kilometer area to the north where dogs are allowed off leash year-round (Jim Jordan, pers. comm. 2007).

Comments: The northern section of this survey area can have very high human disturbance levels during fall migration; in addition, use of bicycles allows people quick access to the high quality habitat at the inlet even though this area is more remote. While dogs off-leash are prohibited at the inlet, there is a concern about dogs off leash at this location. At low tide, people walking along the water may not see the sign, which is placed near the high tide line.

Because of movements across Captain Sam’s Inlet, it would be easy to miss Piping Plovers using this inlet complex if surveys were limited to one side of the inlet. In addition, at least limited movements between Deveaux Banks and Kiawah exist. One Great Lakes bird that wintered at Deveaux Bank, -bO:X,Y, was observed on 31 March 2008 at Kiawah South and a fall migrant that used Deveaux Bank also was observed at the south end of Kiawah Island.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Kiawah Island South are presented in **Figure 91**; their locations on are presented in **Figure 92**.

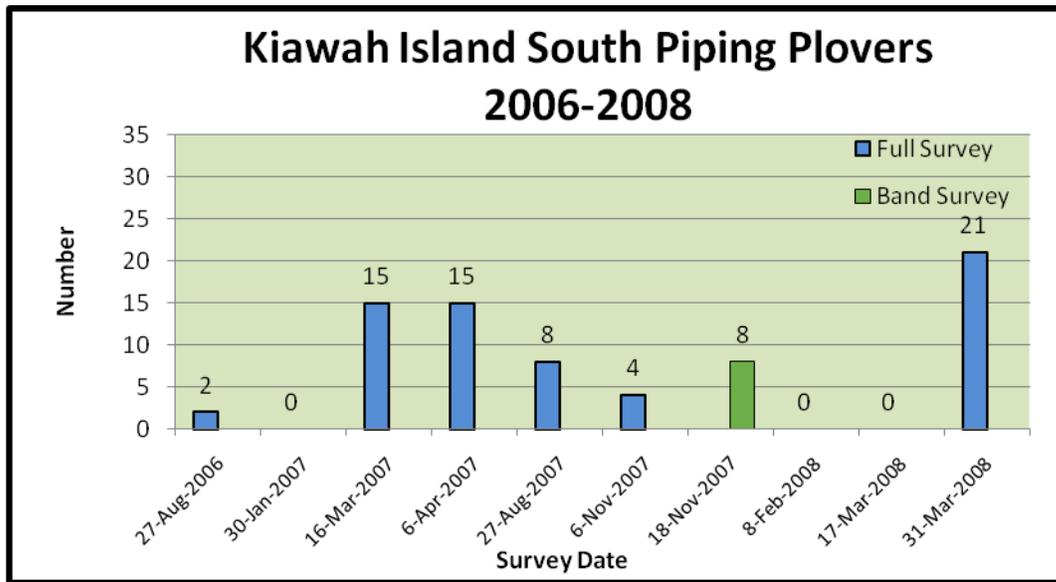


Figure 91. Kiawah Island South Piping Plover observations.

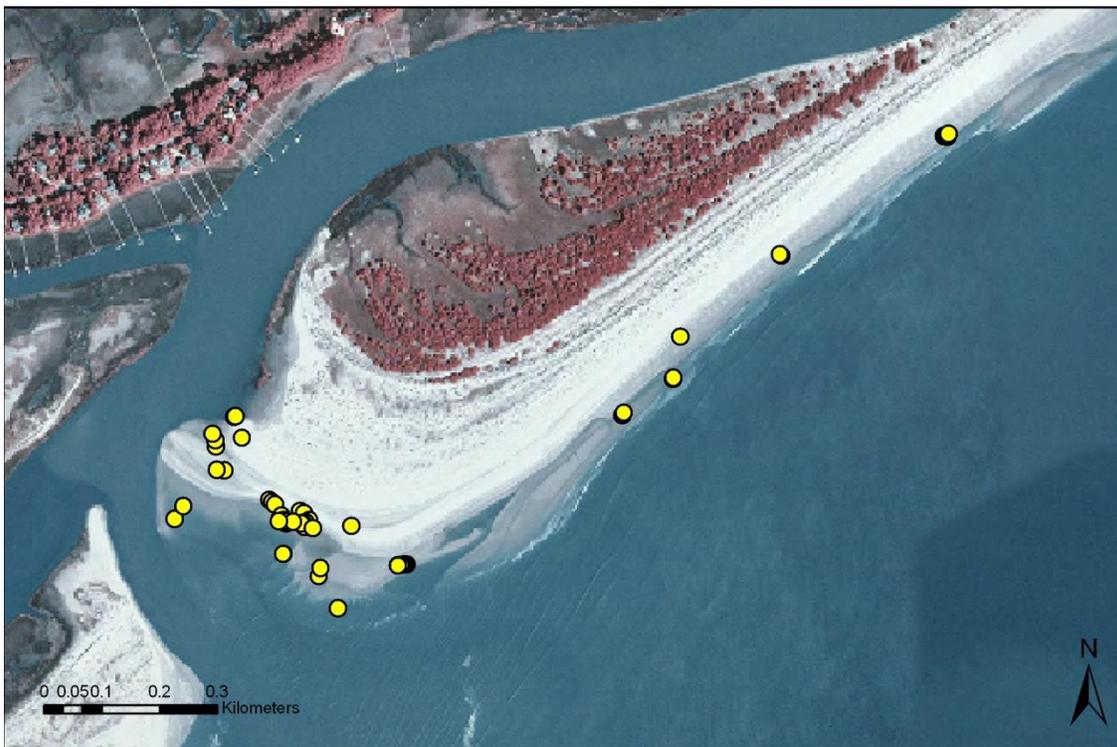


Figure 92. Kiawah Island South Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Kiawah Island South are presented in **Table 56**.

Table 56. Kiawah Island South Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	6-Apr-2007	-,WA:Gf,GL		W	GP US	Wintered at north end of Kiawah
2	6-Apr-2007	Lf,B:X,OR		W	GP C	Wintered at north end of Kiawah
3	27-Aug-2007	O,R:X,R	R007	M (W)	GL US	Fledgling; seen as a migrant at Deveaux and a wintering bird at Hunting/Harbor Islands
4	18-Nov-2007	-,g:X,g/O/g	g016	M or W	GL US	Wintering if December is winter; migrant if November is winter
5	31-Mar-2008	-,bO:X,Y		W	GL US	Wintered at Deveaux

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Kiawah Island South from 2006-2008 are presented in **Table 57**.

Table 57. Kiawah Island South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
27-Aug-2006	L	F	2	1	3	0	4
30-Jan-2007	H	R	0	1	1	43	0
16-Mar-2007	M	R	15	3	2	NR	0
6-Apr-2007	H	R	15	3	0	0	0
27-Aug-2007	H	F	8	0	8	0	2
6-Nov-2007	L	F	4	0	0	0	0
8-Feb-2008	L	F	0	0	0	0	0
17-Mar-2008	L	R	0	7	0	0	0
31-Mar-2008	M	R	21	2	1	0	3

33. Seabrook North

County: Charleston

Survey Area: The critical habitat unit “runs from just 0.16 km (0.10 mi) north of Captain Sams Inlet to the southwest approximately 3.4 km (2.1 mi) along the Atlantic Ocean shoreline. It includes land areas from the MLLW on the Atlantic Ocean to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36093-36094). Note: this verbal description of the critical habitat boundary appears to be based on the old location of Captain Sams Inlet. On the ground, the survey started at the ORV ramp and went north to the inlet, including the interior pond and lagoon and unvegetated flats.

Critical Habitat Designation: Unit SC-10, Seabrook Island

Habitat conditions: A developed island, though the area within critical habitat unit is undeveloped. In the first season, roosting habitat was limited at high tide in part of the unit due to high tide being against the artificial dune, but in the second season, the breach of the artificial dune increased roosting habitat. The relatively flat beach slope results in a wide intertidal area at low tide; there also are extensive ebb bars at Captain Sam’s Inlet. The interior of the lagoon provides low energy mud/sand and mud substrates.

Habitat Modifications: Captain Sam’s Inlet was artificially relocated to the north in 1996; an artificial dune that blocks overwash and facilitates vegetative succession was rebuilt during the 2006-07 winter season but breached again in the summer of 2007.

Management Measures: The designated dog off leash area is located within the critical habitat area.

Comments: The soft stabilization effort (artificial berm) has degraded the quality of the habitat; however, existing habitat values are still higher at this location that the number of Piping Plovers would suggest. Human disturbance can be high at this location and the location of the dog off leash area inside critical habitat is a serious concern. Dogs off-leash were observed chasing shorebirds at this location.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Seabrook North are presented in **Figure 93**; their locations on are presented in **Figure 94**.

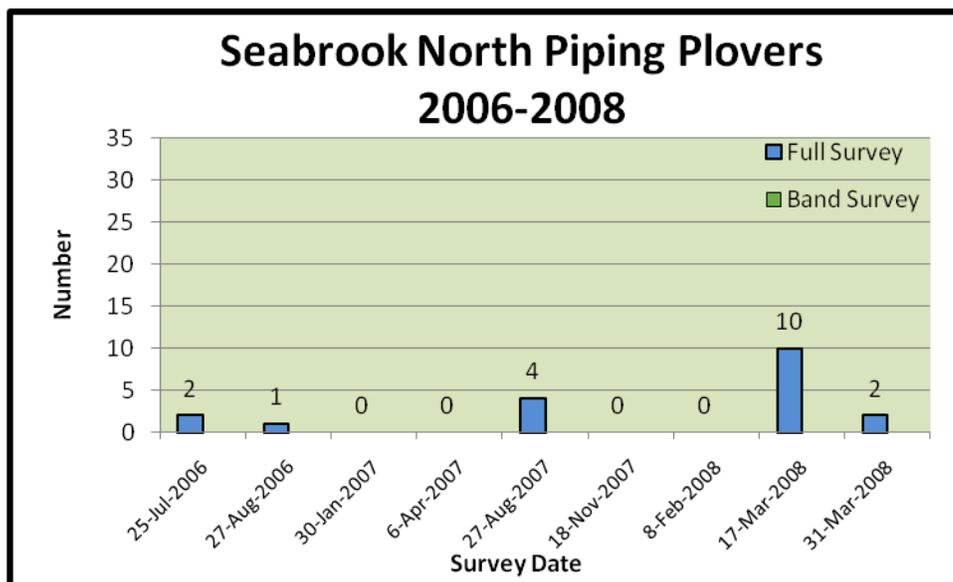


Figure 93. Seabrook North Piping Plover observations, 2006-2008.

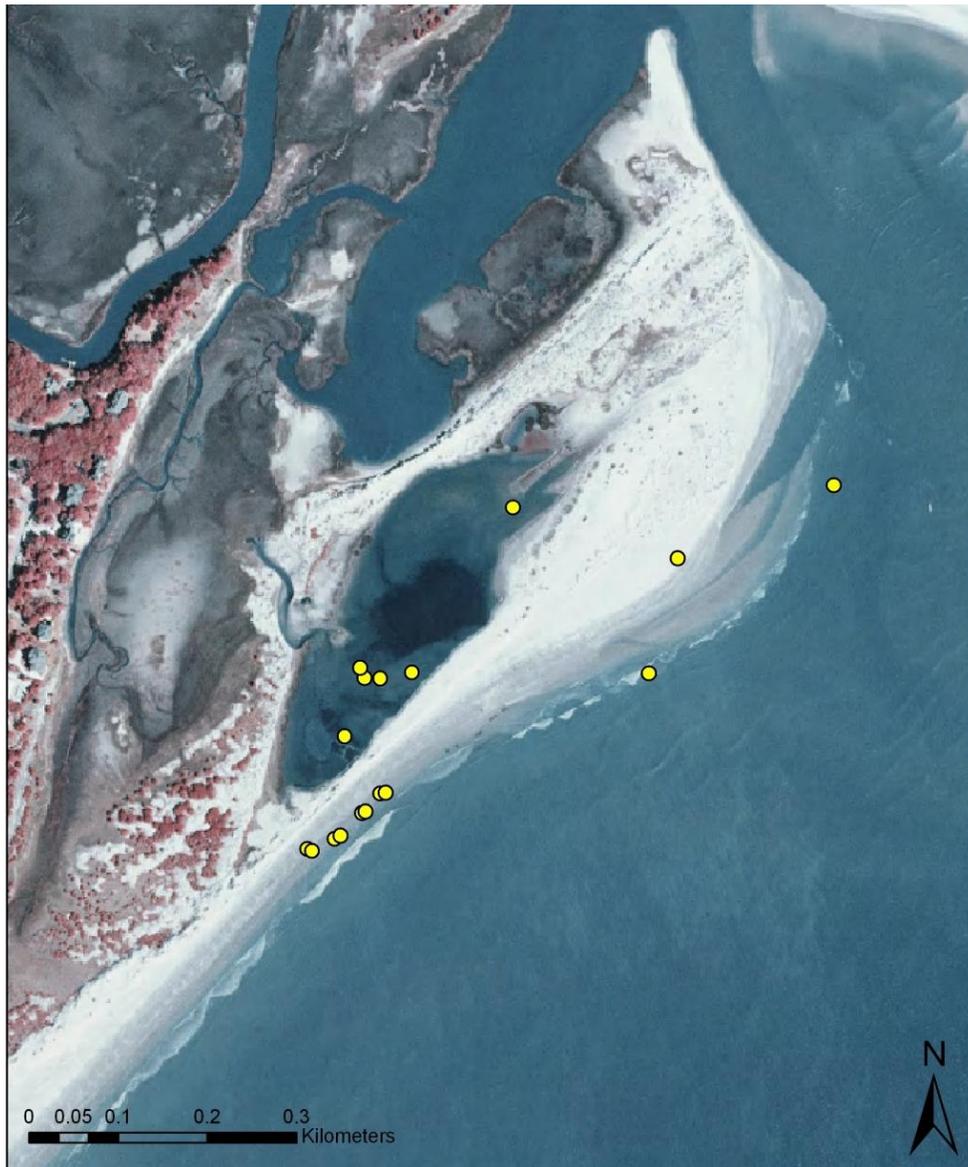


Figure 50. Seabrook North Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Seabrook North are presented in **Table 58**.

Table 58. Seabrook North Piping Plover band observations.

#	Date	Bands	Band #	M or W	Population	Comments
1	25-Jul-2006	-,O:X,O/b		M	GL US	orange tape partially fallen off on one side (similar to what was later seen at Deveaux)
2	27-Aug-2007	O,R:X,R	0[??]	M or W (?)	GL US	Non-unique band combination and partial number observations here match bird seen at Kiawah South and Deveaux as a migrant and Harbor/Hunting as a wintering bird

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Seabrook North from 2006-2008 are presented in **Table 59**.

Table 59. Seabrook North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
25-Jul-2006	L	NR	2	0	30	0	0
27-Aug-2006	M	F	1	0	1	0	4
30-Jan-2007	M	R	0	0	0	0	0
6-Apr-2007	H	R	0	0	2	0	0
27-Aug-2007	M	F	4	7	1	0	15
18-Nov-2007	L	R	0	0	1	0	0
8-Feb-2008	L	R	0	0	0	5	0
17-Mar-2008	L	F	10	4	2	0	1
31-Mar-2008	L	R	2	3	2	0	0

34. Deveaux Bank

County: Charleston

Survey Area: The unvegetated area of the entire island, though colonial waterbird nesting areas were not entered during the breeding season but were observed from outside of the area to avoid impacts to nesting waterbirds.

Critical Habitat Designation: Unit SC-11, Deveaux Bank

Habitat Conditions: An undeveloped ebb bar island. Extensive flats are exposed at low tide, including excellent quality low energy mud/sand substrates inside a recurved spit on the southwest side of the island. Roosting habitat can be limited during higher high tides or storms due to vegetative succession in the higher parts of the island, though at moderate or low high tides, the spit at the southwest side of the island provides high quality roosting habitat.

Habitat Modifications: None observed.

Management Measures: This area is managed by SCDNR. Dogs are prohibited year-round. Except for two small designated areas on the west side of the island, the area of the island above the high tide line is closed to public entry year-round. The island is well posted with large signs and multiple small signs indicating the closure area.

Comments: One of the top four locations in the state for Piping Plovers. The majority of the highest quality Piping Plover roosting and feeding habitat is outside of the closure area. There were instances during the summer months when human disturbance could pose a risk to nesting shorebirds or colonial waterbirds due to the lack of adequate minimum buffer distances for nests

that were located near the high tide line. However, in non-summer months, observed disturbance was low or nonexistent.

This location is accessible by boat only. For safety reasons, only mariners with local knowledge of the area should attempt to land due to numerous large, shifting sandbars, limited safe anchor locations, and a high tidal range.

One wintering banded bird from this location also was observed at the south end of Kiawah Island in the spring of 2008. In addition, a fall migrant that used Deveaux Bank also was observed at the south end of Kiawah Island. While movement was not documented between Deveaux Bank and Botany Bay Island, this could be due to the lack of surveys at Botany Bay and only one survey at Frampton Island. Future survey efforts should consider the possibility of movements from Deveaux Bank to Botany Bay, Seabrook, or Kiawah islands, especially during higher high tide levels when roosting habitat is limited on Deveaux Bank.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Deveaux Bank are presented in **Figure 95 and 96**; their locations on are presented in **Figure 97**.

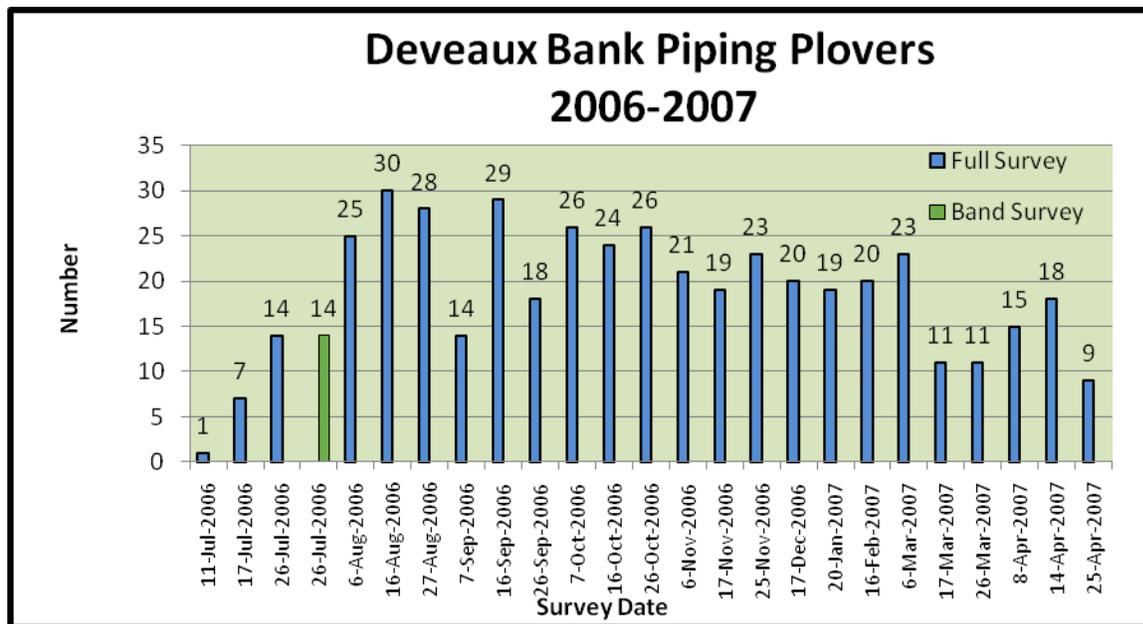


Figure 51. Deveaux Bank Piping Plover observations, 2006-2007.

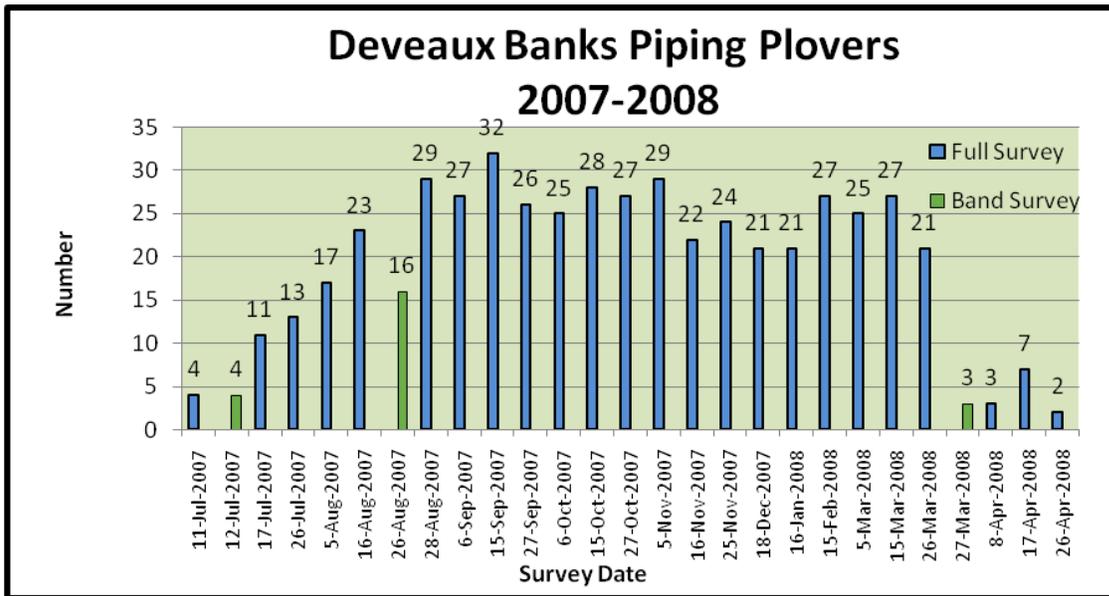


Figure 52. Deveaux Bank Piping Plover observations, 2007-2008.

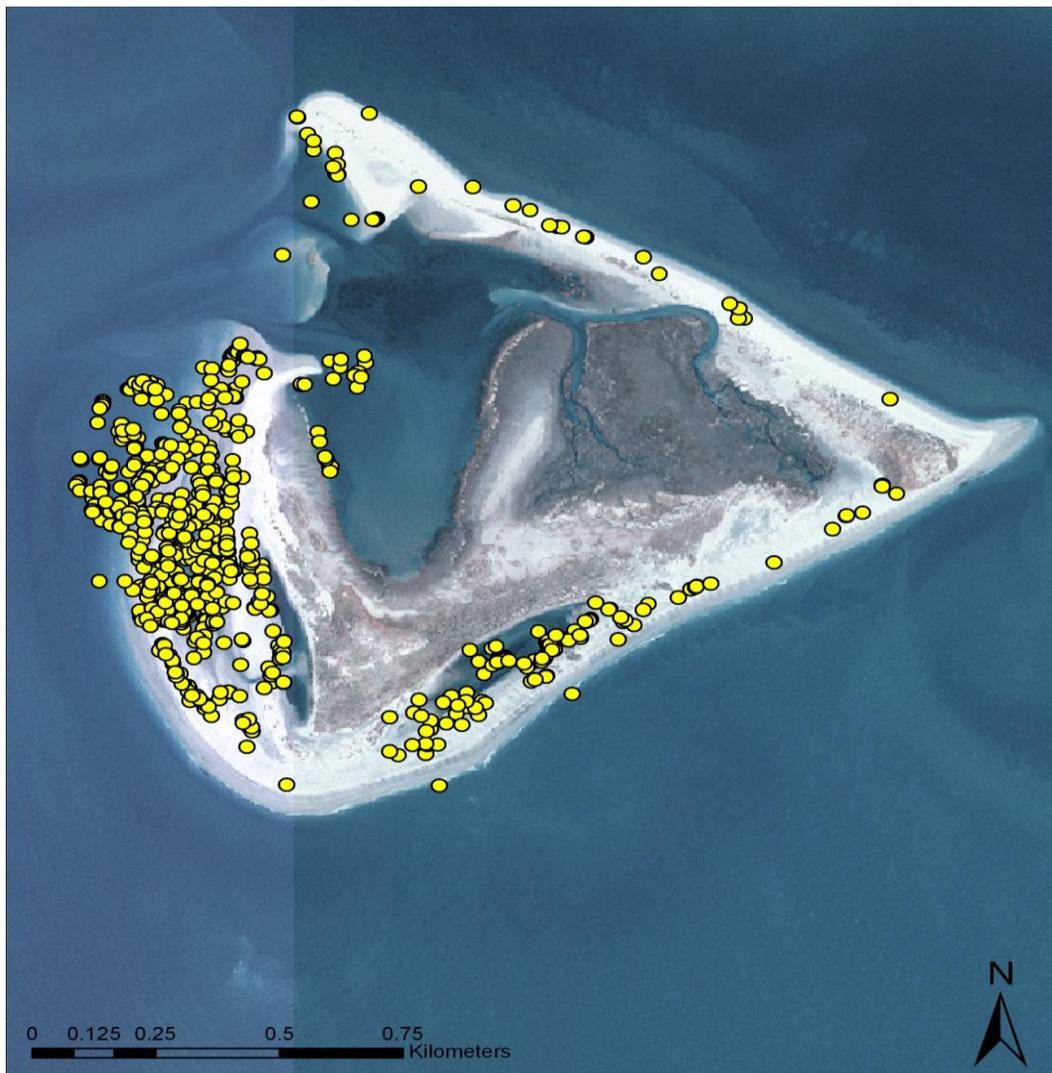


Figure 53. Deveaux Bank Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Cedar Island North are presented in **Table 60**.

Table 60. Deveaux Bank Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	17-Jul-2006	-,bO:X,Y		W	GL US	
2	17-Jul-2006	X,L/O:-,-		W	GL US	
3	17-Jul-2006	X,R:-,Ob		W	GL US	
4	26-Jul-2006	-,-:X,b/O	9 on top left, 766 on bottom left	M	GL US	
5	26-Jul-2006	-,X:-,-			UK	
6	26-Jul-2006	N,N:N,BY			UK	partial match to X,O:-,BY
7	26-Jul-2006	N,Y:N,YO			UK	partial match to X,Y:Of,YO
8	26-Jul-2006	Of,GY:X,G		W	GL US	
9	26-Jul-2006	X,L/O:-,-		W	GL US	
10	26-Jul-2006	X,O:-,-		W	UK	missing part of right tarsus; bird walking/feeding okay; probable Great Lakes (orange tape)
11	26-Jul-2006	-,bO:X,Y		W	GL US	
12	26-Jul-2006	-,X:-,-			UK	
13	26-Jul-2006	Of,GY:X,G		W	GL US	
14	26-Jul-2006	X,L/O:-,-		W	GL US	
15	26-Jul-2006	X,O:-,-		M	UK	Probable Great Lakes (orange tape)
16	26-Jul-2006	X,R:-,Ob		W	GL US	
17	26-Jul-2006	X,Y:Of,YO		M/W	GL US	seen as a migrant at Deveaux; wintered at Huntington Beach SP/Garden City South
18	6-Aug-2006	-,-:X,b/O	top row left side 9, bottom row left side 76	M	GL US	
19	6-Aug-2006	-,-:X,Y		M	UK	
20	6-Aug-2006	-,bO:X,Y		W	GL US	
21	6-Aug-2006	-,O:X,b		M	GL US	
22	6-Aug-2006	-,X:-,-	top ends 01		UK	
23	6-Aug-2006	N,N:X,O			UK	Tarsus broken off midpoint; bird having a harder time feeding (fell several times); orange tape
24	6-Aug-2006	Of,gO:X,g		M	GL US	
25	6-Aug-2006	Of,GY:X,G		W	GL US	
26	6-Aug-2006	X,L/O:-,-		W	GL US	
27	6-Aug-2006	X,O:-,BY		W	GL US	
28	6-Aug-2006	X,R:-,Ob		W	GL US	

#	Date	Bands	Band #	M or W	Pop.	Comments
29	6-Aug-2006	X,Y:Of,YO		M/W	GL US	
30	16-Aug-2006	-, -:X,b/O		M	GL US	
31	16-Aug-2006	-,bO:X,Y		W	GL US	
32	16-Aug-2006	-,O:X,O/b	981-766[]0(?)	M	GL US	
33	16-Aug-2006	-,X:-,-			UK	
34	16-Aug-2006	Of,gO:X,g		M	GL US	
35	16-Aug-2006	Of,GY:X,G		W	GL US	
36	16-Aug-2006	X,L/O:-,-		W	GL US	
37	16-Aug-2006	X,O:-,BY		W	GL US	
38	16-Aug-2006	X,R:-,Ob		W	GL US	
39	16-Aug-2006	X,Y:Of,YO		M/W	GL US	
40	27-Aug-2006	-,bO:X,Y		W	GL US	
41	27-Aug-2006	-,O:X,O/b			GL US	bird missing part of O tape
42	27-Aug-2006	-,X:-,-			UK	
43	27-Aug-2006	Of,gO:X,g		M	GL US	
44	27-Aug-2006	Of,GY:X,G		W	GL US	
45	27-Aug-2006	X,L/O:-,-		W	GL US	
46	27-Aug-2006	X,O:-,-		M	UK	missing part of right tarsus; probable Great Lakes
47	27-Aug-2006	X,O:-,BY		W	GL US	
48	27-Aug-2006	X,R:-,Ob		W	GL US	
49	27-Aug-2006	X,R:O,-		W	GL US	bands corrected from picture
50	27-Aug-2006	X,Y:Of,YO		M/W	GL US	
51	7-Sep-2006	-,O:X,O/b			GL US	missing part of O tape (similar to previous bird)
52	7-Sep-2006	-,X:-,-			UK	
53	7-Sep-2006	X,L/O:-,-		W	GL US	
54	7-Sep-2006	X,O:-,BY		W	GL US	
55	7-Sep-2006	X,R:-,Ob		W	GL US	
56	16-Sep-2006	-, -:X,b/O		M	GL US	
57	16-Sep-2006	-,X:-,-			UK	
58	16-Sep-2006	Of,bL/O/L:X,g		W or M	GL US	wintering bird if November is winter; migrant if December is winter. Captive reared.
59	16-Sep-2006	Of,GY:X,G		W	GL US	
60	16-Sep-2006	X,L/O:-,-		W	GL US	
61	16-Sep-2006	X,O:-,-		M	UK	missing right foot (not seen but same as before); probable Great Lakes
62	16-Sep-2006	X,O:-,BY		W	GL US	
63	16-Sep-2006	X,R:O,-		W	GL US	
64	16-Sep-2006	X,Y:Of,YO		M/W	GL US	
65	26-Sep-2006	Of,GY:X,G		W	GL US	
66	26-Sep-2006	X,O:-,BY		W	GL US	
67	26-Sep-2006	X,R:O,-		W	GL US	
68	7-Oct-2006	-,bO:X,Y		W	GL US	
69	7-Oct-2006	Of,bL/O/L:X,g		W or M	GL US	
70	7-Oct-2006	Of,GY:X,G		W	GL US	

#	Date	Bands	Band #	M or W	Pop.	Comments
71	7-Oct-2006	X,L/O:-,-	old style, ends in 6693	W	GL US	
72	7-Oct-2006	X,O:-,BY		W	GL US	
73	7-Oct-2006	X,R:O,-		W	GL US	
74	16-Oct-2006	Of,bL/O/L:X,g		W or M	GL US	
75	16-Oct-2006	Of,GY:X,G		W	GL US	
76	16-Oct-2006	X,L/O:-,-		W	GL US	
77	16-Oct-2006	X,O:-,BY		W	GL US	
78	16-Oct-2006	X,R:-,Ob		W	GL US	
79	16-Oct-2006	X,R:O,-		W	GL US	
80	26-Oct-2006	-,bO:X,Y		W	GL US	
81	26-Oct-2006	-,X:-,-			UK	
82	26-Oct-2006	Of,bL/O/L:X,g		W or M	GL US	
83	26-Oct-2006	Of,GY:X,G		W	GL US	
84	26-Oct-2006	X,L/O:-,-		W	GL US	
85	26-Oct-2006	X,O:-,BY		W	GL US	
86	26-Oct-2006	X,R:-,Ob		W	GL US	
87	26-Oct-2006	X,R:O,-	new style, 195 top, 2638 bottom	W	GL US	
88	6-Nov-2006	-,bO:X,Y		W	GL US	
89	6-Nov-2006	N,R:N,Ob			UK	partial match to X,R:-,Ob
90	6-Nov-2006	Of,bL/O/L:X,g		W or M	GL US	
91	6-Nov-2006	Of,GY:X,G		W	GL US	
92	6-Nov-2006	X,L/O:-,-		W	GL US	
93	6-Nov-2006	X,O:-,BY		W	GL US	
94	6-Nov-2006	X,R:O,-		W	GL US	
95	17-Nov-2006	-,bO:X,Y		W	GL US	
96	17-Nov-2006	Of,bL/O/L:X,g		W or M	GL US	
97	17-Nov-2006	Of,GY:X,G		W	GL US	
98	17-Nov-2006	X,L/O:-,-		W	GL US	
99	17-Nov-2006	X,O:-,BY		W	GL US	
100	25-Nov-2006	-,bO:X,Y		W	GL US	
101	25-Nov-2006	Of,GY:X,G		W	GL US	
102	25-Nov-2006	X,L/O:-,-		W	GL US	
103	25-Nov-2006	X,R:O,-		W	GL US	
104	17-Dec-2006	Of,GY:X,G		W	GL US	
105	17-Dec-2006	X,L/O:-,-		W	GL US	
106	17-Dec-2006	X,R:O,-		W	GL US	
107	20-Jan-2007	-,bO:X,Y		W	GL US	
108	20-Jan-2007	Of,GY:X,G		W	GL US	
109	20-Jan-2007	X,L/O:-,-		W	GL US	
110	20-Jan-2007	X,O:-,BY		W	GL US	
111	20-Jan-2007	X,R:-,Ob		W	GL US	
112	16-Feb-2007	Of,GY:X,G		W	GL US	
113	16-Feb-2007	X,L/O:-,-		W	GL US	
114	16-Feb-2007	X,O:-,BY		W	GL US	
115	16-Feb-2007	X,R:-,Ob		W	GL US	
116	16-Feb-2007	X,R:O,-		W	GL US	
117	6-Mar-2007	-,bO:X,Y		W	GL US	
118	6-Mar-2007	Of,GY:X,G		W	GL US	

#	Date	Bands	Band #	M or W	Pop.	Comments
119	6-Mar-2007	X,L/O:-,-		W	GL US	
120	6-Mar-2007	X,O:-,BY		W	GL US	
121	6-Mar-2007	X,R:O,-		W	GL US	
122	17-Mar-2007	Of,GY:X,G		W	GL US	
123	17-Mar-2007	X,L/O:-,-		W	GL US	
124	17-Mar-2007	X,O:-,BY		W	GL US	
125	26-Mar-2007	-,bO:X,Y		W	GL US	
126	26-Mar-2007	Of,GY:X,G		W	GL US	
127	26-Mar-2007	X,L/O:-,-		W	GL US	
128	26-Mar-2007	X,O:-,BY		W	GL US	
129	26-Mar-2007	X,R:-,Ob		W	GL US	
130	8-Apr-2007	-,:-,X		M	UK	
131	8-Apr-2007	-,bO:X,Y		W	GL US	
132	8-Apr-2007	X,L/O:-,-		W	GL US	
133	8-Apr-2007	X,R:-,Ob		W	GL US	
134	14-Apr-2007	X,L/O:-,-		W	GL US	
135	14-Apr-2007	X,R:-,Ob		W	GL US	
136	14-Apr-2007	X,R:O,-		W	GL US	
137	25-Apr-2007	X,R:O,-		W	GL US	
138	11-Jul-2007	N,N:N,BY			UK	partial match to X,O:-,BY
139	11-Jul-2007	X,L/O:-,-		W	GL US	
140	11-Jul-2007	X,R:-,Ob		W	GL US	
141	12-Jul-2007	X,L/O:-,-		W	GL US	
142	12-Jul-2007	X,O:-,BY		W	GL US	
143	12-Jul-2007	X,R:-,Ob		W	GL US	
144	17-Jul-2007	-,bO:X,Y		W	GL US	
145	17-Jul-2007	-,GX:-,-		M	UK	matches Great Lakes but combination might be shared by other banders so listed as UK
146	17-Jul-2007	X,G:Of,OL		W	GL US	
147	17-Jul-2007	X,L/O:-,-		W	GL US	
148	17-Jul-2007	X,O:-,BY		W	GL US	
149	17-Jul-2007	X,R:-,Ob		W	GL US	
150	26-Jul-2007	-,bO:X,Y		W	GL US	
151	26-Jul-2007	X,G:Of,OL		W	GL US	
152	26-Jul-2007	X,O:-,BY		W	GL US	
153	26-Jul-2007	X,R:-,Ob		W	GL US	
154	5-Aug-2007	X,G/O/G:O,-	19[1-265][1	M	GL US	fledgling
155	5-Aug-2007	-,bO:X,Y		W	GL US	
156	5-Aug-2007	O,R:X,R	R007	W/M	GL US	fledgling; seen at Seabrook as a migrant and Hunting/Harbor Islands as a wintering bird
157	5-Aug-2007	X,G:Of,OL		W	GL US	
158	5-Aug-2007	X,L/O:-,-		W	GL US	
159	5-Aug-2007	X,O:-,BY		W	GL US	
160	5-Aug-2007	X,R:-,Ob		W	GL US	
161	16-Aug-2007	-,b:X,b		M	GL US	adult
162	16-Aug-2007	-,bO:X,Y		W	GL US	
163	16-Aug-2007	Of,GY:X,G		W	GL US	

#	Date	Bands	Band #	M or W	Pop.	Comments
164	16-Aug-2007	X,G:Of,OL		W	GL US	
165	16-Aug-2007	X,L/O:-,-		W	GL US	
166	16-Aug-2007	X,O:-,BY		W	GL US	
167	16-Aug-2007	X,R:-,Ob		W	GL US	
168	26-Aug-2007	N,R:N,R			UK	would match O,R:X,R, seen previously there.
169	26-Aug-2007	Of,N:N,N		W	GL US	would match Of,GY:X,G, known wintering bird
170	26-Aug-2007	X,O:-,BY		W	GL US	
171	28-Aug-2007	-,b:X,b		M	GL US	
172	28-Aug-2007	-,bO:X,Y		W	GL US	
173	28-Aug-2007	Of,GY:X,G		W	GL US	
174	28-Aug-2007	X,G:Of,OL		W	GL US	
175	28-Aug-2007	X,L/O:-,-		W	GL US	
176	28-Aug-2007	X,O:-,BY		W	GL US	
177	28-Aug-2007	X,R:-,Ob		W	GL US	
178	6-Sep-2007	-,b:X,b		M	GL US	
179	6-Sep-2007	-,bO:X,Y		W	GL US	
180	6-Sep-2007	Of,GY:X,G		W	GL US	
181	6-Sep-2007	X,G:Of,OL		W	GL US	
182	6-Sep-2007	X,L/O:-,-		W	GL US	
183	6-Sep-2007	X,R:-,Ob		W	GL US	
184	15-Sep-2007	-,b:X,b	new style. 19 top. 2 on left, possible 6, 35, appears to end in 0	M	GL US	
185	15-Sep-2007	-,bO:X,Y		W	GL US	
186	15-Sep-2007	Of,GY:X,G		W	GL US	
187	15-Sep-2007	X,G:Of,OL		W	GL US	
188	15-Sep-2007	X,L/O:-,-		W	GL US	
189	15-Sep-2007	X,O:-,BY		W	GL US	
190	15-Sep-2007	X,R:-,Ob		W	GL US	
191	27-Sep-2007	-,b:X,b		M	GL US	
192	27-Sep-2007	-,bO:X,Y		W	GL US	
193	27-Sep-2007	Of,GY:X,G		W	GL US	
194	27-Sep-2007	X,G:Of,OL		W	GL US	
195	27-Sep-2007	X,L/O:-,-		W	GL US	
196	27-Sep-2007	X,O:-,BY		W	GL US	
197	27-Sep-2007	X,R:-,Ob		W	GL US	
198	6-Oct-2007	-,b:X,b		M	GL US	
199	6-Oct-2007	Of,GY:X,G		W	GL US	
200	6-Oct-2007	X,G:Of,OL		W	GL US	
201	6-Oct-2007	X,L/O:-,-		W	GL US	
202	6-Oct-2007	X,O:-,BY		W	GL US	
203	6-Oct-2007	X,R:-,Ob		W	GL US	
204	15-Oct-2007	-,bO:X,Y		W	GL US	
205	15-Oct-2007	Of,GY:X,G		W	GL US	
206	15-Oct-2007	X,G:Of,OL		W	GL US	
207	15-Oct-2007	X,L/O:-,-		W	GL US	
208	15-Oct-2007	X,O:-,BY		W	GL US	

#	Date	Bands	Band #	M or W	Pop.	Comments
209	15-Oct-2007	X,R:-,Ob		W	GL US	
210	27-Oct-2007	-,bO:X,Y		W	GL US	
211	27-Oct-2007	-,g:X,g/O/g	g016	W or M	GL US	Wintering bird if November is winter; migrant if December is winter
212	27-Oct-2007	Of,GY:X,G		W	GL US	
213	27-Oct-2007	X,G:Of,OL		W	GL US	
214	27-Oct-2007	X,L/O:-,-		W	GL US	
215	27-Oct-2007	X,R:-,Ob		W	GL US	
216	5-Nov-2007	-,g:X,g/O/g			GL US	
217	5-Nov-2007	Of,GY:X,G		W	GL US	
218	5-Nov-2007	X,G:Of,OL		W	GL US	
219	5-Nov-2007	X,L/O:-,-		W	GL US	
220	5-Nov-2007	X,O:-,BY		W	GL US	
221	5-Nov-2007	X,R:-,Ob		W	GL US	
222	16-Nov-2007	-,bO:X,Y		W	GL US	
223	16-Nov-2007	Of,GY:X,G		W	GL US	
224	16-Nov-2007	X,G:Of,OL		W	GL US	
225	16-Nov-2007	X,L/O:-,-		W	GL US	
226	16-Nov-2007	X,O:-,BY		W	GL US	
227	16-Nov-2007	X,R:-,Ob		W	GL US	
228	25-Nov-2007	-,bO:X,Y		W	GL US	
229	25-Nov-2007	Of,GY:X,G		W	GL US	
230	25-Nov-2007	X,G:Of,OL		W	GL US	
231	25-Nov-2007	X,L/O:-,-		W	GL US	
232	25-Nov-2007	X,O:-,BY		W	GL US	
233	25-Nov-2007	X,R:-,Ob		W	GL US	
234	18-Dec-2007	-,bO:X,Y		W	GL US	
235	18-Dec-2007	Of,GY:X,G		W	GL US	
236	18-Dec-2007	X,G:Of,OL		W	GL US	
237	18-Dec-2007	X,L/O:-,-		W	GL US	
238	18-Dec-2007	X,O:-,BY		W	GL US	
239	16-Jan-2008	-,bO:X,Y		W	GL US	
240	16-Jan-2008	Of,GY:X,G		W	GL US	
241	16-Jan-2008	X,G:Of,OL		W	GL US	
242	16-Jan-2008	X,L/O:-,-		W	GL US	
243	16-Jan-2008	X,R:-,Ob		W	GL US	
244	15-Feb-2008	-,bO:X,Y		W	GL US	
245	15-Feb-2008	Lf,B:X,OR		W	GP C	wintered at Kiawah Island North
246	15-Feb-2008	Of,GY:X,G		W	GL US	
247	15-Feb-2008	X,G:Of,OL		W	GL US	
248	15-Feb-2008	X,L/O:-,-		W	GL US	
249	15-Feb-2008	X,O:-,BY		W	GL US	
250	15-Feb-2008	X,R:-,Ob		W	GL US	
251	5-Mar-2008	Of,GY:X,G		W	GL US	
252	5-Mar-2008	X,L/O:-,-		W	GL US	
253	5-Mar-2008	X,O:-,BY		W	GL US	
254	5-Mar-2008	X,R:-,Ob		W	GL US	
255	15-Mar-2008	-,bO:X,Y		W	GL US	
256	15-Mar-2008	Of,GY:X,G		W	GL US	

#	Date	Bands	Band #	M or W	Pop.	Comments
257	15-Mar-2008	X,G:Of,OL		W	GL US	
258	15-Mar-2008	X,L/O:-,-	98[]-76693	W	GL US	
259	15-Mar-2008	X,O:-,BY		W	GL US	
260	15-Mar-2008	X,R:-,Ob		W	GL US	
261	26-Mar-2008	O,R:X,R		UK	GL US	
262	26-Mar-2008	X,G:Of,OL		W	GL US	
263	26-Mar-2008	X,L/O:-,-		W	GL US	
234	26-Mar-2008	X,O:-,BY		W	GL US	
265	26-Mar-2008	X,R:-,Ob		W	GL US	
266	17-Apr-2008	-,O/g:X,g	g006	M	GL US	
267	17-Apr-2008	X,G:Of,OL		W	GL US	
268	17-Apr-2008	X,L/O:-,-		W	GL US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Deveaux Bank from 2006-2008 are presented in **Table 61**.

Table 61. Deveaux Bank shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
11-Jul-2006	H	F	1	55	39	0	12
17-Jul-2006	H	R	7	85	46	0	28
26-Jul-2006	H	F	14	68	36	0	6
6-Aug-2006	M	R	25	117	21	0	13
16-Aug-2006	H	R	30	80	3	0	0
27-Aug-2006	H	R	28	75	5	4	4
7-Sep-2006	H	F	14	63	22	0	1
16-Sep-2006	H	F	29	16	13	0	0
26-Sep-2006	H	F	18	6	0	0	0
7-Oct-2006	L	F	26	2	0	0	0
16-Oct-2006	H	F	24	12	0	0	0
26-Oct-2006	H	F	26	3	0	5	0
6-Nov-2006	H	F	21	2	0	0	0
17-Nov-2006	H	R	19	6	0	0	0
25-Nov-2006	H	F	23	6	0	23	0
17-Dec-2006	H	R	20	3	0	5	0
20-Jan-2007	H	F	19	4	21	1	0
16-Feb-2007	H	F	20	2	40	0	2
6-Mar-2007	H	F	23	18	45	0	0
17-Mar-2007	H	F	11	16	58	0	0
26-Mar-2007	H	F	11	21	48	0	0
8-Apr-2007	H	F	15	8	47	0	0
14-Apr-2007	M	R	18	11	40	15	0
25-Apr-2007	H	F	9	14	37	182	0
11-Jul-2007	M	R	4	89	31	0	9
17-Jul-2007	H	R	11	59	28	1	9
26-Jul-2007	M	F	13	93	26	0	2
5-Aug-2007	H	F	17	87	8	0	1
16-Aug-2007	H	F	23	54	8	0	12
28-Aug-2007	L	R	29	75	2	0	10
6-Sep-2007	M	R	27	20	0	0	4
15-Sep-2007	M	F	32	3	0	0	1
27-Sep-2007	H	F	26	10	1	7	0
6-Oct-2007	H	R	25	13	0	0	0
15-Oct-2007	H	R	28	6	0	0	0
27-Oct-2007	H	F	27	18	0	0	0
5-Nov-2007	L	R	29	3	0	0	2
16-Nov-2007	H	F	22	3	0	0	1
25-Nov-2007	L	F	24	4	0	0	1
18-Dec-2007	H	R	21	7	4	11	0
16-Jan-2008	H	R	21	2	4	1	0
15-Feb-2008	H	F	27	4	11	0	0
5-Mar-2008	H	R	25	10	29	0	0
15-Mar-2008	L	R	27	30	27	0	0
26-Mar-2008	M	F	21	20	28	0	0
8-Apr-2008	H	F	3	15	42	1	20
17-Apr-2008	L	F	7	17	33	139	0
26-Apr-2008	H	R	2	15	35	321	0

35. Frampton Island

County: Charleston

Survey Area: Ocean and inlet beaches of the southern island.

Critical Habitat Designation: None.

Habitat Conditions: Moderate to low width beach with overwash fans extending into marsh.

Habitat Modifications: None observed.

Management Measures: None observed.

Comments: Frampton Island and the island to the north (Botany Bay) contain suitable roosting habitat and may be alternative roost sites for Deveaux Bank’s Piping Plovers during very high tides; additional surveys should be done at these locations.

Piping Plovers: None on a survey dated 26 October 2006.

Piping Plover Band Observations: None

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Frampton Island from 2006-2008 are presented in **Table 62**.

Table 62. Frampton Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
26-Oct-2006	H	R	0	0	2	0	0

36. Otter Island

County: Colleton

Survey Area: Designated critical habitat, which “includes the southern portion of Otter Island to the eastern mouth of Otter Creek. It includes the MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36094).

Critical Habitat Designation: Unit SC-12, Otter Island.

Habitat Conditions: An undeveloped island that is accessible only by boat. At high tide, roosting habitat on south end of island is limited; on the north end, there are overwash fans that are available for roosting as well as a small point. Very large sand flats are exposed at low tide at the north end, though sand/mud substrate flats are limited.

Habitat Modifications: None observed.

Management Measures: This area is managed by SCDNR as part of the St. Helena Sound Heritage Preserve. No dogs are allowed. <http://www.dnr.sc.gov/mlands/specregshp.html>.

Comments: While relatively large numbers of other shorebirds and suitable habitat were observed at this location, it was surprising that no Piping Plovers were observed during surveys in the first season. However, SCDNR biologist Felecia Sanders did observe a single Piping Plover during the 2006-2007 winter here (Felecia Sanders, pers. comm. 2007). It is possible that Piping Plovers may be using the extensive intertidal areas on the island to the north to feed, and moving back to Otter Island as a roosting location at high tide.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Otter Island are presented in **Figure 98**; their locations on are presented in **Figure 99**.

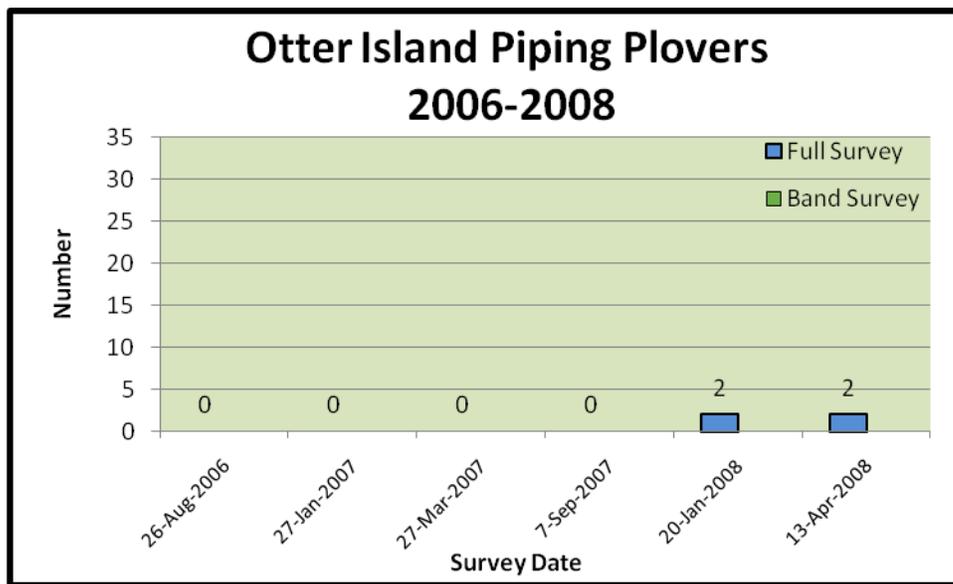


Figure 54. Otter Island Piping Plover observations.

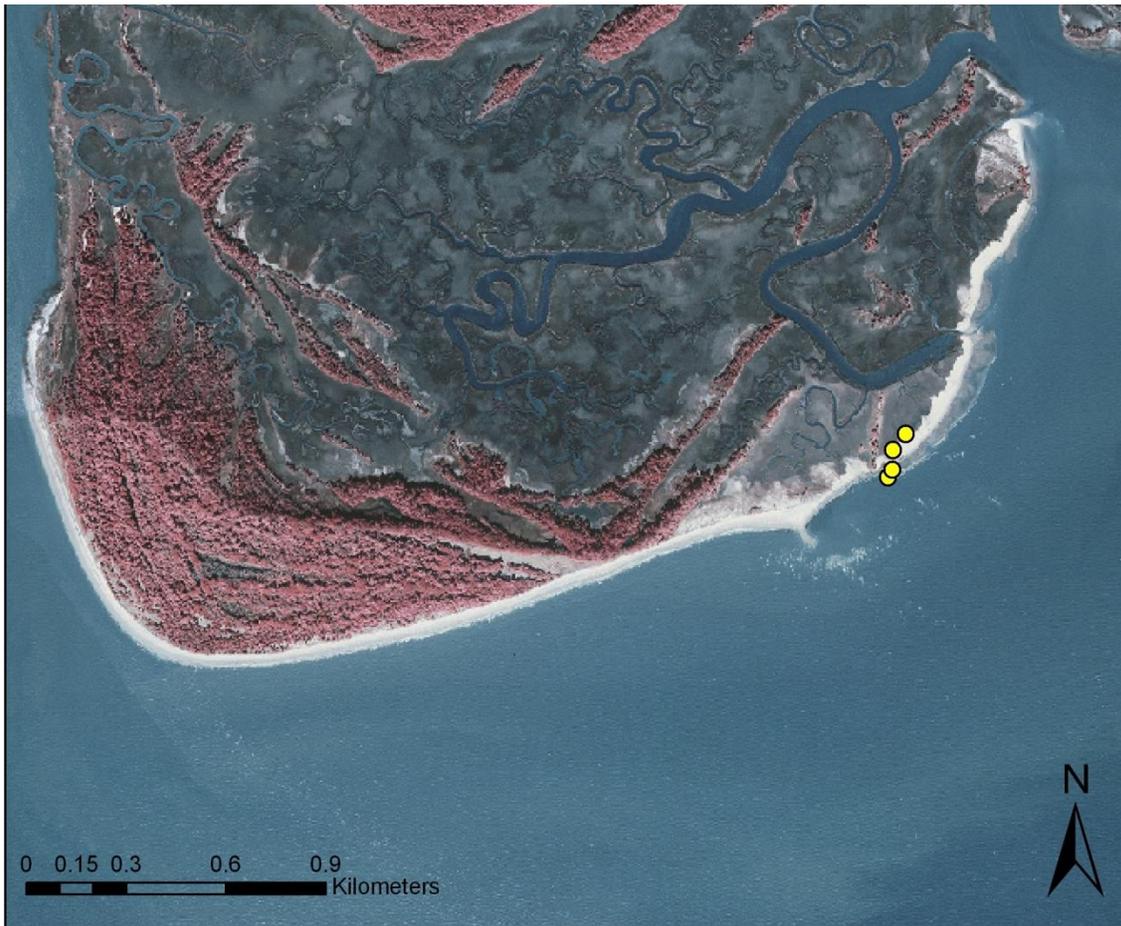


Figure 55. Otter Island Piping Plover locations, 2006-2008.

Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Otter Island from 2006-2008 are presented in **Table 63**.

Table 63. Otter Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
26-Aug-2006	M	F	0	6	0	65	8
27-Jan-2007	H	R	0	7	4	0	2
27-Mar-2007	M	R	0	7	2	0	0
7-Sep-2007	M	F	0	2	0	25	17
20-Jan-2008	H	R	2	7	0	0	23
13-Apr-2008	M	R	2	5	2	100	12

37. St. Helena Sound Sandbar

County: Beaufort

Survey Area: Western and central part of sandbar.

Critical Habitat Designation: None.

Habitat Conditions: A large sandbar in St. Helena Sound with a sand substrate.

Habitat Modifications: None observed.

Management Measures: None observed.

Comments: The west and central ends of the sandbar were walked and the eastern part of the bar was scanned using a scope. The bar was used by several hundred shorebirds and habitat is suitable for Piping Plovers.

Piping Plovers: None observed on a survey dated 26 August 2006.

Piping Plover Band Observations: None.

Shorebird Observations: None of the focal shorebird species were observed at this site.

38. Harbor Island

County: Beaufort

Survey Area: Designated critical habitat south to the creek, and on the north of the unit, north to the house with the seawall. Critical habitat boundaries are: “from the northeastern tip of Harbor Island and includes all of Harbor Spit. It begins at the shoreline east of Cedar Reef Drive running south, stopping at the mouth of Johnson Creek. It includes the MLLW on the Atlantic Ocean and St. Helena Sound to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur. All of Harbor Spit to MLLW is included” (USFWS 2001: 36094).

Critical Habitat Designation: Unit SC-13, Harbor Island.

Habitat Conditions: An island with residential development in a gated community. There are very large, high quality intertidal feeding habitats that are exposed at low tide. An offshore sandbar provides roosting habitat during mid and low high tides, but in the second season, this sandbar became easier to access at low and mid-tides due to accretion between the beach and bar. A small point on Harbor Island provided roosting habitat at mid and low high tides during the first season but by the second season, it had eroded, reducing roosting habitat.

Habitat Modifications: One small area of stabilized beach from a sea wall in front of a house just west of the survey area.

Management Measures: Dogs are required to be on leash; recreational off-road vehicle use is not allowed.

Comments: This area is one of the top four locations in the state for Piping Plovers and it also has excellent quality habitat for other shorebirds.

While Harbor Island and the north side of Hunting Island are discussed separately in this report, these areas should be viewed as a single area in terms of use by Piping Plovers as birds moved easily across Johnson Creek. Due to movements between these two areas and the use of a large sandbar that is east of Harbor Island that is not accessible at high tide, this is perhaps the most difficult location in the state to obtain an accurate count total count.

Any Piping Plovers that were seen at either Harbor Island or Hunting Island North during the wintering period (December – February) location were counted as wintering birds for both locations due to movements between the two areas. Any Piping Plovers that were seen on the sandbar were included in the Harbor Island count due to the proximity to the island. Future survey efforts should consider simultaneous surveys at Harbor and Hunting Island to minimize the chance that birds are missed or double counted due to movements between the two islands. In addition, depending on the accessibility of the offshore sandbar, birds may be located on the sandbar that are not able to be observed at high tide without use of a boat. A low tide count allows a person to walk or wade to the sandbar. At low tide however, the Piping Plovers can be spread out over the very large sand flats, so movements may occur that are not detected.

Due to limited high tide roosting habitat, the impact of disturbance is magnified at high tide. Dogs off leash are a concern at the sandbar area; some residents took their dog there as it was not considered by them to be part of the area that was subject to the subdivision's dog on leash requirement. Continued accretion between the sandbar and Harbor Island will allow the sandbar to be more easily accessible and raises serious concerns about disturbance to resting Piping Plovers and other shorebirds.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Harbor Island are presented in **Figure 100 and 101**; their locations on are presented in **Figure 102**.

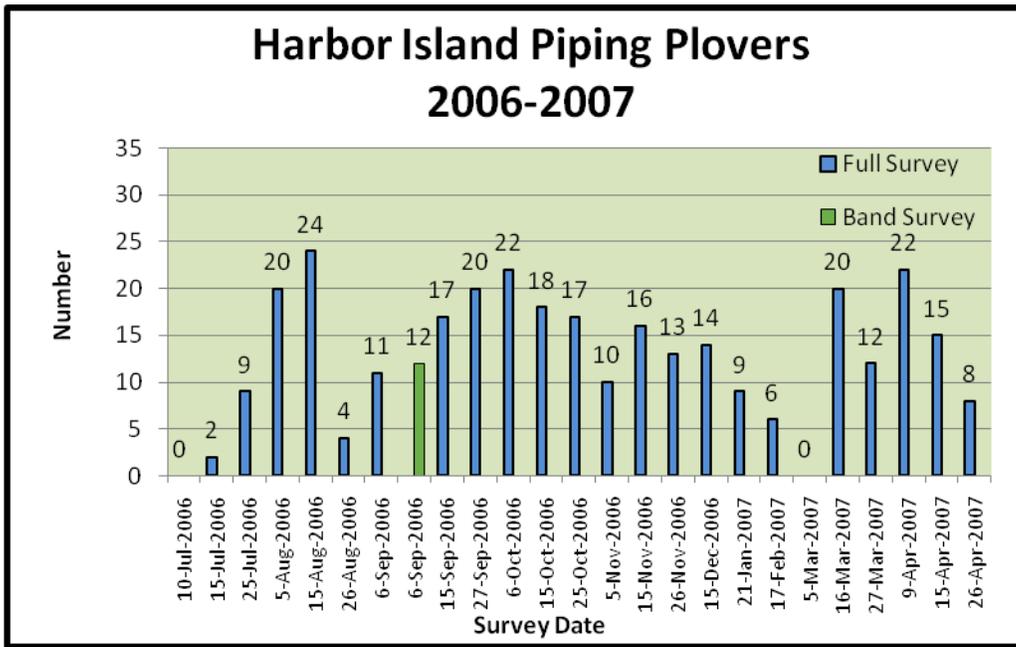


Figure 100. Harbor Island Piping Plover observations, 2006-2007.

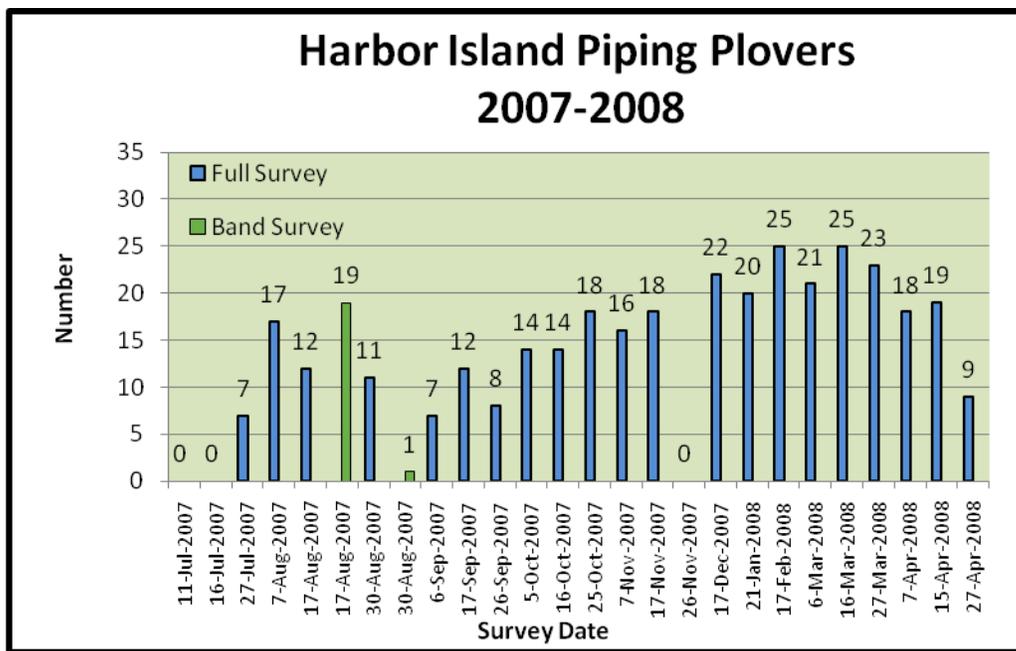


Figure 101. Harbor Island Piping Plover observations, 2007-2008.



Figure 102. Harbor Island Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Harbor Island are presented in **Table 64**.

Table 64. Harbor Island Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	15-Jul-2006	Of,LO:X,g		W	GL US	
2	15-Jul-2006	X,L:-,-		M	UK	adult bird (molting from breeding plumage)
3	25-Jul-2006	X,-:Wf,-		W	GP C	
4	5-Aug-2006	-,:X,b	195 on top, 263 on bottom left, "open"	M	GL US	fledgling
5	5-Aug-2006	-,:X,b/O/b		M	GL US	
6	5-Aug-2006	-,:X,g		W	GL US	molting from breeding plumage
7	5-Aug-2006	Of,LO:X,g		W	GL US	
8	5-Aug-2006	X,-:Wf,-		W	GP C	
9	5-Aug-2006	X,L:O,-		M	GL US	
10	15-Aug-2006	-,:X,g		W	GL US	molting breeding plumage
11	15-Aug-2006	Of,LO:X,g		W	GL US	
12	15-Aug-2006	X,-:Wf,-		W	GP C	
13	15-Aug-2006	X,g:O,-	1951-26363	M	GL US	fledgling
14	6-Sep-2006	-,:X,g		W	GL US	
15	6-Sep-2006	-,:X,g		W	GL US	
16	6-Sep-2006	O,-:X,R		W	GL US	
17	15-Sep-2006	-,:X,g		W	GL US	
18	15-Sep-2006	O,-:X,R		W	GL US	
19	15-Sep-2006	Of,LO:X,g		W	GL US	
20	15-Sep-2006	X,-:Wf,-		W	GP C	
21	27-Sep-2006	-,:X,g/O		UK	GL US	GL US bird from split but not counted in individual count because combination didn't match issued band; might be -,:X,g/O, wintering bird from this location
22	27-Sep-2006	O,-:X,R		W	GL US	
23	6-Oct-2006	-,:X,g	[[981-76625	W	GL US	
24	6-Oct-2006	-,:X,g/O		W or M	GL US	likely wintering bird; wintering if November is used; migrant if December is used; same combination seen in spring and at Hunting Island SP (partial combination match in February and full match in March)
25	6-Oct-2006	O,-:X,R		W	GL US	
26	6-Oct-2006	Of,LO:X,g		W	GL US	
27	6-Oct-2006	X,-:Wf,-		W	GP C	
28	15-Oct-2006	O,-:X,R	1951-2[[356; missing number may be 6	W	GL US	rebanded as adult as Of,BG:X,R
29	15-Oct-2006	X,-:Wf,-		W	GP C	

#	Date	Bands	Band #	M or W	Pop.	Comments
30	25-Oct-2006	-, -:X,g		W	GL US	
31	25-Oct-2006	-, -:X,g/O		W or M	GL US	
32	25-Oct-2006	N, LO:N,g		UK	UK	partial match to Of, LO:X,g
33	25-Oct-2006	O, -:X,R		W	GL US	
34	5-Nov-2006	-, -:N,g		UK	UK	partial match to -, -:X,g
35	5-Nov-2006	-, -:N,g/O		UK	GL US	probably -, -:X,g/O known wintering bird from that location
36	5-Nov-2006	O, -:X,R		W	GL US	
37	15-Nov-2006	-, -:X,g		W	GL US	
38	15-Nov-2006	-, -:X,g/O		W or M	GL US	
39	15-Nov-2006	N, -:N,R		UK	UK	
40	26-Nov-2006	-, -:X,g		W	GL US	
41	26-Nov-2006	-, -:X,g/O		W or M	GL US	
42	15-Dec-2006	-, -:X,g		W	GL US	
43	21-Jan-2007	-, -:X,g		W	GL US	
44	21-Jan-2007	X, -:Wf,-		W	GP C	
45	17-Feb-2007	-, -:X,g		W	GL US	
46	17-Feb-2007	X, -:Wf,-		W	GP C	
47	16-Mar-2007	-, -:X,?		UK	UK	
48	16-Mar-2007	-, -:X,g		W	GL US	
49	16-Mar-2007	X, -:Wf,-		W	GP C	
50	27-Mar-2007	X, -:Wf,-		W	GP C	
51	9-Apr-2007	-, -:X,g		W	GL US	
52	9-Apr-2007	-, -:X,g/O	new style	W or M	GL US	
53	9-Apr-2007	O, -:X,R		W	GL US	
54	9-Apr-2007	Of, LO:X,g		W	GL US	
55	9-Apr-2007	X, -:Wf,-		W	GP C	
56	9-Apr-2007	X, L: -, YO		M	GL US	
57	15-Apr-2007	-, -:X,g		W	GL US	
58	15-Apr-2007	-, -:X,g/O		W or M	GL US	
59	15-Apr-2007	O, -:X,R		W	GL US	
60	15-Apr-2007	X, -:Wf,-		M or W?	GP C	matches combination seen previous winter at this location; possible mortality
61	27-Jul-2007	-, -:X,g	bottom row 76625	W	GL US	0981-76625; similar combination also used Hunting Island SP; second season at same location
62	27-Jul-2007	-, b:X,b/O/b	b003	M	GL US	
63	27-Jul-2007	Of, gR:X,b	1951-26327	M	GL US	previously -, -:X,b
64	27-Jul-2007	X, -:Wf,-		M or W?	GP C	
65	7-Aug-2007	-, -:X,g	1[]51-[]6311	M (W)	GL US	lighter color light green; different bird - checked two times; last three numbers match wintering bird at Fripp Island
66	7-Aug-2007	-, -:X,g		UK	GL US	color band and metal band type matches wintering bird

#	Date	Bands	Band #	M or W	Pop.	Comments
67	7-Aug-2007	Of,BG:X,R	1951-26356	W	GL US	Metal number match to 1951-26356, wintered this location 06-07 as O,-:X,R
68	7-Aug-2007	X,-:Wf,-		M or W?	GP C	
69	7-Aug-2007	X,G:Of,LO		W	GL US	
70	17-Aug-2007	-,:X,g		UK	GL US	listed as unknown for migration period because a wintering bird and migrant with same combination used this location in fall
71	17-Aug-2007	O,Y:X,Y		M	GL US	
72	17-Aug-2007	X,-:Wf,-		M or W?	GP C	
73	17-Aug-2007	X,G:Of,LO		W	GL US	
74	30-Aug-2007	O,R:X,R	R007	W (M)	GL US	Wintered at Hunting/Harbor Islands; also used Deveaux and Kiawah South as a migrant
75	17-Sep-2007	-,:X,g		UK	GL US	
76	17-Sep-2007	O,Y:X,Y		M	GL US	
77	17-Sep-2007	X,-:Wf,-		M or W?	GP C	
78	26-Sep-2007	O,Y:X,Y	Y001	M	GL US	
79	25-Oct-2007	Of,BG:X,R		W	GL US	
80	7-Nov-2007	-,:X,g		UK	GL US	
81	7-Nov-2007	O,R:X,R		W (M)	GL US	
82	7-Nov-2007	Of,BG:X,R		W	GL US	
83	7-Nov-2007	X,G:Of,LO		W	GL US	
84	17-Nov-2007	-,:X,g		UK	GL US	
85	17-Nov-2007	O,R:X,R		W (M)	GL US	
86	17-Nov-2007	Of,BG:X,R		W	GL US	
87	17-Nov-2007	X,G:Of,LO		W	GL US	
88	17-Dec-2007	-,:X,g		W	GL US	
89	17-Dec-2007	O,R:X,R		W (M)	GL US	
90	17-Dec-2007	Of,BG:X,R		W	GL US	
91	17-Dec-2007	X,G:Of,LO		W	GL US	
92	21-Jan-2008	-,:X,g		W	GL US	
93	21-Jan-2008	O,R:X,R		W (M)	GL US	
94	21-Jan-2008	Of,BG:X,R		W	GL US	
95	21-Jan-2008	X,G:Of,LO		W	GL US	
96	17-Feb-2008	-,:X,g		W	GL US	
97	17-Feb-2008	O,R:X,R		W (M)	GL US	
98	17-Feb-2008	Of,BG:X,R		W	GL US	
99	17-Feb-2008	X,G:Of,LO		W	GL US	
100	16-Mar-2008	-,:X,g		UK	GL US	
101	16-Mar-2008	O,R:X,R		W (M)	GL US	
102	16-Mar-2008	Of,BG:X,R		W	GL US	
103	16-Mar-2008	X,G:Of,LO		W	GL US	
104	27-Mar-2008	-,:X,g		UK	GL US	
105	27-Mar-2008	Of,BG:X,R		W	GL US	
106	27-Mar-2008	X,G:Of,LO		W	GL US	
107	7-Apr-2008	-,:X,g		UK	GL US	
108	7-Apr-2008	Of,BG:X,R		W	GL US	

#	Date	Bands	Band #	M or W	Pop.	Comments
109	15-Apr-2008	-, -:X,g		UK	GL US	
110	15-Apr-2008	O,R:X,R		W (M)	GL US	
111	15-Apr-2008	Of,BG:X,R		W	GL US	
112	15-Apr-2008	X,G:Of,LO		W	GL US	
113	15-Apr-2008	X,O:O,-		M or W?	GL US	combination matches wintering bird from Fripp Island

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Harbor Island from 2006-2008 are presented in **Table 65**.

Table 65. Harbor Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
10-Jul-2006	H	F	0	0	9	27	29
15-Jul-2006	H	R	2	0	7	60	27
25-Jul-2006	M	R	9	0	3	26	24
5-Aug-2006	M	R	20	0	7	9	23
15-Aug-2006	H	R	24	0	5	0	66
26-Aug-2006	H	R	4	0	1	0	20
6-Sep-2006	H	F	11	0	24	38	30
15-Sep-2006	H	F	17	4	0	44	44
6-Oct-2006	H	F	22	7	0	0	0
15-Oct-2006	H	F	18	5	0	2	42
25-Oct-2006	H	F	17	6	1	0	12
5-Nov-2006	H	F	10	3	0	0	0
15-Nov-2006	H	F	16	5	0	4	31
26-Nov-2006	H	R	13	0	0	0	35
15-Dec-2006	H	R	14	2	0	0	31
21-Jan-2007	H	F	9	6	22	0	42
17-Feb-2007	H	F	6	0	0	0	7
5-Mar-2007	H	F	0	1	2	0	0
16-Mar-2007	H	F	20	1	39	0	41
27-Mar-2007	H	F	12	2	0	0	34
9-Apr-2007	H	F	22	0	2	17	21
15-Apr-2007	M	R	15	2	0	157	5
26-Apr-2007	H	R	8	0	4	15	17
11-Jul-2007	H	F	0	0	5	0	16
16-Jul-2007	H	R	0	0	6	0	17
27-Jul-2007	H	R	7	0	15	0	24
7-Aug-2007	H	R	17	0	12	0	27
17-Aug-2007	H	F	12	0	5	51	48
30-Aug-2007	H	F	11	0	4	48	34
6-Sep-2007	M	F	7	0	23	0	58
17-Sep-2007	H	R	12	0	0	0	0
26-Sep-2007	M	F	8	1	0	218	42
5-Oct-2007	H	F	14	2	15	0	39
16-Oct-2007	H	F	14	0	0	0	33

25-Oct-2007	M	F	18	1	0	312	81
7-Nov-2007	M	F	16	7	0	0	64
17-Nov-2007	M	F	18	1	0	0	43
26-Nov-2007	H	F	0	0	114	8	35
17-Dec-2007	L	R	22	11	0	0	14
21-Jan-2008	L	F	20	2	0	4	33
17-Feb-2008	L	R	25	12	0	0	140
6-Mar-2008	H	F	21	2	0	16	31
16-Mar-2008	L	F	25	14	0	0	23
27-Mar-2008	M	F	23	8	1	36	23
7-Apr-2008	M	F	18	1	1	180	8
15-Apr-2008	M	F	19	6	0	17	10
27-Apr-2008	L	R	9	5	2	150	2

39. Hunting Island State Park North

County: Beaufort

Survey Area: North from the volleyball net at the Campground to the Point then to just inside Johnson Creek entrance.

Critical Habitat Designation: None.

Habitat conditions: An island with limited recreational development as a state park, the beach has a moderate to small width except at the north end, where there is a moderately sized spit that provides good roosting habitat. In the second season, the size of the spit increased. There are extensive sand flats at low tide, though much of the substrate is sand, rather than sand with a thin mud top layer as found in areas of the Harbor Island side.

Habitat Modifications: Multiple beach stabilization efforts, including an old concrete groin near the north end of the island; a T groin constructed in 2006; artificial dune construction and sand fencing in front of the campground area; and beach replenishment in front of the campground.

Management Measures: This area is managed by SCDPRT as part of Hunting Island State Park. Dogs are required to be on leash. In the 2008-2009 season, the Park prohibited dogs north of the northernmost groin, protecting the high quality roosting habitat from disturbance.

Comments: This area was added on 26 August 2006 when there was a sharp drop in the number of birds observed during a survey at Harbor Island and the closest suitable habitat was searched to see if the area was used as an alternative roost location. Surveys indicate the north end of Hunting Island is an important roosting area for Piping Plovers and other shorebirds at periods of higher high tides when the offshore sandbar between Harbor and Hunting islands is flooded or when the single roosting area on Harbor Island is not available due to human disturbance or erosion, as occurred during the second season. Hunting Island also serves as a nighttime roosting location.

However, to detect nighttime roosting plovers, surveys must be timed so that the observer is at the spit before the sun has risen, as the birds can leave the spit at sunrise. The Harbor Island/ Hunting Island complex is one of the top three locations in South Carolina for Piping Plovers.

While Harbor Island and Hunting Island are under separate jurisdictions, observations of multiple banded Piping Plovers indicate that the wintering home range of individual birds includes habitat on both sides of Johnson’s Creek.

Due to the limited area of roosting habitat at high tide, the impacts of human disturbance are magnified. In addition, during both seasons, while dogs were required to be on a leash, it was not unusual to see dogs off-leash. Accordingly, survey results may have been influenced by human disturbance from park visitors.

The importance of this area to Piping Plovers would be easy to miss if surveys were not scheduled at the appropriate tide. In addition, as over 1,000 roosting birds may be concentrated at the spit at the north end of the island during periods of higher high tides, it would be easy to undercount Piping Plovers roosting at this location due to difficulties associated with detection.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Hunting Island State Park North are presented in **Figure 103 and 104**; their locations on are presented in **Figure 105**.

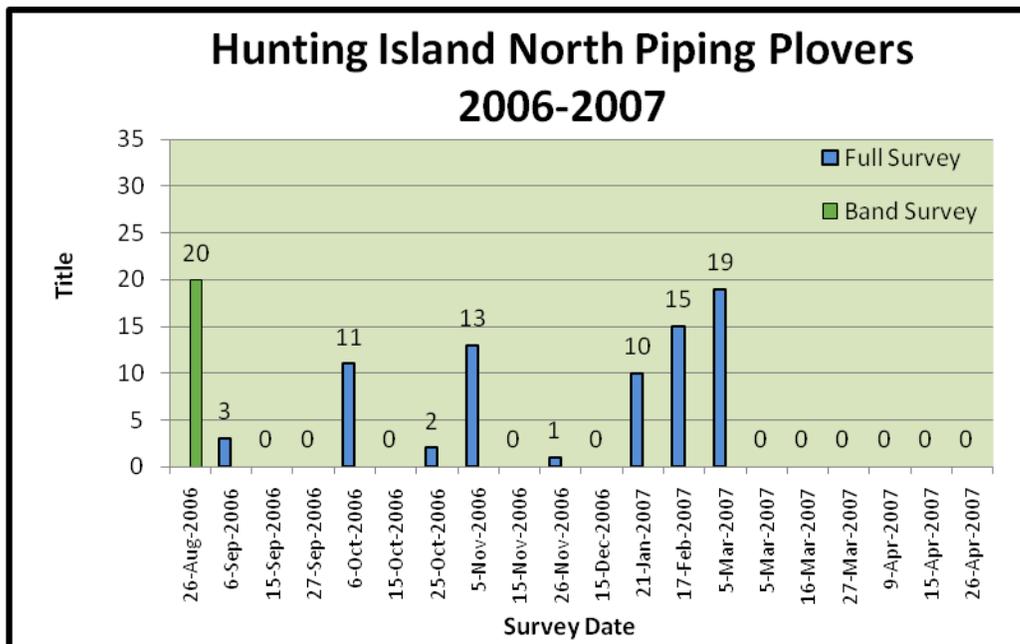


Figure 103. Hunting Island State Park North Piping Plover observations, 2006-2007.

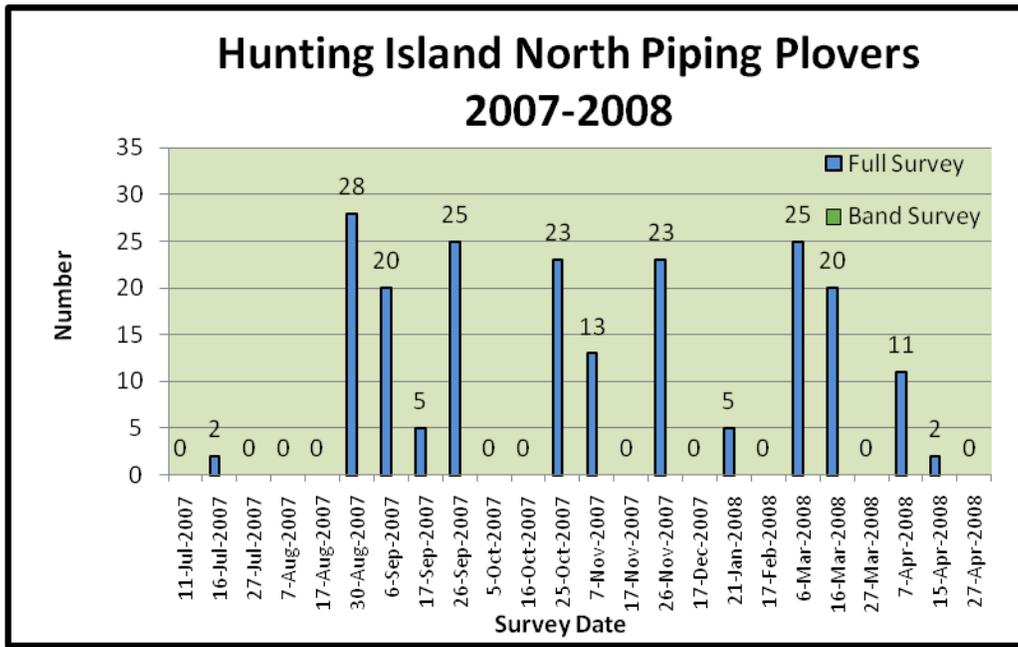


Figure 104. Hunting Island State Park North Piping Plover observations, 2007-2008.

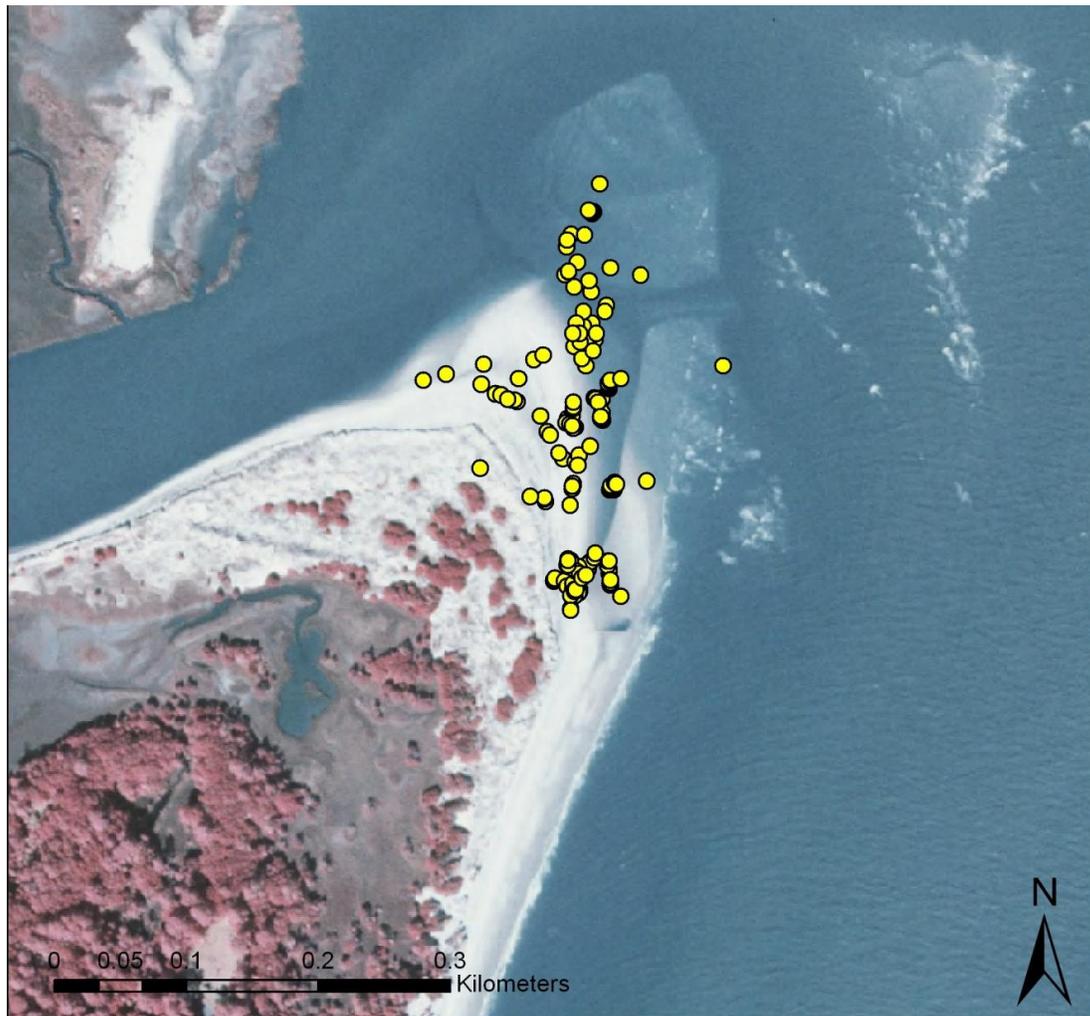


Figure 105. Hunting Island State Park North Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Hunting Island State Park North are presented in **Table 66**.

Table 66. Hunting Island State Park North Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	26-Aug-2006	-, -:X,g		W	GL US	Also used Harbor Island; second season return
2	26-Aug-2006	O, -:X,R	ends in 6, "abre" on joint	W	GL US	Also used Harbor Island
3	26-Aug-2006	Of,LO:X,g		W	GL US	Also used Harbor Island
4	26-Aug-2006	X, -:Wf,-		W	GP C	Also used Harbor Island; matches brood marker seen previous season
5	6-Oct-2006	N, -:Wf,-		W	GP C	
6	6-Oct-2006	Of,LO:X,g		W	GL US	
7	5-Nov-2006	N,LO:N,g		UK	UK	Partial match to Of,LO:X,g, wintering bird from this location
8	26-Nov-2006	Of,LO:X,g		W	GL US	
9	21-Jan-2007	O, -:X,R		W	GL US	
10	17-Feb-2007	N, -:N,g/O		W	GL US	partial match to -, -:X,g/O
11	17-Feb-2007	O, -:X,R		W	GL US	
12	17-Feb-2007	Of,LO:X,g		W	GL US	
13	5-Mar-2007	-, -:X,g		W	GL US	
14	5-Mar-2007	-, -:X,g/O		W or M	GL US	Also used Harbor Island; wintering if November is used and migrant if December is used, but also seen in spring (probable wintering)
15	5-Mar-2007	O, -:X,R		W	GL US	
16	5-Mar-2007	Of,LO:X,g		W	GL US	
17	5-Mar-2007	X, -:Wf,-		W	GP C	
18	30-Aug-2007	-, -:X,g		UK	GL US	lighter light green (06 year) - both seen at same time so know they are different birds
19	30-Aug-2007	-, -:X,g		UK	GL US	darker light green (05 year)
20	30-Aug-2007	O,R:X,R	R007	W (M)	GL US	Also used Harbor Island; seen as a migrant at Deveaux Bank and Seabrook Island
21	30-Aug-2007	O,Y:X,Y		W (M)	GL US	
22	30-Aug-2007	Of,BG:X,R		W	GL US	Also used Harbor Island
23	30-Aug-2007	X, -:Wf,-		M or W (?)	GP C	
24	30-Aug-2007	X,G:Of,LO		W	GL US	Also used Harbor Island

#	Date	Bands	Band #	M or W	Pop.	Comments
25	6-Sep-2007	-, -:X,g		UK	GL US	
26	6-Sep-2007	-, -:X,g		UK	GL US	
27	6-Sep-2007	O,Y:X,Y		W (M)	GL US	
28	6-Sep-2007	X,-:Wf,-		M or W (?)	GP C	
29	6-Sep-2007	X,G:Of,LO		W	GL US	
30	26-Sep-2007	-, -:X,g		UK	GL US	
31	26-Sep-2007	N,Y:X,Y		UK	UK	Partial match to O,Y:X,Y
32	26-Sep-2007	Of,OO:X,Y		M	GL US	
33	26-Sep-2007	X,-:Wf,-		M or W (?)	GP C	
34	26-Sep-2007	X,G:Of,LO		W	GL US	
35	25-Oct-2007	-, -:X,g		UK	GL US	
36	25-Oct-2007	Of,BG:X,R		W	GL US	
37	25-Oct-2007	X,G:Of,LO		W	GL US	
38	7-Nov-2007	N,LG:N,R		UK	UK	would match if it was Of,BG:X,R (incorrect recording of B?)
39	26-Nov-2007	O,R:X,R		W (M)	GL US	
40	26-Nov-2007	Of,BG:X,R		W	GL US	
41	26-Nov-2007	X,G:Of,LO		W	GL US	
42	21-Jan-2008	BNID		W	UK	bands seen but not identified before bird flew; probably O,R:X,R
43	6-Mar-2008	-, -:X,g		UK	GL US	
44	6-Mar-2008	O,R:X,R		W (M)	GL US	
45	6-Mar-2008	Of,BG:X,R		W	GL US	
46	6-Mar-2008	X,G:Of,LO		W	GL US	
47	16-Mar-2008	X,G:Of,LO		W	GL US	
48	7-Apr-2008	Of,N:N,R		UK	GL US	Would match wintering bird Of,BG:X,R
49	7-Apr-2008	X,G:Of,LO		W	GL US	
50	15-Apr-2008	X,G:Of,LO		W	GL US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Hunting Island State Park North from 2006-2008 are presented in **Table 67**.

Table 67. Hunting Island State Park North shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
6-Sep-2006	M	F	3	0	0	0	0
15-Sep-2006	H	R	0	0	0	0	0
27-Sep-2006	H	F	0	0	0	0	0
6-Oct-2006	H	F	11	13	0	47	61
15-Oct-2006	H	R	0	0	0	0	0
25-Oct-2006	H	R	2	0	0	1	15
5-Nov-2006	H	R	13	2	0	0	45
15-Nov-2006	H	R	0	0	0	0	0
26-Nov-2006	H	R	1	0	0	0	0
15-Dec-2006	H	R	0	0	0	0	0
21-Jan-2007	H	R	10	0	30	0	18
17-Feb-2007	H	F	15	0	5	0	78
5-Mar-2007	H	R	19	14	0	0	0
5-Mar-2007	M	F	0	0	0	0	0
16-Mar-2007	H	R	0	0	1	0	0
27-Mar-2007	H	R	0	0	0	0	0
9-Apr-2007	L	F	0	0	0	40	0
15-Apr-2007	M	R	0	0	0	0	0
26-Apr-2007	H	F	0	0	0	0	0
11-Jul-2007	M	F	0	0	0	0	0
16-Jul-2007	H	R	2	2	0	0	0
27-Jul-2007	H	F	0	1	0	0	0
7-Aug-2007	M	R	0	0	0	0	0
17-Aug-2007	H	R	0	0	0	0	0
30-Aug-2007	H	R	28	2	0	0	0
6-Sep-2007	H	F	20	2	0	0	0
17-Sep-2007	M	R	5	0	0	0	0
26-Sep-2007	H	F	25	6	0	0	27
5-Oct-2007	H	R	0	0	0	0	0
16-Oct-2007	H	R	0	0	0	0	0
25-Oct-2007	H	R	23	7	80	0	30
7-Nov-2007	H	F	13	1	0	0	0
17-Nov-2007	M	F	0	0	0	0	0
26-Nov-2007	H	R	23	6	30	0	0
17-Dec-2007	M	R	0	0	0	0	0
21-Jan-2008	H	F	5	0	0	0	0
17-Feb-2008	L	F	0	0	0	39	0
6-Mar-2008	H	F	25	1	1	0	0
16-Mar-2008	M	F	20	0	1	0	0
27-Mar-2008	H	F	0	0	0	0	0
7-Apr-2008	M	R	11	1	0	0	0
15-Apr-2008	M	F	2	0	0	0	0
27-Apr-2008	L	F	0	0	0	0	0

40. Hunting Island State Park South

County: Beaufort

Survey Area: Just north of the footpath that exits at the beach spit around the spit to the vegetated area inside the lagoon entrance.

Critical Habitat Designation: Not designated.

Habitat Conditions: An island with low density residential development just to the north of the survey area and a recurved spit with a lagoon; there are extensive ebb bar sand flats at low tide. At high tide, roosting habitat is limited to nonexistent on the ocean beach but does exist at the recurved spit.

Habitat Modifications: One small area of stabilized beach due to rip rap in front of a house just north of the survey area; further north of the survey area, there are several groins.

Management Measures: This area is managed by SCDPRT as part of Hunting Island State Park. Dogs are required to be on leash.

Comments: Several hundred shorebirds were observed roosting here during the one survey, though they were not the species that are counted in this report.

Piping Plovers: None on surveys dated 15 October 2006, 30 August 2007, 17 December 2007, 20 January 2008, and 27 March 2008.

Piping Plover Band Observations: none.

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Hunting Island State Park South from 2006-2008 are presented in **Table 68**.

Table 68. Hunting Island State Park South shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
15-Oct-2006	M	R	0	0	0	0	0
30-Aug-2007	H	R	0	0	0	0	0
17-Dec-2007	H	R	0	0	0	0	0
20-Jan-2008	H	F	0	0	1	0	0
27-Mar-2008	H	F	0	0	0	0	0

41. Fripp Island Center

County: Beaufort

Survey Area: From the seawall on the ocean beach south to the south end of where the lagoon drains into the ocean.

Critical Habitat Designation: None.

Habitat conditions: An island with residential development; a lagoon on the ocean beach that provides a moderate sized intertidal feeding area at mid and low tide; a relatively flat ocean beach that provides a moderately sized intertidal area at low tide; at high tide, there is roosting habitat in the center of the island but the ocean is against the seawall at the north and south end of the islands.

Habitat Modifications: There is a long seawall along the island that runs north into the inlet and a rip-rap wall on the ocean beach south to the inlet.

Management Measures: None observed.

Comments: Several hundred shorebirds of other species also were observed using this area. Dogs off leash were a concern. One Piping Plover observed at Hunting/Harbor Islands as a migrant wintered at this location.

Piping Plovers: Piping Plovers recorded during the 2007-2008 survey seasons at Fripp Island Center are presented in **Figure 106**; their locations on are presented in **Figure 107**.

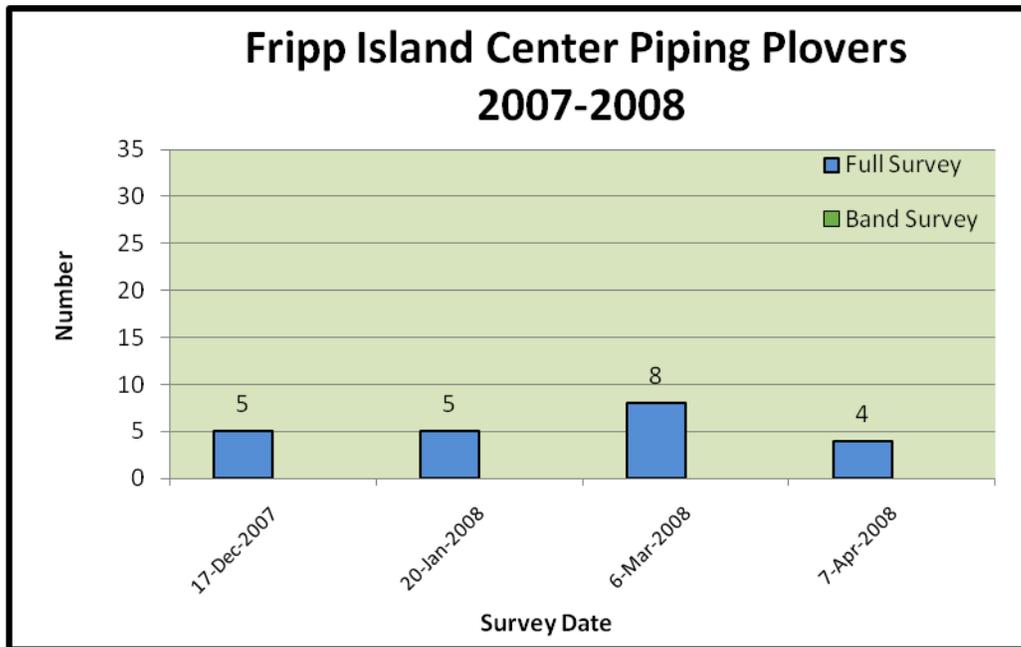


Figure 106. Fripp Island Center Piping Plover observations.

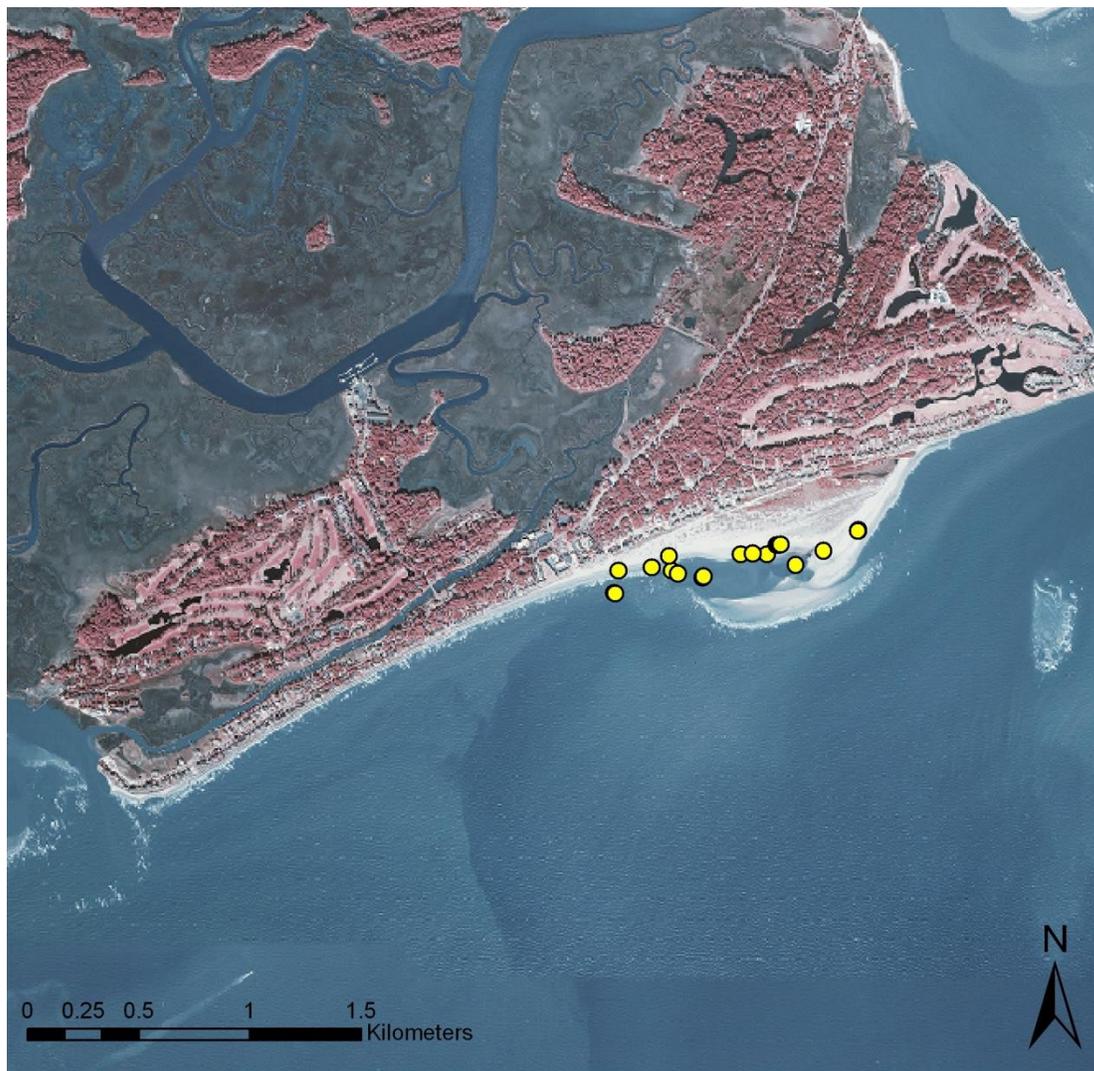


Figure 107. Fripp Island Center Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Fripp Island Center are presented in **Table 69**.

Table 69. Fripp Island Center Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	17-Dec-2007	-, -:X,g	ends in 11; appears to be 3 to left of 1	W (M)	GL US	1951-26311; metal band matches migrant see at Harbor Island
2	17-Dec-2007	X,O:O,-	"abre" on joint	W	GL US	matches spring migrant seen at Harbor Island
3	20-Jan-2008	-, -:X,g		W (M)	GL US	All 5 birds central area, zero on south end, 1 on north side of Pritchards visible in scope
4	20-Jan-2008	X,O:O,-		W	GL US	
5	6-Mar-2008	-, -:X,g		W (M)	GL US	
6	6-Mar-2008	X,O:O,-	1951-[]6593	W	GL US	
7	7-Apr-2008	-, -:X,g		W (M)	GL US	
8	7-Apr-2008	X,O:O,-		W	GL US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Fripp Island Center from 2006-2008 are presented in **Table 70**.

Table 70. Fripp Island Center shorebird observations.

Date	Tide St.	Tide Dir.	WIPL	WIPL	AMOY	REKN	MAGO
17-Dec-2007	H	F	5	0	0	0	0
20-Jan-2008	M	F	5	0	0	0	0
6-Mar-2008	M	F	8	8	0	0	0
7-Apr-2008	H	R	4	10	0	400	0

42. Pritchards Island South

County: Beaufort

Survey Area: extreme southern end of island (recurved spit area).

Critical Habitat Designation: Unit SC-14, Capers Island.

Habitat Conditions: the survey area was undeveloped, with a recurved spit providing limited roosting habitat; the ocean beach was narrow. This area was not surveyed at mid or low tides so intertidal feeding habitat conditions were not viewed.

Habitat Modifications: None observed.

Management Measures: None observed.

Comments: this area was observed from across the narrow inlet at the north end of Capers Island.

While no Piping Plovers were seen during the surveys, other shorebirds were observed. The

Pritchards Island spit does contain suitable Piping Plover habitat and it can be expected that Piping Plovers would move between this location and Capers Island.

The north end of Pritchards Island was not surveyed; however, on 20 January 2008 one Piping Plover was observed there by using a scope from the south end of Fripp Island. One of the wintering Piping Plovers at Fripp Island center had been observed flying south so birds may move between Fripp Island and Pritchards Island.

Piping Plovers: None on surveys dated 25 August 2006, 25 January 2007, 9 April 2007, 5 September 2007, 17 November 2007, 28 January 2008, and 14 April 2008.

Piping Plover Band Observations: None

Other Shorebird Observations: None.

43. Capers Island

County: Beaufort

Survey Area: All sandy inlet beaches, ocean beach, and bay beach at the south end.

Critical Habitat Designation: Unit SC-14, Capers Island.

Habitat conditions: Three islands that are accessible only by boat, the central Capers Island has a single house and the northern island has several houses; the southern island is undeveloped. The north and central islands have relatively narrow beaches at high tide with limited roosting habitat except at the inlets which have open sand areas; the southern island beach is wider with multiple overwash fans and a moderate size open sand area at the southern end. The beach is relatively flat in slope so there are large intertidal feeding areas, with the inlets providing areas that are mud/sand substrate and the beach with sand substrate. All three islands have overwash fans that provide low energy feeding habitat in the fan area which extends into the marsh.

Habitat Modifications: None observed except for the northern island which has sand fencing.

Management Measures: None observed.

Comments: One of the better locations in the state for Piping Plovers, and an important location for birds from the Great Lakes population.

ATV tracks were observed on the northern island. The island is difficult to survey due to the two inlets that bisect the island. While the north and southern islands can be accessed from interior channels, the middle island is accessible by boat only at mid/high tide, when the ocean is calm, or by wading across the southern inlet at low tide. At times, disturbance may be a concern on both the southern island and the northern island. Movements between the three sections of Capers Islands were documented based on band observations.

This location is one of the top locations in the state for Wilson's Plovers.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Capers Island are presented in **Figure 108**; their locations on are presented in **Figure 109**.

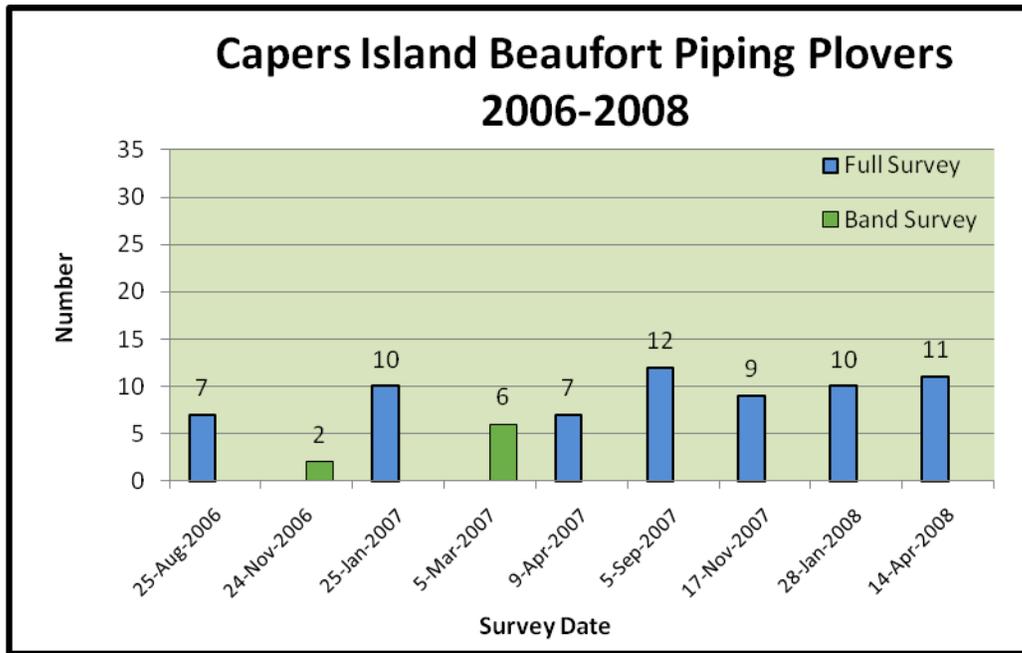


Figure 56. Capers Island Piping Plover observations.



Figure 109. Capers Island Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Capers Island are presented in **Table 71**.

Table 71. Capers Island Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comments
1	25-Aug-2006	-,X:-,C		M	At C	At C double size metal band, completely faded
2	25-Aug-2006	X,L:-,YO		M	GL US	
3	24-Nov-2006	-, -:X,g		W	GL US	
4	25-Jan-2007	-, -:X,g		W	GL US	
5	25-Jan-2007	O, -:X,O/R		W	GL US	band faded
6	25-Jan-2007	X,Y:-,Ob		W	GL US	
7	25-Jan-2007	X,Y:Wf,Yg		W	GP C	
8	5-Mar-2007	-, -:X,g	ends in 312	W	GL US	1951-26312
9	5-Mar-2007	X,Y:-,Ob		W	GL US	
10	9-Apr-2007	O, -:X,O/R		W	GL US	
11	9-Apr-2007	X,b:O,-		M	GL US	Matches brood marker for adult banded bird seen in 2007-8
12	9-Apr-2007	X,Y:-,Ob		W	GL US	
13	9-Apr-2007	X,Y:Wf,Yg		W	GP C	Central island
14	5-Sep-2007	-, -:X,g		W	GL US	second season at same location
15	5-Sep-2007	O, -:X,-		W	UK	This would match GL bird from 06-7 same location if the split fell off (spit worn first season)
16	5-Sep-2007	Of,BR:X,R		W	GL US	seen at middle island also
17	5-Sep-2007	X,b:Of,LO		W	GL US	previously banded X,b:O,- (matches a bird seen in spring previous year)
18	5-Sep-2007	X,Y:Wf,Yg		W	GP C	
19	17-Nov-2007	-, -:X,g	[951-[6312	W	GL US	
20	17-Nov-2007	Of,BR:X,R		W	GL US	
21	17-Nov-2007	X,Y:-,Ob		W	GL US	bird moved across S inlet to N side (middle island)
22	28-Jan-2008	O, -:X,-		W	UK	This would match GL bird from 06-7 same location if the split fell off (spit worn first season)
23	28-Jan-2008	Of,BR:X,R		W	GL US	
24	28-Jan-2008	X,b:Of,LO		W	GL US	
25	28-Jan-2008	X,Y:-,Ob		W	GL US	
26	28-Jan-2008	X,[Y]:Wf,Yg		W	GP C	Y band missing
27	14-Apr-2008	-, -:X,g		W	GL US	
28	14-Apr-2008	Of,BR:X,R		W	GL US	
29	14-Apr-2008	X,b:Of,LO		W	GL US	
30	14-Apr-2008	X,[Y]:Wf,Yg		W	GP C	Y band missing

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Capers Island from 2006-2008 are presented in **Table 72**.

Table 72. Capers Island shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
25-Aug-2006	H	R	7	66	10	340	3
25-Jan-2007	H	F	10	0	6	0	0
9-Apr-2007	M	R	7	73	7	73	0
5-Sep-2007	M	R	12	18	14	116	2
17-Nov-2007	M	R	9	1	2	25	13
28-Jan-2008	H	F	10	0	11	13	2
14-Apr-2008	H	F	11	50	12	107	0

44. St. Phillips Island

County: Beaufort

Survey Area: The inlet shoreline on the north end of the island.

Critical Habitat Designation: None.

Habitat Conditions: An island with very low density residential development accessible by boat only. A spit on the south end of the island has suitable feeding and roosting habitat and intertidal feeding habitat exists on the south end of the island and west of the seawall along the northern inlet shoreline.

Habitat Modifications: Sand fencing at the south end of the island and a rip rap seawall in front of a house at the north end.

Management Measures: None observed.

Comments: While a complete survey was not done on this island, a band survey was conducted on the north end of the island to scan, from the boat, for a banded Piping Plover that wintered at Capers Island. -, -:X,g and an unbanded Piping Plover were seen foraging along the intertidal area of the inlet on the north side of the island, so there may be movements between the Capers Island and St. Phillips Island. In addition, movements of a banded bird between Bay Point Island and the south end of St. Phillips Island were observed from the St. Phillips Island side. Future surveys should consider covering the three islands at the same time to minimize the chance of movements between the islands affecting survey results.

Piping Plovers: Two Piping Plovers were recorded in a survey dated 28 January 2008 (**Figure 110**).

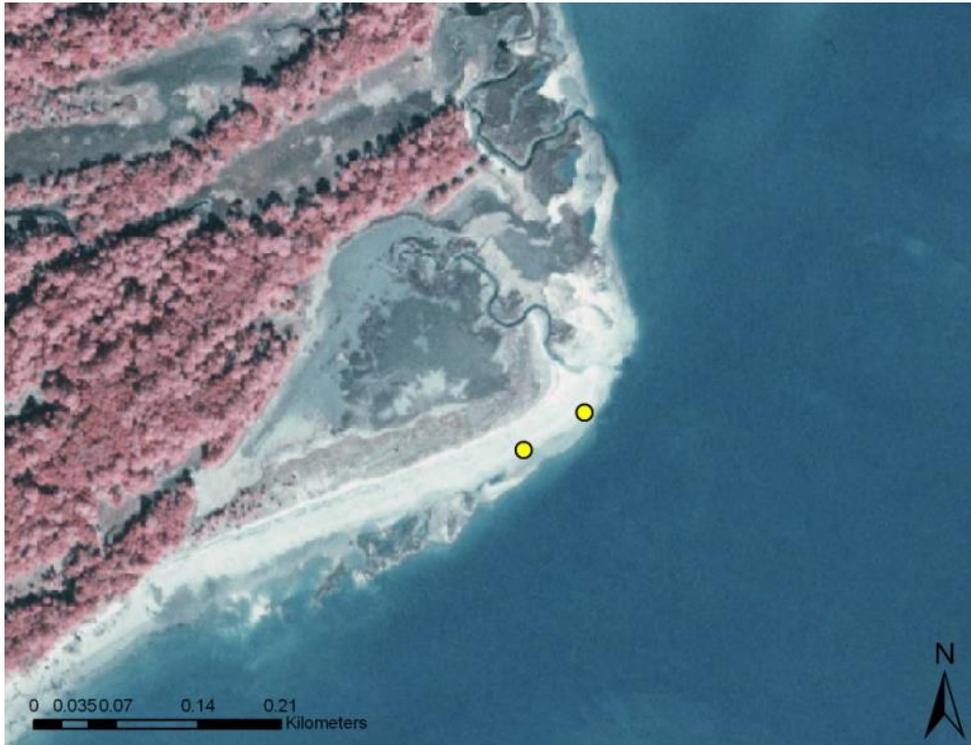


Figure 11057. St. Phillips Island Piping Plover locations, 2007-2008.

Piping Plover Band Observations: -, -:X,g, from the Great Lakes population, on 28 January 2008.

Shorebird Observations: A complete shorebird survey was not conducted at this site.

45. Bay Point

County: Beaufort

Survey Area: Surveys were conducted below the mean-high tide line; the north end was walked and the south end was walked or viewed from the boat.

Critical Habitat Designation: None.

Habitat Conditions: An undeveloped island except for a small house near the ocean beach and a dock on the bay side; this island has extensive exposed flats at low tide on the north and central parts of the island. There is good roosting habitat on the north end, but such habitat is limited at high tide on the center and south parts of the island with the high tide line at the vegetation line for much of the southern half of the island.

Habitat Modifications: Sand fencing at several locations on the island.

Management Measures: None observed.

Comments: In both seasons, this location was one of the better areas in the state for Piping Plovers. Piping Plovers and other shorebirds were observed moving between Bay Point and the south end of

St. Philips Island; such movements may influence count accuracy. Utility vehicle tracks were observed on the island.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Bay Point are presented in **Figure 111**; their locations on are presented in **Figure 112**.

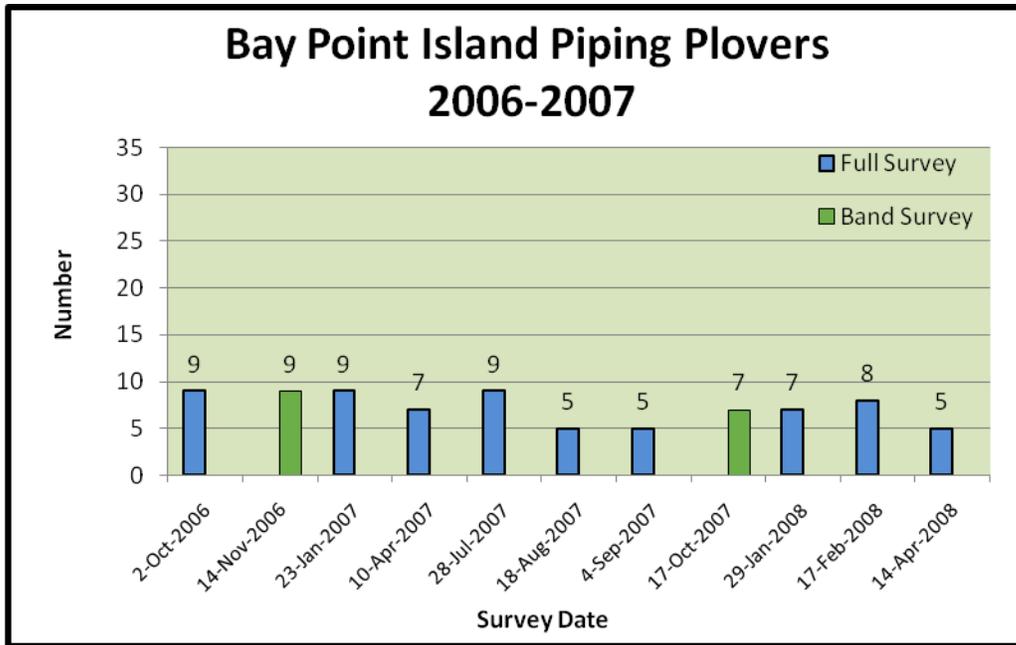


Figure 58. Bay Point Island Piping Plover observations.



Figure 112. Bay Point Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recoded at Bay Point are presented in **Table 73**.

Table 73. Bay Point Piping Plover band observations.

#	Date	Bands	Band #	M or W	Pop.	Comment
1	2-Oct-2006	O,-:X,L		W	GL US	
2	2-Oct-2006	Of,OO:X,Y		W	GL US	
3	14-Nov-2006	O,-:X,L		W	GL US	
4	14-Nov-2006	Of,OO:X,Y		W	GL US	
5	23-Jan-2007	O,-:X,L		W	GL US	
6	23-Jan-2007	Of,OO:X,Y		W	GL US	
7	10-Apr-2007	O,-:X,L	8061-19210	W	GL US	
8	28-Jul-2007	O,-:X,L		W	GL US	
9	28-Jul-2007	X,O:-,L		W	GL US	
10	18-Aug-2007	-,g;X,g/O/g	g015	M	GL US	
11	18-Aug-2007	O,-:X,L		W	GL US	
12	18-Aug-2007	O,L/O/L:X,L	L012	M	GL US	
13	4-Sep-2007	O,-:X,L		W	GL US	
14	17-Oct-2007	O,-:X,L		W	GL US	
15	17-Oct-2007	Of,OO:X,Y		W or M (?)	GL US	first season wintering; second season seen fall but not winter or spring; possible mortality
16	29-Jan-2008	O,-:X,L	8061-19210	W	GL US	Second season at same location; metal band match
17	17-Feb-2008	O,-:X,L		W	GL US	
18	14-Apr-2008	-,b:X,b/O/b	b003	M	GL US	
19	14-Apr-2008	O,-:X,L		W	GL US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Bay Point from 2006-2008 are presented in **Table 74**.

Table 74. Bay Point shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
2-Oct-2006	L	R	9	12	42	5	0
23-Jan-2007	H	F	9	1	27	0	0
10-Apr-2007	M	R	7	10	4	3	1
28-Jul-2007	H	F	9	0	2	0	0
18-Aug-2007	M	F	5	0	2	2	0
4-Sep-2007	H	R	5	0	7	0	0
29-Jan-2008	M	R	7	0	4	0	5
17-Feb-2008	H	R	8	0	2	0	0
14-Apr-2008	M	R	5	5	2	330	0

46. Joiner Bank
County: Beaufort

Survey Area: Entire bar.

Critical Habitat Designation: Unit SC-15, Hilton Head.

Habitat Conditions: An ebb bar island that was not above water during higher high-tide surveys and just barely above water in other surveys; however, at low tide, the island does provide a large area of intertidal feeding habitat.

Habitat Modifications: None observed.

Management Measures: None observed.

Comments: The island has become much smaller since the designation as a critical habitat unit. The habitat is suitable for Piping Plovers and does contain good quality intertidal feeding habitat; from the close proximity to Hilton Head and habitat quality, it can be expected that Piping Plovers move between the two locations. The low count numbers are likely an artifact of timing the counts on high tide when habitat is limited; more counts at mid or low tides probably would result in increased observations of Piping Plovers.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Joiner Bank are presented in **Figure 113**.

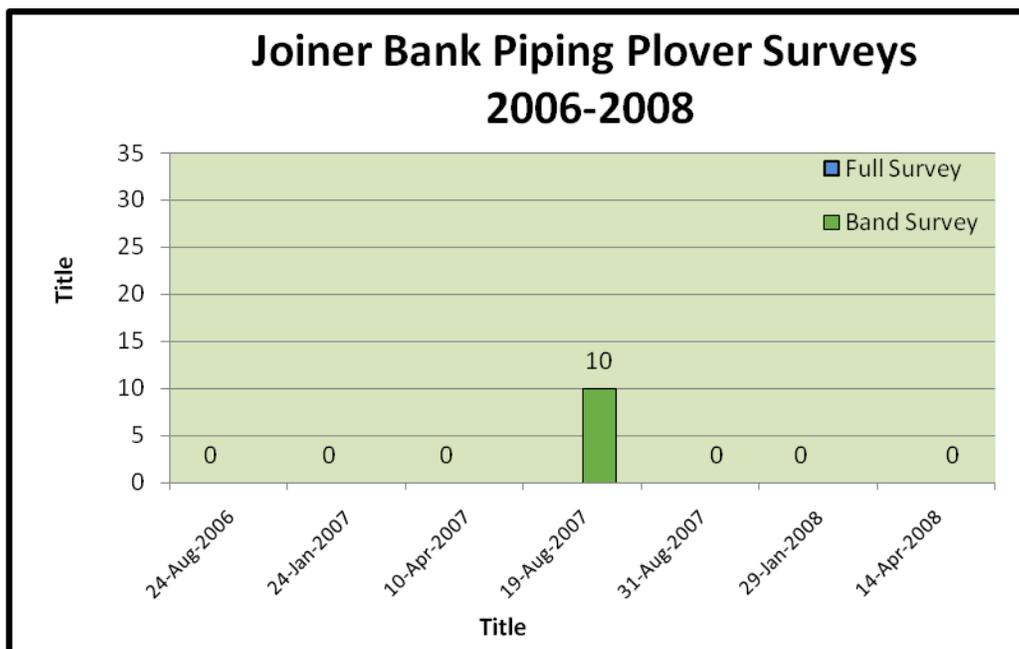


Figure 113. Joiner Bank Piping Plover observations.

Piping Plover Band Observations: None.

Other Shorebird Observations: None on surveys dated 24 August 2006, 24 January 2007, 10 April 2007, and 29 January 2008.

47. Hilton Head

County: Beaufort

Survey Area: Designated critical habitat on the ocean and sound beach and north to the first newly constructed groin if tide levels allowed or, at high tide, to the east side of Fish Haul Creek; the critical habitat area “begins at the shoreline east of northern Planters Row and ends at the shoreline east of Donax Road. It includes the MLLW of Port Royal Sound and the Atlantic Ocean to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur” (USFWS 2001: 36094).

Critical Habitat Designation: Unit SC-15, Hilton Head.

Habitat Conditions: A developed island, with residential houses landward of most of the survey route. Good roosting habitat exists at the point, the 133 post, and the east side of the tidal creek; there are large intertidal feeding areas with areas of mud/sand substrate at areas in the bay near Fish Haul Creek and a moderate width areas to the east on the bay and ocean sides.

Habitat Modifications: Beach replenishment and new rock groins were constructed in the 2006-07 winter at the west end of the survey area; old groins existed on the east end the Port Royal Sound.

Management Measures: Public boat landing and recreational off-road vehicle use are prohibited; dogs are not permitted on the beach between 10 AM and 5 PM Friday before Memorial Day through Labor Day; must be on a leash between 10 AM and 5 PM 1 April through Thursday before Memorial Day and between 10 AM and 5 PM Tuesday after Labor Day through 20 September and on a leash or “under positive voice control at all other times.”

Comments: High levels of human disturbance were observed on the ocean beach, though disturbance could be lower on the sound side of the unit. One of the main roosting areas, at the point, is subject to high levels of disturbance.

From differing numbers seen at high and low tides, it is possible that Piping Plovers may be moving at low tide to an area outside of the survey area to feed. Based on habitat characteristics, areas to the west of the survey area as well as Joiner Bank should be considered for surveys at differing tidal stages.

Piping Plovers: Piping Plovers recorded during the 2006-2008 survey seasons at Hilton Head are presented in **Figure 114**; their locations on are presented in **Figure 115**.

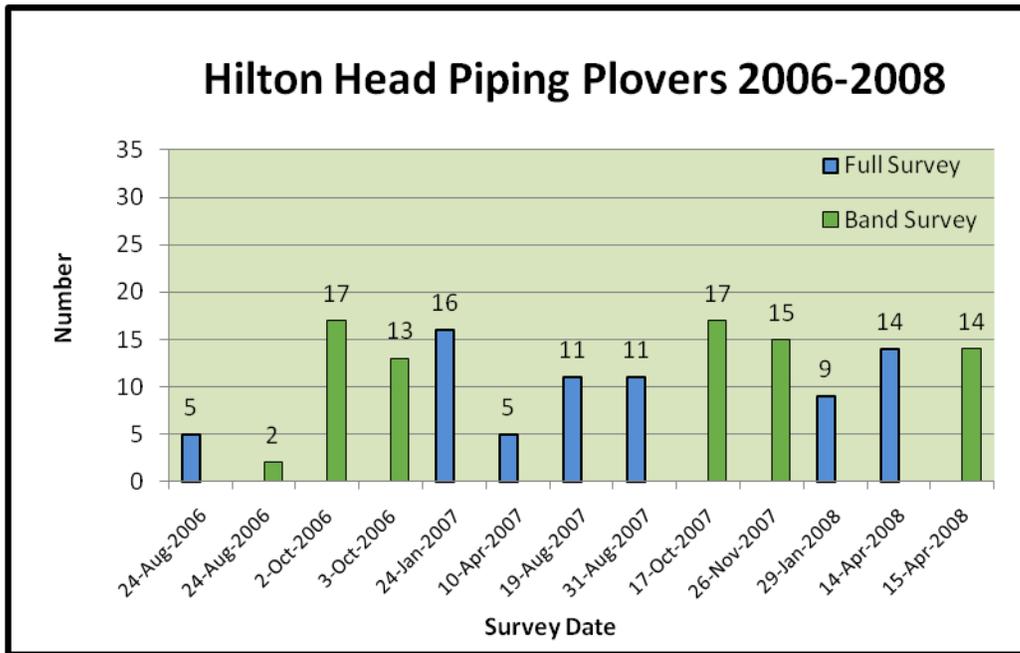


Figure 114. Hilton Head Piping Plover observations.



Figure 59. Hilton Head Piping Plover locations, 2006-2008.

Piping Plover Band Observations: Banded Piping plovers recorded at Hilton Head are presented in **Table 75**.

Table 75. Hilton Head Piping Plover band observations.

#	Date	Bands	Band #	M or W	Population	Comment
1	24-Aug-2006	X,O:-,LR		W	GL US	
2	2-Oct-2006	-, -:X,b		W	GL US	
3	2-Oct-2006	X, -: -,C		M	At C	
4	2-Oct-2006	X,O:-,LR		W	GL US	
5	2-Oct-2006	X,R:Lf,YR		W	GP C	
6	3-Oct-2006	-, -:X,b	981-76665	W	GL US	
7	3-Oct-2006	X, -: -,C		M	At C	
8	24-Jan-2007	-, -:X,b		W	GL US	
9	24-Jan-2007	X,O:-,LR		W	GL US	
10	24-Jan-2007	X,R:Lf,YR		W	GP C	
11	10-Apr-2007	-, -:X,b		W	GL US	
12	10-Apr-2007	X,O:-,LR		W	GL US	
13	19-Aug-2007	-,O/g:X,g	g008	M	GL US	
14	19-Aug-2007	Of,GY:X,b	0981-76665	W	GL US	Match to -, -:X,b, seen year before at same location
15	19-Aug-2007	X,O:-,L		W	GL US	ends in 8, possible 9 before 8
16	31-Aug-2007	-,O:X,g/O		M	GL US	
17	31-Aug-2007	Of,GY:X,b		W	GL US	
18	17-Oct-2007	-,O:X,g/O		M	GL US	
19	17-Oct-2007	Of,GY:X,b		W	GL US	
20	17-Oct-2007	X,O:-,L		W	GL US	
21	26-Nov-2007	Of,GY:X,b		W	GL US	
22	26-Nov-2007	X,O:-,L		W	GL US	
23	29-Jan-2008	Of,GY:X,b		W	GL US	
24	29-Jan-2008	X,O:-,L		W	GL US	
25	14-Apr-2008	O, -:X,G		M	GL US	
26	14-Apr-2008	X,O:-,L		W	GL US	
27	15-Apr-2008	O, -:X,G		M	GL US	Old style. 8 top, 19 bottom left
28	15-Apr-2008	X,O:-,L		W	GL US	

Shorebird Observations: The survey dates and total number of focal shorebird species recorded at Hilton Head from 2006-2008 are presented in **Table 76**.

Table 76. Hilton Head shorebird observations.

Date	Tide St.	Tide Dir.	PIPL	WIPL	AMOY	REKN	MAGO
24-Aug-2006	H	F	5	0	0	0	0
24-Jan-2007	H	F	16	0	3	0	139
10-Apr-2007	H	F	5	0	0	12	13
19-Aug-2007	M	R	11	0	3	0	0
31-Aug-2007	H	R	11	0	0	1	0
29-Jan-2008	M	F	9	0	0	0	23
14-Apr-2008	M	R	14	0	0	50	16

DISCUSSION

Piping Plover

This study focused on the threatened Piping Plover in South Carolina. There have been prior state census efforts in South Carolina (Wilkinson and Spinks 1994, Dodd et al. 1999, Bimbi and Sanders 2009). Unlike those efforts, this study did not attempt to census the entire state. Rather, there was an intensified focus was on Piping Plover winter range critical habitat sites and other high and moderate quality Piping Plover wintering locations during fall migration, winter, and spring migration. With 136 observations of Piping Plovers at 31 sites during the 2006-2007 winter, and 154 observations of Piping Plovers at 39 sites during the 2007-2008 winter survey, this study found a noticeably higher number than all prior state winter census efforts. The most recent census, the 2006 International Piping Plover Census, found 100 Piping Plovers (Bimbi and Sanders 2009). The higher count in this study may be due in part to the additional visits to the sites during the fall and spring surveys. Additionally, increased familiarity with the habitats used by Piping Plovers at specific sites may have increased detection rates.

There can be considerable challenges associated with accurately counting the number of wintering Piping Plovers using a site. During the winter, the small size and light colored feathering of this species blend in very well with the old wrack and backshore beach sand areas that are used for roosting habitats. In addition, movements between islands may make detection difficult, as the bird may not be available for observation at the time the survey is being done. However, banded individuals that are known to be wintering in an area allow detectability rates to be calculated. Noel and Chandler (2008) found that detectability of banded Piping Plovers wintering in Georgia was around 66%, with the listed range for detecting specific individuals varying between 19-100%. During this study, the detectability of Piping Plovers at Bird Key Stono and Deveaux Bank ranged between 52% and 100%. Harbor Island was particularly interesting, with a detection rate the first season of 29% to 70% and a rate the second season between 39% and 55%. However, if the observations on the same day across the inlet at Hunting Island are combined with the Harbor Island observations, the detection rate increases to 48% to 80% the first season and 56% to 80% the second season. Thus, movements between Harbor Island and Hunting Island were influencing the detection rates for individual birds at this location.

Based on our findings, we agree with Noel and Chandler's (2008) concern that surveys for wintering Piping Plovers may underestimate the number of individuals at a site due to limited detection probability. At the Harbor/Hunting Islands complex, movements across the inlet were

influencing detection rates. Due to localized movements, Piping Plovers may not be available for detection at a specific site at the time the survey is conducted.

In North Carolina, Cohen et al. (2008) found that wintering Piping Plovers moved between a barrier island and shoals, with the intertidal areas of the sound islands preferred over the ocean and sound sides of the barrier island when water levels were low. In South Carolina, over the two seasons, banded Piping Plovers were resighted on different sides of an inlet at 8 locations and unbanded birds were observed during surveys moving across two additional inlets. Sometimes, these movements may be complex, such as between the north side of the Stono River inlet at the South end of Folly Beach, Bird Key Stono near the middle of the Stono River inlet, and the north end of Kiawah Island on the south side of the inlet. Designing surveys to address movements, such as using experienced survey personnel at the same time on both sides of an inlet, may reduce the chance of Piping Plovers being missed.

An important finding of this study is the high number of individuals from the endangered Great Lakes breeding population that used South Carolina as either as a wintering or migratory stopover location. In 2008, an estimated 63 breeding pairs were observed in the Great Lakes (USFWS 2009). Based on observations of color bands, at least 64 different individuals from the Great Lakes were resighted in South Carolina coastal habitats over the two non-breeding seasons. It should not be assumed that all of the observed Great Lakes birds were breeding pairs, as some of the individuals were hatch year birds. Nevertheless, this data from two wintering seasons, when combined with the findings of Noel and Chandler (2008) of a minimum of 77 Great Lakes birds at Little Saint Simons Island in Georgia over a three year period, continue to suggest the high importance of Atlantic Coast habitats to migrating and wintering birds from the Great Lakes.

This study also suggests that observer effort may influence the rate of band returns for birds from the Great Lakes. Stucker et al. (2010) note that between 1995 and 2005, Piping Plovers from the Great Lakes were resighted in six South Carolina units; each of those six units had between 1 and 3 individuals observed, for no more than 11 individuals total. In this two season study, 22 adults from the Great Lakes that were individually marked were resighted; in addition, there were birds not included in this total that were individually identified including adults with brood marker bands, fledglings with brood marker bands, and captive reared birds. This study had as a specific goal the observation of banded Piping Plovers, and extra effort was devoted to looking for color bands using a spotting scope. Research efforts that include band observations as a priority may increase our knowledge of the wintering distribution for differing breeding populations of this species.

Piping Plovers appear to have high inter-annual fidelity to wintering locations. Noel and Chandler (2008) found in Georgia that Piping Plovers that were observed the first season exhibited a 69.2% site fidelity rate for the second season, and, even with higher apparent mortality during that second season, a 44.4% return rate for wintering individuals during the third season. Stucker et al. (2010), in a review of 10 years of band returns, found that 62% of individuals from the Great Lakes seen in subsequent seasons exhibited inter-annual site fidelity. This study found apparent inter-annual site fidelity of a rate of 76.9% for wintering banded birds that were individually identifiable. This high rate may be due to the calculation method, which required the bird to be individually identifiable to be included in the sample. The non-individually identifiable birds using brood markers for which the metal band number was not known may have had a higher percentage of younger, hatch year birds that may have a higher mortality rate and a lower return rate.

During this study, the behavior of non-breeding Piping Plovers when they were first observed during a survey was recorded. Wrack appears to be an important habitat type for Piping Plovers wintering in South Carolina. Approximately 9.8% and 19.4% of all behavioral observations were in fresh wrack and old wrack respectively. The percentage of observations of wrack use during roosting is even higher, with 18% of the observations in fresh wrack and 44.9% of the observations in old wrack. With over 60% of roosting observations in either old wrack or fresh wrack, this habitat cover should be a priority for management efforts to protect roosting Piping Plovers. The amount of wrack that birds used as a roosting location varied, with birds often roosting in or next to lines of sparse, scattered old wrack left from a very high tide (as shown in the picture on the cover) and sometimes next to denser wrack concentrations.

This study also allows an evaluation of the adequacy of the critical habitat designation locations for wintering Piping Plovers in South Carolina based on surveys that were conducted in a relatively narrow time window. In the second season wintering survey, 124 Piping Plovers were observed in or just adjacent to areas designated by the USFWS as WRCH. This represents about 81% of the 154 birds that were observed during the winter state survey in South Carolina. Sites where Piping Plovers were observed that were not designated as WRCH were Bay Point Island, Bull Island North, Cape Island North, Fripp Island, Murphy Island, St. Phillips Island North, and Sullivan's Island. In addition, based on observations throughout the non-breeding season, there are areas located just outside of existing WRCH boundaries – such as between the north end of the WRCH boundary at Hilton Head and the north side of Fish Haul Creek – that clearly are valuable to Piping Plovers. The critical habitat designations are a helpful guide for much of the habitat that is important to Piping Plovers in South Carolina. However, the designations are not a substitute for

surveys by experienced personnel who can provide up to date knowledge of Piping Plover use at a specific site.

Wilson's Plover

In 2006, in conjunction with the Piping Plover Winter Census, a census was conducted of wintering Wilson's Plovers that found 30 Wilson's Plovers in South Carolina, with the high count at Deveaux Bank of 11 birds (Bimbi and Sanders 2009). This survey effort did not attempt to census the state wintering population, but instead counted Wilson's Plovers that were observed during the Piping Plover counts during fall, winter, and spring counts at 26 sites, 4 of which were surveyed more frequently. For the wintering survey results, 26 Wilson's Plovers were seen in 2006-2007 at 31 sites, and 13 were seen in 2007-2008 at 38 sites.

The interesting finding from this study is the number of migratory adults observed at three South Carolina sites. The Wilson's Plover is estimated to have a population of 6,000 individuals, though confidence in that estimate is low (Brown et al. 2001). Deveaux Bank had 10 counts, all during fall migration, where more than 60 Wilson's Plovers were observed. Capers Island in Beaufort County had more than 60 Wilson's Plovers counted during one spring and one fall migration count, with another spring count at 50 birds. In addition, there were 68 Wilson's Plovers counted south of the lagoon inlet on the north end of Kiawah Island on 28 August 2006. The high counts suggest these three South Carolina locations are important migratory stopover spots for the species.

Red Knot

This survey effort did not attempt to census the state wintering population, but instead counted Red Knots that were observed during the Piping Plover counts. For the wintering survey results, 232 Red Knots were seen in 2006-2007 at 31 sites, and 242 were seen in 2007-2008 at 38 sites.

During migration, much larger counts of Red Knots were observed. In both years, the north end of Kiawah Island had the highest counts that were observed at our study sites, with the south side of the lagoon having a count of 1,500 Red Knots on 6 April 2007. Other high counts during spring migration include Deveaux Bank with 321 Red Knots on 26 April 2008, Bay Point Island with 330 knots on 14 April 2008, Fripp Island with 400 on 7 April 2008, and Bird Key Stono with 459 on 6 March 2007. During fall migration, Harbor Island had 312 Red Knots on 25 October 2007. Based on the more frequent migration counts that were conducted every 10 days at four sites,

the number of Red Knots using a site during migration can vary significantly, so limited visits to a site may not be sufficient to estimate the use of a site.

Marbled Godwit

This study found that few of the South Carolina beaches that were surveyed had observations of wintering Marbled Godwits. The two exceptions were the beaches of Harbor/Hunting Islands and Hilton Head Island, which had high counts of 140 birds on 17 February 2008 and 139 birds on 24 January 2007, respectively.

American Oystercatcher

Sanders et al. (2004) estimated the wintering population of American Oystercatchers in South Carolina at around 3,536 birds. This study was not an attempt to census the state population. This study did not include many of the areas found by Sanders et al (2004) that were large roost sites for wintering American Oystercatchers. Instead, American oystercatchers that were seen during Piping Plover surveys of beach habitats also were counted. This study did not find any data that contradicted Saunders et al. (2004). Most beach sites that were surveyed during this study had low numbers of wintering American Oystercatchers, with the exceptions being North Inlet and Lighthouse Island.

CONCLUSION

The findings of the South Carolina Shorebird Project reaffirm the importance of South Carolina beaches to non-breeding Piping Plovers, Wilson's Plovers, and Red Knots. Shorebirds such as the Piping Plover spend most of their time away from the breeding grounds, and small changes in survival rates during the non-breeding period can influence whether the population is increasing, decreasing, or stable (USFWS 2009). Thus, conservation efforts at migratory and wintering areas can be critical to the success of shorebird recovery efforts.

SCDNR employees and local Audubon members have a long standing interest in shorebirds. Nevertheless, during the two years of field work in South Carolina, we observed an increasing interest in shorebird conservation by individuals, agencies, and landowners and managers. In some locations, specific measures were implemented that provide additional protection for wintering shorebirds. For instance, based on this work, the South Carolina Park Service made the north end of Hunting Island State Park and Huntington Island State Park dog free areas, while still allowing pets on leash in the remaining beach areas of the park. In addition, there were numerous informal contacts that may have provided benefits. For example, after Hilton Head Audubon was contacted and Piping Plover surveys were done at high quality habitat at the north end of Hilton Head Island, there was an increased understanding of the locations of high tide roosts. When a beach replenishment project was proposed that would have included the storage of heavy equipment in one of the main high tide Piping Plover roosting areas, informal discussions between Hilton Head Audubon and town leaders resulted in a decision to move the storage area down the beach a short distance, which protected the roosting habitat while still allowing the project to go forward (Howard Costa, pers. comm. 2007).

While this project raised the profile of non-breeding shorebirds in South Carolina and resulted in increased protections at certain sites, many challenges remain. Human disturbance at the developed sites can be high, especially during the fall migration period. Dogs off leash are a particular concern at certain sites such as Seabrook Island and Sullivan's Island. Both of these threats can be managed, if there is public support. However, the threat of rising sea levels and resulting efforts to stabilize the coastline are serious long-term concerns (USFWS 2009) that may be more difficult to address. Continuing research can provide the information to better manage the conservation challenges that face non-breeding shorebirds.

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