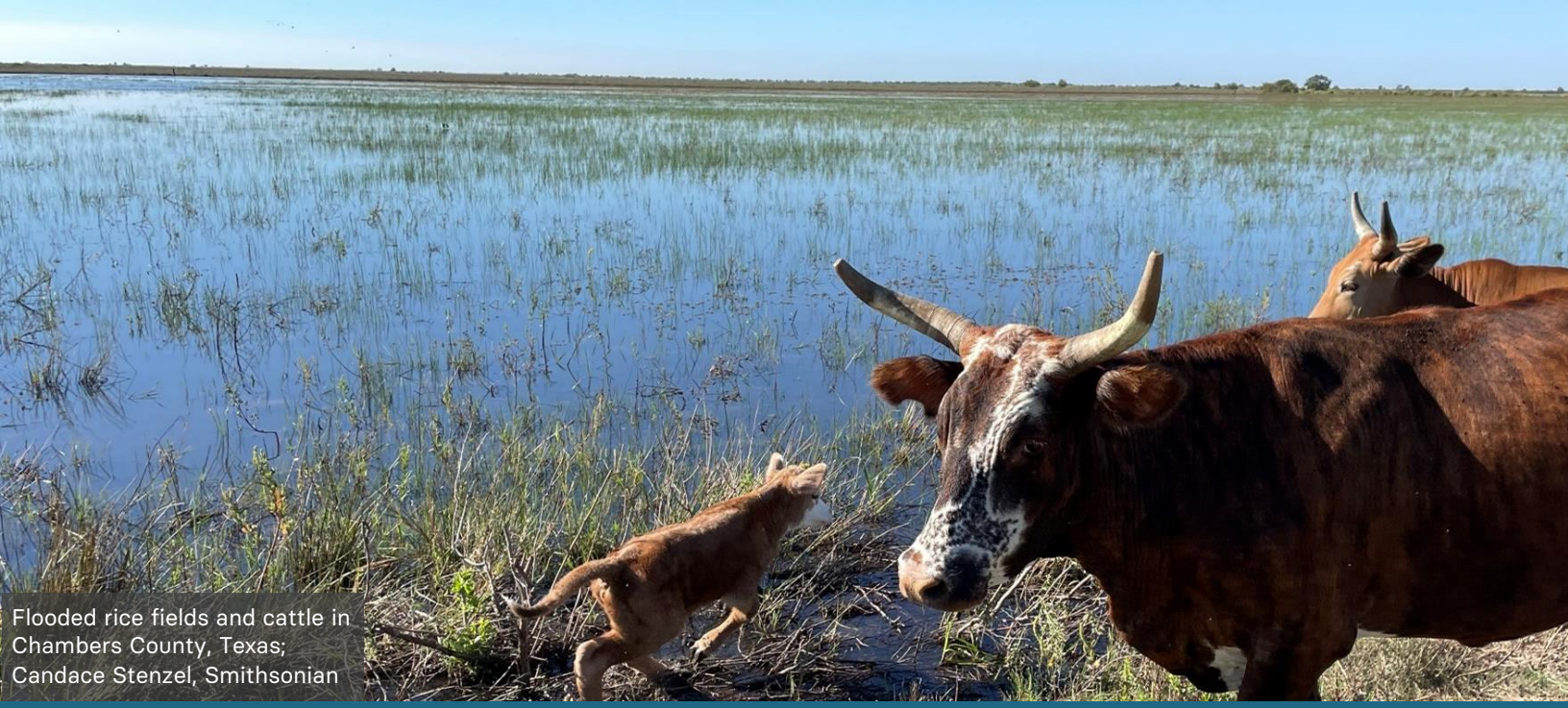

Flooded rice fields and cattle in Chambers County, Texas; Candace Stenzel, Smithsonian

Using shorebird tracking data to support a nomination package for a Western Hemisphere Shorebird Reserve Network site in Chambers County, Texas

Conservation Contribution #12

Conservation Action: Land/Water Protection; Land/Water Management

Smithsonian Migratory Bird Center

Manomet Conservation Sciences

Prepared by the Shorebird Science & Conservation Collective:
Candace Stenzel, Allie Anderson, Autumn-Lynn Harrison

January 2024

*This report for public audiences describes how the Shorebird Collective fulfilled a conservation request, presents key findings, and due to data privacy settings, **shows only a subset of the data** used in a full report to our partner.*

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Project Background

Conservation Request

Manomet Conservation Sciences (hereafter, "Manomet") requested information from the Shorebird Science and Conservation Collective (hereafter, "Shorebird Collective") to support their nomination package for a Western Hemisphere Shorebird Reserve Network (WHSRN) site[1] in Chambers County, Texas, USA (**Figure 1**). Specifically, Manomet requested information on electronically tracked shorebirds (see page 9 for more information on shorebird tracking data) located in Chambers County with details on the timing of their movements and length of stay. Shorebird Collective compiled contributed shorebird tracking data and summary information to support this request. Manomet intends to compile this information with other data types (e.g., survey data) to include in a WHSRN nomination package that will be sent to the WHSRN executive office for official review.

Important Note: This report describes how the Shorebird Collective fulfilled Manomet's request and presents key outputs and findings showing only a subset of the data used to inform our partner. Due to the privacy settings of some datasets contributed to the Shorebird Collective, a full report of findings provided to Manomet is for internal planning use only.

About the Shorebird Science and Conservation Collective

The Shorebird Collective is a partnership of scientists and practitioners working to translate the collective findings of shorebird tracking and community science data into effective on-the-ground actions to advance shorebird conservation in the Western Hemisphere. Learn more on our webpage: web link for the Shorebird Collective's webpage.

About Manomet Conservation Sciences

Manomet is a conservation non-profit dedicated to using science and collaboration to strengthen bird migration routes, coastal ecosystems, and working lands and seas across the Western Hemisphere. They also host the Executive Office of the Western Hemisphere Shorebird Reserve Network. For 50+ years, Manomet has formed vital partnerships with businesses, producers, and educators, to help nature and local communities thrive. Learn more on Manomet's website: web link for Manomet's website.

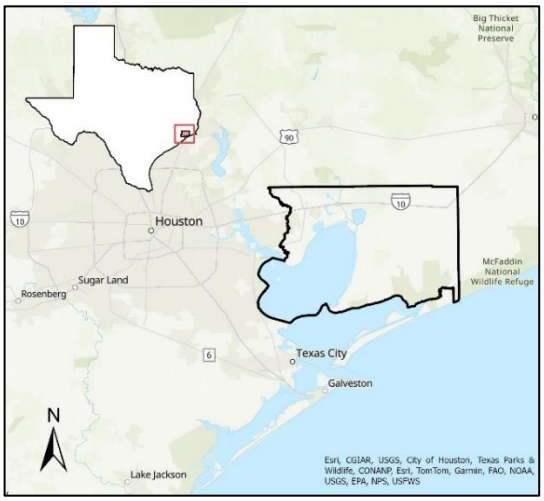


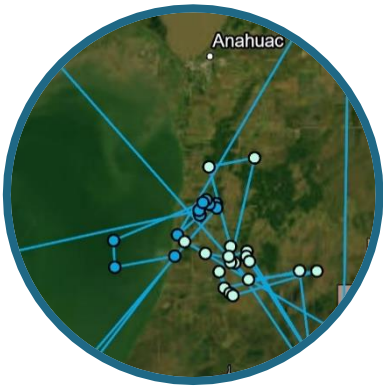
Figure 1. Location of Chambers County in the state of Texas.

[1] WHSRN is a voluntary, non-regulatory network of public and private partners working to protect shorebirds through a network of key sites throughout the Americas. There are currently 125 WHSRN sites in 20 countries covering over 39.1 million acres of shorebird habitat across the Americas. Learn more on WHSRN's website: web link to WHSRN's website.

Key Outputs & Recommendations

Below we summarize key outputs, findings, and recommendations provided to Manomet to support their Chambers County WHSRN site nomination package:

1. The Shorebird Collective provided Manomet with detailed information on electronically tracked shorebird movements in Chambers County, Texas to support their nomination package for a WHSRN site in the county. Specifically, Manomet intends to compile this information with other data types (e.g., survey data) to include in a WHSRN nomination package that will be sent to the WHSRN executive office for official review. **Nine** individuals of **five** species were tracked in the county.



2. In a full report to Manomet and with permission of data owners, we provided maps of tracked shorebird movements in the county with additional details on the timing of movements, stopover durations, and migratory connections to other parts of the Western Hemisphere.

3. Additional information may become available as data contributors continue to share new tracking data with the Shorebird Collective. We invited Manomet to periodically check in with the Shorebird Collective on the availability of new data to better understand the importance of Chambers County to shorebirds.

Images: 1. Long-billed Curlew (*Numenius americanus*) in Texas wetland, Tim Romano Smithsonian; **2.** Tracked Whimbrel (*Numenius phaeopus*) locations in Chambers County, Texas, contributed by Jennie Rausch, Canadian Wildlife Service, Environment and Climate Change Canada. See page 10 for additional data contributor information; **3.** Red Knot (*Calidris canutus*) with 3.4 g GPS tag, Tim Romano, Smithsonian

Summary of Results

Of 1,678 individuals tracked by GPS and Argos satellite technologies and contributed to the Shorebird Collective[2] (**Box 1**), **17%** (*n* = 279) moved through the state of Texas during their annual cycle.

Nine individuals of **five** species were tracked between 2013 and 2022 in Chambers County, Texas (see **Figure 3** for an example). Tracked individuals include:

- **1** Buff-breasted Sandpiper (*Calidris subruficollis*)
- **1** Hudsonian Godwit (*Limosa haemastica*)
- **4** Long-billed Dowitcher (*Limnodromus scolopaceus*)
- **1** Pectoral Sandpiper (*C. melanotos*)
- **2** Whimbrel (*Numenius phaeopus*)

Tracked locations occurred during migration and the nonbreeding period, ranging from a single observation during a flyover to an overwintering duration of 201 days. Individuals were primarily tracked in agricultural fields and wetlands in the eastern half of the county. Collectively, these nine individuals stopped in 12 countries across the Americas.

Box 1. Summary of shorebird tracks in Chambers County

1,678 individuals of **21** species contributed to the Shorebird Collective

279 individuals of **14** species tracked in Texas

9 individuals of **5** species tracked in Chambers County

Note that while the number of tracked individuals in the county was limited, shorebirds often travel in flocks, so these tracked birds could act as sentinels highlighting areas where many more shorebirds occur. Thus, we recommended that Manomet compare tracking data to survey data to assess if lands used by tracked shorebirds represent areas where shorebirds congregate in Chambers County. Additional information may become available as data contributors continue to share new tracking data with the Shorebird Collective. We invited Manomet to periodically check in with the Shorebird Collective on the availability of new data to better understand the importance of this area to shorebirds.

Figure 2. Species tracked in Chambers County, Texas: **a)** Buff-breasted Sandpiper, Shiloh Schulte, USFWS (CC); **b)** Hudsonian Godwit, Kristine Sowl, USFWS (CC); **c)** Long-billed Dowitcher, Andy Boyce, Smithsonian; **d)** Pectoral Sandpiper, Lisa Hupp, USFWS (CC); **e)** Whimbrel, Rachel Richardson, USGS Alaska Science Center (CC)

[2] These data come from 74 organizations, collected from 2006 to 2023

Methods

The Shorebird Collective used statistical models to account for spatial uncertainty and determined the most likely movement path of each bird recorded by the tracking device (example code is available on GitHub: web link for GitHub page). We then overlayed the tracks on a map of Chambers County, Texas.

In a full report to Manomet, we provided maps of tracked shorebird movements in Chambers County (see **Figure 3a** for an example), with additional details on seasonal timing of land use, stopover durations, and migratory connections to other parts of the Western Hemisphere (see **Figure 3b** for an example).

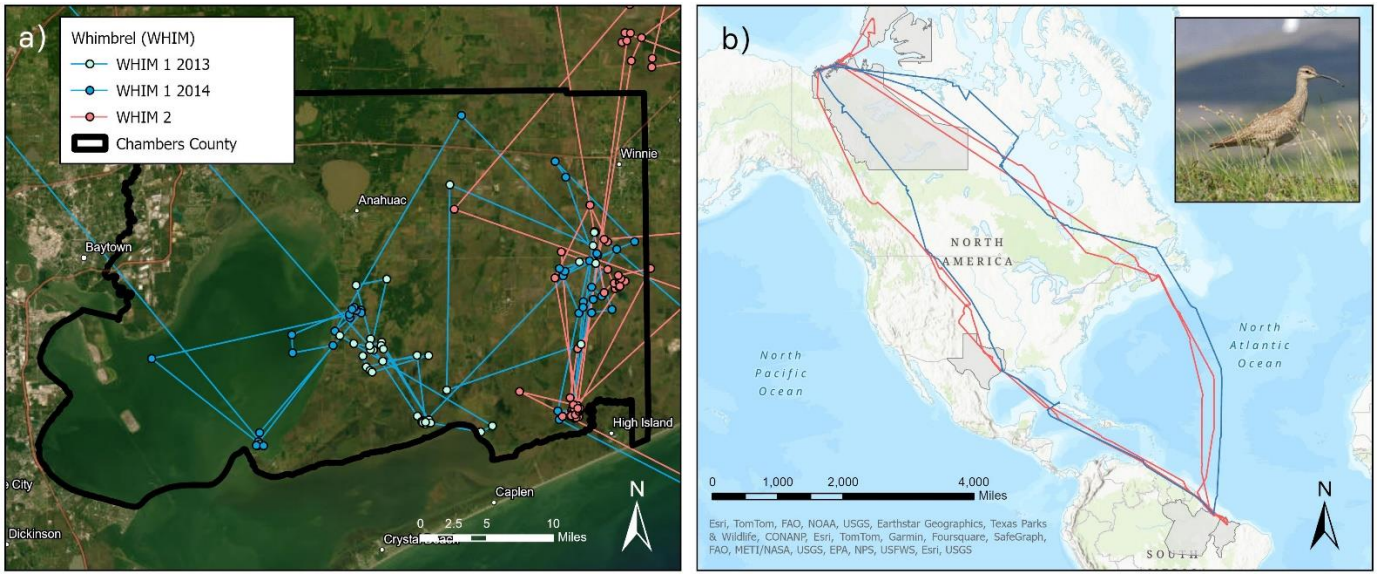


Figure 3. a) An example of Argos satellite locations of two Whimbrel (*Numenius phaeopus*) tracked in Chambers County, Texas. Both individuals stopped in the county for three weeks in April/May on northbound migration; Whimbrel 1 both in 2013 and 2014 and Whimbrel 2 in 2014. Not shown are tracks for one Buff-breasted Sandpiper (*Calidris subruficollis*), one Hudsonian Godwit (*Limosa haemastica*), four Long-billed Dowitcher (*Limnodromus scolopaceus*), and one Pectoral Sandpiper (*C. melanotos*) due to the privacy settings of the datasets but were provided to Manomet for their internal planning use. **(b)** Annual movements of the two Whimbrels in Figure 2a. Tracking data revealed both individuals spent the breeding and nonbreeding seasons in Northwest Territories, Canada and Maranhão (Whimbrel 1) and Pará (Whimbrel 2), Brazil, respectively, each logging over 13,000 miles in the year(s) they were tracked. Whimbrel tracking data were contributed by Jennie Rausch, Canadian Wildlife Service, Environment and Climate Change Canada. See page 10 for additional data contributor information. Whimbrel photo credit: Rachel Richardson, USGS Alaska Science Center (CC).

Coastal Texas and Shorebirds

The Gulf Coast is considered one of the most significant regions in the United States for shorebirds (Elliot and McKnight 2000). Along the Texas coast in particular, the variety of wetland, riparian, and coastal prairie habitats provide critical breeding, stopover, and/or wintering habitat for at least 38 Nearctic shorebird species (Elliot and McKnight 2000). For shorebirds using the midcontinent, areas along the Texas coast provide the first and/or last suitable habitat for individuals migrating to and from more distant wintering sites in Central and South America, providing an important area for shorebirds to rest and refuel before and/or after a strenuous journey over the Gulf (Withers 2002).

Chambers County, the area being considered for WHSRN designation by Manomet, is located along the Texas coast and part of the wider Galveston Bay region of Texas (**Figure 4**), which serves as an important region for shorebirds (Lester et al. 2002). Riparian and coastal prairie habitats in the area provide critical habitat for shorebirds, waterfowl, waterbirds, and other coastal wildlife. Within Chambers County, the 34,000-acre Anahuac National Wildlife Refuge (NWR) is a designated WHSRN site, hosting more than 2,200 Whimbrels (*Numenius phaeopus)* during migration every April and May, in addition to providing important stopover habitat for several other shorebird species (WHSRN 2023). Other protected areas within the county that benefit shorebirds include Moody NWR and Candy Abshier Wildlife Management Area (WMA).

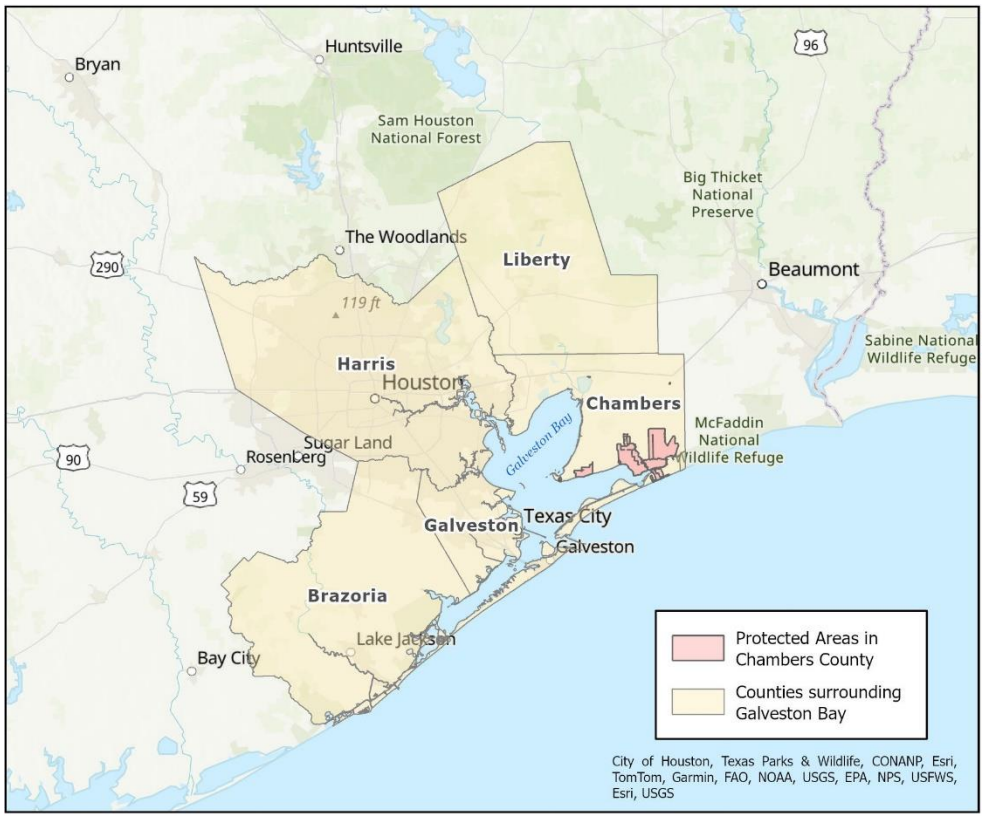


Figure 4. The Galveston Bay region, subdivided into five counties: Brazoria, Harris, Galveston, Liberty, and Chambers; adapted from Lester et al. (2002). Chambers County is located on the eastern side of Galveston Bay. An additional map layer showing other protected areas, as defined by UNEP-WCMC and IUCN (2021), in Chambers County that could support shorebirds is provided for additional context.

Shorebird Background

Shorebirds are a diverse group of birds in the order Charadriiformes, including sandpipers, plovers, avocets, oystercatchers, and phalaropes. There are approximately 217 shorebird species in the world (O'Brien at al. 2006), 81 of which occur in the Americas. 52 species breed in North America (Morrison et al. 2000) and 35 species breed in Latin America and the Caribbean (Lesterhuis and Clay 2019). They are among the planet's most migratory groups of animals. Many species in the Western Hemisphere, for example, travel thousands of miles every year between their breeding grounds in the Arctic and wintering grounds in the Caribbean and Central and South America, stopping at key sites along the way to rest and refuel. Across their vast range, shorebirds depend on a variety of habitats, including coastlines, shallow wetlands, mudflats, lake and pond edges, grasslands, and fields.

Long-billed Curlew (*Numenius americanus*); Tim Romano, Smithsonian

Although shorebirds are often seen in large flocks, it may surprise some to know that their populations are rapidly declining. Many populations have lost over 70% of their numbers in the past 50 years (NABCI 2022, Rosenberg et al. 2019, Smith et al. 2023), making them one of the most vulnerable bird groups in North America. Habitat loss and alteration, human disturbance, and climate change are just some of the major threats shorebirds face today. Effective shorebird management is even more of a challenge due to many species depending on habitats across multiple countries under different political jurisdictions. Despite these trends, many public and private groups are working to protect shorebirds and the habitats they depend on.

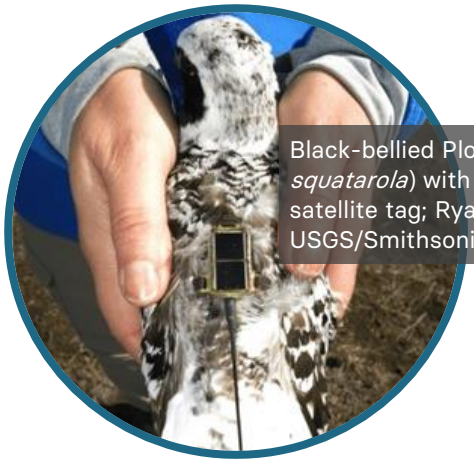
Flock of Marbled Godwits (*Limosa fedoa*) next to a shorebird scientist; Tim Romano, Smithsonian

Scientists attaching a GPS transmitter to a Red Knot (*Calidris canutus*) to track its migration; Tim Romano, Smithsonian

MANOMET CONSERVATION SCIENCES
Smithsonian Migratory Bird Center

About Shorebird Tracking Data

Tracking data provide valuable insight into where shorebirds move and are located throughout the year (**Figure 5**). These data can ultimately help biologists and practitioners make more informed conservation and land management decisions to protect shorebirds and their habitats. Tracking data are collected via tiny electronic devices (often called "tags") which are attached directly to individual birds (typically with either leg bands, harnesses, or glue) and may be carried by the birds year-round. Data from shorebirds tracked with satellite tags were shared with Manomet.



Black-bellied Plover (*Pluvialis squatarola*) with <5 g solar satellite tag; Ryan Askren, USGS/Smithsonian

Satellite tags work by sending signals to orbiting satellites that re-transmit location data back to a receiving station which researchers can access through their computer. The two types of satellite tags commonly used to study birds include Global Positioning System (GPS) and Argos tags. GPS tags typically have high spatial accuracy (i.e., minimal location error, generally <10 meters), while Argos tags can have location error of 500-2,500 meters. The Shorebird Collective compiled both contributed GPS and Argos satellite data to support Manomet's request. Web link for more information on satellite tags.

One key benefit of tracking data compared to other data types such as survey or count data is that they give detailed information on movements and habitat use of individual animals in areas that are otherwise difficult to access, such as remote areas or private lands. Therefore, the birds themselves show us where they are, independent of the need for direct human observation.

Figure 5. Full cycle track line across two years for an individual Black-bellied Plover (Pluvialis squatarola); contributed by Autumn-Lynn Harrison, Smithsonian Migratory Bird Center; David Newstead, Coastal Bend Bays & Estuaries Program; and Lee Tibbitts, U.S. Geological Survey, Alaska Science Center. Photos: **a)** Breeding male Black-bellied Plover with leg flag and <5 g solar satellite tag, Ryan Askren, USGS/Smithsonian; **b)** Satellite tag attached to the back of a Black-bellied Plover; Tim Romano, Smithsonian.

Data Contributors

Tracking data for this project were contributed to the Shorebird Collective by the following people and organizations. Individuals with an asterisk (*) indicates the technical point of contact for the dataset. A full list of data contributors to the Shorebird Collective can be found on our webpage: web link for the Shorebird Collective's webpage.

Buff-breasted Sandpiper

Lee Tibbitts*[1], Daniel Ruthrauff*[1], Gabriel Castresana[2], Juliana Almeida[3,4], Bob Gill[1], Dave Douglas[1], Joaquin Aldabe[3,5,6], Rebecca McGuire[7], Richard Lanctot[8]

Associated Citation: Tibbitts, T. L., Lanctot, R. B., and Douglas, D. C. 2023. Tracking data for Buff-breasted Sandpipers (*Calidris subruficollis*) (ver 1.0, October 2023): U.S. Geological Survey data release, https://doi.org/10.5066/P9TYMUID.

Hudsonian Godwit

Nathan Senner*[9, 10], Jennifer Linscott[9], Jorge Ruiz[11], Mitch Weegman*[12,13], Bart Ballard*[20], Juan Navedo[11]

Associated Citation: Linscott, J. A., Navedo, J. G., Clements, S. J., Loghry, J. P., Ruiz, J., Ballard, B. M., Weegman, M. D., and Senner, N. R. 2022. Compensation for wind drift prevails for a shorebird on a long-distance, transoceanic flight. *Movement Ecology*, 10(1), 1-16.

Long-billed Dowitcher

Bart Kempenaers*[15], Eunbi Kwon[15]

Unpublished Data, Department of Ornithology, Max Planck Institute for Biological Intelligence

Pectoral Sandpiper

Bart Kempenaers*[15], Mihai Valcu[15]

Associated Citation: Kempenaers, B., and M., Valcu. 2017. Breeding site sampling across the Arctic by individual males of a polygynous shorebird. *Nature*, 541(7638), 528-531.

Whimbrel

Jennie Rausch*[16], Fletcher Smith[17,18], Bryan Watts[17], Brad Winn[19], Julie Paquet[16]

Associated Citation: Watts, B. D., Smith, F. M., Hamilton, D. J., Keyes, T., Paquet, J., Pirie-Dominix, L., Truitt, B., and Woodard, P. 2019. Seasonal variation in mortality rates for Whimbrels (*Numenius phaeopus*) using the Western Atlantic Flyway. *The Condor: Ornithological Applications*, 121(1), duy001.

Contributor Organizations:

[1] U.S. Geological Survey Alaska Science Center, [2] Ministerio de Ambiente de la Provincia de Buenos Aires, [3] Manomet, [4] SAVE Brasil, [5] Aves de Uruguay, [6] Universidad de la Republica Uruguay, [7] Wildlife Conservation Society, [8] U.S. Fish and Wildlife Service, [9] University of South Carolina, [10] University of Massachusetts Amherst, [11] Universidad Austral de Chile, [12] University of Missouri, [13] University of Saskatchewan,[14] Texas A&M University, Kingsville, [15] Max Planck Institute for Biological Intelligence, [16] Canadian Wildlife Service, Environment and Climate Change Canada, [17] College of William and Mary, [18] Georgia Department of Natural Resources, [19] Manomet

References

Elliott, L., and K., McKnight. 2000. Lower Mississippi/Western Gulf Coast shorebird planning region. U.S. Shorebird Conservation Plan, Lakewood, CO.

Lester, J., Gonzalez, L, Sage, T., and Gallaway, A. 2002. The state of the bay: A characterization of the Galveston Bay ecosystem, 2nd ed. Galveston Bay Estuary Program.

Lesterhuis, A. J., and R. P. Clay. 2019. Conservation status of shorebird species resident to Latin America and the Caribbean, v1. WHSRN Executive Office and Manomet, Inc., Manomet, MA.

Morrison, R. I. G., Gill, R. E., Harrington, B. A., Skagen, S., Page, G. W., Gratto-Trevor, C. L., and Haig, S. M. 2000. Population estimates of Nearctic shorebirds. *Waterbirds*, 23:337-352.

[NABCI] North American Bird Conservation Initiative. 2022. The State of the Birds, USA, 2022.

O'Brien, M., Crossley, R., and Karlson, K. 2006. The shorebird guide. Houghton Mifflin Company, New York, NY.

Rosenberg, K. V., Dokter, A. M., Blancher, P. J., Sauer, J. R., Smith, A. C., Smith, P. A., Stanton, J. C., Panjabi, A., Helft, L., Parr, M., and Marra, P. 2019. Decline of the North American avifauna. *Science*, 366(6461):120-124.

Smith, P. A., Smith, A. C., Andres, B., Francis, C. M., Harrington, B., Friis, C., Guy Morrison, R. I., Paquet, J., Winn, B., and Brown, S. 2023. Accelerating declines of North America's shorebirds signal the need for urgent conservation action. *Ornithological Applications,* 125:1-14.

[UNEP-WCMC and IUCN] UN Environment Programme World Conservation Monitoring Centre and International Union for Conservation of Nature. 2021. Protected planet: the world database on protected areas (WDPA), Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.

[WHSRN] Western Hemisphere Shorebird Reserve Network. Anahuac National Willdife Refuge. 2023. Manomet, MA.

Withers, K. 2002. Shorebird use of coastal wetland and barrier island habitat in the Gulf of Mexico. The Scientific World, 2:514-536.