

# Abundance and Distribution of Wilson's Plovers During the Breeding Season in South Carolina

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## Abstract

Wilson's Plover (*Charadrius wilsonia*) is listed as threatened in South Carolina. Although the species is not federally listed, the US Shorebird Conservation Plan identified Wilson's Plover as a "species of high concern" partly due to threats on the breeding grounds. Suitable nesting habitat on the beaches of South Carolina was surveyed for breeding Wilson's Plovers for the first time between 2009–2012. A mean of 376 pairs were recorded in South Carolina with 29% on private land and 71% on public land. Of the pairs, 68% were within 1 km of an inlet and 56% were located within 0.5 km. Because Wilson's Plovers nest primarily on beaches (79%) in South Carolina and this habitat is increasingly used by humans, conservation efforts should be focused on this migratory shorebird.

## Introduction

Wilson's Plover is a medium-sized plover recognized by a single breast band, brown back, whitish underside, and heavy bill. During the breeding season, the breast band and forecrown is dark brown to black in males and lighter brown in females. Juveniles are similar in appearance to adult females, but the breast band is less complete and juvenile plumage appears lighter (Corbat and Bergstrom 2000).

Wilson's Plovers are migratory shorebirds that are associated with coastal habitats. In the United States, Wilson's Plovers nest from Virginia to southern Florida and along the Gulf coast from Florida to Texas (Corbat and Bergstrom 2000). Historically, Wilson's Plovers also nested as far north as New Jersey and Maryland, but the last nest record for Maryland was in 1985 (Hoffman 1996).

Although it is not federally listed, the US Shorebird Conservation Plan identified Wilson's Plover as a "species of high concern", partly due to threats on the breeding grounds (Brown et al. 2001). It is listed as state endangered in Maryland and Virginia, state threatened in Georgia and South

Carolina, a species of special concern in North Carolina, and state protected in Alabama (Corbat and Bergstrom 2000, North Carolina Wildlife Resources Commission 2008, Georgia Department of Natural Resources 2010, Maryland Natural Heritage Program 2010, Virginia Department of Game and Inland Fisheries 2011, Alabama Natural Heritage Program 2012, South Carolina Department of Natural Resources 2012).

The purpose of this study was to determine the abundance and distribution of nesting pairs of Wilson's Plovers in South Carolina. For the first time, nearly all suitable nesting habitat on the beaches of South Carolina was surveyed for breeding Wilson's Plovers. This study provides baseline data for South Carolina that can be used to analyze population trends and to identify important sites for conservation.

## **Methods**

Surveys were conducted in 2009 (May 10–July 15), 2010 (April 20–June 7), 2011 (April 19–June 1) and 2012 (March 29–May 24). Wilson's Plovers are known to nest in coastal dunes and on beaches. All suitable nesting habitat on beaches along the coast of South Carolina was surveyed for pairs of Wilson's Plovers at least once during the study, except 4 km of coast at Edingsville Beach. Beaches with sea walls and rocks or with forest or thick vegetation adjacent to the high tide line were not surveyed because plovers prefer nesting in more open areas with sparse vegetation (Corbat and Bergstrom 2000). Wilson's Plover density in South Carolina is significantly lower at sites with human development (Dikun 2008). Sites with heavy human disturbance, such as Myrtle Beach, were considered unsuitable habitat and also were not surveyed.

In addition to beach habitat, shell rakes composed primarily of washed Eastern oyster (*Crassostrea virginica*) shells that were visited as part of other avian monitoring projects were included in the study. Also, two sites that have managed wetland impoundments were surveyed because Wilson's Plovers had been observed there in the past. During surveys, sites were categorized as mainland beach, barrier island beach, impoundment, estuarine shell island, estuarine sand island, and shell rake adjacent to marsh.

The primary goal of the survey was to record the number of Wilson's Plover adults and to determine whether they represented a breeding pair. Wilson's Plovers were located by direct observation and by listening for their calls. Number of nests, chicks, fledglings and sex of adult, if possible, were also recorded. Adults were categorized as breeding or unknown. Adults were considered breeding if they displayed courtship or defensive territorial behavior or if a nest, chicks or fledglings were found near an adult. Occasionally only one adult was observed near a nest site but still categorized as representing a breeding pair. During surveys later in the season, some fledglings were difficult to distinguish from adults; thus total adults recorded at each site may have included older fledglings.

Thirty-six individuals, mostly volunteers, participated in the surveys, but the majority of the sites were surveyed by four individuals. Surveys were

done in conditions that afforded high visibility. Days with high wind, rain or low light were avoided. To minimize the amount of habitat that needed to be searched, surveys were conducted around high tide (2 hours before to 2 hours after high tide). Surveying consisted of walking through all potential nesting habitat. If suitable habitat was wide, such as an expansive dune system, a line of parallel surveyors would walk through the habitat to keep track of moving birds and minimize overestimating breeding pairs. Locations of plovers and area surveyed were recorded with a GPS unit or on an aerial photo. Some areas were surveyed for more than one year, and the mean number of pairs and standard deviation were calculated for each site.

Distances of the coast surveyed were calculated in a GIS by georeferencing survey routes onto projected digital imagery in ArcGIS 10.0 at 1:25,000 scale (ESRI 2009). Only one survey per site was used for mapping locations of pairs. For sites that were surveyed in multiple years, the survey with the most pairs or best location information was used. Distances of pairs to the nearest inlet were calculated by creating 0.25 km, 0.5 km, and 1 km buffers around points marking an inlet. At broad inlets, where islands terminated at a river or bay, multiple points at the edge of the island were created to mark the inlet. For small inlets such as a breach in an island, only one point was created. For small estuarine islands, the entire perimeter of the island was classified as an inlet. These buffers were overlaid onto breeding pair locations to categorize pairs into distance classes. The density of pairs north and south of Charleston Harbor was calculated to determine if there were geographical differences in the state. Density was calculated by dividing the number of pairs by linear suitable habitat.

## **Results**

A mean of 376 pairs were recorded and 131 km of suitable coastline habitat were surveyed (Table 1). The total of 634 adult plovers counted during the four years included 27 plovers whose age and breeding status observers were uncertain of. Nests with eggs were observed from April 19 to June 3. Thorough nest searches were not conducted during the study, so these dates represent a minimum window of nesting in South Carolina. Fledglings were recorded from May 10 to July 15, the latter being the latest date on which surveys were conducted; thus these dates also represent a minimum window in which fledglings are present. On private land there were 107 Wilson's Plover pairs (28%), and on public land there were 269 pairs (72%). Within 1 km of an inlet, there were 268 pairs (68%), 221 pairs (56%) were within 0.5 km and 170 pairs (43%) were within 0.25 km. Density of plovers north of Charleston Harbor was 2.4 pairs/km (188 pairs in 79 km), which was lower than the density south of Charleston Harbor, where there were 3.6 pairs/km (188 pairs in 52 km). On barrier island beaches there were 296 pairs (79%), 30 pairs (8%) in impoundments, 29 pairs (8%) on mainland beaches, 10 pairs (3%) on sandy estuarine islands, 9 pairs (2%) on shell rakes at the edge of marsh, and 2 pairs (1%) on shell estuarine islands.

Table 1. Estimated number of Wilson's Plover pairs and (total number of plovers) at 41 sites in SC, visited at least once during the breeding seasons of 2009–2012, listed north to south. Total number of plovers includes adults and plovers of unknown age. Mean number of pairs (followed by standard deviation) for each site. A blank space indicates the site was not surveyed.

| Sites                     | Pairs (total individuals) |         |         |         | Mean pairs<br>(SD) |
|---------------------------|---------------------------|---------|---------|---------|--------------------|
|                           | 2009                      | 2010    | 2011    | 2012    |                    |
| Waites Island             | 7 (11)                    | 8 (12)  |         |         | 8 (1)              |
| Huntington Beach          | 3 (5)                     | 5 (12)  |         |         | 4 (2)              |
| Litchfield Beach          | 2 (5)                     | 2 (2)   |         |         | 2 (0)              |
| Pawley's Island           |                           | 0       |         |         | 0                  |
| Debideaux                 | 3 (3)                     | 0       |         |         | 2 (2)              |
| Bosun's Point             | 1 (1)                     |         |         |         | 1                  |
| North Island              | 26 (62)                   | 23 (41) |         |         | 25 (2)             |
| Sand Island               |                           | 9 (17)  |         |         | 9                  |
| South Island, Gibson Pond | 2 (9)                     |         |         |         | 2                  |
| South Island              |                           |         | 15 (26) |         | 15                 |
| Cedar Island              | 16 (29)                   | 14 (25) |         |         | 15 (1)             |
| Murphy Island             | 8 (15)                    |         |         |         | 8                  |
| Cape Island               | 29 (58)                   |         |         |         | 29                 |
| White Banks               |                           | 2 (4)   |         |         | 2                  |
| Raccoon Key               | 15 (26)                   | 16 (30) |         |         | 16 (1)             |
| Lighthouse Island         | 17 (35)                   | 23 (45) |         |         | 20 (4)             |
| Bulls Bay shell rakes     |                           | 9 (18)  |         |         | 9                  |
| Bull Island               | 8 (14)                    | 10 (16) |         |         | 9 (1)              |
| Capers Island             | 8 (14)                    | 6 (11)  |         |         | 7 (1)              |
| Deweese Island            | 5 (9)                     | 4 (8)   |         |         | 5 (1)              |
| Isle of Palms             | 0 (0)                     |         |         |         | 0                  |
| Sullivan's Island         | 2 (3)                     |         |         |         | 2                  |
| Morris Island, North end  | 2 (3)                     | 1 (2)   |         |         | 2 (1)              |
| Morris Island, South End  |                           |         | 33 (66) |         | 33                 |
| Folly Beach               | 11 (22)                   | 7 (17)  |         |         | 9 (1)              |
| Bird Key                  | 12 (22)                   | 8 (16)  | 7       |         | 9 (3)              |
| Kiawah Island             | 28 (53)                   | 26 (65) |         |         | 27 (1)             |
| Seabrook Island           |                           | 2 (4)   |         |         | 2                  |
| Deveaux Bank              | 1 (3)                     |         |         |         | 1                  |
| Botany Bay Plantation     | 7 (12)                    | 12 (21) |         |         | 10 (4)             |
| Edisto Beach State Park   |                           | 4 (7)   |         |         | 4                  |
| Otter Island              | 3 (6)                     | 3 (6)   |         | 6 (16)  | 4 (2)              |
| Harbor Island             | 2 (4)                     | 5 (10)  | 14 (27) |         | 7 (6)              |
| Hunting Island            | 1 (2)                     |         |         |         | 1                  |
| Fripp Island              | 3 (5)                     |         | 0 (0)   |         | 3 (2)              |
| Pritchard's Island        |                           | 1 (2)   | 0 (0)   |         | 1 (1)              |
| Little Capers             |                           |         | 37 (73) |         | 37                 |
| St Philips                | 2 (5)                     | 1 (2)   |         | 1 (2)   | 1 (0)              |
| Bay Point                 |                           |         |         | 11 (20) | 11                 |
| Savannah Spoil Sites      | 43                        | 24      | 18      |         | 28 (13)            |
| <b>Total</b>              |                           |         |         |         | <b>376</b>         |

## Discussion

This study expanded the survey efforts of Dikun (2008), which covered 26 sites (representing 25% of the South Carolina coast) in May and June of 2006 and 2007. Because the 2006 and 2007 surveys counted only the number of birds seen and did not determine the number of breeding pairs, it is difficult to compare results of these surveys to our project. Dikun (2008) found a high number of plovers at North Island, Cedar Island, and Lighthouse Island. These islands are among the ten sites in these surveys that had the highest number of breeding pairs.

Range-wide breeding-pair surveys are lacking, but Wilson's Plover estimates are available for some states. Wilson's Plover surveys in Virginia between 1988 and 2009 found between 23 and 50 pairs (Smith et al. 2009). In 2004 and 2007 in North Carolina, statewide surveys estimated 232 and 240 pairs respectively (Houston and Cameron 2008). A 2010 survey of the Georgia coast found 350 breeding pairs (Georgia Department of Natural Resources 2010). Surveys in Florida suggest that there are at least 160 pairs (Burney 2009). In 2004, a survey of Texas found 817 pairs of Wilson's Plovers (Kolar and Withers 2004).

Unlike American Oystercatchers (*Haematopus palliatus*) in South Carolina, which nest primarily on public land (97% on public land, SCDNR unpublished data), private and public land are both important for breeding Wilson's Plovers. Although we did not categorize the amount of human disturbance at each site, it appeared that the most undeveloped and remote sites (far from a boat ramp or difficult to access via boat because of shallow creeks, bars, etc.) had more Wilson's Plovers than sites that are easily accessible by humans. For example, the north end of Morris Island (1.5 km of linear suitable habitat) had only two pairs and the south end (1.2 km of suitable habitat) had 33. The north end of the island is easily accessible to boaters in Charleston Harbor and has frequent recreational use. The south end is more difficult to access and has less use by humans (personal obs.) and this lack of disturbance probably results in higher numbers of Wilson's Plover pairs. Dikun (2008) found the density of Wilson's Plovers at developed (2.0 plovers/km) and undeveloped (7.0 plovers/km) sites was significantly different. Human disturbance can negatively affect reproductive success on beach nesting birds by reducing hatching and brood success (Burger 1995). We found that density was higher in the southern part of SC compared to the north of Charleston Harbor, although the reasons for this difference were not investigated.

A majority of Wilson's Plovers were found within 0.5 km of an inlet. Habitat at inlets is often flat because over-wash reduces the height of the dunes (pers. obs). Dikun (2008) in a study of nest site characteristics in South Carolina found Wilson's Plover nests were in habitat consisting of over-wash areas with scattered dunes more than other available habitat types such as elevated dunes or active over-wash. This habitat type may be preferred by Wilson's Plovers because: a) it provides dunes that will not flood as easily as low areas, b) dune vegetation provides a place for chicks to

hide, and c) open areas that wash provide visibility of predators (Burger 1987, Dikun 2008). Areas around inlets are often the only area of a beach accessible to boaters and thus should be high priority for protection of nesting plovers from disturbance.

Due to logistical difficulties in visiting all sites in one year, this project spanned four years. Many sites that were surveyed in multiple years had similar numbers of Wilson's Plovers each year; therefore surveying the state over the course of multiple years may result in an accurate estimate of pairs in South Carolina. However some sites, such as Harbor Island, had large fluctuations in the number of pairs. On the south end of Harbor Island a sand spit formed and provided additional Wilson's Plover nesting habitat in 2011, thereby resulting in an increase in pairs. As coastal habitat changes, plovers would be expected to move to make use of newly formed available nesting habitat and to leave areas that have limited optimal habitat. Future surveys should attempt to cover the entire state in one year to get a more accurate breeding estimate.

Two sites, Gibson Pond on South Island and Savannah River Dredge Spoil Sites, which have managed wetland impoundments, were surveyed because Wilson's Plovers had been observed there in the past. The Savannah River Dredge Spoil Site is a US Army Corps of Engineers dredge spoil containment facility located in Jasper County. The facility is located adjacent to the Savannah River and approximately 14 km from the front ocean. South Island is part of the Yawkey Center, a coastal property owned by South Carolina Department of Natural Resources in Georgetown County. South Carolina has 70,500 acres of old rice field impoundments (Migliarese and Sandifer 1982) that are often dry in the spring and early summer. Eight per cent of the plover pairs in South Carolina were found in impoundments because Savannah Spoil Sites had many pairs (28). Savannah Spoil Sites are important to other shorebirds and waterbirds, and highlight management potential in artificial habitats. Plovers may nest in impoundments that were not visited, and future surveys may include surveying a larger sample of this widespread habitat type.

Only two areas with shell rakes, located in Cape Romain National Wildlife Refuge, were included in this survey. These sites are White Banks, three estuarine islands in Bulls Bay, and the shell rakes along the southwest edge of Bulls Bay. Although only a few sites that were not beach habitat were surveyed, we expect that most Wilson's Plovers in South Carolina nest on beaches. Unlike American Oystercatchers that are frequently observed nesting on shell rakes in South Carolina, i.e. 56% of American Oystercatchers in South Carolina nest on washed shell habitat (Sanders et al. 2008), Wilson's Plovers are not common in this habitat type. American Oystercatchers have received much conservation and research attention (Schulte et al. 2010). Because Wilson's Plovers nest primarily on beaches and this habitat is increasingly used by humans, equal conservation concern should be focused on this shorebird.

## Acknowledgements

We are grateful for the many people who helped with these surveys especially M. Bimbi, N. Dias, S. Calver, A. Given, J. Jordan, A. Segars, C. Snook. We appreciate the many properties, private and public, that allowed us access to complete this project. This manuscript benefitted from comments by C. Hand, J. Thibault, Dr. C. Hill and K. Fiala. This work was partly funded by federal money from the State Wildlife Grant Program.

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*Received 9 October 2012, accepted 25 November 2012*