



Lake Meredith, Texas, USA;
National Park Service (CC)

Assessing shorebird use of the Lake Meredith Conservation Area in the Texas Panhandle to support land acquisition and management

Conservation Contribution #09

Conservation Action: Land/Water Protection



Smithsonian
Migratory Bird Center

The Nature
Conservancy



Prepared by the Shorebird Science & Conservation Collective:

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September 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 Nature Conservancy (TNC) requested shorebird tracking data from the Shorebird Science and Conservation Collective (hereafter, “Shorebird Collective”) to support their funding efforts in purchasing a 9,550-acre private property adjacent to Lake Meredith National Recreation Area, Texas, U.S.A. and within TNC’s wider Lake Meredith Conservation Area (LMCA) (**Figure 1**). Specifically, TNC requested information on electronically tracked shorebirds ([see page 12 for more information on tracking data](#)) located within the private property and surrounding LMCA to demonstrate the value of the area 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 TNC’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 TNC 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 Nature Conservancy

TNC is a global environmental nonprofit dedicated to the protection of land and water. Founded in 1951, TNC has grown to become one of the most effective and wide-reaching environmental organizations in the world with an impact on conservation in 77 countries and territories. Learn more on TNC’s website: [web link for TNC’s website](#).

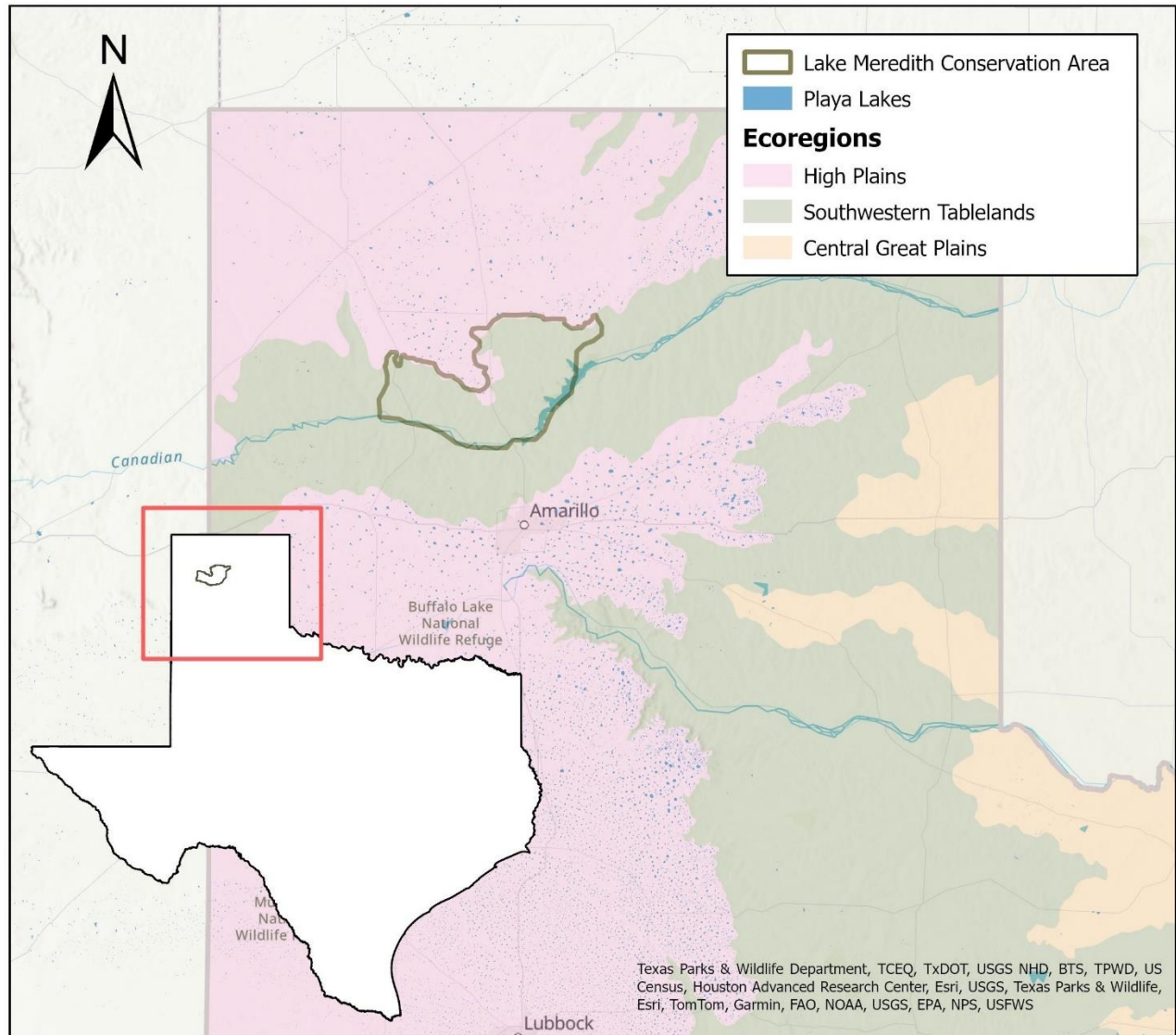
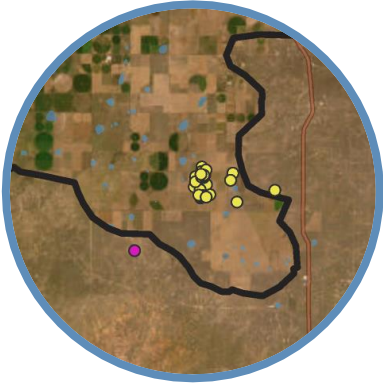


Figure 1. TNC's LMCA within the Texas Panhandle overlaid with Texas Level III ecoregions (US EPA 2013). The 9,550-acre private property under consideration for purchase falls within the LMCA but was left out of the map to respect the privacy concerns of TNC. Playa lakes layer provided by PLJV 2025.

Key Outputs & Recommendations

Below we summarize key outputs, findings, and recommendations provided to TNC to support their funding efforts in acquiring the 9,550-acre private property for conservation:



1. The Shorebird Collective provided TNC with detailed information on electronically tracked shorebird movements near a 9,550-acre private property adjacent to Lake Meredith National Recreation Area and within TNC's wider LMCA (**Figure 1**). While no shorebirds were tracked within the property or TNC's LMCA, **nine** individuals of **two** species had tracked locations within 800 meters of the LMCA. In a full report to TNC, we provided maps of the shorebirds' movements with additional details on seasonal timing of land use, stopover duration, and habitat use.



2. Shorebird tracking data currently suggest that TNC's LMCA tend to support fewer shorebirds than the surrounding lands in the High Plains Ecoregion with playa lakes. Playa lakes are used by thousands of shorebirds migrating through the panhandle region every year (Davis and Smith 1998). As such, the limited number of playa lakes within TNC's LMCA (compared to areas immediately outside of the LMCA, as shown in **Figure 1**) could explain the lower use of the LMCA by shorebirds.



3. Though no shorebirds were tracked in TNC's LMCA, on-the-ground surveys should be conducted to verify these patterns and fill data gaps. Additionally, new tracking data are always being contributed to the Shorebird Collective. We invited TNC to periodically check in with the Shorebird Collective on the availability of new data to support their efforts.

Images: 1. Tracked Long-billed Curlew (*Numenius americanus*) locations within 800m of TNC's LMCA. Tracking data contributed by Autumn-Lynn Harrison, Smithsonian Migratory Bird Center. See page 13 for additional data contributor information; 2. Aerial view of playa lakes in Texas; 3. Red Knot (*Calidris canutus*) with 3.4 g GPS tag, Tim Romano, Smithsonian

Summary of Results

Tracked Birds

Of 1,480 individuals tracked by GPS and Argos satellite technologies and contributed to the Shorebird Collective¹ (**Box 1**), **18%** ($n = 260$) moved through the state of Texas during their annual cycle.

No shorebirds were tracked in or near the 9,550-acre private property, but **nine** individuals of **two** species were tracked within 800 meters of TNC's wider LMCA between 2017 and 2022 (see **Figure 2** and **3** for an example). Tracked individuals include:

- **8** Long-billed Curlew (*Numenius americanus*)
- **1** Long-billed Dowitcher (*Limnodromus scolopaceus*)

Tracked locations ranged from a single observation during a flyover to a six-day stopover just outside of the LMCA boundary. Most individuals were tracked in agricultural fields and playas to the north and south of the LMCA during spring and fall migration (**Figures 2** and **Figure 3**). Some tracked locations also occurred within the LMCA boundary, most of which were flyovers as birds migrated through the region.

In general, tracking data showed limited use of the LMCA by shorebirds compared to other areas in the Texas panhandle. The limited number of playa lakes within TNC's LMCA (compared to areas immediately outside of the LMCA, as shown in **Figure 1**) could explain the lower use of the LMCA by shorebirds. However, tracking data are limited to a subset of individuals and species that may use the area. Thus, we recommended that on-the-ground surveys should be conducted to determine shorebird use of lands in TNC's LMCA. Additional information may become available as data contributors continue to share new tracking data with the Shorebird Collective. We invited TNC to periodically check in with the Shorebird Collective on the availability of new data to support their efforts.

Box 1. Summary of shorebird tracks in areas of interest

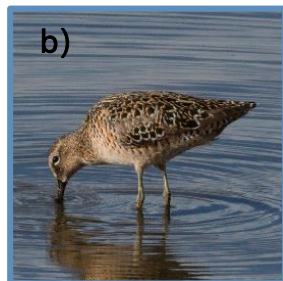
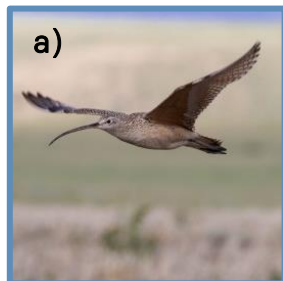
1,480 individuals of 17 species contributed to the Shorebird Collective



260 individuals of 12 species tracked in Texas



9 individuals of 2 species within 800 meters of TNC's LMCA



Images: a) Long-billed Curlew (*Numenius americanus*), Andy Boyce, Smithsonian; b) Long-billed Dowitcher (*Limnodromus scolopaceus*), Andy Boyce, Smithsonian

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 overlaid shorebird tracks on a map of TNC's LMCA and the 9,550-acre private property under consideration for purchase (which falls within the boundaries of the LMCA).

In a full report to TNC, we provided maps of tracked shorebird movements within 800 meters of TNC's LMCA (see **Figure 2** and **3** for an example), with additional details on seasonal timing of land use, stopover durations, and habitat use.

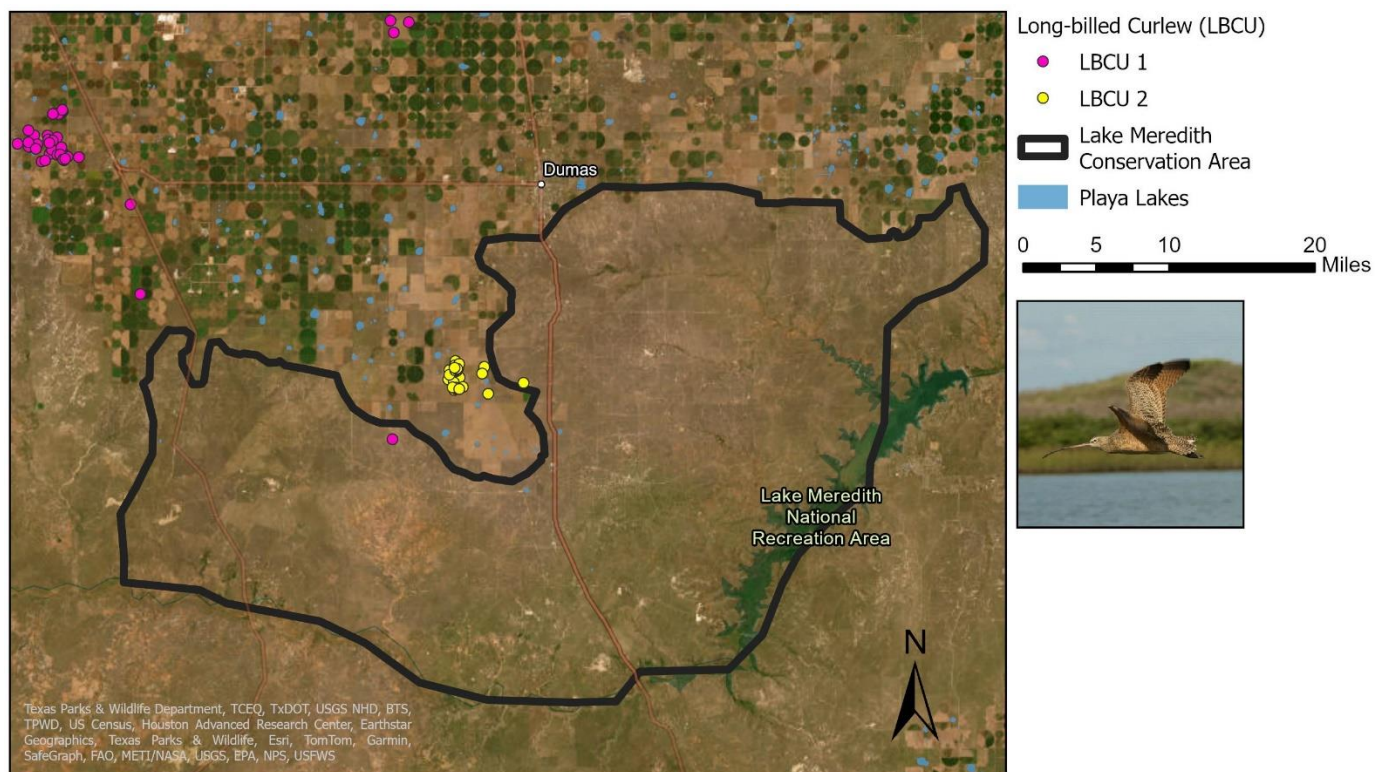


Figure 2. An example of Argos satellite locations from two Long-billed Curlew (*Numenius americanus*) tracked within 800m of TNC's LMCA¹. Shorebird locations are from multiple years and the map does not necessarily reflect the birds co-occurring in the area at the same time. Not shown are six additional Long-billed Curlews and one Long-billed Dowitcher (*Limnodromus scolopaceus*) due to the privacy settings of the datasets but were provided to TNC for their internal planning use. Data shown contributed by Jay Carlisle, Boise State University and Autumn-Lynn Harrison, Smithsonian Migratory Bird Center. See page 13 for additional data contributor information. Playa lakes layer provided by PLJV 2025. Long-billed Curlew photo credit: Tim Romano, Smithsonian.

¹ The 9,550-acre private property under consideration is not shown to respect the privacy concerns of TNC.

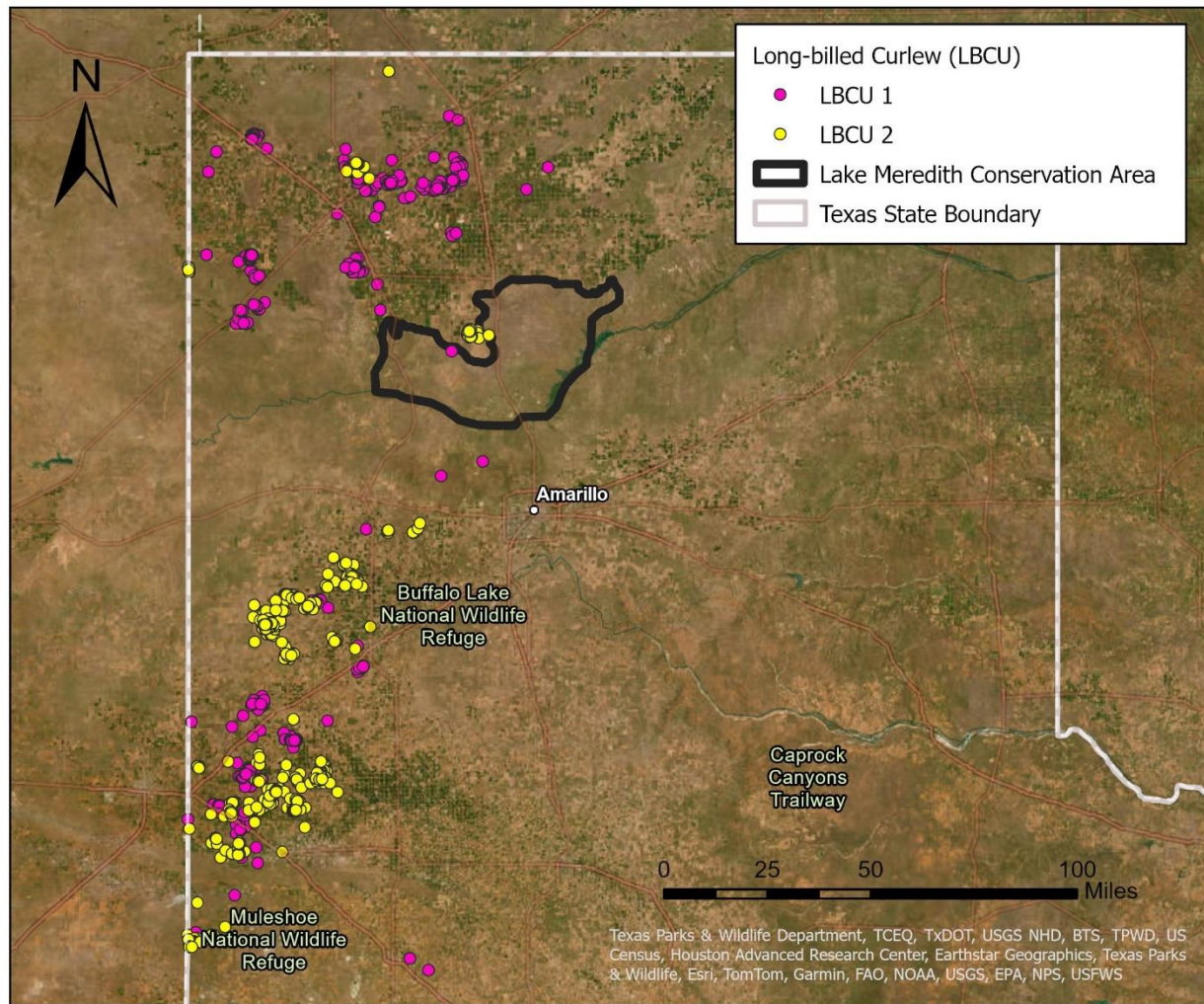


Figure 3. The Texas Panhandle region with an example of Argos satellite locations from the two Long-billed Curlews (*Numenius americanus*) featured in Figure 2 that were tracked within 800m of TNC's LMCA. Shorebird locations are from multiple years and the map does not necessarily reflect the birds co-occurring in the area at the same time. Data shown were contributed by Jay Carlisle, Boise State University and Autumn-Lynn Harrison, Smithsonian Migratory Bird Center. See page 13 for additional data contributor information.

Shorebird Use of the Broader Texas Panhandle

Eighty-two tracked individuals of **seven** shorebird species were tracked in the Southwestern Tablelands and High Plains Ecoregions (US EPA 2013) surrounding TNC's LMCA in the Texas Panhandle region. The majority (66%) of these tracked birds were Long-billed Curlews. Tracked shorebirds largely stopped in agricultural areas and around playa lakes in the High Plains Ecoregion during migration, and few stopped in the Southwestern Tablelands Ecoregion (**Figure 4**). In most cases, tracked shorebirds flew over the strip of the Southwestern Tablelands Ecoregion that surrounds the Canadian River where TNC's LMCA is situated.

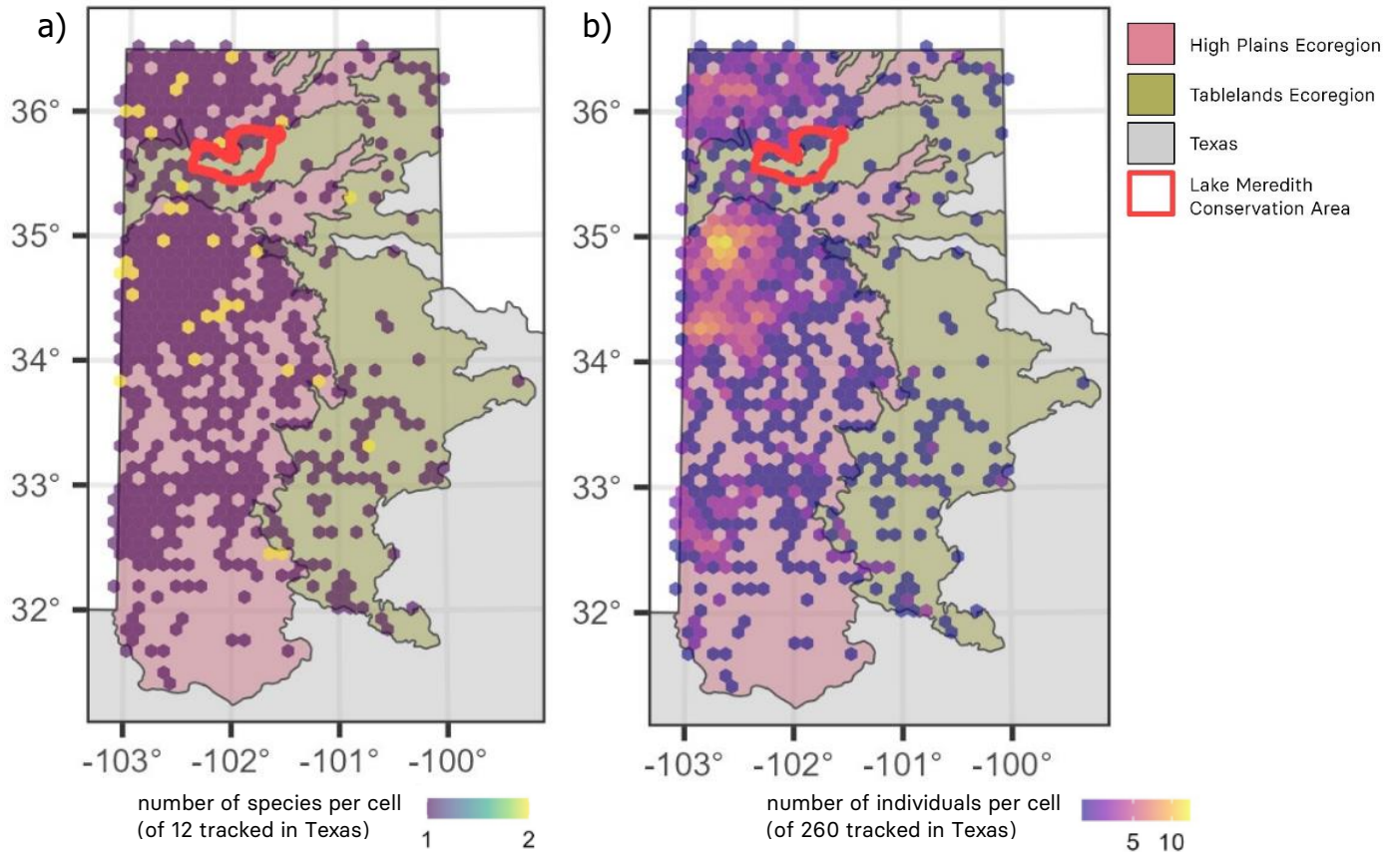


Figure 4. Counts of **a)** shorebird species and **b)** individuals tracked with Argos or GPS satellite tags that stopped in the High Plains or Southwestern Tablelands Ecoregions (US EPA 2013). Number of species and individuals were tallied in standardized grid cells each with an area of 105 km².

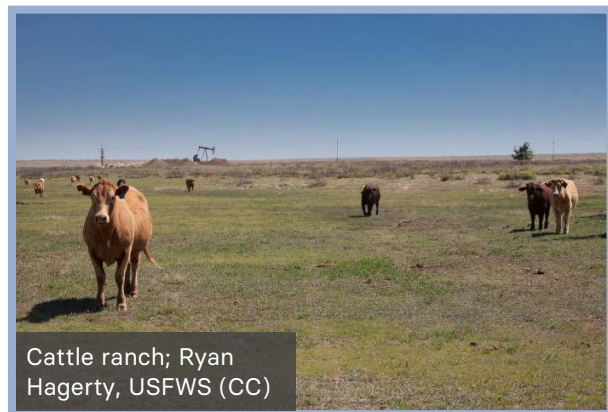
About the Texas Panhandle

The Texas Panhandle is an important region for many shorebirds, providing critical breeding, stopover, and/or wintering habitat for at least 38 North American shorebird species (Fellows et al. 2001). Common shorebird habitats in the panhandle region include playa lakes and other ephemeral and permanent wetlands, shortgrass prairie, agricultural fields, rivers, reservoirs, and other shallow water sources (Fellows et al. 2001). Playa lakes, which are shallow depressions in the ground filled from precipitation and groundwater, cover a significant proportion of the Texas panhandle (**Figure 1**) and are used by thousands of migrating shorebirds every year (Davis and Smith 1998). These lakes are generally ephemeral, but some may hold water year-round under the right conditions (Fellows et al. 2001).



TNC's LMCA encompasses approximately 515,000 acres within the High Plains and Southwestern Tablelands ecoregions of Texas (**Figure 1**). The eastern and southern borders of the LMCA are adjacent to the Canadian River and Lake Meredith, a reservoir and the largest body of water in the panhandle; the rest of the LMCA consists primarily of mixed-grass and shortgrass prairie, as defined by Elliott et al. (2009).

A major shorebird conservation challenge in the Texas panhandle is the dynamic and unpredictable fluctuations of water levels and wetland conditions (Fellows et al. 2001). As such, many shorebird populations are opportunistic in their use of habitats and distributed across a changing landscape (Fellows et al. 2001). Additionally, a significant portion of shorebird habitat falls on private lands (Fellows et al. 2001), making landowners a key stakeholder for successful conservation.



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 et 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.

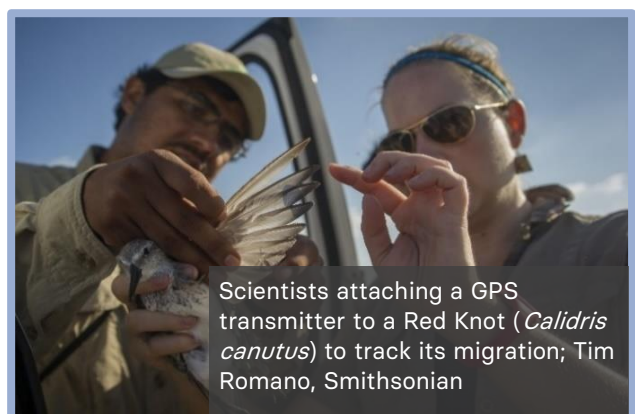


Long-billed Curlew
(*Numenius americanus*);
Tim Romano, Smithsonian

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 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 TNC.



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 TNC'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.

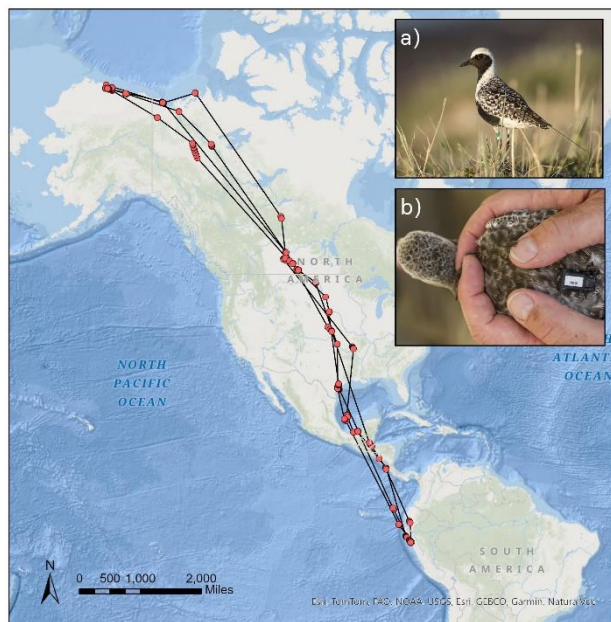


Figure 5. Full cycle track line across two years for an individual Black-bellied Plover (*Pluvialis squatarola*); contributed by Autumn-Lynn Harrison, Smithsonian Migratory Bird Center; David Newstead, Coastal Bend Bays & Estuaries Program; and Lee Tibbitts, U.S. Geological Survey, Alaska Science Center. 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](#).

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

Long-billed Dowitcher Track

Bart Kempenaers*¹, Eunbi Kwon¹

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

Long-billed Curlew Tracks

Andy Boyce*², Jeff Kelly³, Kate Goodenough³, Paula Cimprich³

Unpublished Data, Smithsonian Conservation Biology Institute, University of Oklahoma

Jay Carlisle*⁴, Stephanie Coates⁴

Unpublished Data, Intermountain Bird Observatory, Boise State University

Autumn-Lynn Harrison*², David Newstead⁵, David Bradley⁶

Unpublished Data, Migratory Connectivity Project

These additional contributors shared data of shorebirds tracked in the High Plains and Southwest Tablelands Ecoregions of Texas:

Alina Olalla Kerstupp*⁷, Gabriel Ruiz Aymá⁷, José Ignacio González Rojas⁷, Antonio Guzmán Velasco⁷, Allison Pierce*⁸, Michael Wunder⁸, Bridget Olson*⁹, Callie Gesmundo*⁹, James Johnson*⁹, Katie Christie¹⁰, Laura McDuffie¹¹, Christian Friis¹², Christopher Harwood⁹, Benoit Laliberte¹², Erica Nol¹³, Jennie Rausch*¹², Audrey Taylor¹⁴, Jay Wright¹⁵, Zachary Pohlen⁹, Joint Base Elmendorf-Richardson¹⁶, Brad Winn¹⁷, Bryan Watts¹⁸, Fletcher Smith^{18, 19}, Julie Paquet¹², Walter Wehtje²⁰

Contributor Organizations:

¹ Max Planck Institute for Biological Intelligence, ² Smithsonian Migratory Bird Center, ³ University of Oklahoma, ⁴ Intermountain Bird Observatory, Boise State University, ⁵ Coastal Bend Bays & Estuaries Program, ⁶ Birds Canada, ⁷ Universidad Autónoma de Nuevo León, ⁸ University of Colorado Denver, ⁹ U.S. Fish and Wildlife Service, ¹⁰ Alaska Department of Fish and Game, ¹¹ U.S. Geological Survey, Alaska Science Center, ¹² Canadian Wildlife Service, Environment and Climate Change Canada, ¹³ Trent University, ¹⁴ University of Alaska Anchorage, ¹⁵ Ohio State University, ¹⁶ U.S. Department of Defense, ¹⁷ Manomet, ¹⁸ College of William and Mary, ¹⁹ Georgia Department of Natural Resources, ²⁰ Ricketts Conservation Foundation



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