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

Assessing shorebird use of land parcels under consideration for purchase near the Laguna Atascosa and Lower Rio Grande Valley National Wildlife Refuges in coastal Texas

Conservation Contribution #07

Conservation Action: Land/Water Protection

THE CONSERVATION FUND

Smithsonian Migratory Bird Center

Prepared by the Shorebird Science & Conservation Collective:
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June 2023

*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

The Conservation Fund (TCF) requested shorebird tracking data from the Shorebird Science and Conservation Collective (hereafter, "Shorebird Collective") to support their funding efforts in acquiring 1,550 acres in several small land tracts around the Laguna Atascosa and Lower Rio Grande Valley National Wildlife Refuges (NWRs) (**Figure 1**), Texas, USA. Specifically, TCF requested information on electronically tracked shorebirds (see page 11 for more information on shorebird tracking data) located within these tracts to demonstrate their value for shorebirds. The Shorebird Collective compiled contributed shorebird tracking data and summary information to support this request.

Important Note: This report describes how the Shorebird Collective fulfilled TCF'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 TCF 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 The Conservation Fund

TCF works with public, private, and nonprofit partners to protect America's legacy of land and water resources through land acquisition, sustainable community and economic development, and leadership training. Since 1985, TCF has worked in all 50 states to protect over 8.8 million acres of land. Learn more on TCF's website: web link for TCF's website.

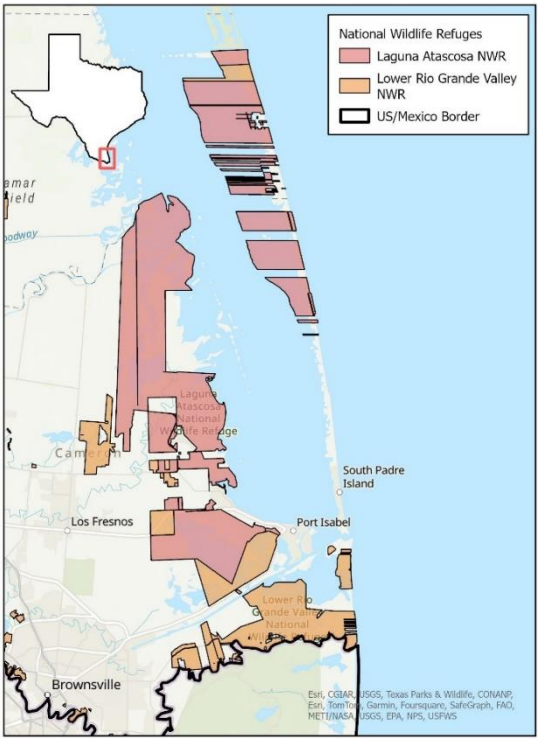


Figure 1. Location of the Laguna Atascosa and Lower Rio Grande Valley NWRs. Note that parcels under consideration for purchase are not shown for privacy reasons.

Key Outputs & Recommendations

Below we summarize key outputs, findings, and recommendations provided to TCF to support their efforts in acquiring new lands for protection:

1. The Shorebird Collective provided TCF with detailed information on electronically tracked shorebird movements in or near land parcels under consideration for purchase bordering the Laguna Atascosa and Lower Rio Grande Valley NWRs. In a full report to TCF and with permission of data owners, we provided maps of tracked shorebird movements on these land parcels with additional details on seasonal timing of land use and stopover durations. While no individuals had tracked locations in the land parcels of interest to TCF, **14** individuals of **four** species had tracked locations in other nearby areas within or near the Laguna Atascosa and Lower Rio Grande Valley NWRs.

2. Tracking data can be biased to the individuals and/or species equipped with tracking devices. Therefore, an absence of shorebird tracking data in TCF's land parcels of interest does not necessarily indicate lack of use by or value to shorebirds. The Shorebird Collective explored other data types (e.g., habitat and observation data) to provide TCF with additional context about the potential value of the land parcels to shorebirds.

3. Additional information may become available as data contributors continue to share new tracking data with the Shorebird Collective. We invited TCF to periodically check in with the Shorebird Collective on the availability of new data to support their work.

Images: 1. Laguna Atascosa NWR, Steve Hillebrand, USFWS (CC); **2.** Laguna Atascosa NWR habitat types, differentiated by color, using the Texas Parks and Wildlife Texas Ecosystem Analytical Mapper (Elliott et al. 2009); **3.** Red Knot (*Calidris canutus*) with 3.4-gram GPS tag, Tim Romano, Smithsonian

Summary of Results

Of 1,480 individuals tracked by GPS and Argos satellite and contributed to the Shorebird Collective[1] (**Box 1**), **18%** (*n* = 260) moved through the state of Texas during their annual cycle.

No individuals were tracked in the land parcels under consideration for purchase by TCF; however, **14** individuals of **four** species were tracked between 2017 and 2023 in other nearby areas within or near the Laguna Atascosa and Lower Rio Grande Valley NWRs (see Error! Reference source not found. for an example). Tracked individuals include:

- **9** Long-billed Curlew (*Numenius americanus*)
- **2** Long-billed Dowitcher (*Limnodromus scolopaceus*)
- **1** Hudsonian Godwit (*Limosa haemastica*)
- **2** Whimbrel (*N. phaeopus*)

Tracked locations occurred during migration and while overwintering, ranging from less than a week during migration to an overwintering duration of 281 days. Two Long-billed Curlews spent two consecutive winters in the area. All of these individuals were tagged outside of Texas on their breeding or overwintering grounds.

Box 1. Summary of shorebird tracks in areas of interest

1,480 individuals of **17** species contributed to the Shorebird Collective

260 individuals of **12** species tracked in Texas

14 individuals of **4** species stopped in or near the Laguna Atascosa and Lower Rio Grande NWRs

Though no shorebirds were tracked on TCF's land parcels of interest, these lands could still support shorebirds. For example, some of the habitats on the parcels are similar to those used by tracked shorebirds nearby and therefore could support shorebirds; however, on-the-ground surveys would be needed to confirm shorebird use of the parcels. Additional information may become available as data contributors continue to share new tracking data with the Shorebird Collective. We invited TCF to periodically check in with the Shorebird Collective on the availability of new data to support their efforts.

Long-billed Curlew (*Numenius americanus*); Andy Boyce, Smithsonian

Long-billed Dowitcher (*Limnodromus scolopaceus*); Andy Boyce, Smithsonian

Whimbrel (*Numenius phaeopus*); Rachel Richardson, USGS Alaska Science Center (CC)

Hudsonian Godwit (*Limosa haemastica*); Kristine Sowl, USFWS (CC)

[1] These data come from 52 organizations, collected from 2006 to 2022.

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 shorebird tracks on a map of the land parcels under consideration for purchase bordering the Laguna Atascosa and Lower Rio Grande Valley NWRs.

In a full report to TCF, we provided maps of tracked shorebird movements on or near these land parcels (see Error! Reference source not found. for an example), with additional details on seasonal timing of land use and stopover durations. We also explored other data types (e.g., habitat and observation data) to provide TCF with additional context about the potential value of the land parcels to shorebirds.

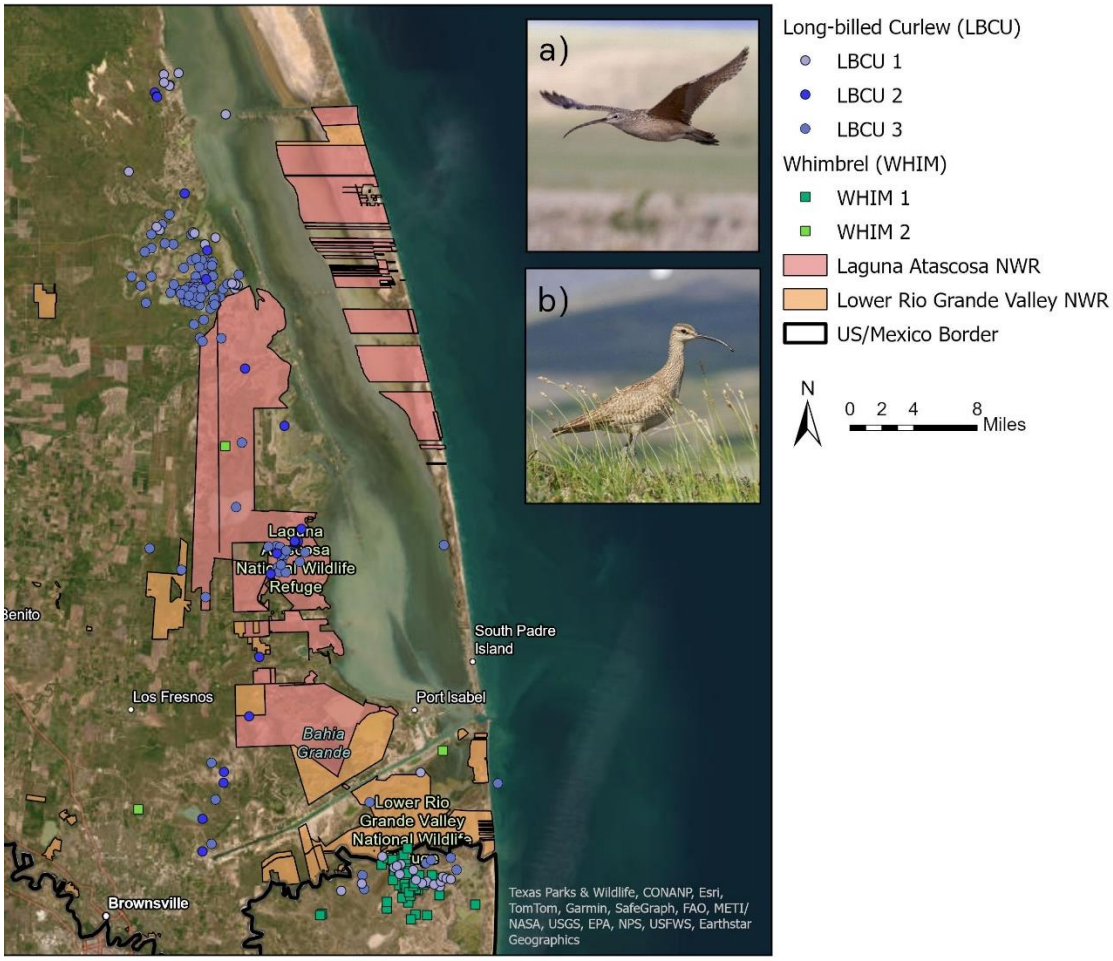


Figure 2. An example of Argos satellite locations from three Long-billed Curlews (*Numenius americanus*) and two Whimbrels (*N. phaeopus*) tracked near land parcels bordering the Laguna Atascosa and Lower Rio Grande Valley NWRs and under consideration for purchase[1]. Shorebird locations are from multiple years and the map does not necessarily reflect the birds co-occurring in the area at the same time. Not shown are six additional Long-billed Curlew, two Long-billed Dowitcher (*Limnodromus scolopaceus*), and one Hudsonian Godwit (*Limosa haemastica*) due to the privacy settings of the datasets but were provided to TCF for their internal planning use. Data shown were contributed by Jay Carlisle, Boise State University and Jennie Rausch, Canadian Wildlife Service, Environment and Climate Change Canada. See page 11 for additional data contributor information. Photos: **a)** Long-billed Curlew, Andy Boyce, Smithsonian; **b)** Whimbrel, Rachel Richardson, USGS Alaska Science Center (CC).

[1] The parcels under consideration for purchase are not shown on the map to respect the privacy concerns of TCF.

Additional Supporting Data

Insights from tracking data can be limited by the individuals and/or species equipped with tracking devices. For example, some shorebird species are too small to carry tracking devices, while larger species can carry heavier tags that collect more detailed data. Therefore, an absence of shorebird tracking data in TCF's land parcels of interest does not necessarily indicate lack of use by or value to shorebirds. Other types of data, such as spatial habitat layers can provide additional context on the potential value of these land parcels to shorebirds.

Habitat Data

Knowing the specific habitats used by shorebirds in the region can help TCF assess habitat suitability for shorebirds on the land parcels under consideration for purchase. We used the Texas Ecosystem Analytical Mapper (Elliott et al. 2009) to compare the habitats on private land parcels (see **Figure 3** for a hypothetical example) to the habitats used by tracked shorebirds in or near the Laguna Atascosa and Lower Rio Grande Valley NWRs where multiple tracked individuals and species aggregated. In those areas, shorebirds were primarily tracked in salt and brackish high tidal marsh, salty prairie, open water, row crops, and wind tidal flats habitats.

Returning to our hypothetical example (**Figure 3**), portions of the parcel have the potential to support shorebirds even though no tracked individuals were found there. These areas included salt and brackish high tidal marsh, salty prairie, open water, row crops, and wind tidal flats habitats. For the report we delivered to TCF (with private parcel and tracking information for their internal planning), we did this comparison for all parcels and suggested areas where on-the-ground surveys could be useful in confirming shorebird use of the parcel. Some habitats could also be managed to become suitable for shorebirds in the future.

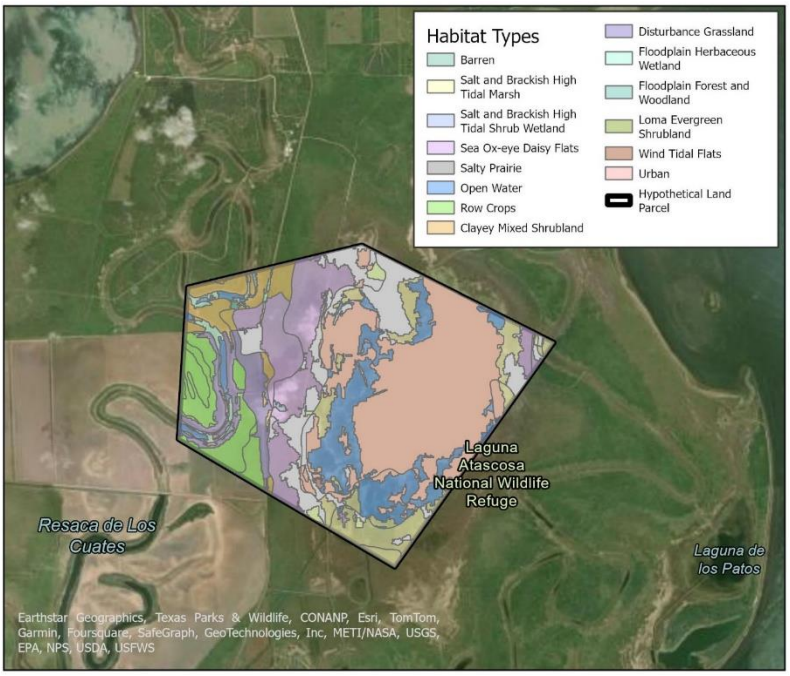


Figure 3. Habitat types on a hypothetical land parcel[1]. Multiple shorebirds were tracked in many of the same habitat types, indicated by an asterisk (*), in areas within or near the Laguna Atascosa and Lower Rio Grande Valley NWRs, thus indicating that this parcel could also support shorebirds. Habitat data were obtained from the Texas Parks & Wildlife Texas Ecosystem Analytical Mapper (Elliott et al. 2009)

[1] To respect TCF privacy concerns, the land parcel shown is hypothetical and does not represent a real property boundary or area under consideration for purchase by TCF.

About TCF's Area of Interest

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 also 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).

Shorebirds and waterbirds at Laguna Atascosa NWR; Steve Hillebrand, USFWS (CC)

TCF's area of interest for land purchase includes 1,550 acres in several small land tracts around the Laguna Atascosa and Lower Rio Grande Valley NWRs of the south Texas coast. Both refuges host a myriad of riparian and coastal prairie habitats and provide important habitat for shorebirds, waterfowl, waterbirds, and other coastal wildlife species.

The Laguna Atascosa NWR is a 110,000+ acre refuge that provides habitat for nearly half of all avian species found in the continental United States (USFWS 2023a). The refuge also contains the United States' largest ocelot population and serves as the central hub for their conservation and recovery efforts (USFWS 2023a). The Lower Rio Grande Valley NWR is a 40,000+ acre refuge that follows the Rio Grande River along its last 275 miles (USFWS 2023b). The refuge provides important habitat for over 500 species of birds and other coastal wildlife and connects several isolated tracts of land owned by private landowners and other public and private groups (USFWS 2023b).

Laguna Atascosa NWR wetland; Nichol Young, USFWS (CC)

Lower Rio Grande Valley NWR; Thamara Hernandez, USFWS (CC)

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

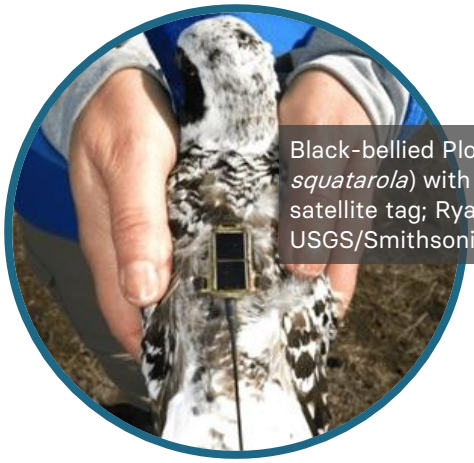
Although shorebirds are often seen in large flocks, it may surprise some to know that their populations are rapidly declining. Many populations have lost over 70% of their numbers in the past 50 years (NABCI 2022, Rosenberg et al. 2019, Smith et al. 2023), making them one of the most vulnerable bird 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

About Shorebird Tracking Data

Tracking data provide valuable insights into where shorebirds move and are located throughout the year (**Figure 4**). 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 TCF.



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 the TCF. 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 4. 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.

The following contributors provided detailed tracks and maps of shorebird movements:

Hudsonian Godwit Track

Nathan Senner*[1,2], Jennifer Linscott[1], Jorge Ruiz[3], Mitch Weegman*[4,5], Bart Ballard*[6], Juan Navedo[3]

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 Curlew Tracks

Andy Boyce*[7], Jeff Kelly[8], Kate Goodenough[8], Paula Cimprich[8]

Unpublished data, Great Plains Science Program

Jay D. Carlisle*[9], Stephanie E. Coates[9]

Unpublished data, Intermountain Bird Observatory Long-billed Curlew Project

Long-billed Dowitcher Tracks

Bart Kempenaers*[10], Eunbi Kwon[10]

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

Whimbrel Tracks

Jennie Rausch*[11], Fletcher Smith[12,13], Bryan Watts[12], Brad Winn[14]; Julie Paquet[11]

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] University of South Carolina, [2] University of Massachusetts Amherst, [3] Universidad Austral de Chile, [4] University of Missouri, [5] University of Saskatchewan, [6] Texas A&M University, Kingsville, [7] Smithsonian Migratory Bird Center, [8] University of Oklahoma, [9] Boise State University, [10] Max Planck Institute for Biological Intelligence, [11] Canadian Wildlife Service, Environment and Climate Change Canada, [12] College of William & Mary, [13] Georgia Department of Natural Resources, [14] Manomet

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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.

[USFWS] U.S. Fish and Wildlife Service. 2023a. Laguna Atascosa National Wildlife Refuge. U.S. Fish and Wildlife Service. Retrieved from: https://www.fws.gov/refuge/laguna-atascosa.

[USFWS] U.S. Fish and Wildlife Service. 2023b. Lower Rio Grande Valley National Wildlife Refuge. U.S. Fish and Wildlife Service. Retrieved from: https://www.fws.gov/refuge/lower-rio-grande-valley.

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