

## Dataset – Shorebird Habitat Characterization Data: Benthic community, elevation, and substrate

This document provides detailed information about a dataset that was generated through a 2021-2022 catalyst project titled *Identifying Optimal Foraging Characteristics to Inform Piping Plover and Red Knot Habitat Management*. This document also provides information [about the project](#). The project was supported by the National Estuarine Research Reserve System (NERRS) Science Collaborative, which is funded by the National Oceanic and Atmospheric Administration. All Science Collaborative supported projects that collect new data adhere to federal data sharing and archiving requirements.

3 related datasets are described in this document:

1. Piping Plover Benthic Habitat Characterization
2. Piping Plover Fecal Analysis Summary
3. UAV imagery to Understand Piping Plover Habitat Spatial Distribution and Relationships

### About the Associated Project

**Project title:** Identifying Optimal Foraging Characteristics to Inform Piping Plover and Red Knot Habitat Management

**Name of reserve(s) involved in the project:** ACE Basin, SC

**Project Period:** January 2021 - October 2022

**Project lead and contact information:**

Andrew Tweel, South Carolina Department of Natural Resources, [tweela@dnr.sc.gov](mailto:tweela@dnr.sc.gov)

**Purpose:**

Through a 2020 catalyst project, staff from the South Carolina Department of Natural Resources worked with ACE Basin NERR and U.S. Fish and Wildlife Service to fill a critical gap in understanding piping plover needs by quantifying foraging habitat characteristics of this declining shorebird species and developing a habitat assessment tool to inform state and federal permitting and habitat management activities.

**Abstract:**

Shorebird populations are declining globally in the face of sea level rise, increasing coastal development, and shoreline modifications. The piping plover (*Charadrius melodus*) and red knot

(*Calidris canutus*) have exhibited population declines in recent years. The piping plover is a federally listed species that spends most of the year in its wintering range, including intertidal habitats in South Carolina. Recent research has established linkages between benthic prey abundance and foraging activity along South Carolina beaches; however, most of these projects focused on determining impacts from shoreline modification, rather than quantifying habitat characteristics. Identifying characteristics associated with optimal foraging habitat would help inform state and federal permitting and habitat management activities in areas these shorebirds inhabit.

A project team at the South Carolina Department of Natural Resources worked with the ACE Basin NERR, U.S. Fish and Wildlife Service, and other partners, including beach communities and conservation groups, to develop a habitat assessment tool for the piping plover. This easy-to-use tool was derived from new data collections in areas of high foraging activity, application of new genetic tools to distinguish preferred prey, and reanalysis of a decade of sampling data collected along the South Carolina coast. The tool allows for identification of important habitats and provides the user (e.g., state or federal biologist making recommendations about permit applications such as beach nourishment) an understanding of what is unique about each of these areas. Information was collected to further knowledge of red knot foraging areas, but more work is needed before there is sufficient information to develop a similar tool for red knots.

## About the Project Datasets

### 1. Piping Plover Benthic Habitat Characterization

#### **General description of data:**

Data were collected to characterize piping plover habitat in the context of prey availability. Benthic cores and sediment samples were used to study available benthic infauna species and characterize habitat variability. RTK GPS was used to determine elevations and locations.

#### **Search keywords:**

Benthic habitat, shorebird, piping plover, prey

#### **More about the data:**

At least ten hand cores were collected at each site sampled (135 total), and each sample was accompanied by a sediment core sample and surveyed for its elevation using RTK GPS. The main sampling areas included Captain Sam's Inlet, Deveaux Bank, and Hunting Island, with three habitats sampled in each of those areas. This allowed comparison between the DNA dataset and the availability of prey species at that specific foraging site. Additionally, sediment characteristics (sand phi, silt/clay content, organic matter %), elevation data (elevation of each core taken), and unmanned aerial imagery were collected at each foraging site sampled. Sediment was analyzed for sand and silt/clay content, calcium carbonate, and total organic matter using methods outlined by Folk (1980), Pequegnat and others (1981), and Plumb (1981).

**Data collection period:**

March 2021 to May 2021

**Geographic extent:**

Sites were near Charleston and Beaufort, South Carolina and ranged from (32.574338, -80.148055) to (32.391310, -80.428098)

**File format:**

Data are provided as Excel files (<500 kb, .xlsx)

**File name(s):**

PloverHabitat\_BenthicData.xlsx

**Data access and archival:**

This dataset is under a two-year embargo to allow authors to publish the results. Data will be made available at this site by November 2024.

In the meantime, please direct any questions to Andrew Tweel (tweela@dnr.sc.gov).

## 2. Piping Plover and Red Knot Fecal Analysis Summary

**General description of data:**

Fecal samples were collected to allow analysis of the benthic infauna data through the lens of preferred prey. Samples were collected for piping plover and red knot. Handheld GPS was used to determine locations. Fecal samples were processed to amplify the CO1 gene and sent to a commercial lab for analysis of contents.

**Search keywords:**

Benthic habitat, shorebird, piping plover, prey, fecal analysis

**More about the data:**

- During monitoring of foraging piping plovers in the winter of 2020-2021, early in the project, 84 (33 PIPL, 51 REKN) fecal samples were collected from popular foraging grounds following methods of Gerwing and others (2016). Samples were collected using laboratory spatulas and placed directly into 95% ethanol and then frozen (-20 C) within 12 hours and remaining frozen until processing. For six collections, samples of adjacent sediment were collected to compare with any DNA present that is not associated directly with the fecal material from the target species. Collection locations ranged from Bull Island to Hunting Island and were collected between February and May 2021.
- These samples were amplified using PCR analysis and analyzed using the CO1 gene marker and global genetic databases to identify genetic material in the fecal samples. Many fewer samples than were collected produced usable data, particularly for red knot. We looked for host DNA as well as filtered out any species hits comprising less than 1% of the total reads

**Data collection period:**

March 2021 to May 2021

**Geographic extent:**

Sites were near Charleston and Beaufort, South Carolina and ranged from (32.574338, -80.148055) to (32.391310, -80.428098)

**File format:**

Data are provided as Excel files (<500 kb, .xlsx)

**File name(s):**

PloverHabitat\_FecalData.xlsx

**Data access and archival:**

This dataset is under a two-year embargo to allow authors to publish the results. Data will be made available at this site by November 2024.

In the meantime, please direct any questions to Andrew Tweel ([tweela@dnr.sc.gov](mailto:tweela@dnr.sc.gov)).

**Maps and schematics for data collection**

Sample coordinates and associated sampling information are listed in the project file on a per-sample basis.

### 3. UAV Imagery to Understand Piping Plover Habitat Spatial Distribution and Relationships

**General description of data:**

UAV imagery was collected to explore elevation and habitat variability at areas beyond those that were directly sampled for piping plover prey availability.

**Search keywords:**

Beach habitat, intertidal habitat, aerial imagery

**More about the data:**

Metadata are included in the embedded format standard for spatial data, shown below as an example:

*Tags* unmanned aerial vehicle, unmanned aerial system, UAV, UAS, orthomosaic, imagery, South Carolina Department of Natural Resources, Coastal South Carolina

*Summary*

Provide high-resolution GIS imagery layer of a plover foraging area on Seabrook Island.

### *Description*

Natural color (RGB) orthomosaic dataset created from photographs collected using a DJI Phantom 4 Pro unmanned aerial vehicle (UAV) and processed using Pix4D photogrammetry software. Dataset covers 31 acres and was processed to 1.81 cm GSD resolution from 243 photos and using 4 GCPs.

### *Credits*

The South Carolina Department of Natural Resources should be acknowledged in products derived from these data.

### *Use limitations*

NO WARRANTY: The South Carolina Department of Natural Resources (SCDNR) provides these geographic data "as is" and makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. SCDNR further makes no warranties, either expressed or implied, as to any other matter whatsoever, including, without limitation, the condition of the product, or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully on computers of SCDNR, no warranty, expressed or implied, is made regarding the use of these data on any other system, nor does the fact of distribution constitute or imply any such warranty. LIMITATION OF LIABILITY: In no event shall the SCDNR have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by SCDNR.

### **Data collection period:**

March 2021

### **Geographic extent:**

Sites were near Charleston and Beaufort, South Carolina and ranged from (32.574338, -80.148055) to (32.391310, -80.428098)

### **File format:**

Data are maintained as georeferenced image files (> 20 mb, .tif). SCDNR will also await guidance on listing file names. These are georeferenced .tif and as such contain several associated files (.prj, .tft, .tif, .tif.ovr, and .xml).

### **File name(s):**

DeveauxBanks\_UAV\_031221.tif and associated files for georeferenced shapefile.  
HuntingIsland\_UAV\_031021.tif and associated files for georeferenced shapefile.  
Seabrook1\_UAV\_030821.tif and associated files for georeferenced shapefile.  
Seabrook2\_UAV\_030821.tif and associated files for georeferenced shapefile.  
Seabrook3\_UAV\_031621.tif and associated files for georeferenced shapefile.

### **Data access and archival:**

Data are archived with the NERRS Centralized Data Management Office and are accessible via a data request link on [this page](#).

**Maps and schematics for data collection**

Imagery includes three areas: Captain Sam's Inlet and 500 m S of inlet (Seabrook Island, SC), Deveaux Bank, and Hunting Island State Park (easternmost 500 m of island).