CURRENT RESEARCH REPORT

2024-2025

www.ckwri.tamuk.edu

CAESAR KLEBERG
WILDLIFE RESEARCH INSTITUTE
TEXAS A&M UNIVERSITY - KINGSVILLE®

Providing the Science Behind Wildlife Conservation and Management

REPORT OF CURRENT RESEARCH

September 1, 2024 to August 31, 2025
Caesar Kleberg Wildlife Research Institute

CKWRI Advisory Board

Chad Auler
Gus T. Canales
Lauren Fisher
T. Dan Friedkin
Jeff Hildebrand
Karen Hunke
Whit Jones
David W. Killam
Mason D. King
Chris C. Kleberg
Tio Kleberg
C. Berdon Lawrence
Tim Leach (Chair)
James McAllen, Jr.
Ellen B. Randall
Barry Coates Roberts
Carter Smith
Stuart W. Stedman
Bryan Wagner
Ben Wallace
Charles A. Williams

Emeritus Board Members

Kenneth E. Leonard
James A. McAllen

Texas A&M University - Kingsville

Dr. Robert H. Vela, Jr.
President

Dr. James Palmer
Provost and Vice President for Academic Affairs

Dr. Shad D. Nelson
Dean, Dick and Mary Lewis Kleberg College of Agriculture and Natural
Resources

Dr. David G. Hewitt
Leroy G. Denman, Jr. Endowed Director of Wildlife Research

ABOUT

The Caesar Kleberg Wildlife Research Institute at Texas A&M University - Kingsville is the leading wildlife research organization in Texas and one of the finest in the nation. Established in 1981 by a grant from the Caesar Kleberg Foundation for Wildlife Conservation, the Institute operates as a nonprofit organization and depends financially upon private contributions and faculty grantsmanship. Our mission is to provide science-based information for enhancing the conservation and management of Texas wildlife.

The Caesar Kleberg Wildlife Research Institute is located on the campus of Texas A&M University - Kingsville and functions as a unit within the Dick and Mary Lewis Kleberg College of Agriculture and Natural Resources.

SUPPORT US

Three ways to give:

1. Use this QR code.

2. Visit our giving webpage:

https://www.ckwri.tamuk.edu/giving

3. Use the envelope to send a check.

December 2025

Editors: Sandra Rideout-Hanzak and Kyndra McGovern

Mysteries & Discoveries

In the early 1700's a farmer in New York dug up a huge fossil tooth. Because it clearly came from a massive animal, but nothing else of the animal was known, it was named incognitum. As additional fossil bones were found, more was learned about this American Incognitum. In the late 1700's, the species was officially recognized and given a scientific name. We know it today as the mastodon.

Later, Thomas Jefferson and other Americans sought to show that the newly formed United States was on equal footing with European countries. They used the mastodon as evidence that North America had large, impressive wildlife, rivaling anything in Europe. Because vast expanses of North America had yet to be explored, Jefferson tasked Lewis and Clark with looking for American Incognitum during their trek across the country in the early 1800s. The possibility of finding a mastodon was part of the excitement and adventure of the Corps of Discovery.

The lure of the unknown and unexpected is one reason people are drawn to the outdoors. Wildlife is a big part of the unpredictability inherent in an outdoor excursion because animals act of their own accord. We do not control their behavior. We no longer go afield looking for mammoths, but outings are enriched by the surprise sighting of an unusual bird, a previously unseen buck, or a rarely observed predator.

Lewis and Clark not only ventured into an unknown physical world but into an intellectually mysterious world. They collected scientific specimens and information, increasing humanity's knowledge. Like those early nineteenth-century explorers, CKWRI faculty and students step into a similarly unknown world with their research. They experience the thrill of learning something new about wildlife, its habitat, and how to conserve it.

The pages of this Current Research Report contain the equivalent of journal entries as CKWRI scientists return to their writing desks and report their discoveries. They do not seek American Incognitum but rather discoveries in DNA, insights from imagery, and understanding from habitat use. These findings enrich our lives and help us be better stewards of our piece of the world. I hope you enjoy these reports and learn from them. I also encourage you to embark on your own wildlife adventure, whether it be in your yard, a local park, your ranch, or somewhere far out over the horizon. Mysteries, your very own American Incognitum, await.

All the Best,

David Hewitt
Leroy G. Denman, Jr. Endowed Director of Wildlife Research

Table of Contents

1 Foreward

2 Table of Contents

3 North Texas Research Program

4 In Memory & Honor

5 Our Students

9 Scientists & Staff

10 Project Sponsors & Cooperators

12 Wild Cats

26 Patton Center for Deer Research

42 The Richard M. Kleberg, Jr., Center for Quail Research

50 Shorebirds & Waterfowl

56 Texas Native Seeds

74 Habitat Restoration & Management

- 77 Feature Article--New Insights on Managing Whitebrush: Effective Chemical Options for Challenging Conditions

84 Biology & Ecology

- 100 Feature Article--Keeping Your Childhood Alive: Management Recommendations for Texas Horned Lizards

103 Highlight External Co-Authors

- 104 TAMUK Undergraduate Co-Authors

105 Publications 2023-In Press

- 105 Books
- 105 Book Chapters & Monographs
- 105 Scientific Journals & Proceedings
- 111 Popular Literature

CKWRI SEEKS PARTNERS

Based in Lubbock, TX, CKWRI has expanded its presence to northern Texas to research large mammals, game birds, and the myriad of other species that live in the region. Within and beyond the Texas border, the southwest deserts and southern Great Plains offer abundant wildlife resources, including many iconic species. These species face regulatory and policy issues that require applied research to inform management decisions, such as shifting agriculture, increased energy development, diminishing groundwater resources, and emerging wildlife diseases. Further, this remote unit offers a regional contact for nearby research partners and wildlife managers, from Dallas to Amarillo to El Paso, in hopes of enhancing outreach and collaboration. The North Texas Research Program of CKWRI is strategically and geographically equipped to meet these needs in northern Texas and beyond.

INAUGURAL PROJECTS

Elk and Deer Movement Ecology Influences on Chronic Wasting Disease Spread: Investigating movement, survival and population estimates in the Panhandle and Trans-Pecos Regions of Texas. Additionally, these data will be used to predict chronic wasting disease dynamics in these regions.

Pronghorn Movement and Demography in the Texas Panhandle and Western Oklahoma: Studying how roads, fences, and cropland may influence movement and survival in the Oklahoma and Texas Panhandles.

Movement, Abundance, and Demography of Mule Deer at the Geographic Range Extent: Researching adult and fawn movement and survival throughout western Oklahoma and the Texas Panhandle.

Impacts of Pinyon-Juniper Fuel Reduction Treatments on Mammals in Grass Valley, Utah: Evaluating how different sage brush and juniper treatments may influence wildlife distribution and interactions.

White-tailed Deer Interactions with Nonnative Ungulates and Historic Brush Management in the Texas Hill Country: Exploring habitat use and interactions with nonnatives in the Hill Country region.

HOW TO HELP

Currently, our biggest need is operating funds. Operating funds can be provided by gift designations through the following giving programs (complete benefits of each opportunity can be found on our website). If you would like to make a contribution to this important work, scan the QR code below. Please specify "North Texas Research Program" to be sure your gift is directed to support our northern efforts.

- Named Endowment Opportunities starting at $100,000
- Caesar Kleberg Patron: $5,000 or greater in a single year
- Caesar Kleberg Friend: up to $4,999 in a single year
- Caesar Kleberg Partner (Annual Gift): $5,000+

In Memory and Honor

Many people choose to send unsolicited gifts in honor of cherished friends or family. In FY2025, we received memorials and gifts to honor:

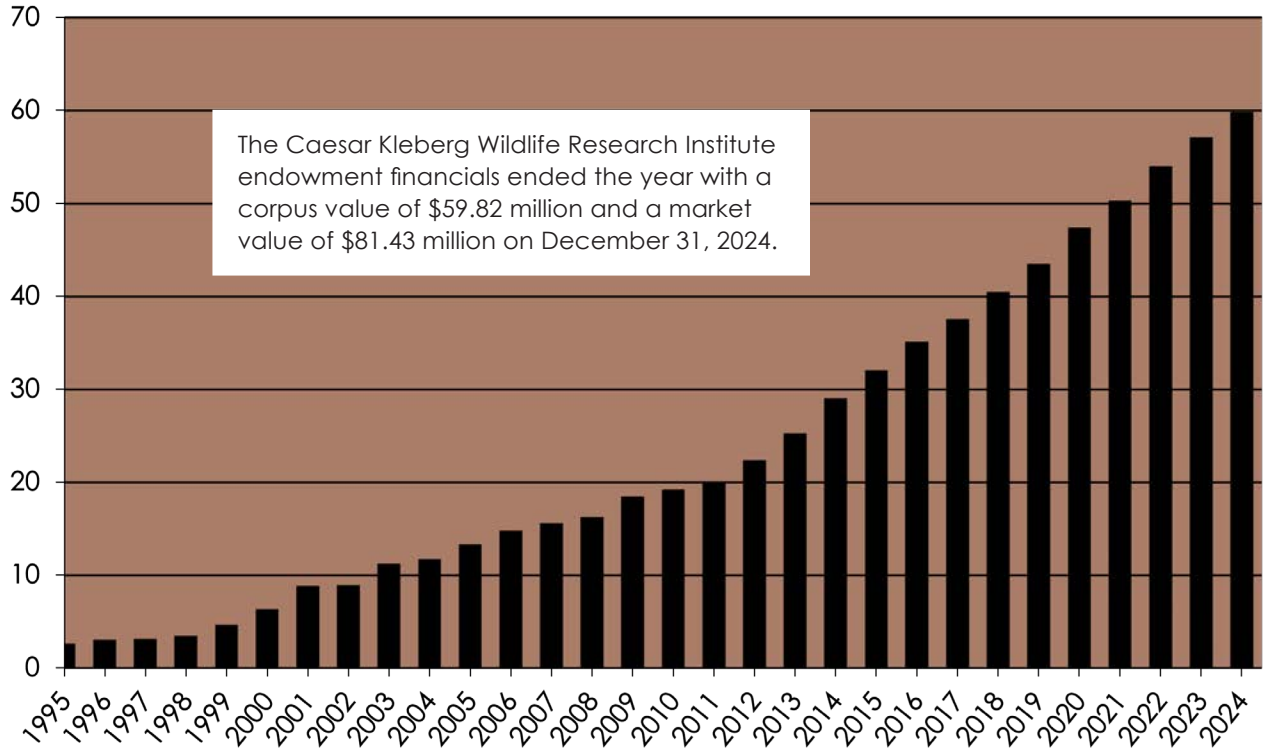
Chad Auler*
Alston Beinhorn
Celia Dupré*
Cornelius Dupré*
Henry Hamman*
Walter Hanover
John Harris*
Laura Hickman
A.C. "Dick" Jones, IV
Elizabeth "Libby" Jones
Dick & Mary Lewis Kleberg
Richard M. Kleberg, III*
Scott Kleberg*
Tio & Janell Kleberg*
William "Bill" Kuvlesky
Dennis Marbach
Brian E. O'Brien
Jeffrey Diver Reamer
Alec D. Ritzell*
Nicholas Swyka, Jr.
John David Terry, III*
Marshall "Spencer" Thurman
Ben F. Vaughan, III*
Ted White, PhD
C.C. "Charlie" Winn*
Mary Yturria*

* Also honored in previous years

New Endowments

Paula Maywald Stumberg Endowment for Texas Native Seeds
Ronnie Howard Fellowship in Quail Research

Endowment Financials



The Caesar Kleberg Wildlife Research Institute endowment financials ended the year with a corpus value of $59.82 million and a market value of $81.43 million on December 31, 2024.

Graduate Students

Mr. Cole C. Anderson
Ms. Kendall L. Bancroft
Mr. Michael R. Barrett
Ms. Laura C. Beck
Ms. Tyler A. Bostwick
Mr. Sean Blundell
Ms. Caitlin Camp
Mr. Marlin M. Dart II
Mr. Duston R. Duffie
Ms. Georgina R. Eccles
Mr. Calvin C. Ellis
Mr. Forrest C. Fay
Mr. Raziel I. Flores
Ms. Breanna R. Green
Ms. Ashlyn Halseth-Ellis
Dr. Joseph A. Hediger
Mr. James N. Helferich
Ms. Alexandria N. Hiott
Ms. Ashley G. Hodge
Ms. Miranda L. Hopper
Mr. Austin Ibarra
Ms. Jessica Johnston
Mr. Sean A. Kiernan
Ms. Victoria L. Locke
Mr. Kevin T. Lovasik
Mr. Herbert Magobwe
Mr. Rupesh Maharjan
Ms. Katherine G. McDaniel
Mr. Joseph McGovern
Ms. Kyndra McGovern
Mr. Caleb M. McKinney
Ms. Dakota R. Moberg
Ms. Carolina M. Munoz
Ms. Chloe M. Nouzille
Mr. Ben Oswald
Ms. Micayla E. Pearson
Ms. Katie Pennartz
Ms. Tiffany Pope
Mr. Braiden Quinlan
Mr. Harry Rakosky
Ms. Maydeliz Ramos-Gonzalez
Mr. Ed Rhodes
Ms. Celine M. J. Rickels
Mr. Javier Robledo
Dr. Mauricio Rued

A graduate student releases a northern bobwhite fitted with a GPS backpack amid emerging guineagrass.


Megan Spina

Mr. Landon Schofield
Mr. Javier Segovia
Ms. Hannah Shapiro
Ms. Liza A. Soliz
Ms. Megan Spina
Ms. Kristyn G. Stewart-Murphy
Mr. Michael T. Stewart
Mr. Levi D. Sweeten
Mr. Jack G. Towson
Ms. Janice Travis
Ms. Katherine A. Travis
Mr. Parker C. Trifiletti
Ms. Rachel V. Walters
Mr. Zachary M. Wardle
Ms. Emma R. Weber
Ms. Marianna Wharff
Mr. Daniel Woolsey
Mr. Cole Wzientek
Mr. Thomas J. Yamashita

Student Scholarships

Caesar Kleberg Foundation for Wildlife Conservation Fund for Graduate Student Tuition
Every graduate student in our program financially benefits from this fund.

Houston Safari Club Dan L Duncan Scholarship
Kendall L. Bancroft, Marlin M. Dart II, Duston R. Duffie, Forrest C. Fay, Kevin T. Lovasik, Joseph M. McGovern, Dakota R. Moberg, Maggie Rector, Celine M.J. Rickels, Kimberly M. Tanguma

South Texas Quail Coalition Scholarships in Wildlife Management
Caesar Kleberg Wildlife Research Institute graduate students and Range and Wildlife Science undergraduate students gain financial support from this organization.

San Antonio Livestock Exposition, Inc. (S.A.L.E.) Assistantship & Scholarship
Liza A. Soliz

Houston Livestock Show & Rodeo Graduate Scholarship
Alejandro Bazaldua, Carolina M. Munoz

Houston Livestock Show & Rodeo Graduate Fellows in Wildlife Research
Javier A. Segovia

Endowed Student Scholarships

Robert and Rebecca Palmer Scholarship Fund, Graduate Students
Marlin M. Dart II, Duston R. Duffie, Forrest C. Fay, Miranda L Hopper, Joseph M. McGovern, Caleb M. McKinney, Dakota R. Moberg, Harry Rakosky, Kimberly M. Tanguma, Jack G. Towson, Emma R. Weber, Cole M. Wzientek
Undergraduate Students
Myrella R. Munoz, Wraith M. Rodriquez

A. E. Leonard Undergraduate Student Scholarship in Wildlife Conservation
Shayla M. Haiflich, Logan A. Liesman, Myrella R. Munoz

Phillip M. Plant Endowment for Graduate Scholarships in Wildlife
Kendall L. Bancroft, Laura C. Beck, Ashlyn N. Halseth-Ellis, Sean A. Kiernan, Kevin T. Lovasik, Rupesh Maharjan, Kyndra N. McGovern, Carolina M. Munoz, Kristyn G. Murphy, Hannah A. Shapiro, Parker C. Trifiletti, Cole M. Wzientek

Alec D. Ritzell Memorial Fund for Wildlife Research and Education Scholarship
Michael T. Stewart

Endowed Student Fellowships

Sam Walton Fellowship in Quail Research
Caleb M. McKinney

Alice Gertrudis King Kleberg Reynolds Endowed Fellowship in Quail Research
Kristyn G. Stewart-Murphy

Elliot B. & Adelle Bottom Fellowship in Quail Research
Search in Progress

Walter Fondren, III Fellowship in Shorebird & Wading Bird Research
Jessica J. Johnston, Joseph M. McGovern

Betty and George Coates Fellowship in Habitat Enhancement Research
Search in progress

Jess Y. Womack, II Fellowship in Wetlands & Wetland Bird Research
Jack R. Rogers

Boone & Crockett Club Fellowship in Ungulate Research
Chloe M. Nouzille

Hixon Fellowships in Deer
Kendall L. Bancroft, Ashlyn N. Halseth-Ellis

Hixon Fellowships in Quail
Carolina M. Munoz

Hixon Fellowships in Range Restoration
Katherine A. Travis

Kenneth E. Leonard Fellowship for Livestock-Wildlife Research
Search in Progress

Stuart W. Stedman-Faith Ranch Fellowships in Deer Research
Breanna R. Green, Kevin T. Lovasik

Mike & Mary Terry Endowed Fellowship for Habitat Research
Laura C. Beck

Coates-Kelso Graduate Fellowship for Conservation & Management of White-tailed Deer
Kendall L. Bancroft

CKWRI's world-class program attracts some of the brightest minds from all over the US and beyond. Our program is unique in that our students have the opportunity to conduct research on private lands. Because of this, they leave with a greater appreciation for private landowners and their stewardship values.

WHERE
THEY COME FROM

WHERE THEY GO

Once they graduate, our students are some of the most sought after in the field of wildlife biology and habitat management. CKWRI graduates are working for:

American Bird Conservancy
Arkansas Game and Fish
Austin Community College
CrossTimbers Consulting, Inc.
Deseret Cattle & Timber
Ducks Unlimited
East Foundation
Florida Fish and Wildlife Conservation
Georgia Dept. of Natural Resources
Idaho Fish and Game
Kansas Wildlife Service
King Ranch, Inc.
Michigan Dept. of Natural Resources
Mississippi Department of Wildlife, Fisheries and Parks
Montana Fish, Wildlife, and Parks
National Parks and Wildlife
Natural Resources Conservation Services
The Nature Conservancy
Pheasants Forever
Rocky Mountain Bird Observatory
Stephen F. Austin University in Forest Wildlife Management
Sul Ross State University
Texas A&M University-Agrilife
Texas A&M University-College Station
Texas A&M University-Kingsville
Texas Parks and Wildlife Department
USDA-NRCS
US Fish and Wildlife Service
US Forest Service
US Geological Survey, Patuxent Wildlife Research Center
US Geological Survey, Natl. Wildlife Health Center
University of Idaho
University of San Diego
Washington Department of Fisheries & Wildlife
Welder Wildlife Foundation
Wisconsin Department of Natural Resources

CKWRI graduates also work for countless private ranches and in management positions throughout the country.

2024-2025 M.S. & PH.D Graduates

ALEJANDRO BAZALDUA, M.S.
Thesis: Forecasting Spatial Abundance of Northern Bobwhite in South Texas Using Roadside Surveys

TYLER BOSTWICK, M.S.
Thesis: Genomic insights into endangered ocelot populations to inform species recovery

JOSEPH MCGOVERN, M.S.
Thesis: Intraspecific Variation in Migration Strategy is Linked to Disparate Behavioral Responses of Northern Pintail During Thermal Extremes at Spring Stopovers

MICAYLA PEARSON, M.S.
Thesis: Evaluation of Grassland Restoration Techniques and Seed Mix Development for use on New Solar Developments in South Texas

DANIEL RAMIREZ, M.S.
Thesis: Developing a LORA Virtual Fencing System for Large Areas in South Texas

KIMBERLY TANGUMA, M.S.
Thesis: Very Fine Resolution Multispectral Imagery for Rangeland Forage Quality and Soil Moisture

KATHERINE TRAVIS, M.S.
Thesis: Navigating the Fragmented Thornscrub: Assessing Movement Responses and Space Use Partitioning in a Declining Galliform

THOMAS YAMASHITA, PH.D.
Dissertation: A Comprehensive Approach to Assessing Wildlife Crossing Effectiveness in South Texas







Mr. Robert S. Alonso, Program Manager
Dr. Bart M. Ballard, Professor
Mrs. Yolanda Ballard, Director, CKWRI Administration
Mrs. Sara K. Barrera, Manager-Event Services
Mr. Michael R. Barrett, Laboratory Manager
Mr. Alejandro Bazaldua, Research Associate
Dr. Jamie S. Benn, Research Asst. Professor
Mr. John R. Boone, Farm Foreman II, Texas Native Seeds-Coastal Prairie
Mr. Joshua D. Breeden, Farm Foreman II, Texas Native Seeds
Dr. Emma K. Brookover, Research Asst. Professor
Dr. Fred C. Bryant, Director, CKWRI Development
Ms. Caroline C. Cage, Director of Donor Relations
Ms. Katherine Campbell, Research Tech. I
Ms. Gina M. Cavazos, Administrative Coordinator I
Mrs. Cecilia A. Chapa, Business Coord. III
Mr. John R. Chapa, Facilities Coordinator III
Dr. Michael J. Cherry, Associate Professor
Mr. Jameson S. Crumpler, Asst. Director, Texas Native Seeds, Permian Basin
Mrs. Alexandra J. Dart, Program Manager
Dr. Charles A. DeYoung, Research Scientist
Dr. Randy W. DeYoung, Professor
Mr. John A. Dietz, Purchasing Specialist
Ms. Nicole R. Durtschi, Research Technician I
Mr. Jonathan Edwards, Texas Native Seeds-East Texas
Mrs. Florinda G. Falcon, Admin. Associate V
Dr. Anthony D. Falk, Program Director, Texas Native Seeds
Mrs. Sandra L. Fischer, Business Coordinator III
Dr. Aaron M. Foley, Research Asst. Professor
Dr. Jordan C. Giese, Research Asst. Professor
Mrs. Elizabeth A. Grunwald, Research Associate
Dr. Lon I. Grassman, Jr., Research Scientist
Dr. Whitney K. Hansen, Research Asst. Professor
Mr. Terry E. Hanzak, Research Tech. I
Dr. Joseph A. Hediger, Research Tech. I
Dr. Levi J. Heffelfinger, Asst. Professor & Director-CKWRI North
Dr. Scott E. Henke, Professor
Dr. Fidel Hernández, Professor
Mr. John E. Herschberger, Research Associate
Dr. David G. Hewitt, Executive Director
Mrs. Liisa L. Hewitt, Research Technician II
Dr. Clayton D. Hilton, Research Scientist
Ms. Nancy T. Jennings, Asst. Director-CKWRI Administration
Mrs. Edna G. Kirkpatrick, Travel Specialist II
Ms. Bailey A. M. Kleeberg, Admin. Coord. I
Dr. William P. Kuvlesky, Jr., Professor
Mr. Thomas M. Langschied, Research Tech. I
Mr. Brian K. Loflin, Adjunct Faculty
Ms. Kendal A. Martel, Asst. Director, Texas Native Seeds-East Texas
Dr. Alynn M. Martin, Asst.Professor
Mr. Hagen D. Meyer, Research Associate
Mr. Daniel Newman, Research Tech. I
Ms. Meghan K. Peoples, Asst. Director, Texas Native Seeds-Coastal Prairie
Dr. Lisanne S. Petracca, Asst. Professor
Mrs. Shyla E. Rabe, Assistant Director, CKWRI Operations
Dr. Sandra Rideout-Hanzak, Professor
Ms. Carol M. Ridgeway, Administrative Associate V
Mr. Cesar Robledo, Purchasing Specialist
Ms. Tara L. Rodkey, Research Associate
Mr. Zachary W. Rodriguez, Business Coord. II
Mr. Tristian J. Saxon, Research Tech. II, Texas Native Seeds
Dr. Daniel G. Scognamillo, Research Associate Professor
Mr. Antonio Segura, Farm Foreman II
Mr. Colin S. Shackelford, Associate Director, Texas Native Seeds–West Texas
Dr. Aditya Singh, Asst. Professor
Dr. Matthew M. Smith, Research Asst. Professor
Dr. Jennifer A. Smith, Asst. Professor
Mrs. Susan C. Smith, Administrative Coord. I
Dr. Ashley M. Unger Tanner, Asst. Professor
Dr. Evan P. Tanner, Asst. Professor
Mr. Hayden R. Taylor, Asst. Director, Texas Native Seeds-Coastal Prairie
Dr. Michael E. Tewes, Professor
Mr. Raymond K. Turner, Research Tech, I
Dr. Bhemeshwar Yeturi, Senior Data Analyst

Project Sponsors & Cooperators

3H Ranch
A.E. Leonard Family Giving Council
Alfred S Gage Foundation
American Forests
Drs. Loren Ammerman & Michael Dixon
Bamert Seed Company
Mr. Bruce & Mrs. Joy Bates
Boone & Crockett Club
Borderlands Research Institute, Sul Ross State University
The Brown Foundation
Brush Country Wildlife Consulting, LLC
Caesar Kleberg Foundation for Wildlife Conservation
Center for Conservation and Research of Endangered Wildlife (CREW)
CF Ranches
Comanche Ranch
ConocoPhillips
Daisy Farms, LLC
Mr. Steve & Mrs. Donna Dittmann
Dan L Duncan Family
Mr. Rufus Duncan
Double D Ranch
Douglass W. King Seed Company
East Foundation
ExxonMobil Corporation
Faith Ranch
Florida Fish & Wildlife Conservation Commission
Frederic C. Hamilton Foundation
Fred C. Hamilton
Harris County Flood Control District
Harry L. Willet Foundation
Mr. William & Mrs. Pam Harte
Henderson-Wessendorf Foundation
Hill Country Quail Coalition
Ms. Julianna Hawn Holt
Houston Livestock Show & Rodeo
Houston Quail Coalition
Joan & Herb C. Kelleher Foundation
Joan & Rufus Duncan Memorial Fund
Killam Ranch
Mr. James & Mrs. Tammy King
King Ranch, Inc.
Mr. David Kitner
Richard M. Kleberg, Jr. Family
Lavaca Navidad River Authority
Marie & James H Galloway Foundation
Dr. Robert Martin
Mr. Travis Mathis
Mule Deer Foundation
National Fish & Wildlife Foundation
Oklahoma Dept. of Wildlife Conservation
Park Cities Quail Coalition
Quail Ranch
Railway Ranch
RES Texas Mitigation, LLC
Richard King Mellon Foundation
Rob & Bessie Welder Wildlife Foundation
Robert J. Kleberg, Jr. and Helen C. Kleberg Foundation
Rotary Club of Corpus Christi
Sandbrock Ranch
San Pedro Ranch
Shield Ranch
Shield Ranch Cherry Canyon
Shield-Ayres Foundation
SK Foundation
Mr. Stan Smith
South Texas Quail Coalition
Stedman West Foundation
Stephen F. Austin State University
TAMUK Dept. of Biological & Health Sciences
Tarleton State University
Mrs. Ellen Temple
TLL Temple Foundation, Boggy Slough Conservation Area
Texas A&M AgriLife Research Station-Bushland
Texas A&M AgriLife Research & Extension Center-Stephenville
Texas A&M University, Natural Resources Institute
Texas Department of Transportation
Texas Parks & Wildlife Department
Texas Tech University
The Nature Conservancy, Davis Mountains Preserve
The Nature Conservancy, Texas City Prairie Preserve
Toyota Motor Manufacturing
Turner Seed Company
Mr. Edward Underbrink
University of Idaho
USDA Forest Service

USDA Natural Resources Conservation Service (NRCS)
USDA NIFA Nextgen LEADING
USDA NRCS E. "Kika" de la Garza Plant Materials Center
USDA NRCS East Texas Plant Materials Center
USDA NRCS James E. "Bud" Smith Plant Materials Center
U.S. Department of Defense
USDHS Customs & Border Protection
USDI Bureau of Land Management
USDI Fish & Wildlife Service
Vrije Universiteit
White Bluff Ranch
Wild Cat Conservation, Inc.
Wildlife Futures Program, U. of Pennsylvania
Wildlife Restoration & Basic Hunter Education Grant Program
Willard & Ruth Johnson Foundation
Winston 8 Land & Cattle
Yturria Ranch

A reddish egret with a tracking device on her back and her chicks in the marsh vegetation below.

Jack Rogers

Wild Cats

Elizabeth A. Grunwald

How Many Ocelots Are Left in Texas?

James N. Helferich, Randy W. DeYoung, Beth Gardner, Alynn M. Martin, Ashley M. Reeves, Daniel G. Scognamillo, and Lisanne S. Petracca

For cryptic or endangered species, knowing how many individuals exist within a population is crucial for conservation efforts. Two methods that can help determine how many individuals there are in one place are camera traps and working dogs that can sniff out scat from a particular species. Ocelots are an endangered species that, in the US, are only found in South Texas in the Lower Rio Grande Valley. Because ocelots are rare and elusive, it is challenging to acquire a reliable estimate of how many currently exist in South Texas. Also, the effectiveness of camera traps compared to detection dogs has not been evaluated in this area. Our goals are to: (1) estimate how many ocelots are still in Texas, and (2) compare the efficacy of camera traps and scat detection dogs for data collection.

We placed 466 cameras across the habitat of the last two remaining ocelot populations in Texas and conducted two seasons of scat detection dog work. Using dogs, we surveyed over 205 miles and collected 58 scat samples. We will analyze these data with statistical models to predict the total number of ocelots in the population. This work will also tell us how cost effective it is to use scat detection dogs, and will provide important information for guiding ocelot conservation actions.

Cooperative funding provided by the US Customs & Border Protection in partnership with US Fish & Wildlife Service

Ocelot Monitoring on the Laguna Atascosa Refuge

Elizabeth A. Grunwald, Emma K. Brookover, Daniel G. Scognamillo, Andrew P. Grunwald, Sergio J. Vasquez, Brandon N. Jones, and Michael E. Tewes

We are studying ocelots and bobcats, which could compete with each other for resources, at Laguna Atascosa National Wildlife Refuge (LANWR). We have conducted wildlife camera surveys, identifying individual ocelots based on their unique coat patterns. These have been used to estimate the population density at LANWR. We are also live-trapping ocelots and bobcats to gain insight into their movements, reproduction, and genetic relatedness.

Our camera surveys have identified 23 ocelot individuals, closely matching our statistical population estimate of 21 individuals. From January through April 2025, we captured and attached GPS collars to 10 ocelots (7 male, 3 female) and 8 bobcats (4 male, 4 female). Based on our analyses, this may represent nearly half of the refuge ocelot population.

This research builds upon a long-term study by refuge staff. Based on refuge data from recent years, the population may be expanding slightly. This is promising, but ongoing research will help determine if this is truly the case. Ocelots are threatened by disease and vehicle collisions, so studying the ocelot population over time is important. Our research will support ocelot conservation and restoration in Texas and conservation planning by the Texas Department of Transportation.

Cooperative funding provided by the US Fish & Wildlife Service and the Texas Department of Transportation.

Understanding Parasite Risks for Texas's Endangered Ocelots

Tiffany Pope, Ashley Reeves, Richard Gerhold, Randy DeYoung, Michael Tewes, and Alynn Martin

Parasites can cause serious health problems in wild animals, especially when combined with other stressors like low genetic diversity or harsh environmental conditions. In southern Texas, the last remaining populations of nationally-endangered ocelots live alongside more common bobcats. While ocelots are already vulnerable because of inbreeding and habitat loss, little is known about how parasites might affect their health or how parasite exposure compares between the two species.

To learn more, we are collecting fecal samples from trapped and released ocelots and bobcats, in collaboration with other scientific studies. The fecal samples will be analyzed to identify intestinal parasites. Samples will be tested using several standard methods including fecal flotation, fecal sedimentation, and molecular testing to detect worms and protozoa.

So far, roundworms and hookworms, both known to cause illness in cats, are the most common. Protozoa have also been detected in more than half of the animals. These early findings suggest that both ocelots and bobcats carry parasites that may pose a health risk, especially for these small, isolated ocelot populations. Continued research will help wildlife managers better understand disease threats and plan for long-term ocelot conservation.

Seasonal Ocelot Use of Artificial Water Sources

Hunter G. Vasquez, Elizabeth A. Grunwald, Andrew P. Grunwald, Joelysa Garcia, Sergio J. Vasquez, Brandon N. Jones, Daniel G. Scognamillo, and Michael E. Tewes

Ocelots in South Texas depend on water sources, especially during dry and hot periods. At Laguna Atascosa National Wildlife Refuge, we are monitoring how ocelots use artificial water sources, known as guzzlers, and how guzzler use is influenced by environmental conditions.

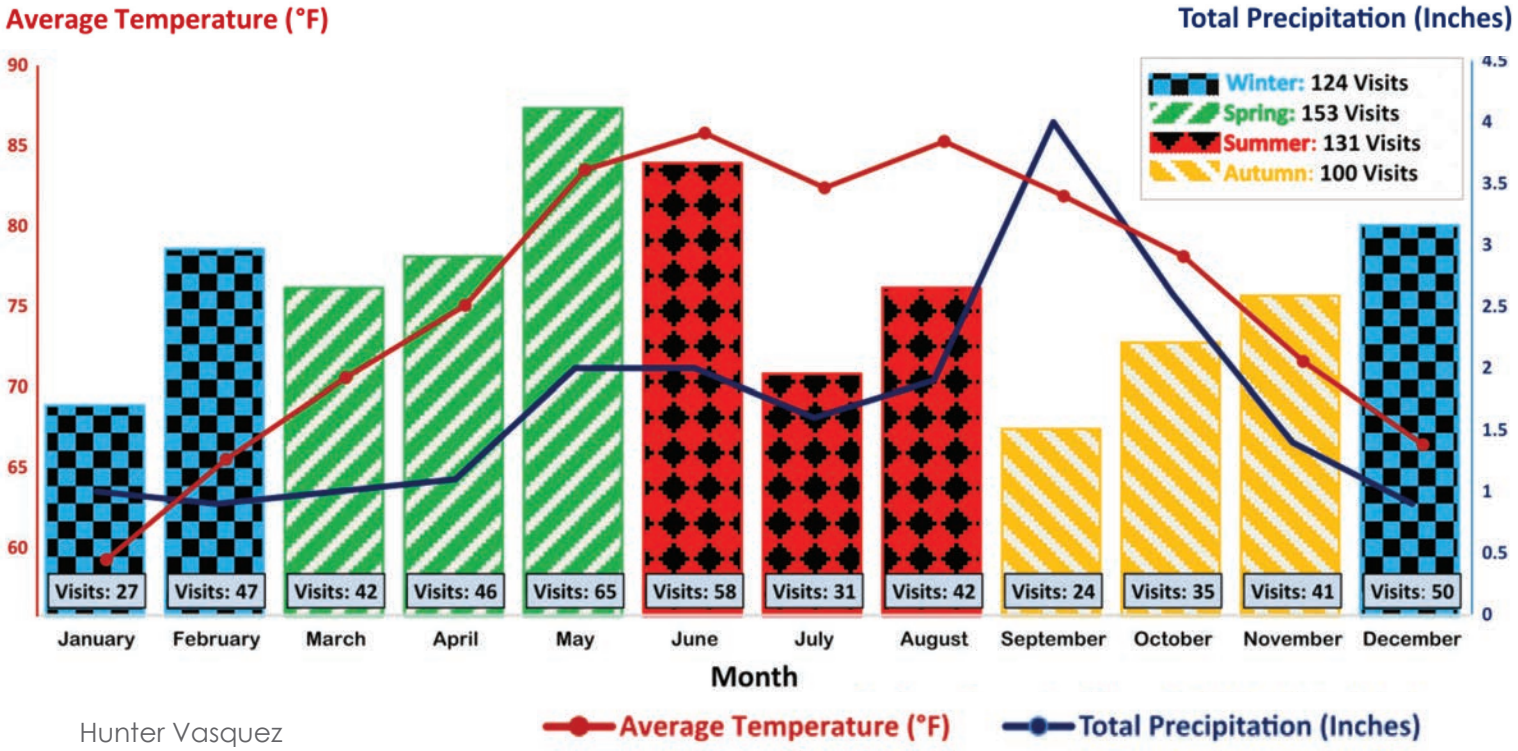
From January to December 2024, we reviewed wildlife camera photos from 14 guzzler sites each month. We recorded ocelot visits and behavior and paired these data with monthly temperature and rainfall records. Of 23 ocelots detected across the refuge, 18 (10 male, 8 female) were observed drinking from guzzlers.

Ocelots used guzzlers year-round, with peaks in May, June, and December 2024: months with moderate daily averages and dry conditions. Most visits were brief, typically lasting 2 to 6 minutes. Guzzlers where multiple individuals were photographed are likely important locations for monitoring and, potentially, management efforts.

These findings show that guzzlers are especially valuable during seasonal dry periods. Keeping guzzlers functional before and during warmer months may help keep ocelots within refuge boundaries, where they are less likely to be hit by a vehicle. Continued monitoring will improve our understanding of ocelot water use as climate conditions change over time.

Cooperative funding provided by the US Fish & Wildlife Service.

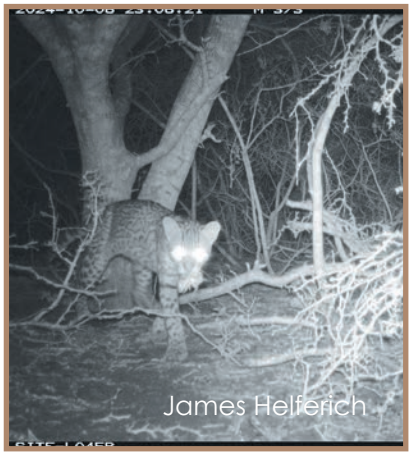
Ocelot visits to guzzlers at Laguna Atascosa National Wildlife Refuge in 2024.



Hunter Vasquez

Drought Changes Habitat use and Movement of Wild Cats

Matthew M. Smith, Ashley Reeves, Daniel G. Scognamillo, Michael E. Tewes, and Lisanne Petracca



Extreme weather is becoming more common and is affecting animals and their habitat. This creates new challenges for conservation and management, especially when the recovery of endangered species occurs in places that differ from historical conditions. Drought can make it harder for wildlife to survive by reducing the availability of food and water. To better understand these effects, we studied two wild cats in South Texas—the endangered ocelot and the more common bobcat. We looked at how drought affected their habitat use, daily movement, and behavior using GPS tracking data.

We found that ocelots and bobcats used the same habitat during periods of extreme drought, which may increase competition between them. Ocelots also traveled longer distances during droughts and spent more time making longer, more direct movements. Consequently, ocelots need more food during drought; that can affect their overall health and expose them to greater risk. We calculated that this increased energy need was equal to eating one medium-sized rodent per day. Extreme weather, such as prolonged drought, poses significant challenges for species recovery, particularly when management options for mitigating drought conditions are limited. Predicting how animals respond to these conditions is key to improving the persistence and recovery of endangered species.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.

Ocelots and Bobcats on Ranches in Southern Texas

Daniel G. Scognamillo, Emma K. Brookover, Sean A. Kiernan, Jack G. Towson, and Michael E. Tewes

Because nearly all land in Texas is privately owned, private ranches are important entities that can benefit plants and wildlife into the future. We have been monitoring ocelots on various ranches along Highway 77 in South Texas with GPS collars and wildlife cameras. Using GPS collars, we can gain knowledge on the movement patterns of both cat species, which potentially compete with each other. Photographs allow us to identify ocelot individuals based on their unique coat patterns. We were unable to collar ocelots during winter 2025, but we collared 12 bobcats (7 male, 5 female). During captures, we took measurements and collected samples for genetic studies. We plan to capture more bobcats in the fall and resume trapping ocelots in the winter.

Analyzing data collected from ranches is a critical step in designing and implementing dispersal corridors for ocelots on private lands. Further, cats collared on the ranches may travel close to the neighboring highway, where they can be hit by vehicles. Our study will contribute to both ocelot and bobcat conservation on private lands and conservation planning by the Texas Department of Transportation.

Cooperative funding provided by the US Fish & Wildlife Service and the Texas Department of Transportation.

Felid Social Structure and Road Crossing Behavior

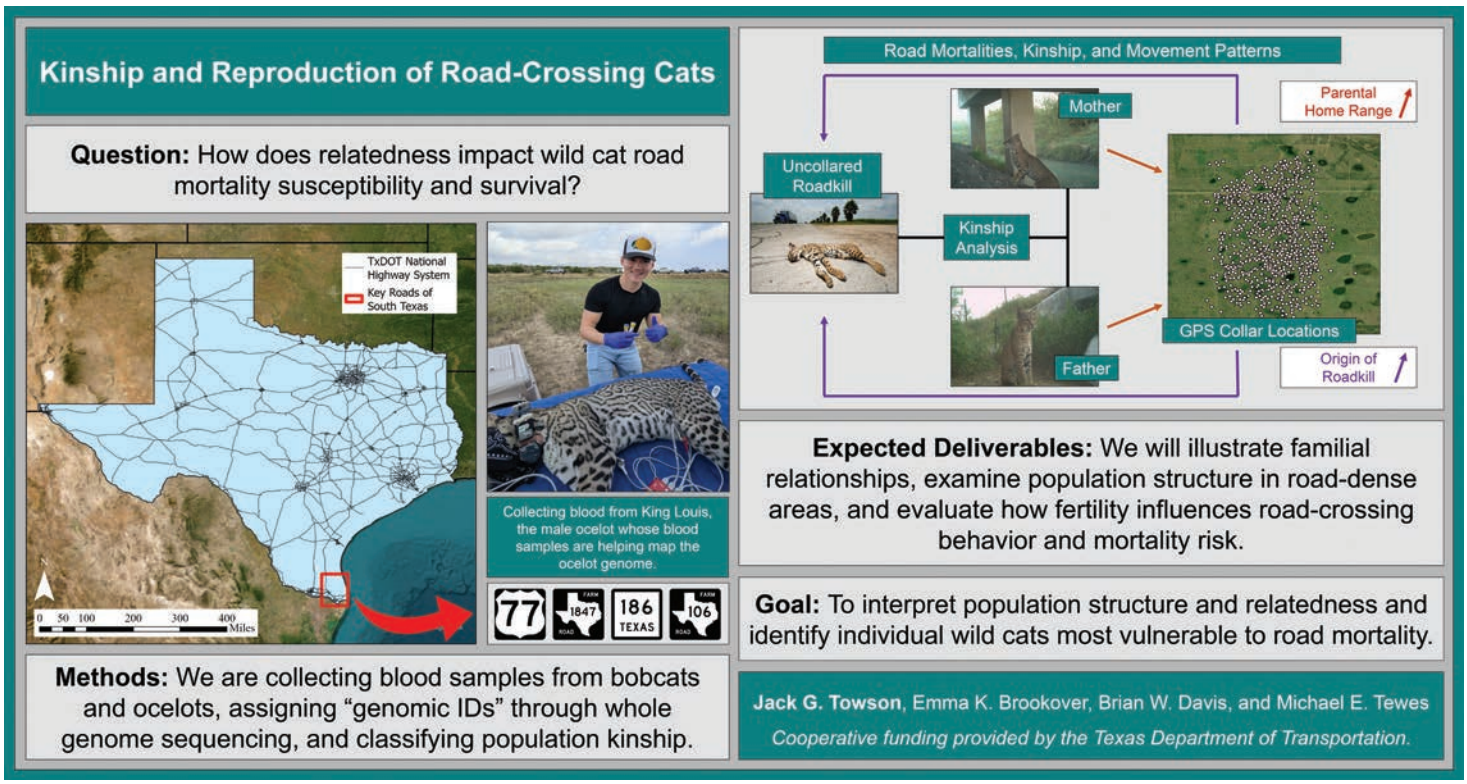
Jack G. Towson, Emma K. Brookover, Brian W. Davis, Sean Kiernan, John H. Young, Jr., and Michael E. Tewes

Roads endanger wildlife by causing vehicle collisions and fragmenting habitat. Cats will responsively adapt to such barriers by altering their movement patterns and decreasing their ranges. These shifts in space use impact social organization— specifically territoriality, tolerance, and dispersal—and collectively influence road crossing behavior. This project will examine how genetics regulates social structure and its role in wild cat movement and road crossing success.

We identified eight 'social genes' in the bobcat genome that influence decisions to cross roads. These genes affect exploratory behavior, risk-taking, stress regulation, and other social components. We plan to analyze variation within the 'social' genes across individual South Texas bobcats and ocelots. Additionally, we used GPS collars to map home ranges and interaction opportunities between neighboring individuals. Movement patterns will be examined, and different 'barrier behaviors' around roads will be classified. We aim to integrate genomic, spatial, and social data to assess each individual cat's predisposition for road crossing success.

This study is critical for understanding how social structure drives wild cat dispersal. Our research can guide wildlife crossing managers to improve landscape and genetic connectivity despite road-related challenges to the survival of these species.

Cooperative funding provided by the Texas Department of Transportation.



Kitten Survival of Bobcats and Ocelots

Victoria L. Locke, Ashley Reeves, Evan P. Tanner, Julie K. Young, and Lisanne Petracca

Understanding how many young animals survive to adulthood is important in figuring out if a population is increasing or decreasing. This is true for species like ocelots, which are endangered in the US, as well as abundant species like bobcats. Both of these wild cat species overlap in our study area in South Texas. The last research on ocelot kittens was over 30 years ago, and no research has been done on bobcat kitten survival in our study area. The goal of our research is to determine first-year survival rates, timing and frequency of reproduction, and drivers of den site selection for both species.

We GPS-collared 4 female ocelots and 13 female bobcats on private lands and Laguna Atascosa National Wildlife Refuge during 2024 and 2025. We are monitoring GPS locations weekly to detect evidence of denning behavior. We have confirmed one successful bobcat den and placed an expandable collar on one bobcat kitten to date. We aim to use these expandable collars to track kittens. We will also sample vegetation at den sites. With these data, we will be able to shed light on aspects of ocelot and bobcat reproduction that are not thoroughly understood.


Victoria Locke

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.

Impact of Roads on Bobcat Movement in South Texas

Sean A. Kiernan, Simona Picardi, Emma K. Brookover, Elizabeth A. Grunwald, Thomas M. Langschied, Jack G. Towson, Daniel G. Scognamillo, Thomas J. Yamashita, John H. Young, Jr., and Michael E. Tewes

Roads pose a serious threat to wildlife, especially wide-ranging carnivores like ocelots and bobcats. In South Texas, both species live in a landscape dominated by roads, which can lead to habitat loss, blocked movement, and increased risk of getting hit by vehicles. Our research uses GPS collar data to explore how wild cats respond to roads—whether they avoid them, try to cross them, or become trapped near them—and what factors influence those behaviors.

We collared 12 bobcats near roads this year (7 male, 5 female). Using these GPS tracking collars, we will study how individual bobcats move near roads, focusing on how traffic, road type, and animal characteristics like sex and home range status affect their actions. We will look for changes in their movement, such as hesitation or avoidance, and examine which kinds of roads act as stronger barriers. During fall 2025, we will begin capturing bobcats again and fitting them with GPS collars.

This study will help explain how roads affect cat behavior and survival in fragmented landscapes. The results could guide better road planning and help wildlife managers place crossing structures where they are needed most, improving safety for both animals and drivers.

Cooperative funding provided by the Texas Department of Transportation.

A bobcat after receiving a GPS collar.

Sean Kiernan

Targeted Camera Sampling for Wild Cat Monitoring

Sean A. Kiernan, Hunter G. Vasquez, Jack G. Towson, Rupesh Maharjan, Elizabeth A. Grunwald, Thomas J. Yamashita, Thomas M. Langschied, Terry Hanzak, Emma K. Brookover, and Michael E. Tewes

Understanding population size, sex ratio, and habitat use is important for conserving ocelots and maintaining healthy numbers of bobcats. Cats and other species may interact in positive and negative ways, with competition potentially influencing behavior.

We have gathered data on ocelots and other carnivores using cameras on Laguna Atascosa National Wildlife Refuge and ranches near roadways in South Texas. Ocelots on the refuge are identified based on their coat pattern. Since May 2023, we have identified 23 individuals (11 male, 11 female, 1 undetermined). On ranches we have examined activity patterns of ocelots, bobcats, coyotes, and badgers. Ocelots and bobcats were primarily nocturnal, with bobcats more active during the day than ocelots. Coyotes and badgers were active during both day and night.

Targeted camera placement allows us to focus on areas that appear to be suitable habitat. This can enhance conservation by providing data not always available from camera grids. Our research also provides a greater understanding of how other carnivores may affect ocelots, and how animals survive near roads. Our success identifying ocelots and other species highlights the importance of both public and private lands in carnivore conservation.

Cooperative funding provided by the US Fish & Wildlife Service, the Texas Department of Transportation, the East Foundation, and Wild Cat Conservation, Inc.

Bobcat Dynamics and Selection on Ranches by US 77

Sean A. Kiernan, Jack G. Towson, Rupesh Maharjan, Thomas M. Langschied, Terry Hanzak, Emma K. Brookover, and Michael E. Tewes

Rangeland management activities, like brush clearing, usually combine agriculture and wildlife management goals. These management activities on ranchlands can affect landscape temperatures, resources, and animal interactions, such as shade, food and water, and competition. While many ranches are remote, some are near major highways, which could affect wildlife on the ranches.

We have been using wildlife cameras and GPS collars to examine how rangeland features affect bobcats. From 2021-2022, 9 collared bobcats in La Salle County, Texas, frequently used areas closer to water, woody vegetation, and greater woody edge density. Effects occurred at finer scales; for example, woody edge density had a stronger effect at a 33-yard scale compared to a 110-yard scale.

We are now studying how bobcats on managed ranches respond to US 77, which is undergoing construction to add lanes, frontage roads, and wildlife crossing structures. Responses to changes along US 77 may vary based on rangeland features, such as the amount of cleared brush. Our research could help ranch managers and state entities plan both brush and road management to benefit carnivores, including the endangered ocelot.

Cooperative funding provided by Wild Cat Conservation, Inc. and the Texas Department of Transportation.

Road Effect Zone Impacts

Thomas J. Yamashita, Sean A. Kiernan, Rupesh Maharjan, Jack G. Towson, Thomas M. Langschied, Terry Hanzak, Emma K. Brookover, and Michael E. Tewes

Disturbance from human activity, including vehicle noise, extends into nearby areas. A "road effect zone" can create changes in the wildlife community and behavior. We used wildlife cameras to assess how distance to road and traffic volume influenced mammal beta diversity, which is the difference in species composition between different areas.

We detected nearly all locally known mammal species larger than rodents in the road effect zone. There was greater species diversity and more rare species near the low-volume road. Diversity varied more across the year around the high-volume road, indicating there may be a stronger, more dynamic community response to the high-volume road.

Bobcats are often considered a "surrogate" species for ocelots. Monthly bobcat camera detections were not affected by traffic volume and distance to the road, but they varied among months. Bobcats were more active around noon and 6 p.m. around the low-volume road, and were more active from 9 p.m. to midnight near the high-volume road.

We are currently expanding on this research by examining the activity of collared bobcats in the road effect zone. This research can aid managers planning wildlife crossings, which are implemented for endangered ocelots in South Texas but can benefit entire wildlife communities.

Cooperative funding provided by the Texas Department of Transportation.

Thomas Yamashita

Monitoring Road Crossings for Wildlife

Rupesh Maharjan, Thomas J. Yamashita, Daniel G. Scognamillo, Elizabeth A. Grunwald, Thomas M. Langschied, Emma K. Brookover, John H. Young, Jr., and Michael E. Tewes

Roads can have large impacts on wildlife, including but not limited to vehicle mortality and disturbance from vehicle noise. Wildlife crossings can reduce impacts by providing safe passage below or above roads. Crossings in South Texas are built for ocelots but used by many species, so there are benefits to studying the wildlife community as a whole.

We are evaluating crossing success on US 77 and Farm-to-Market 1847 in South Texas. Currently using wildlife cameras and road mortality surveys, we have also used acoustic recorders in the past. Analyses have included various aspects of crossings, including structural, environmental, and anthropogenic (human).

We have found that structural and anthropogenic characteristics of crossings are most important to wildlife in the year after construction. For example, despite being a disturbance-tolerant species, opossums spent more time at crossings and were more likely to successfully use a crossing when there was less vehicle noise. Less disturbance-tolerant species could be impacted more by road placement in relation to human-caused noise.

Our research can aid in ocelot conservation by increasing ocelot survival. By examining the wildlife community as a whole, it could also help the Texas Department of Transportation determine which crossing designs are most beneficial. Our methods can also be applied elsewhere.

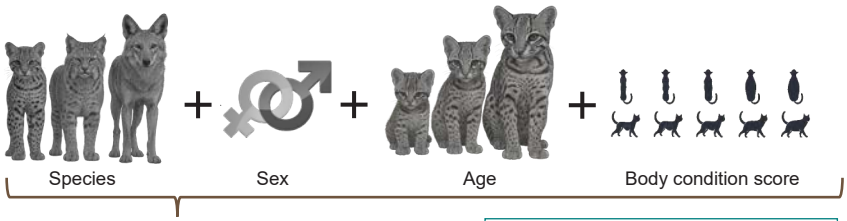
Cooperative funding provided by the Texas Department of Transportation.

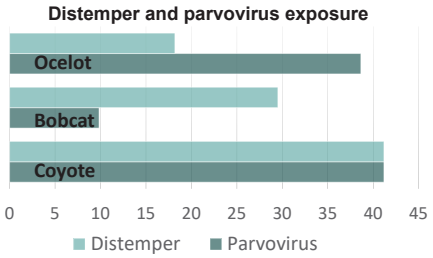
Exposure of Ocelots, Bobcats, and Coyotes in South Texas to Two Harmful Viruses: Canine Distemper and Parvovirus

Question: Have ocelot, bobcat, and coyote populations in southern Texas been exposed to canine distemper virus or parvovirus?

Methods: Blood samples were collected from 2020 to 2025 at the East Foundation's El Sauz ranch and Laguna Atascosa National Wildlife Refuge (site map below). We screened for antibodies that indicate exposure to canine distemper virus and parvovirus.

Goals: Determine if species, sex, age, and physical condition influence likelihood of exposure to harmful viruses.





Preliminary results: All three species have been exposed:

- Exposure to **distemper**:
  - 18% of ocelots,
  - 30% of bobcats, and
  - 41% of coyotes
- Exposure to **parvovirus**:
  - 39% of ocelots,
  - 10% of bobcats, and
  - 41% of coyotes

Mauricio Rued, Ashley Reeves, Christopher Kozakiewicz, Lisanne Petracca, and Alynn M. Martin
Cooperative funding provided by U.S. Customs and Border Protection in partnership with U.S. Fish & Wildlife Service.

Gut Microbiome in Ocelots, Bobcats, and Coyotes in Southern Texas

Mauricio Rued, Ashley Reeves, Christopher Kozakiewicz, Lisanne Petracca, and Alynn Martin

The ocelot is an endangered wild cat found in two small populations in southern Texas. These animals are at risk from random events like disease outbreaks. To protect them, we must understand how diseases spread and what makes animals more, or less, vulnerable.

The gut microbiome, which is the mix of bacteria, viruses, and other microorganisms in the digestive system, plays an important role in health. It helps with digestion, immunity, and resistance to infections. Stress, environmental changes, and diet changes can upset this balance and weaken the immune system. We are studying the gut microbiome and viruses in ocelots, bobcats, and coyotes to learn more about disease risks. We will test fecal samples with advanced genetic tools to describe the gut microbes and identify any microbes that may cause disease. Further, we will see if there is a relationship between the number of different microbes (microbial richness) and disease exposure and infection history (including canine distemper virus, parvovirus, feline leukemia, and immunodeficiency viruses) for each species.

Our results will give us a better picture of the health of these animals and help us find ways to reduce disease risks. This will support efforts to protect ocelots and keep wild populations healthy.

Cooperative funding provided by U.S. Customs & Border Protection in partnership with U.S. Fish & Wildlife Service.


Lisanne Petracca

Disease Transmission Among Wild Cat Species

Alexandria N. Hiott, Alynn Martin, Mason Fidino, Clayton D. Hilton, Ashley Reeves, and Lisanne Petracca

Transmission of pathogens between species can have negative impacts on wildlife. When a new disease enters a population, it's referred to as a spillover.

The endangered ocelot has both a small population size and presence of genetic inbreeding. These factors could make them more likely to have a spillover event. A potential exposure route to pathogens could be bobcats, which are common and found in a variety of habitats.

We are using GPS collars and movement models to simulate ocelot and bobcat movements. We will also screen ocelots and bobcats for diseases. This information will be important for identifying potential disease pathways between endangered ocelots and other species.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.

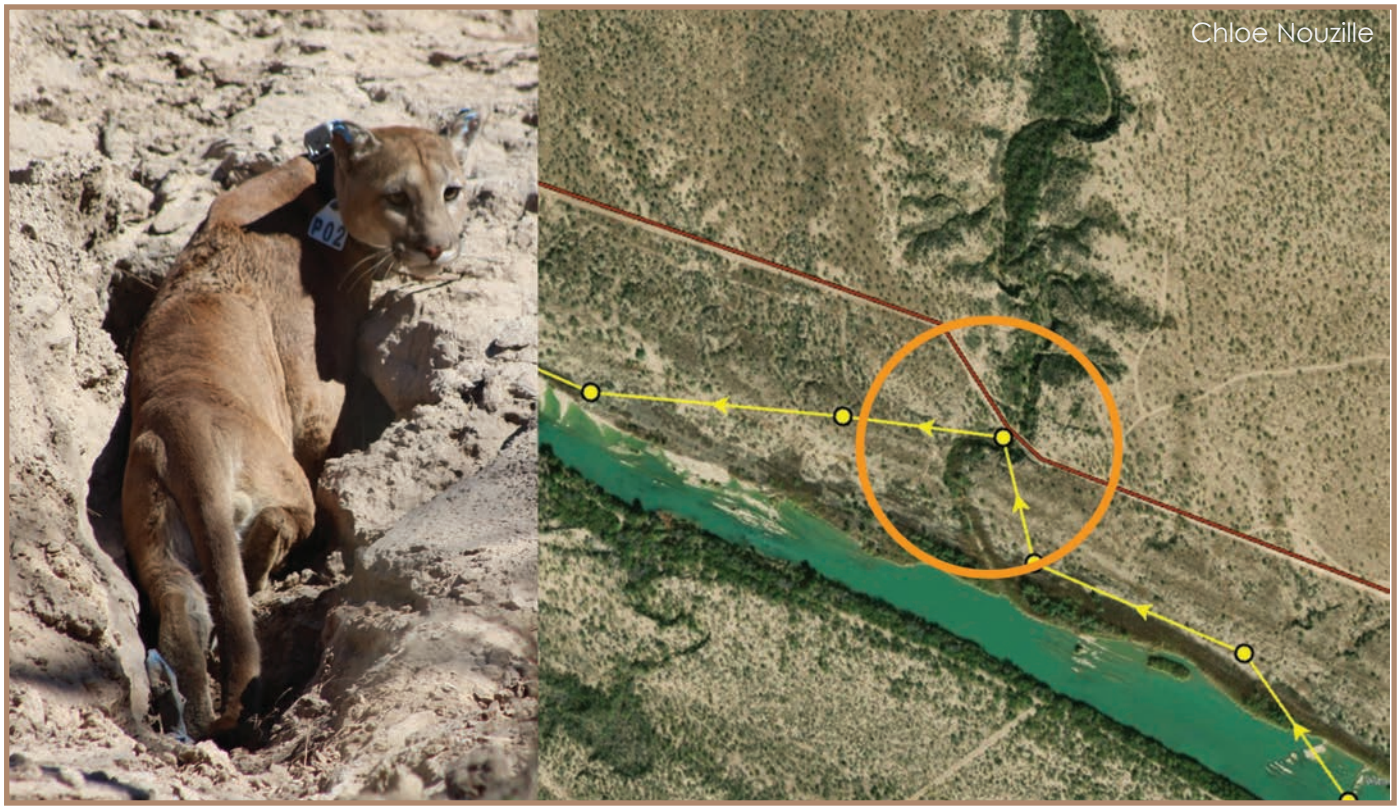
Mountain Lion Movement and Dynamics Around a Barrier System

Katherine G. McDaniel, Chloe M. Nouzille, Robert S. Alonso, David G. Hewitt, Randy W. DeYoung, Matthew M. Smith, Levi J. Heffelfinger, Clayton D. Hilton, Dana L. Karelus, Grant M. Harris, Michael J. Cherry, and Lisanne Petracca

The border barrier system between the US and Mexico has the potential to impact movement of multiple species. Disconnected populations can experience decreased dispersal and gene flow, which in turn can increase extirpation risk. Some species, like the mountain lion, have larger home ranges that require more continuous habitat than smaller animals like bobcats. We are studying how medium and large mammals, particularly mountain lions, are impacted by the border barrier system. In particular, we are interested in whether species are using wildlife crossing structures at the base of the barrier, which are paper-sized 8.5 x 11 inch openings, spaced half a mile apart.

Our team has set up cameras to monitor these wildlife crossing structures. We are also monitoring border sections without the barrier, as well as areas immediately before and after barrier construction. After analyzing 3.7 million images taken in 2024, we have found that while some species (raccoon, coyote, gray fox) can pass through the wildlife crossings, we have no evidence yet that mountain lions are using them. This work will provide a baseline of mammal use of these crossings and can lead to further research into how to increase crossing use.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.



Mountain Lion Movement is Altered by Border Barrier System

Chloe M. Nouzille, Robert S. Alonso, David G. Hewitt, Randy W. DeYoung, Matthew M. Smith, Levi J. Heffelfinger, Clayton D. Hilton, Dana L. Karelus, Grant M. Harris, Michael J. Cherry, and Lisanne Petracca

One objective of the South Texas Lion Project (STXLP) is to determine if the border barrier system impacts mountain lions. We have trapped and collared eight lions so far, three of which spend time around the border barrier system along the Rio Grande. These GPS collars are equipped with geofencing technology. This means that collars collect one location every hour, but when the lion moves within ~0.5 miles of the border barrier system, the collar switches to collecting a location every 10 minutes. Using GPS locations, we categorized lion movement behaviors as either (1) normal, when a lion can cross the barrier without much difficulty or (2) abnormal, when a lion bounces away or traces alongside the barrier, and is unable to cross. Of 24 encounters with the border barrier, 79% were abnormal movements, with 21% representing lions going around the end of a barrier section. This is some of the first evidence showing large carnivore movement is affected by this border barrier.

These data can help identify priority areas for mitigation efforts. Crossing structures, measuring 8.5 x 11 inches, are installed in some barrier sections at the discretion of landowners. Using collar data, we can recommend where to install crossing structures so lions can potentially cross the border barrier.

Any landowners or ranch managers interested in joining the project can contact us at: southtexaslionproject@gmail.com.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.

Leopard Population Study in Botswana

Daniel G. Scognamillo, Christopher E. Comer, and Michael E. Tewes

One of the Big Five wildlife attractions of Africa, the African leopard is an iconic predator species. Leopards receive wide attention for their management and conservation from the range countries and their hunting partners. Thus, understanding leopard distribution and population size is important for the development of sustainable hunting.

In 2024 we completed a nationwide leopard survey in Botswana to estimate their densities in: communal land use areas, private game ranches, protected areas, and wildlife management areas. Individual leopards are identified by unique spot patterns. We are currently analyzing the data and estimating densities. Estimates of density from 25% of the sites range from just over 1 leopard per 100,000 acres in a communal area where local villagers raise cattle to just over 1 leopard per 10,000 acres for a conservation area near Chobe National Park. Our results will assist the Botswana Ministry of Environment, Wildlife, and Tourism in the formation of science-based recommendations for leopard management.

Activity of Six Wild Cat Species in Botswana

William N. Stephens, Daniel G. Scognamillo, and Michael E. Tewes

Understanding the behavior and activity patterns of co-occurring wild cat species could give us insight for developing effective conservation plans. We explored this by studying the activity patterns of 6 species in central Botswana: lions, leopards, cheetahs, caracals, servals, and African wildcats.

- Based on time stamps on wildlife camera photographs, lions, cheetahs, servals, and African wildcats were most active from 6:00 p.m. to 7:00 a.m. Leopard and caracal activity ranged more broadly from 4:00 p.m to 9:00 a.m.
- By studying the overlap of species in both space and time, we found that caracals may be actively avoiding lions. All other species overlapped with lions and leopards in either space or time, suggesting lions are not a threat to their conservation.
- Our study shows that conservation actions targeting 5 of the studied wild cat species likely do not have to be site-specific, but conservation actions for caracals should focus on areas where there are fewer or no lions.

Cooperative funding for both studies above provided by the Safari Club International Foundation.

Ocelot Home Range Dynamics in South Texas

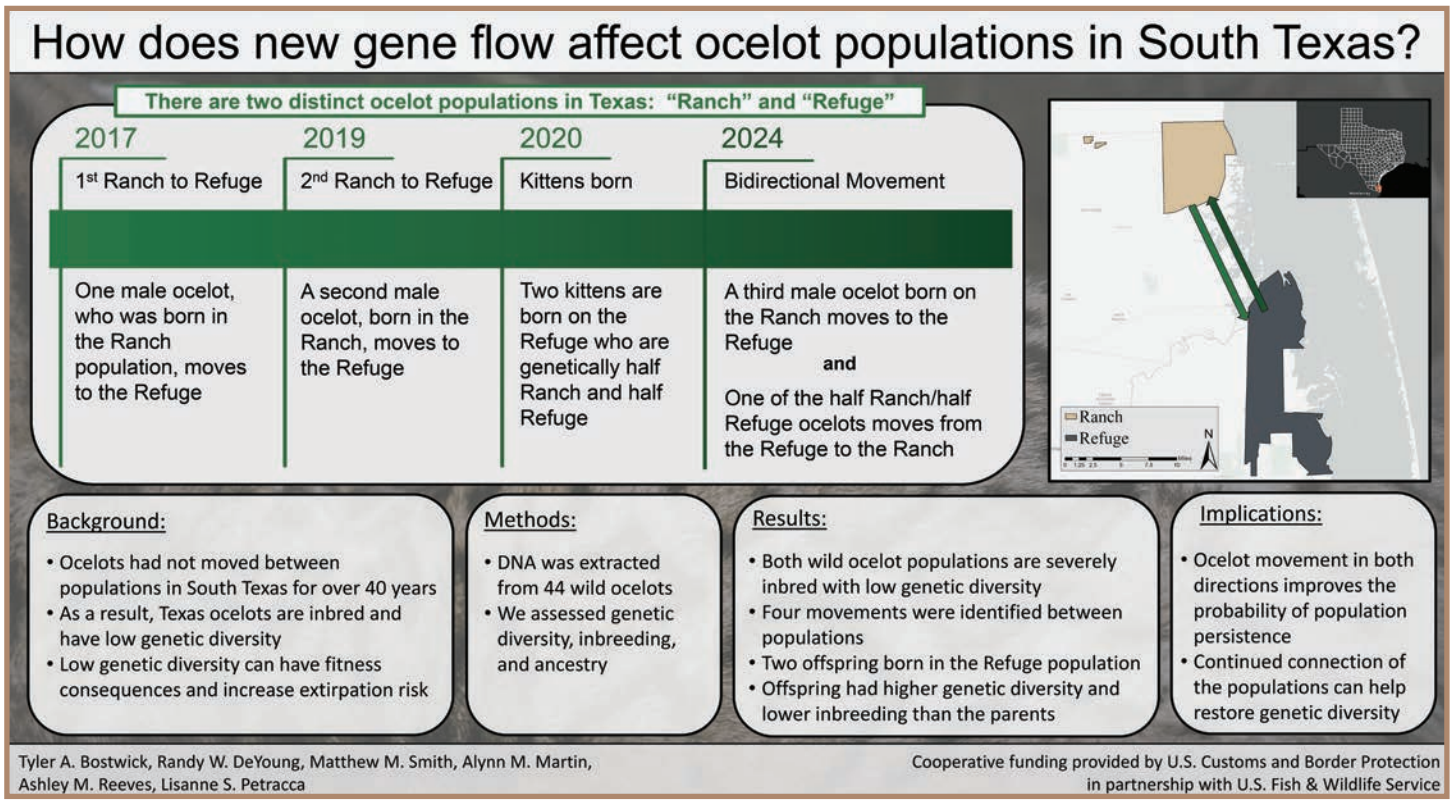
Matthew M. Smith, Amanda M. Veals Dutt, Jason V. Lombardi, Aidan B. Branney, Ashley Reeves, Daniel G. Scognamillo, Maksim Sergeyev, Zachary M. Wardle, Michael E. Tewes, and Lisanne Petracca

Wildlife often live in areas called "home ranges" that they use to find food and shelter, and raise young. We wanted to understand: (1) what habitat features affect home range size, (2) how home range size changes throughout the year, and (3) how male and female ocelots differ in their home range size. This information can help guide management and habitat restoration targets to improve the abundance of small and fragmented ocelot populations.

Using GPS tracking data from 34 ocelots collected over 10 years, we estimated home range size at monthly, 3-month, and 6-month time periods. We then looked at habitat features within each home range to see what influenced its size.

- Male home ranges were about three times larger and more variable between individuals than females.
- Home ranges were smaller when there was more dense woody vegetation and more complexity in the vegetation profile, the latter of which can be associated with greater prey diversity.
- Males used smaller areas in the summer, while female home range size expanded, likely because they were caring for young. We found that woody and complex vegetation could minimize home range size and provide greater landscape connectivity.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.



The Patton Center for Deer Research

Randy DeYoung

Effects of Feed Type and Timing on White-Tailed Deer

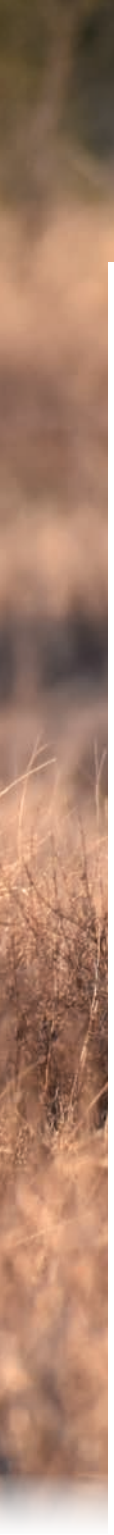
Joseph A. Hediger, K. Whitney Hansen, Randy W. DeYoung, David G. Hewitt, Clay D. Hilton, Lisanne Petracca, Michael J. Sheriff, and Michael J. Cherry

Antler size, doe nutrition, and fawn recruitment are related measures of white-tailed deer performance. Recruitment, or the addition of more individuals to the population through the birth of fawns, is a leading indicator of performance. Recruitment can be used to understand how management affects other performance measures, such as antler size. Many managers supplement feed to improve herd health and deer performance. Yet, we still do not know the best type of supplemental feed or the best time to provide it.

Our project studies how different types of feed and the timing of supplemental feed affect fawn recruitment in South Texas. The research is taking place on the Faith Ranch, inside four separate 200-acre enclosures. The first enclosure has cottonseed supplementation year-round. The second has protein pellets year-round. The third has both protein and cottonseed year-round. The fourth has both protein and cottonseed available year-round with the exception of 60 days during the hunting season.

We are using camera traps to track how many fawns survive each year. During annual deer captures, we will check each deer's body condition and health. These data will help us see how our treatments affect deer performance long-term. Our goal is to find the best ways to feed white-tailed deer to boost herd performance. This will give wildlife managers tools to improve deer management through better feeding strategies.

Cooperative funding provided by the Stedman West Foundation and the Faith Ranch.



Social hierarchies affect feed behavior in white-tailed deer

K. Whitney Hansen, Breanna R. Green, Joseph A. Hediger, Evan P. Tanner, and Michael J. Cherry

White-tailed deer are social animals, and their behavior around food can reveal complex dominance patterns. During fall 2024, we studied social feeding behavior at the Alkek Ungulate Research Facility using 16 female deer of various ages and relatedness. We provided corn at fixed times daily and rotated group composition to test how rank, personality, and kinship shaped access to food.

Preliminary results showed that bold, aggressive deer consistently gained the best access to corn regardless of family ties. Younger deer with more dominant personalities tried to push their way in but were often chased off by older, high-ranking females. We also noticed that low-ranking deer used people as "shields," staying close to technicians during feeding to try to feed before dominant deer returned. Meanwhile, older male deer reshuffled their pecking order during feeding, while yearling bucks shared access with little conflict.

These findings suggest that personality and dominance outweigh kinship in feeding behavior, and that deer adaptively shift strategies to access high-quality resources. Understanding these behaviors can improve deer management strategies in captive and wild settings.

Interactions of WTD and Exotics in the Hill Country

Miranda Hopper, Michael J. Cherry, Bailey Kleeberg, and Levi J. Heffelfinger

The Texas Hill Country is home to a host of diverse large herbivores, which are culturally and economically important for many landowners in this region. Many exotic species have established free-ranging populations in the Hill Country. It is important to understand how exotic species interact with native species, like white-tailed deer and javelina.

In September 2024, we began using game cameras to determine the relative abundance and distribution of native and exotic large herbivores in the Hill Country. We currently have 94 cameras deployed across 17 properties, stretching as far west as Brackettville and as far east as Austin. In the first 5 months of the project, we detected 4,839 native and exotic large herbivores. Of those, 78% were white-tailed deer. The second most commonly detected were feral hogs, at 14%, followed by aoudad, at 5%. Other species detected included axis deer, elk, red deer, zebra, scimitar-horned oryx, fallow deer, and sika deer. Though we did detect javelina, they made up only 0.3% of total detections.

We will continue to monitor cameras to document changes in species abundance and distribution over time. With the abundance and geographic range of some exotic species expanding, our data will be important information for biologists and landowners trying to manage both natives and exotics on their property.

Cooperative funding provided by the Henry Hamman Program for Hill Country Conservation and Management, Amy and Tim Leach, and the Shield Ranch.

Copper and Zinc May Slow Chronic Wasting Disease (CWD)

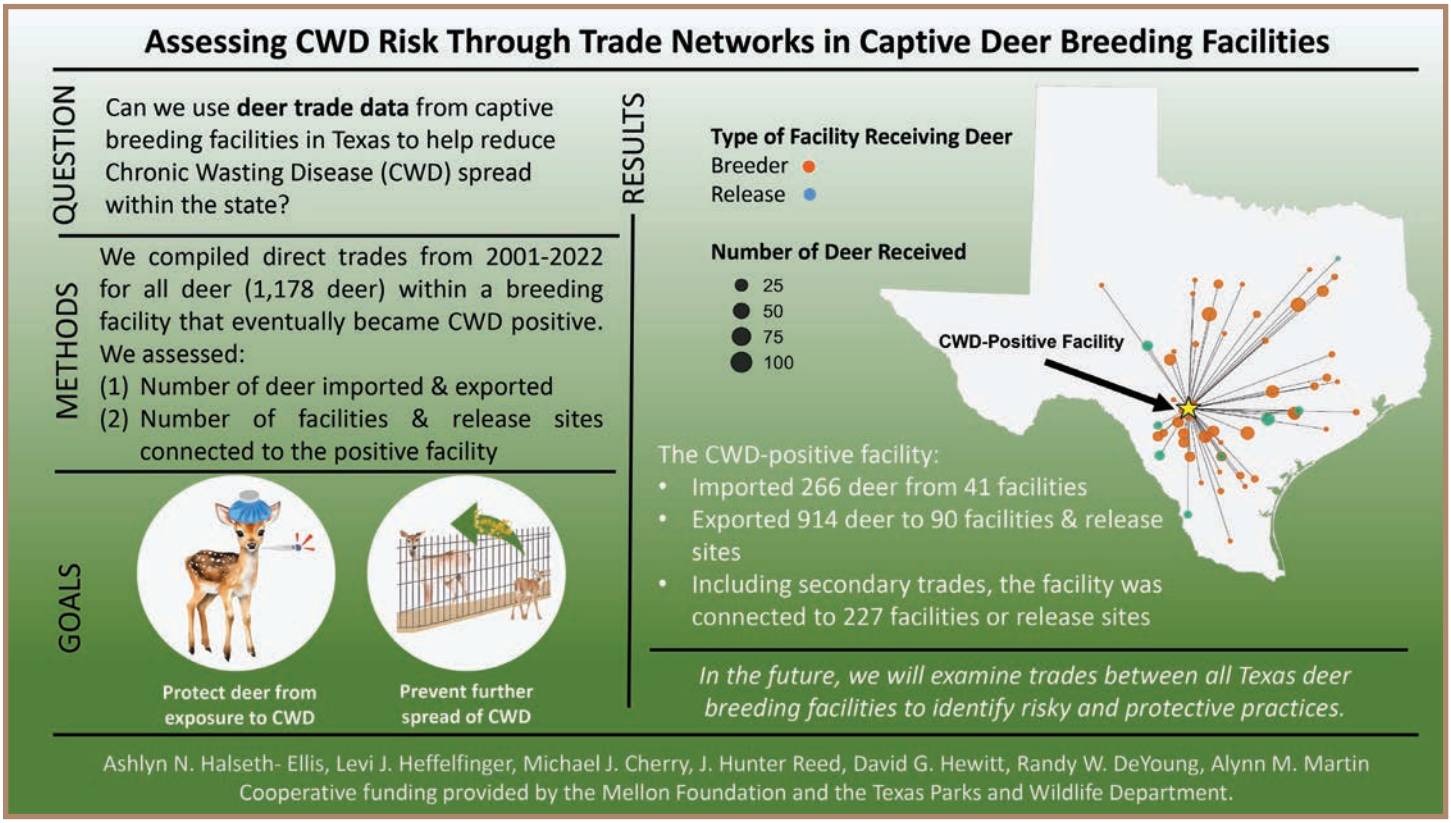
Joseph A. Hediger, Peter A. Larsen, Jason C. Bartz, Randy W. DeYoung, David G. Hewitt, Mitch L. Lockwood, Manci Li, Alynn Martin, Rodrigo Morales, J. Hunter Reed, Marc D. Schwabenlander, Tiffany M. Wolf, Michael J. Cherry

CWD is spreading in deer across the U.S., Canada, Asia, and Europe. While there is no cure or vaccine, some minerals may slow the disease by blocking prion proteins from misfolding. In rodents, copper has been shown to slow this progression of disease. In deer, we do not yet know how minerals affect CWD.

We tested if copper and zinc in the brain and lymph tissues reduce misfolding. We collected brain, liver, tongue, intestines, and lymph nodes from 159 adult white-tailed deer in Texas. Deer came from three groups: (1) free-ranging with no feed, (2) free-ranging with copper and zinc feed, and (3) captive deer on a copper and zinc supplemented diet.

One free-ranging group had mineral levels like deer that were fed supplements. This finding highlights that native forage can provide the same level of copper and zinc as supplementation. Most free-ranging deer in South Texas also had genotypes linked to high or intermediate CWD resilience.

Cooperative funding provided by the USDA Animal & Plant Health Inspection Service.



Assessing CWD Predictive Models

Ashlyn N. Halseth-Ellis, Alynn Martin, Michael J. Cherry, Warren C. Conway, Randy W. DeYoung, Justin T. French, Shawn S. Gray, Courtney L. Ramsey, and Levi J. Heffelfinger

CWD is a fatal neurological disease that affects members of the cervid family. An agent-based model (ABM) is a modeling framework that tracks individual animals as they move, interact, and respond to their environment, helping us understand how things like disease or habitat changes might affect wildlife. ABMs are a common tool used to predict the spread of CWD to help guide management actions. However, despite the fact that both CWD and cervid behavior can be complex, many researchers use broad assumptions when building their ABM. Specifically, models often don't incorporate exploratory juvenile movement or changes in individual movement post-infection.

Following the same assumptions of ABMs published previously, we built a baseline ABM for the Texas Panhandle using data from 175 GPS-collared mule deer. We then expanded upon our baseline model to create 2 additional ABM that each addressed an overlooked assumption: (1) including exploratory juvenile movement, and (2) including changes in individual movement post CWD infection. Preliminary results showed little difference in CWD spread between the baseline model and the one with post-infection movement changes, with CWD prevalence between 0.4% and 3.0%. However, the model with exploratory juvenile movements showed an increase in CWD prevalence, reaching up to 32.1%. Our results highlight the importance of testing and refining common assumptions in ABMs as incorporating often-ignored processes can substantially alter forecasts of disease prevalence across space or time.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Modeling CWD among Three Cervid Species

Ashlyn N. Halseth-Ellis, Austin K. Ibarra, Alynn Martin, Michael J. Cherry, Warren C. Conway, David G. Hewitt, Walter E. Cook, Randy W. DeYoung, Justin T. French, Shawn S. Gray, Courtney L. Ramsey, Levi J. Heffelfinger

The Texas Panhandle is a unique region in that it hosts three free-ranging cervid species, all susceptible to CWD: white-tailed deer, mule deer, and elk. Since the first detection of CWD in the Texas Panhandle in 2016, positive cases have been documented in all three species. As CWD poses significant economic and ecological threats, understanding disease spread dynamics in a system with three susceptible hosts is critical.

In February 2025, we GPS-collared 42 white-tailed deer, 38 mule deer, and 24 elk in the Texas Panhandle. We will use the movement and survival data from these animals to inform an agent-based model (ABM): a type of model that uses individual animal characteristics–like age, sex, and disease status–to understand behavior and interactions with other individuals. The ABM incorporates population metrics (e.g., birth rates, deaths, dispersal), movement parameters (e.g., sex-specific movement rates, seasonal changes in movement) and disease dynamics (e.g., indirect and direct transmission) to forecast CWD dynamics in the Texas Panhandle. We will use this ABM to test different management strategies (e.g., increased hunting seasons, increased bag limits) to understand their efficacy in preventing disease spread. This model is the first ABM developed for free-roaming cervids in the Texas Panhandle.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Mule Deer Management in the Southern Great Plains

Calvin C. Ellis, Michael J. Cherry, Molly M. Koeck, M. Colter Chitwood, Anna K. Moeller, Robert C. Lonsinger, W. Sue Fairbanks, and Levi J. Heffelfinger

Effective wildlife management needs multiple data sources to understand population metrics. However, managers usually rely on limited information like local harvest data or surveys. For many species, complete population understanding requires more data sources, like survival, reproduction rates, proper abundance estimates, and complete harvest data. Yet, these data sources are rarely available together. This challenge increases when populations exist at low densities, like near the edge of their range. In the southern Great Plains, mule deer are near the southeastern edge of the species' range. Specifically, mule deer in Oklahoma are managed and harvested under white-tailed deer regulations with little available data.

To aid Oklahoma Department of Wildlife Conservation (ODWC) with evaluating mule deer populations, we are conducting a population assessment. Our monitoring includes GPS-collaring adult females and fawns to monitor survival. We are also performing aerial and ground-based surveys to estimate population size. By combining our field data with ODWC harvest records, we will build an integrated population model. This model will test various management strategies to help ODWC develop an appropriate management plan. Also, this model will project population trends across different environmental and landscape scenarios.

Cooperative funding provided by Oklahoma Department of Wildlife Conservation.

Survival and Reproduction of Mule Deer in Oklahoma

Calvin C. Ellis, Levi J. Heffelfinger, Molly M. Koeck, M. Colter Chitwood, Anna K. Moeller, Robert C. Lonsinger, W. Sue Fairbanks, and Michael J. Cherry

Mule deer in western Oklahoma live near the southeastern edge of their range, where changing weather, habitat fragmentation, and management create challenging conditions. These stressors can reduce maternal health and survival, threatening population stability. Currently, mule deer are managed under white-tailed deer harvest regulations with population estimates relying on harvest reports and spotlight surveys. As part of an ongoing research project, we are investigating how environmental factors and maternal condition affect survival of adult females and fawns. Additionally, we are evaluating how current reproductive success influences future reproductive output for adult females.

In 2024, we GPS-collared 69 females and captured 49 fawns from 30 females. Fawn survival was extremely low (4%), and adult female survival was also low (64%). We supplemented our sample in February 2025 and now have 108 adult females and 7 adult males collared across Beaver, Ellis, and Roger Mills counties. We will capture additional fawns from adult females during summer 2025. We assess maternal condition through body condition scores and rump fat at capture and characterize reproductive success via fawn birth weight and size, as well as survival. Our goal is to understand how habitat quality, maternal condition, and predation risk drive survival and reproductive success at the edge of the mule deer range. This research will help habitat managers design more accurate conservation strategies in increasingly fragmented and variable landscapes.

Cooperative funding provided by Oklahoma Department of Wildlife Conservation.

Modeling Free-range Elk, Mule Deer, and WTD Interaction

Austin K. Ibarra, Ashlyn N. Halseth-Ellis, Michael J. Cherry, Randy W. DeYoung, Justin T. French, Shawn S. Gray, and Levi J. Heffelfinger

The Texas Panhandle is a dynamic environment with many factors that may influence elk and deer populations. These factors include human-induced impacts, a semi-arid climate, and the presence of Chronic Wasting Disease (CWD). The Panhandle has an eastward expanding elk population and a westward expanding white-tailed deer population. There is also a native mule deer population, which leads to overlapping ranges. This creates potential interactions between species which could alter disease dynamics.

To better understand potential interactions between species, we captured and GPS-collared 24 elk, 38 mule deer, and 42 white-tailed deer in the Texas Panhandle during February 2025. These collars will monitor and collect data on the animal's location allowing us to understand movement and potential species interactions.

Early results show our populations of GPS-collared elk occupy a total of 389,932 acres, GPS-collared mule deer occupy 220,418 acres, and GPS-collared white-tailed deer occupy187,306 acres. We are documenting large areas of overlap between species' ranges. Our GPS-collared elk overlap with 63% of the collared white-tailed deer range and 51% of the collared mule deer range. Our GPS-collared mule deer also overlap with 45% of collared white-tailed deer range. These early results suggest high levels of coexistence may be occurring which could facilitate positive or negative interactions. Our findings will help guide future management of these species and wildlife diseases.

Cooperative funding provided by the Texas Parks & Wildlife Department.

A GPS-collared mule deer is released after capture.

Matt Hewitt

Elk Movement in the Texas Panhandle

Austin Ibarra, Ashlyn N. Halseth-Ellis, Michael J. Cherry, Randy W. DeYoung, Justin T. French, Shawn S. Gray, and Levi J. Heffelfinger

Elk in Texas are a historically understudied species despite free-ranging populations occurring in the Texas Panhandle and Trans-Pecos regions. With only a handful of previous studies focused in the Trans-Pecos, we initiated the first study on elk in the Texas Panhandle. Elk are naturally expanding into the region, and there is no information on their movement or habitat associations.

We captured and GPS-collared 24 elk (10 females and 14 males) in the northwest corner of the Texas Panhandle. The GPS-collars will monitor and collect data on their movement for the next three years. Ages of captured animals ranged from 1.5 to 8.5 years old with a median age of 4.5 years old. To understand how elk are interacting with their environment, we are using resource selection modeling. Early results show that average female space use is 10,652 acres and average male space use is 27,075 acres. Both males and females are selecting canyon bottoms with extreme slopes. Elk are also demonstrating an avoidance of heavily trafficked highways. Findings from this study will help increase understanding of current and future elk movement and habitat selection in the region which will provide managers with the necessary information to manage potential species interactions and subsequent disease spread.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Genetic Evaluation of Texas Nilgai Populations

Megan Guerra and Randy W. DeYoung

Nilgai antelope, also commonly known as blue bull, are native to parts of India and Pakistan. Nilgai were introduced to South Texas in the 1930's and have since expanded throughout the region and into northern Mexico, where the free-ranging population exceeds 30,000 individuals. Nilgai are valued game animals due to their elusiveness and quality meat, yet there have been few studies of nilgai in their historical or introduced range. Introduced populations can have low genetic diversity, depending on the number, origin, and diversity of the founding stocks as well as how quickly the population grew after founding. Little is known about the effects of the introduction on genetic diversity of Texas nilgai. The objectives of this study are to 1) trace the population's origins, and 2) assess genetic diversity. We collected DNA samples from hunter-harvested nilgai throughout the South Texas region and are sequencing genes from mitochondrial DNA, which is inherited directly through the maternal lineage. We will analyze genetic diversity and compare to publicly available DNA sequence data to determine the origin of founding stocks and to determine if there is variation. This research also aims to raise awareness about the effects of introducing exotic species. Understanding the genetic diversity of the Texas nilgai will help guide more informed management strategies and contribute to broader discussions on the effects of non-native species.

Cooperative funding provided by LEADING.

Testing the Use of Drones to Monitor Pronghorn

Celine M. J. Rickels, Michael J. Cherry, M. Colter Chitwood, Marlin M. Dart, Randy W. DeYoung, W. Sue Fairbanks, Robert C. Lonsinger, Evan P. Tanner, Matthew T. Turnley, H. George Wang, and Levi J. Heffelfinger

Drones are becoming increasingly more prominent in wildlife research and management. Much of the research regarding drones and wildlife is still in the novel stages. There is a lack of research surrounding the use of drones to monitor pronghorn including unknown disturbance effects and accuracy in collecting survey data.

To develop a baseline for the use of drones over pronghorn, we assessed pronghorn behavioral responses to the drone and evaluated the reliability of drones to derive herd composition counts. In 2024, we conducted 67 drone flights at various heights using the DJI Matrice 210 V2 (hereafter Matrice) and the DJI Phantom 4 Pro V2 (hereafter Phantom) in western Oklahoma. We recorded pronghorn behavioral reactions to the drone and performed group counts on the ground and using post-flight drone videography.

Pronghorn fled from the drone 79% of the time, generally at lower altitudes. Group composition did not appear to influence reaction to the drone. Drone-derived counts from the Matrice estimated similar group counts when compared to ground counts. Counts derived from the Phantom were typically biased low compared to ground counts. We plan to continue conducting drone flights during summer 2025 and perform further analyses evaluating drone impact and accuracy over pronghorn. Our results will be the first to provide a framework on monitoring pronghorn with drones and provide recommendations for future use by managers.

Cooperative funding provided by the Oklahoma Department of Wildlife Conservation.

Adult Pronghorn Survival and Habitat Quality

Celine M. J. Rickels, Michael J. Cherry, M. Colter Chitwood, Marlin M. Dart, Randy W. DeYoung, W. Sue Fairbanks, Derek P. Hahn, Robert C. Lonsinger, Evan P. Tanner, Matthew T. Turnley, H. George Wang, and Levi J. Heffelfinger

Wildlife populations at the edge of their range often face environmental factors that can limit survival. Pronghorn exist across much of western North America, but no longer occur in certain regions where they did historically. Anecdotal evidence has shown a decline in the pronghorn population along the southeastern extent of their range in Oklahoma.

To gain insight on the pronghorn population in Oklahoma, we evaluated factors driving adult pronghorn survival rates and assessed available habitat quality. During springs in 2022 through 2025, we performed adult pronghorn captures via helicopter and fit GPS collars to 266 pronghorn in Cimarron and Texas counties of Oklahoma. Currently, we are monitoring adult pronghorn survival and investigating cause of death using GPS collar data. We also plan to assess and map habitat quality based off pronghorn survival and movement.

Our preliminary results from 2022-2024 estimated an average yearly survival of adult pronghorn at 74%. Early results also indicated that pronghorn have lower survival when they spend more time in row-crop farmland instead of native grassland. Over the next year, we plan to continue to monitor the pronghorn population and identify factors that are influencing survival. Our results will provide a better understanding of the pronghorn population within Oklahoma and help inform management actions.

Cooperative funding provided by the Oklahoma Department of Wildlife Conservation.

Levi Heffelfinger

Movement and Population Dynamics of Oklahoma Pronghorn

Marlin M. Dart, Evan P. Tanner, Celine M. J. Rickels, Matthew T. Turnley, Derek P. Hahn, W. Sue Fairbanks, M. Colter Chitwood, Robert C. Lonsinger, Levi J. Heffelfinger, Randy W. DeYoung, H. George Wang, and Michael J. Cherry

Pronghorn numbers in Oklahoma dropped from about 3,000 in 2011 to around 800 in 2023, which raised concern for the Oklahoma Department of Wildlife Conservation. Within Oklahoma, pronghorn are confined to the panhandle region, which is characterized by unpredictable weather and resources, as well as growing agriculture and energy development. We are working with researchers from Oklahoma State University and East Central University to understand the factors causing the decline of this important big game species.

To better understand why pronghorn are declining in Oklahoma, we have been capturing and collaring adult and fawn pronghorn from 2022 to 2025. This will allow us to evaluate space use and monitor survival of pronghorn. We have also conducted predator surveys to assess predator density and diet, and are collecting pronghorn fecal samples to examine their diet and evaluate the role of disease.

The project is ongoing, but we have found that fawn survival varies from year to year. In 2022 and 2023, only about 12% of fawns survived to 45 days, while in 2024, survival was higher at about 42%. Fawn survival appears to be influenced by precipitation, which likely affects the availability of forage. The leading cause of fawn mortality in all years was coyote predation. This research will inform pronghorn management and help us evaluate the causes of their population decline in Oklahoma.

Cooperative funding provided by the Oklahoma Department of Wildlife Conservation.

The Costs of Extreme Heat on White-Tailed Deer (WTD)

Joseph A. Hediger, Breanna R. Green, Clayton D. Hilton, Evan P. Tanner, Michael J. Sheriff, and Michael J. Cherry

Understanding how animals respond to extreme heat helps predict how they will cope with climate change. We tested how high temperatures affect the behavior, body function, and nutrition of white-tailed deer. At the Alkek Ungulate Research Facility in Kingsville, Texas, we studied 17 female deer in July and August 2023. We placed them in two treatments—one with normal hot summer conditions and one with cooler, shaded conditions.

- Deer kept their body temperatures stable in both treatments by changing how they behaved and used energy.
- In the hot setting, deer ate more pelleted feed and less hay, and drank more water than in the cool setting.
- Deer in the hot treatment were also 12% less active during daytime.
- Stress hormone levels were higher in deer in the hot setting, and they lost more body mass than deer in the cool treatment.

Our study shows that extreme heat reduces deer performance. Behavioral shifts alone may not protect large mammals from rising air temperatures.

Cooperative funding provided by Wild Animal Initiative.

Fast Food or Fine Dining? Foraging Behavior of Male WTD During the Rut

Ethan Garcia and Aaron M. Foley

Adult male white-tailed deer build up fat reserves in preparation for the breeding season. The stored energy presumably allows males to reduce time spent foraging to increase time searching for females but such behavior is poorly understood. We placed 10 trail cameras programmed to capture video in a 200-acre enclosure in Kingsville, Texas from November 2024 to January 2025. Nine cameras were placed in front of preferred browse species and 1 camera was placed next to an ephemeral pond where grasses and forbs were present.

- Cameras in the brush indicated that during early rut, ~20% of male footage consisted of foraging activities which declined to ~10% during peak rut then returned to ~20% during late rut. Females exhibited a similar pattern.
- The camera at the ephemeral pond indicated an increase in foraging during early to peak rut for males (20% to 30%) and for females (20% to 60%). No decline in foraging was detected during late rut.

Grasses and forbs are easier to consume than thorny brush species and may provide a quick source of nutrition for males with little loss in time spent searching for mates. However, because females also exhibited the same patterns, we cannot rule out whether males were explicitly seeking a quick source of nutrition or were taking advantage of female presence at the pond.

Cooperative funding provided by LEADING.

Heat Influences WTD Behavior in Florida

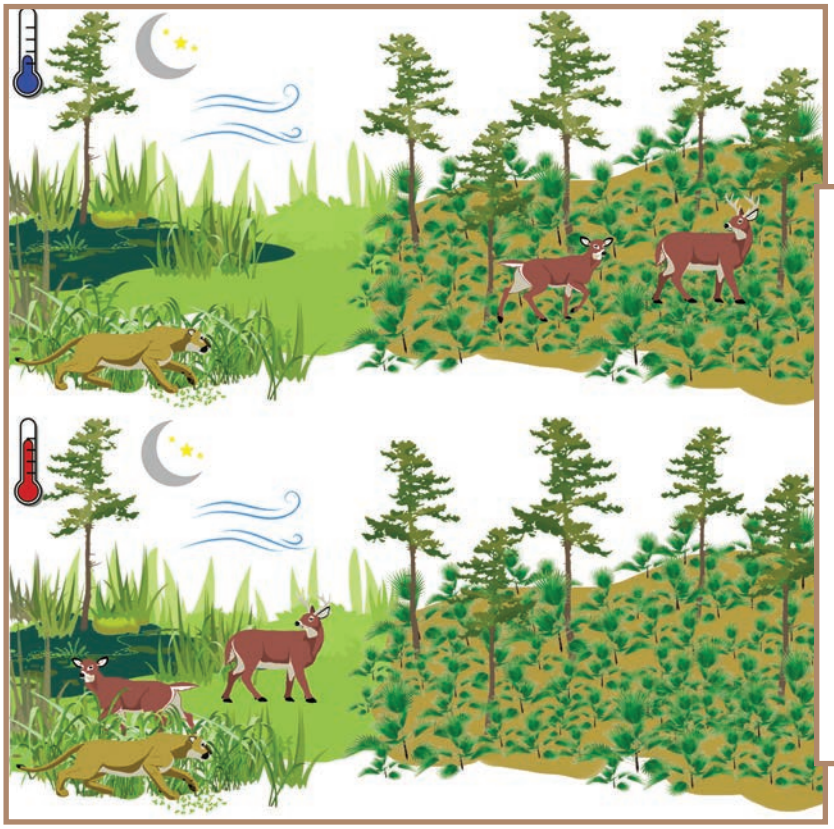
Breanna R. Green, Evan P. Tanner, Richard B. Chandler, Heather N. Abernathy, L. Mike Conner, Elina P. Garrison, David B. Shindle, Karl V. Miller, and Michael J. Cherry

Wild animals make many choices about where and when to move around in their habitats. These choices help them find food, look for mates, and stay safe. But hot temperatures can affect how animals make these decisions. We studied white-tailed deer in Florida from 2015 to 2018 using GPS collars to track their movements. We wanted to see how heat changed the way deer used the land around them. We also looked at where deer had been killed by Florida panthers to figure out which areas were more dangerous for deer.

- Deer changed their behavior when it was hot, but their choices depended on the time of day.
- During the day, deer stayed away from marshes, likely because those areas were in direct sunlight.
- At night, deer were more likely to go into marshes during high temperatures, as the water and wind may have helped them stay cool after dark.
- When temperatures were high (≥ 77 °F), both male and female deer were more willing to enter dangerous areas—even at night, when panthers are more active.

These results show that deer sometimes choose staying cool over staying safe. They also show how important it is to have places in the environment that help animals manage heat, and that these places may differ depending on the time of day.

Cooperative funding provided by Florida Fish & Wildlife Conservation Commission.



Conceptual illustration of white-tailed deer in Florida (top) avoiding panther predation risk during cooler evenings, and (bottom) adjusting both land use and tolerance of panther risk to keep cool during hotter evenings.

WTD Response to Pigs and Predators

Parker C. Trifiletti, L. M. Conner, Steven B. Jack, and Michael J. Cherry

Wildlife are constantly balancing the need to find food with avoiding predators and competitors. These interactions can affect animal behavior and survival by forcing them to make trade-offs between safety and nutrition. In East Texas, white-tailed deer face threats from both coyotes (predators) and invasive wild pigs (competitors), but individuals may respond differently to these pressures. During summer 2024, we used auditory playback experiments to explore how deer react to sounds of coyotes and pigs compared to a non-threatening control at baited foraging sites.

- Deer were more likely to flee and abandon the foraging site after hearing pig sounds compared to coyote sounds. This flight response suggests pigs may be a greater immediate threat to foraging than coyotes.
- When deer did not flee after hearing a sound, they showed increased vigilance only after hearing coyote sounds.
- Across both flight and vigilance behaviors, female deer were more responsive to risk compared to males, likely reflecting their greater vulnerability and investment in offspring care.

Our results show how competition with invasive wild pigs can disrupt native wildlife communities in ways that differ from predators. Understanding these behavioral differences is important for managing wildlife in changing ecosystems.

Cooperative funding provided by T.L.L. Temple Foundation.

Cropland Influence on WTD in the Rolling Plains

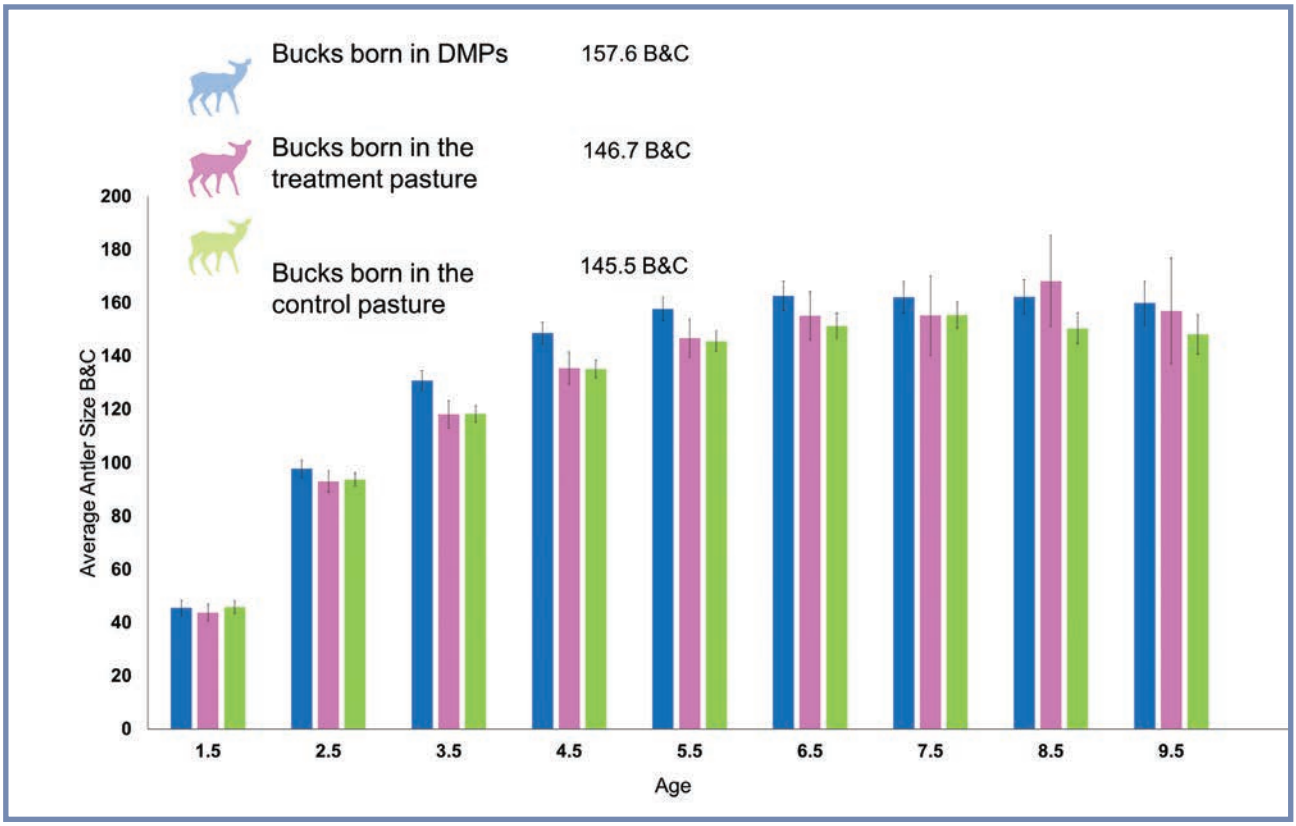
Bailey A. Kleeberg, Ashlyn N. Halseth-Ellis, James K. Kerbow, Charlie Newberry, Kevin Mote, Justin Foster, Courtney L. Ramsey, and Levi J. Heffelfinger

As the human population continues to grow, increasing amounts of land are being converted into cropland and pastures. This shift in land use can influence wildlife species in both positive (e.g., increasing food availability) and negative ways (i.e., decreasing native habitat). Understanding how wildlife interacts with row-crop farming landscapes is essential for effective conservation. We evaluated the influence of inactive and active cropland on seasonal white-tailed deer movement.

- We used 56,605 locations from 5 female and 5 male white-tailed deer GPS-collared in Wilbarger County, Texas, from 2014 to 2017 to estimate how cropland influences the landscape composition, home range size, and resource selection.
- Average monthly home range was 420 acres for females and 734 acres for males.
- The monthly proportion of active cropland within these ranges was between 0 and 40% for females and between 0 and 15% for males. Both sexes had an increase in proportion of active cropland during winter months, which we believe may be because of large amounts of active winter wheat on the landscape during these times.
- Across all individuals and months, deer consistently selected rangeland over both inactive and active cropland, regardless of crop species.

Continued agricultural expansion into rangelands may affect future deer behavior, therefore managers should aim to preserve patches of native areas on the landscape.

Cooperative funding provided by the Texas Parks & Wildlife Department.



Genes, Antler Size, and DMP: The Faith Ranch Yana Study

Cole C. Anderson, Randy W. DeYoung, Michael J. Cherry, E. Ann Staiger, David G. Hewitt, Charles A. DeYoung, Joseph A. Hediger, Matthew T. Moore, and Stuart W. Stedman

Intensive management of white-tailed deer (WTD) has become increasingly popular, with the goal of increased antler size. The main obstacle in wild deer is the lack of control over breeding. Texas' Deer Management Permit (DMP) allows managers to temporarily confine a small population of WTD through fawn-rearing. Typically, DMP enclosures are stocked with 1 large-antlered buck and 15 to 20 adult does. We studied sons produced from 14 bucks in 2 DMP enclosures at the Faith Ranch from 2007 to 2023. We recorded 2,638 antler measurements from 521 bucks.

- Heritability for antler traits was low in young bucks and low to moderate in adult bucks. Antler size in young bucks was influenced more by environmental conditions than genetics. Most antler traits in older deer would respond to selection.
- Bucks born in DMP enclosures had a Boone & Crockett score 10 inches larger than average at 5.5 years old. However, all sons produced by 4 of the 14 sires were below average.
- Release of bucks into a 1,100-acre game-fenced pasture did not increase antler size in the population probably due to lack of control in breeding in a wild system, long generation intervals, and low to moderate heritability of antler traits.

DMP enclosures can produce above-average bucks but have limited ability to make population-level effects on antler size. Managers should select mature sires with the largest antlers and provide nutritional supplementation for optimal results.

Cooperative funding provided by the Stedman West Foundation and Faith Ranch.

Hide and Seek: Quantifying Wildlife Detectability for Drone Surveys

Aaron M. Foley, Ernie Reyes, Dakota Moberg, Randy W. DeYoung, Humberto L. Perotto-Baldivieso, and Belinda Arnero

Drones are becoming a common platform for conducting wildlife surveys. Many drone surveys use thermal sensors during nighttime to increase detectability of wildlife. Wildlife use of woody cover, which can reduce detectability, during nighttime is largely unknown and may offset the advantages of surveying at nighttime. We used nighttime GPS locations of white-tailed deer (WTD), nilgai and wild pigs on 2 sites to examine how use of woody cover were influenced by environmental conditions and habitat type.

- Woody cover use by wild pigs increased from ~17% to ~25% as night approached sunrise.
- Increases in temperature decreased use of woody cover for wild pigs (~48% to ~18%) and WTD (~40% to ~27%).
- Increases in wind speed increased use of woody cover from ~16% to ~27% for wild pigs. Additionally, female white-tailed deer were more sensitive to wind speed than males.
- Moon illumination had little effect on use of woody cover for all 3 species.
- In a thornscrub community, feral pigs averaged ~20% usage of woody cover whereas WTD averaged ~40%. On another thornscrub community, WTD averaged ~25% usage of woody cover and nilgai averaged ~5%.

Overall, temperature and wind speed were the most impactful environmental variables tested. Because use of woody cover varied by species and study site, we cannot assume the probability of detecting wildlife is constant.

Cooperative funding provided by the Rotary Club of Corpus Christi Harvey Weil Sportsman


Aaron Foley

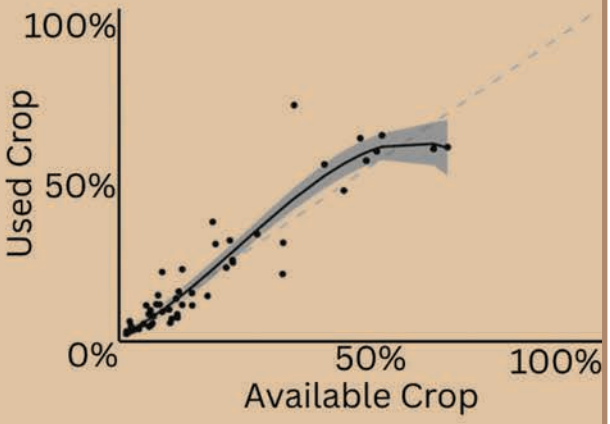
Do pronghorn respond differently to cropland and roads as availability changes?

Data

We studied 73 pronghorn with GPS collars to see how much they use cropland, paved roads, and unpaved roads.

Results

- Pronghorn use available cropland regardless of its density.
- Pronghorn avoid areas with a lot of paved or unpaved roads.



What does this mean?

Pronghorn space use may reduce their access to high quality foraging locations or mating opportunities.

Bailey A. Kleeberg, Timothy E. Fulbright, Michael J. Cherry, Warren C. Conway, Marlin M. Dart, Randy W. DeYoung, Shawn S. Gray, David G. Hewitt, Gary Mizer, Anthony P. Opatz, Evan P. Tanner, Levi J. Heffelfinger

Cooperative funding provided by Texas Parks and Wildlife Department.

The Richard M. Kleberg, Jr. Center for Quail Research

Survival of sympatric quails in South Texas

Levi Sweeten, Caleb McKinney, Maydeliz Ramos-Gonzalez, Katherine Travis, Evan P. Tanner, Leonard Brennan, Fidel Hernández, David G. Hewitt, Ryan S. Luna, John McLaughlin, Humberto L. Perotto-Baldivieso, Lisanne Petracca, and Ashley M. Tanner

Scaled quail and northern bobwhite are iconic game birds in decline throughout much of their range. While bobwhite have been extensively studied, little is known about dynamics between the two species in areas where they live side-by-side. In South Texas, scaled quail and bobwhite occur in areas that have been heavily modified by human activities, like agriculture and development. These changes have altered the habitat available to these birds, possibly resulting in decreased survival. Our goal is to estimate survival of both species and to determine how environmental factors may influence survival rates.

From 2022 to 2024, we captured and banded scaled quail and bobwhite at sites in Dimmit and Duval counties. We used these capture data to build statistical models to estimate how likely a bird is to survive one month to the next. In Dimmit County, scaled quail had monthly survival rates of 77%, lower than bobwhite at 81%. This pattern was flipped in Duval County, where scaled quail had an 82% monthly survival rate, higher than bobwhite at 76%. These results suggest that local conditions may impact the two species differently. To explore these differences, we will incorporate temperature and precipitation data into our models to see how climate variables shape survival. This insight may help managers and landowners make informed decisions to support both species on working lands in South Texas.

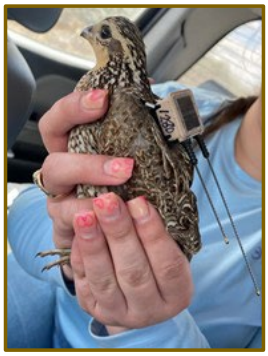
Cooperative funding provided by Texas Parks & Wildlife Department, the South Texas Quail Coalition, and the Rotary Club of Corpus Christi Harvey Weil Sportsman Conservationist Award.

Brian Loflin

How do Northern Bobwhites Respond to Prescribed Fire?

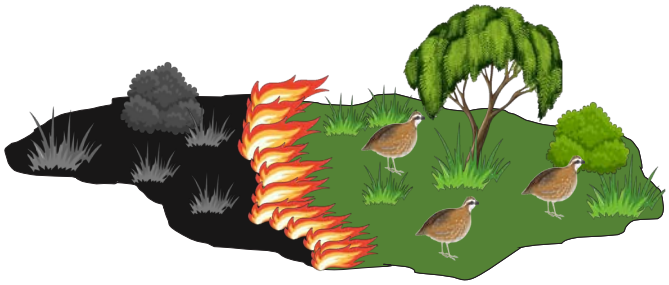
Goal: Prescribed fire developed as a popular management tool for northern bobwhite in the eastern U.S. where annual rainfall is >50 inches. Although prescribed fire is widely used in Texas, its impacts on bobwhite survival, space use, and nest success is poorly known in semiarid environments.

Data: We have placed GPS backpack transmitters on bobwhites to monitor survival, movement, and nest success after a prescribed burn event.



Female bobwhite with a backpack transmitter

Quail nest found in the burned area



Preliminary Results: No bobwhite mortalities occurred during the prescribed fire. In addition, bobwhite space use did not significantly shift during the month following the prescribed burn.

Carolina Muñoz, Fidel Hernández, Abraham Woodard, Kristyn Stewart-Murphy, and Alejandro Bazaldua. Cooperative funding provided by Caesar Kleberg Wildlife Research Institute, Quail Associates 2.0, and South Texas Chapter of Quail Coalition.

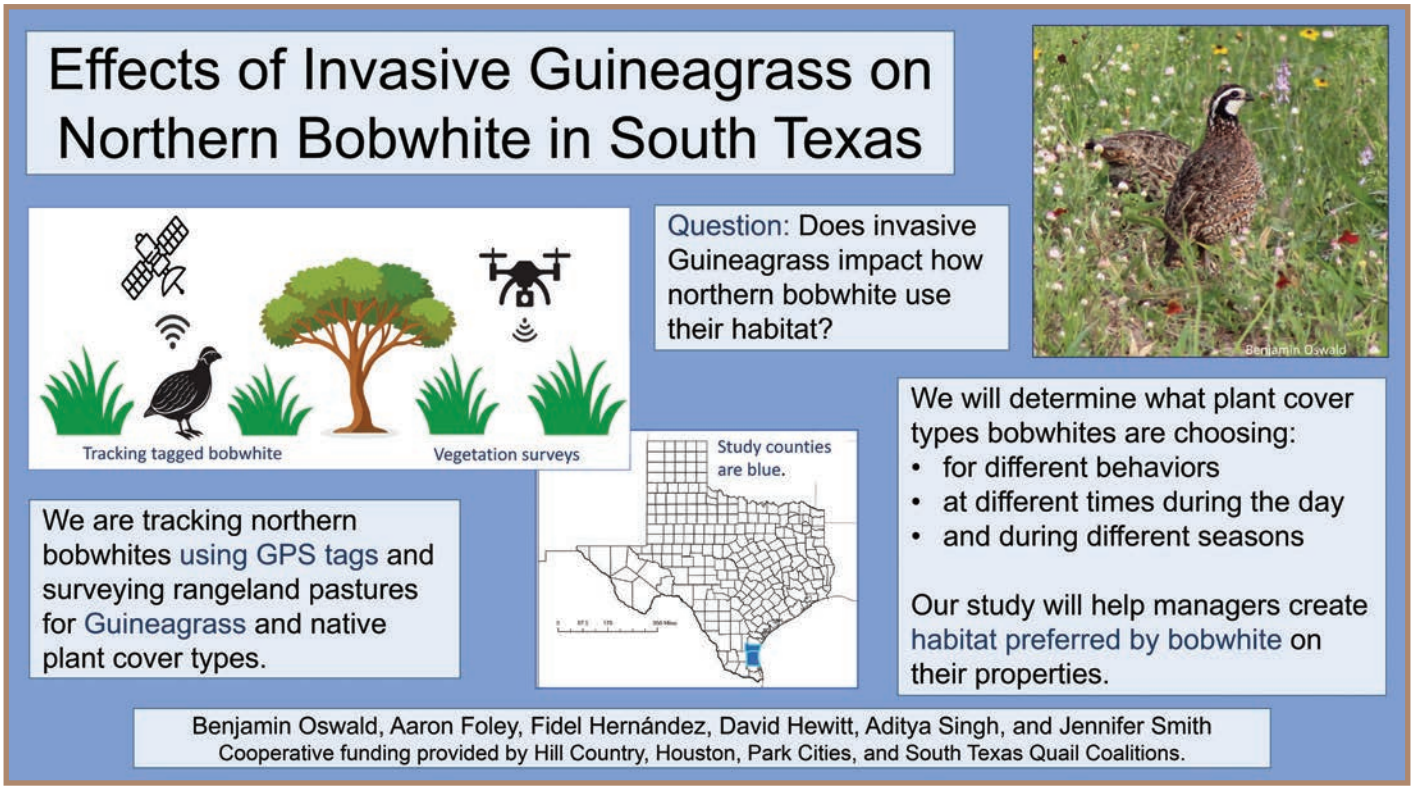
Quail and Parasites: How Much Do We Know?

Liza A. Soliz, Maedean L. Cardenas, Alejandro Bazaldua, Andrea Montalvo, Alynn Martin, and Fidel Hernández

Quail have been experiencing range-wide population declines. Although habitat loss is considered the main cause of the decline, parasites, in particular eyeworms and cecal worms, have been identified as a potential factor contributing to the decline in Texas. This recent interest has spurred a flurry of research over the past decade. Unfortunately, this literature is scattered across numerous sources such that a current state of the knowledge is unknown. In addition, most of the research has focused primarily on the occurrence of parasitism in quail, with little study devoted to whether the observed levels of parasitism are sufficient to negatively impact the species.

We will conduct a thorough search of all studies that have been conducted on quail parasitism throughout the US. The information contained in all the studies will be summarized to develop a synthesis of all that is known to date about eyeworm and cecal worm parasitism in quail. We will develop a concise technical bulletin that will summarize this information for Texas landowners, managers, and quail enthusiasts so they can be informed about all quail-parasite findings and help guide future research.

Cooperative funding provided by the South Texas Quail Coalition.



Fragmentation Effects on the Bird Community Including Scaled Quail

Maydeliz Ramos-Gonzalez, Levi Sweeten, Katherine A. Travis, Caleb M. McKinney, Ashley M. Tanner, Evan P. Tanner, Fidel Hernandez, David G. Hewitt, Jennifer A. Smith, Leonard Brennan, John Mclauglin, Humberto L. Perotto-Baldivieso and Caleb Roberts

The Tamaulipan Thornscrub ecosystem has lost over 90% of its native vegetation to cultivation, grazing, and brush management. This large-scale loss and fragmentation threaten wildlife that rely on these shrublands, including the chestnut-bellied scaled quail, a bird experiencing population declines across South Texas. Understanding how these changes influence bird communities is critical for guiding future management and restoration strategies.

We surveyed birds across 19 counties during the 2024 and 2025 breeding seasons. In 2024, we conducted 1,010 surveys in areas classified as either: high, medium, or low fragmentation. We detected 111 bird species, with the greatest number of species (93 species) and most unique bird community in medium-disturbance areas, suggesting these sites support more varied and dynamic bird communities than either high or low fragmentation areas. Scaled quail detections were low, so we added devices to record bird sounds to assess how roads may affect calling activity. This project will provide critical insight into how shrubland fragmentation affects bird communities and inform management actions in South Texas.

Cooperative funding provide by the Texas Parks & Wildlife Department and the Rotary Club of Corpus Christi Harvey Weil Sportsman Conservationist Award.

Habitat Connectivity for Scaled Quail in South Texas.

Caleb M. McKinney, Katherine A. Travis, Evan G. Tanner, Leonard Brennan, Ashley M. Tanner, Humberto L. Perotto-Baldivieso, Fidel Hernández, David G. Hewitt, Ryan S. Luna, and John Mclaughlin

Scaled quail populations in South Texas have declined greatly in recent decades. These long-term declines are believed to be primarily a result of habitat loss. In addition to habitat loss, fragmentation or the isolation of habitat may be contributing to these declines. Our goal is to evaluate habitat connectivity for scaled quail in South Texas. Connectivity refers to how well animals are able to move on the landscape between patches of habitat. The primary factors in determining habitat connectivity are the inherit movement potential of the species and the landscape features the animal must travel through, such as different types of vegetation or crossing roads.

To determine movement potential of scaled quail in different vegetation types we deployed GPS transmitters on 142 scaled quail on two ranches in South Texas from 2022-2024. Using the data from our transmitters we can then simulate the movements of thousands of scaled quail in other areas of South Texas. This will highlight areas where scaled quail are either able to move effectively or where their movement is restricted by landscape features.

Understanding how habitat connectivity affects scaled quail is crucial for developing strategies to stop the decline of this species. Determining areas of good connectivity can highlight potential areas to prioritize conservation efforts. Alternatively, areas with habitat, but poor connectivity may be good areas to target restoration efforts.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Genetic Analysis of Wild Turkey Across Oklahoma

Michael Barrett, Evan P. Tanner, Randy W. DeYoung, Dwayne Elmore, Colter Chitwood, Craig Davis, Sam D. Fuhlendorf, Nicolle De Fillipo, Cody Griffin, and Cyrena Bedoian

Wild turkeys are a major success story within the United States. Now, wildlife agencies are again seeing population declines. Oklahoma Department of Wildlife Conservation (ODWC) has reported losses across the state, raising concerns about the stability of current populations. Using genomic tools, we aim to better understand the structure of turkey populations across Oklahoma and to identify factors that may affect suitability and gene flow.

We worked with ODWC, the National Wild Turkey Federation, Oklahoma Tribal Nations, and private citizens. Together we collected 450 samples from turkeys harvested during Spring 2022, 2023, and 2024 hunting seasons. We obtained genomic data for 298 individual birds from 70 counties. Data showed a divide between Eastern and Rio Grande subspecies. We also found a large hybrid zone, which may be wider than currently reported. Patterns in south-central Oklahoma suggest higher levels of hybrid ancestry, possibly due to more connectivity in the region.

Future analysis will assess suitability across Oklahoma, identifying conditions that support turkey populations. We will also study patterns of gene flow by using models that show how landscape features can affect turkey movement. Together, these insights will enable ODWC to make management decisions with genetic information in the hope of the recovery of turkey populations in Oklahoma.

Cooperative funding provided by the Oklahoma Department of Wildlife Conservation.

White-winged Dove Breeding Across Urban Gradients

Megan E. Spina, Owen N. Fitzsimmons, Jordan C. Giese, Marianna M. Wharff, and Jennifer A. Smith

In the last 30 years, there has been a shift in the distribution of white-winged doves from their historical breeding range in the Lower Rio Grande Valley, Texas, to urban areas throughout the state. However, little is known about how urbanization affects their breeding ecology.

We are studying the breeding ecology of doves across urban gradients in the San Antonio and Houston areas. Specifically, we are fitting doves with solar-powered GPS transmitters to track their movements. This will allow us to determine the size of their breeding home ranges and identify the resources they select within their home range. We are also monitoring white-winged dove nests, collecting information on nesting sites, and determining whether adults successfully raise chicks.

We've enjoyed working with landowners, non-profits, and government agencies to help establish trapping and banding sites. We predict that home ranges will be the smallest, and nests will be more successful, in suburban areas with mature trees. These areas may give doves better access to backyard bird food and suitable nesting sites. Results will help managers understand white-winged doves' habitat and resource needs.

Cooperative fund provided by the US Fish & Wildlife Service.

Urbanization and White-winged Dove movement

Marianna M. Wharff, Megan E. Spina, Bart M. Ballard, Owen N. Fitzsimmons, and Jennifer A. Smith

White-winged doves are an important game species in Texas. They historically bred exclusively in the Lower Rio Grande Valley and migrated south of the US-Mexico border. However, in the past 50 years they have experienced significant range expansion and now breed throughout Texas, primarily in urban areas. Additionally, increases in their population have not resulted in higher harvest rates by hunters, suggesting that urban populations do not travel into rural areas where they are hunted. This study will investigate differences in movement patterns along urban-rural gradients in South Texas and evaluate the contribution of urban white-winged doves to the harvested population.

We will deploy GPS transmitters on individuals to track fine-scale movements and use bands to evaluate harvest numbers. These efforts will take place in the greater San Antonio and Houston areas, and at traditional breeding sites in the Lower Rio Grande Valley. Our results will inform management plans for white-winged doves in Texas and surrounding states and provide insight into urban wildlife adaptations.

Cooperative funding provided by the US Fish & Wildlife Service.

White-winged dove with a solar-powered GPS transmitter secured by a backpack-style harness.

Jennifer Smith

Habitat and Weather Effects on Northern Bobwhite in Texas

Kristyn G. Stewart-Murphy, Fidel Hernández, Jon S. Horne, Alison C. Ketz, Alejandra Olivera-Mendez, and Angela M. Guerrero.

Urban growth is often seen as a major reason for the loss and fragmentation of native rangelands and many wildlife species. The northern bobwhite, has been declining and circumstantial evidence suggests that habitat loss may be to blame. We measured the effects of habitat (amount and connectivity) and weather (drought index and temperature) on bobwhite population growth in northern and southern Texas from 1978 to 2022. We found that:

- Bobwhite populations were declining in northern and southern Texas during this time.
- Bobwhite habitat comprised about 70% of the landscape.
- Not surprisingly, the amount of habitat did not influence bobwhite population growth in either northern or southern Texas.
- However, the level of drought influenced bobwhite population growth, with wetter conditions resulting in higher growth.

These results suggest that weather may have greater impacts on bobwhite populations in Texas, and that habitat amount and connectivity may play a less significant role in the state.

Cooperative funding provided by the Texas Parks & Wildlife Department and the Houston Chapter of the Quail Coalition.

Validating Bobwhite Habitat Relationships with Remote Sensing

Alejandro Bazaldua, Fidel Hernández, David B. Wester, Aaron M. Foley, Andrea Montalvo, and Kristyn G. Stewart-Murphy

Numerous studies have looked at how habitat features relate to northern bobwhite abundance. Remote sensing technology has recently made it possible to study habitat-quail relationships without long hours in the field or being limited to a few sites. Our objective was to evaluate the use of remotely sensed vegetation data to develop habitat-quail relationships at local and regional scales. We conducted roadside surveys in southern Texas during 2022 and 2023 and acquired remotely sensed data on vegetation and weather along the routes. We then related bobwhite abundance to these characteristics. We found that:

- At a local scale (about a 440-yard buffer around a route), bobwhite abundance increased with increasing amounts of perennial herbaceous plant cover and shrub cover.
- At a regional scale (about 60,000 acres), bobwhites tended to be more abundant in areas with higher perennial herbaceous plant cover.

These findings are reasonable because a mix of herbaceous vegetation and shrubs is needed for bobwhites for food and concealment from predators and scorching summer temperatures. These findings correspond well with previous on-the-ground studies and show that remotely sensed data can be used to understand habitat-quail relationships at large scales.

Cooperative funding provided by the Quail Associates Program, South Texas Chapter of the Quail Coalition, the Rotary Club of Corpus Christi Harvey Weil Sportsman Conservation Award, Houston Safari Club Foundation, and Houston Livestock Show & Rodeo.

Exploring Variability in Scaled Quail Populations

Caleb M. McKinney, Evan P. Tanner, Leonard Brennan, Ashley M. Tanner, Humberto L. Perotto-Baldivieso, Fidel Hernández, David B. Wester, David G. Hewitt, Ryan S. Luna, John Mclaughlin, and Katherine A. Travis

Scaled quail populations and their range continue to shrink in South Texas. Long-term distribution-wide declines are believed to be primarily a result of changes in land use and landscape fragmentation. Scaled quail require large areas of intact Tamaulipan thornscrub vegetation which is being lost due to many factors. Another alarming trend is that scaled quail abundance appears to have rapidly declined around the year 2004. Land cover change and fragmentation could have crossed a threshold where scaled quail populations have reduced ability to recover from short-term fluctuations in abundance.

- Scaled quail abundance was positively associated with woody plant cover and low levels of thornscrub fragmentation.
- The area of effect of woody cover and habitat fragmentation on relative abundance was roughly one-tenth the size post-decline compared to pre-decline, indicating challenges with the population connectivity.
- Local scale (pasture or ranch-level) management is mostly influencing remaining isolated populations of scaled quail.
- Regional management efforts will be needed to reconnect populations.
- Remaining thornscrub should be protected, and woody plant removal focused in already degraded areas to prevent further loss of thornscrub and invasion of nonnative grasses.

Thornscrub restoration is difficult; however, grazing management and control of nonnative grasses in marginal areas may increase scaled quail use.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Caleb McKinney

Shrubland Changes Affect Scaled Quail Habitat

Katherine A. Travis, Caleb M. McKinney, Evan P. Tanner, Ashley M. Tanner, Fidel Hernández, Leonard A. Brennan, David G. Hewitt, Humberto L. Perotto-Baldivieso, Ryan S. Luna, R. Dwayne Elmore, and John McLaughlin

South Texas shrublands are changing because of land management practices and invasive plants. These changes can affect habitat functionality for the chestnut-bellied scaled quail. Understanding how habitat changes impact movements is important to managing for habitat connectivity across the landscape. This study tracked scaled quail movements at two sites—one stable, one declining—to learn how habitat changes impact their ability to move.

- Quail avoided areas with high levels of invasive grasses, especially in shrublands dominated by honey mesquite.
- Shrublands with high herbaceous biomass reduced usable space for quail.
- Within undisturbed thornscrub, movement probabilities increased, suggesting these areas are critical for promoting habitat connectivity.

Management practices that favor diverse native shrubs and limit invasive grasses can help promote habitat connectivity for scaled quail.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Temperature Impacts on Nocturnal Space Use of Scaled Quail

Katherine A. Travis, Caleb M. McKinney, Evan P. Tanner, Ashley M. Tanner, Fidel Hernández, Leonard A. Brennan, David G. Hewitt, Humberto L. Perotto-Baldivieso, Ryan S. Luna, R. Dwayne Elmore, and John McLaughlin

Understanding how wildlife adapt to extreme heat is increasingly important as global temperatures rise. This study explored how temperature changes affect habitat use by chestnut-bellied scaled quail, a declining species in South Texas. We compared quail space use during daytime and nighttime across temperature gradients at two sites—one with a stable population and one with a declining population—to predict how quail adjust to heat stress.

- Differences in habitat use across day versus night shifted more dramatically at the declining site, where temperature thresholds for change were lower (90–95°F) than at the stable site (95–100°F).
- Rising temperatures reduced the overlap between daytime and nighttime habitat use, meaning birds used different areas to cope with heat at night versus day.
- Landscapes with more varied vegetation allowed quail to find cooler microclimates and respond to extreme temperatures more easily.
- Homogeneous landscapes, caused by thornscrub loss and invasion of non-native grasses, limited options for thermal refuge.

Relatively small changes in temperature can affect usable space across the daily cycle.

Cooperative funding provided by the Texas Parks & Wildlife Department.


David Hewitt

Shorebirds & Waterfowl

Conservation of Nesting Waterbirds Along the Texas Coast

Jordan C. Giese, David J. Newstead, David Essian, Dale Gawlik, and Bart M. Ballard

The coastal bays of Texas provide nesting islands for large gatherings of waterbirds, a group that has declined by 22% since 1970. These islands, made up of cacti, shrubs, or grassy vegetation also provide isolation and protection from potential nest predators. There is a growing concern among resource managers along the Texas Gulf Coast regarding the degradation of coastal islands due to erosion from sea-level rise, storm surges, and human disturbance.

In partnership with Coastal Bend Bays and Estuaries Program and the Harte Institute for Gulf of Mexico Studies, we completed the third of a five-year study prioritizing colony islands for rehabilitation and management. While our partners collected data on waterbird productivity on islands, we captured and fitted 12 great egrets, 24 reddish egrets, and 45 tricolored herons with tracking devices during the springs, 2023-2025. Among initial results, we found that both great egrets and tricolored herons prefer freshwater estuaries and avoid urban areas when foraging. When comparing regions of the Texas coast, the two species have larger foraging ranges on the lower coast, and the distance between foraging sites and nesting colonies increases from north to south. In coming years, our data will help to identify high-priority colony islands and improve the ability of resource managers to effectively sustain breeding populations of waterbirds.

Cooperative funding provided by the National Oceanic & Atmospheric Administration and the Texas Comptroller of Public Accounts.

Waterfowl Use of Sanctuaries Along the Texas Mid-coast

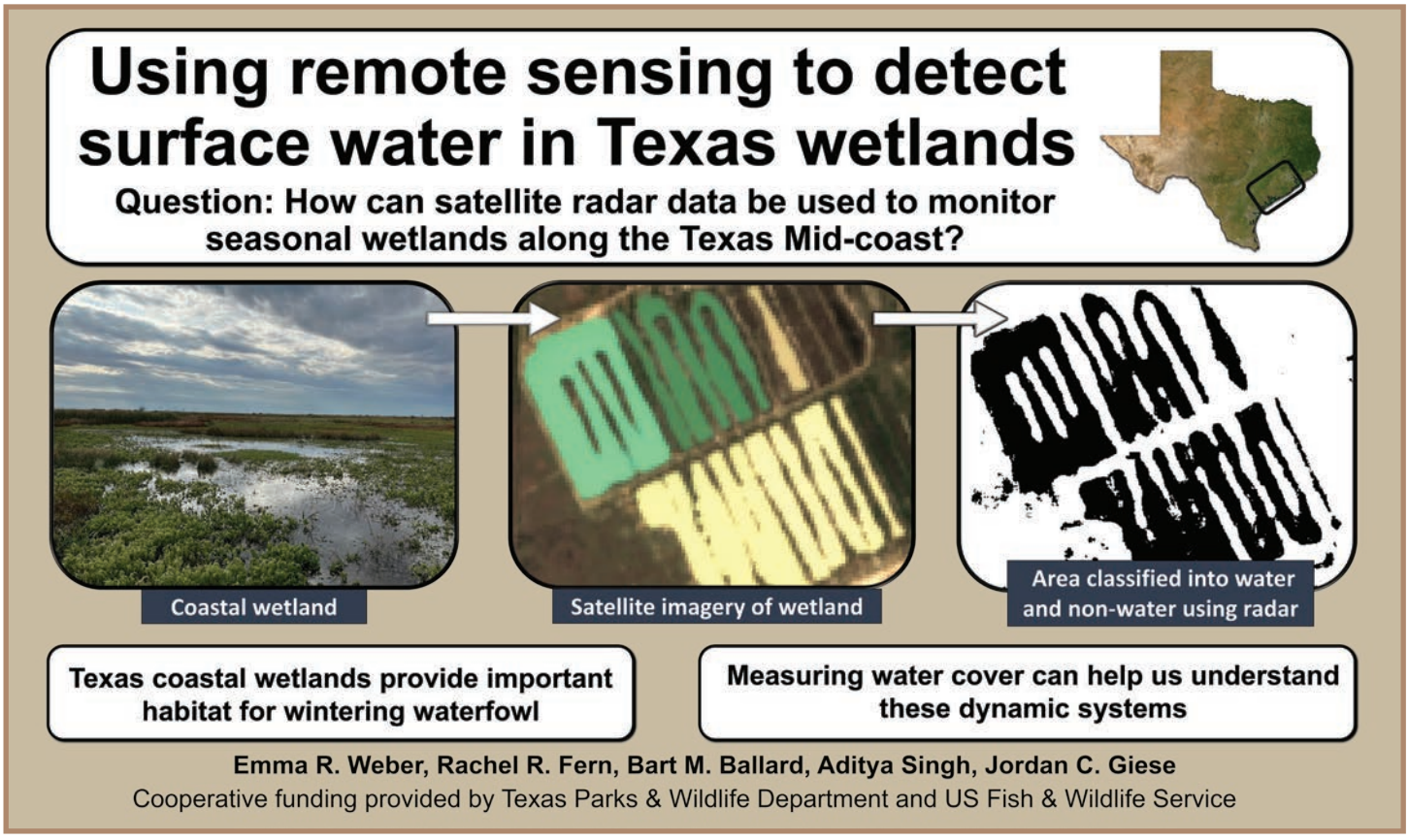
Emma R. Weber, Bart M. Ballard, Rachel R. Fern, and Jordan C. Giese

Texas coastal wetlands provide important habitat for wintering waterfowl. In response to hunting pressure and declining waterfowl populations, Texas Parks and Wildlife Department created the Texas Coast Waterfowl Sanctuary Program. The program creates sanctuaries for waterfowl, or wetlands free of hunting, on privately-owned properties.

To understand the effect of hunting on waterfowl habitat use, we used autonomous recording units (ARUs) to collect audio recordings in 18 pairs of sanctuary and hunted wetlands across two winter hunting seasons, 2023-2025. We used these recordings to monitor 10 species of ducks and geese and understand how they used both types of wetlands. Preliminary results indicate that waterfowl use of sanctuaries and hunted sites shifts across the 24-hour cycle with higher use of hunting areas during nighttime hours. This study will establish a protocol for waterfowl monitoring using ARUs. Our results will guide future sanctuary placement along the Texas coast.

ARU deployment at Mad Island Wildlife Management Area

Cooperative funding provided by the Texas Parks & Wildlife Department and the US Fish & Wildlife Service.



Migratory Connectivity of Cackling Geese Wintering on the Southern Great Plains

Jack R. Rogers, Kevin J. Kraai, Daniel P. Collins, Jay A. VonBank, and Bart M. Ballard

Migratory species make impressive movements between breeding and nonbreeding areas annually, but the capability to track species throughout the annual cycle at fine spatiotemporal scales is the result of recent technological innovations. Advances in animal tracking allow for more accurate tracking of migratory species, more frequent datapoint collection, and over longer periods of time. This can reveal aspects of the annual cycle in greater detail than previously possible.

Cackling geese migrate thousands of miles annually between breeding, molting, and wintering sites. In their seasonal movements between wintering and breeding localities, numerous stopover sites are used to rest and refuel. The importance of stopover sites to migratory birds like cackling geese cannot be overstated. However, there is a significant lack of knowledge to inform management on where the key stopover areas are for most species, making conservation efforts less impactful.

In the winters of 2022-25, 301 GPS-GSM transmitters were deployed on female cackling geese wintering in the southern Great Plains. With all of our devices out and our birds returning from their most recent breeding season in the arctic, we are in the early stages of network construction. Results from this study will help managers understand where money and effort are most efficiently spent for the conservation of this species.

Cooperative funding provided by Texas Parks & Wildlife Department, Colorado Parks & Wildlife, and US Fish & Wildlife Service.

Roost-site selection of non-breeding cackling geese

Javier A. Segovia, Alynn Martin, Kevin J. Kraai, Kyle Shaney, and Bart M. Ballard

Animals interact with their environment based on daily or seasonal resource requirements. Migratory geese use different habitat types depending on their resource needs. Cackling Geese are a gregarious species of waterfowl, meaning they use their large numbers to reduce predation and maximize foraging efficiency. They migrate from their arctic breeding areas to the Southern Great Plains for winter. During this non-breeding period, these geese will often roost in open water bodies when not feeding and at night to avoid predation. They then visit the surrounding landscape at different times of the day to forage. Cackling geese can expend an excessive amount of energy in response to predatory/hunting disturbance through increased flight times and decreased foraging time. The major consequence of increased energy expenditure is poor body condition, which directly impacts survival and reproductive success. Therefore, the selection of roost sites is of great ecological importance during the non-breeding period of cackling geese.

We will use GPS collar data to identify tracked cackling goose roost sites within their non-breeding period and describe the surrounding landscape configuration. By helping to understand the environmental factors which drive roost site selection, this research will guide future waterfowl management and conservation efforts.

Cooperative funding provided by Texas Parks & Wildlife Department, Colorado Parks & Wildlife, and US Fish & Wildlife Service.

Avian Influenza Prevalence in Richardson's Cackling Geese

Javier A. Segovia, Bart M. Ballard, Kevin J. Kraai, Kyle Shaney, and Alynn Martin

Wild waterfowl, such as ducks, geese, swans, and shorebirds, are natural hosts for the zoonotic, avian influenza virus. The virus occurs in low pathogenic (LPAI) strains that cause little to no infectious symptoms. However, it can also occur in highly pathogenic (HPAI) strains that can cause respiratory issues, violent head shaking, and eventually death in wild birds. While HPAI has been documented in mammal species–including wildlife, domestic animals, and humans–the threat to humans is considered low. However, there are waterfowl species that occur across urban landscapes that have not been well studied.

Richardson's cackling geese migrate from their summer arctic breeding areas to the Southern Great Plains of the US in the winter. Overwinter, these birds use waterbodies shared by domestic birds (e.g., poultry) and livestock. We investigated the prevalence of LPAI and HPAI antibodies in cackling geese during winter 2024/2025 at four study sites across three states (Texas, New Mexico, and Colorado) within the cackling geese wintering range. Antibody screening revealed relatively low prevalence of HPAI in cackling geese (2 out of 50 samples) but higher prevalence of LPAI (19 out of 50 samples). The relatively low prevalence of HPAI in cackling geese could indicate either low levels of exposure or high levels of mortality in this species, and further investigation is warranted.

Cooperative funding provided by the Texas Parks & Wildlife Department.

A cackling goose foraging at a capture site in Colorado.

Carry-over Effects of Northern Pintail Breeding Effort

Jessica Johnston and Bart M. Ballard

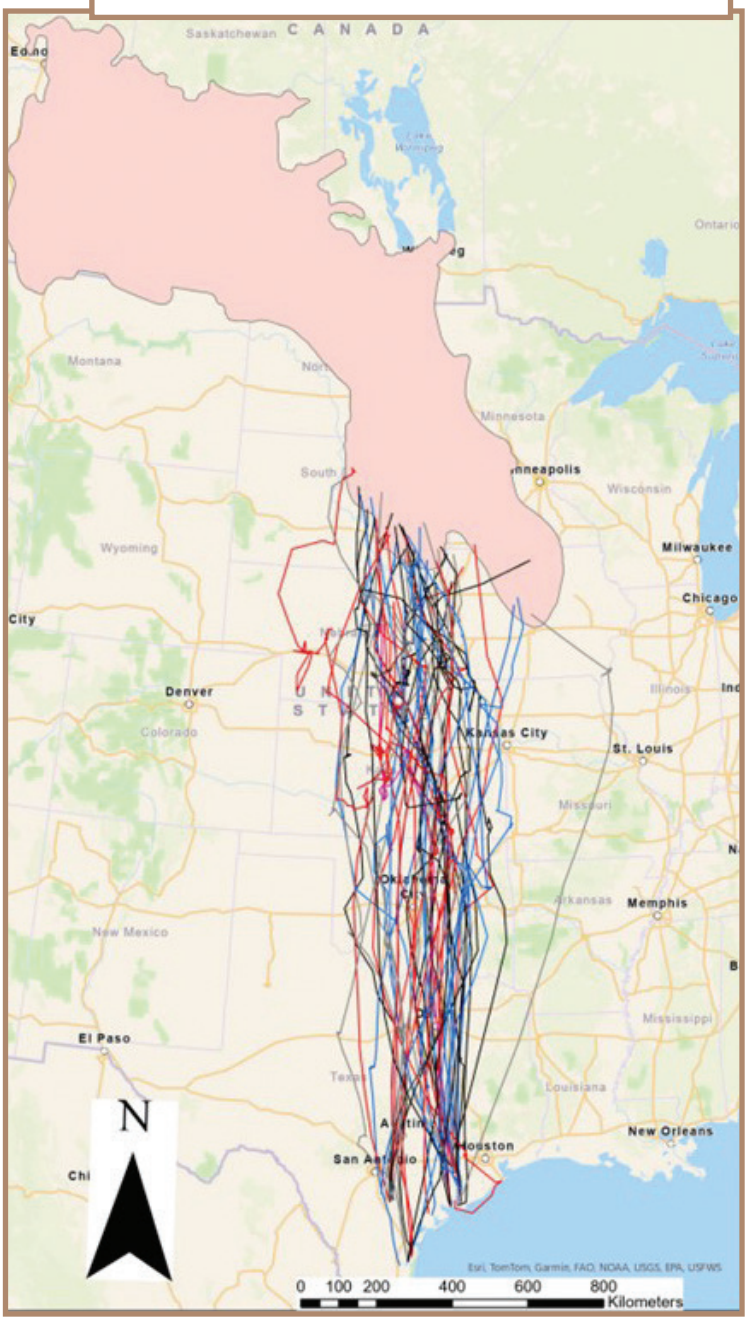
Birds experience a wide variety of conditions throughout the annual cycle and there is growing evidence that factors during one season can carry over and affect them in subsequent seasons. While still a relatively new concept in wildlife ecology, carry-over effects, such as the impact that breeding effort has on subsequent migration, are not well studied. For example, a migratory bird that spends more energy on breeding duties due to its first nest attempt failing might have less time to prepare for fall migration, lowering its chance of survival.

We deployed GPS tracking devices on female northern pintails during the winters of 2020-2024 throughout the southern US. The devices provided both location and behavioral data across wintering, migratory, and breeding seasons.

Our goal is to study how breeding effort affects a bird's performance during its subsequent migration. We will determine if there is a relationship between how much time a female pintail invests in reproduction and her movements during fall migration. This research will help us understand the resource needs of breeding northern pintail females and timing of migration. Our work will aid in the creation of effective management recommendations for conservation of pintail breeding habitat and important migratory stopover locations.

Cooperative funding provided by Texas Parks & Wildlife Department, the US Fish & Wildlife Service, Ducks Unlimited, Inc., and the Louisiana Department of Wildlife & Fisheries.

Spring migration tracks of female northern pintails captured on the Texas coast from 2020 to 2022. Prairie Pothole region is shown in pink.



Northern Pintail Thermal Response Differs by Spring Migration Strategy

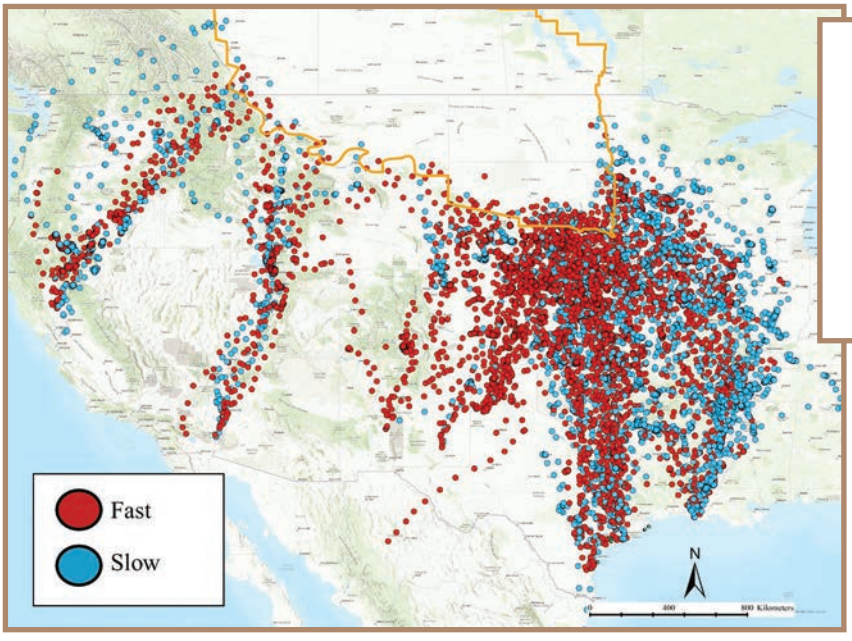
Joseph M. McGovern, Evan P. Tanner, Georgina R. Eccles, Kevin J. Kraai, Daniel P. Collins, Paul T. Link, Cory T. Overton, Michael L. Casazza, Mason H. Cline, J. Dale James, Clayton D. Hilton, and Bart M. Ballard

Temperature is a key part of the environment that influences animal movement and behavior. Extreme weather is becoming more common under our changing climate. These extremes can affect animal fitness, especially when they occur during stressful times, such as breeding or migration. Strategies for coping with conditions in the present may indicate future population resiliency. We compared northern pintails' activity response across temperatures during spring migration between migration strategies. We used GPS and accelerometer data from female Northern Pintails matched with near-the-water temperature data at stopover sites.

- Though all birds experienced similar temperatures overall, fast migrants responded differently to hot and cold temperatures than slow migrants.
- During hot conditions, both strategies decreased activity levels, but fast migrants did so at cooler temperatures.
- During cold conditions, slow migrants reduced activity, while fast migrants sharply increased activity.

Our results suggest that fast migrants cope better with cold, but slow migrants are better at coping with heat. Diverse strategies of Northern Pintail suggest that the population may be resilient to an unpredictable climate. While the slow strategy was much less common in our sample, this strategy may become more common as global warming continues. Our results highlight the need to understand within-species variation when assessing vulnerability to climate change.

Cooperative funding provided by the Texas Parks & Wildlife Department, US Fish & Wildlife Service, Louisiana Department of Wildlife & Fisheries, US Geological Survey, New Mexico Game & Fish Department, Ducks Unlimited, Ducks Unlimited Canada, and Environment & Climate Change Canada.



Northern Pintail spring migration locations for birds with either Fast or Slow migration strategies.

Texas Native Seeds (TNS)

Texas Native Seeds

Anthony Falk, Colin Shackelford, Joshua Breeden, John Boone, Hagen Meyer, Jameson Crumpler, Meghan Peoples Kanute, Tristian Saxon, Kendal Martel, Jonathan Edwards, John Herschberger, Brian Miculka, and Hayden Taylor

Texas Native Seeds (TNS) had a banner year working towards our goal of making successful native plant restoration a possibility for all landowners. Working in collaboration with our many partners we have increased the variety of native seed available to purchase, studied efficacy of various restoration practices, and continued our community education and outreach efforts.

Over the last year, TNS and its partners completed 2 new seed releases and supplied 4 commercial seed dealers with 65 pounds of seed. This seed is used to establish or expand commercial production fields to meet growing market demand. TNS has also added 2 new species and increased our own production by 12 acres across the state.

We also continued to further the understanding of practical steps for native grassland restoration. Over the last year, we added 12 additional seeding projects. The goals of these projects range from techniques to restore saline prairies, to restoration of electrical rights-of-way, to utilizing native grass to enhance water retention structures.

Finally, TNS continues to educate landowners and the scientific community about what we have learned over 24 years of working with native plants in Texas. Over the last year, TNS staff gave 17 presentations to over 500 people. Through greater outreach, we can help to create market demand and improve the success of native grassland restoration.

Cooperative funding provided by numerous generous supporters of Texas Native Seeds.

Myrella Munoz

TNS and PMC partnership

Anthony Falk, Shelly Chambers, R. Alan Shadow, Brandon Carr, John Englert, and Charles Kneuper

Texas Native Seeds (TNS) and the United States Department of Agriculture, Natural Resources Conservation Service (NRCS) continue our long-standing partnership to improve native seed availability. Through expanded collaboration, the two programs were able to add additional production acreage at each of the three Plant Material Centers (PMC) around the state. The partnership between the two programs increases the amount of field space available. Increased field space allows for larger seed production fields and more populations per release, increasing the potential for the release to be better adapted to a broader region.

In addition to seed source development, the partnership put a large emphasis on education this past year. In collaborative efforts, staff from TNS and the PMC hosted two trainings for NRCS staff focused on native grassland restoration. Each of these trainings was able to reach over 40 new NRCS staff from South and Northcentral Texas. At each of the trainings, attendees learned about the benefits of named seed varieties and how to incorporate them into NRCS financial assistance programs to help landowners. TNS staff also participated in the Texas Parks and Wildlife Department's training to landowners and resources professionals focused on erosion control structures. With increased efforts into education we hope to enhance the rate of success for native grassland restoration throughout the state.

Cooperative funding provided by the USDA NRCS Texas Cooperative Ecosystem Studies Unit.

TxDOT and TNS nearing 25 years

Anthony Falk, Travis Jez, Samuel Glinsky, and Missy Lowe

Texas Native Seeds (TNS) and the Texas Department of Transportation (TxDOT) continue their 24-year partnership. Over the history of the partnership, the two organizations working with commercial seed dealers have improved native seed availability, decreased the spread of non-native species, and increased our understanding of plant distribution around the state.

Through this partnership, TNS has been able to select and release new native seed varieties specifically developed for use in road rights-of-way. These species are easy to establish, low growing, and can be commercially produced at scale to ensure seed availability for TxDOT's seeding projects. This past year we began several new evaluations. Species being evaluated will fill critical needs of TxDOT, being suited for saline sites. Other grasses being evaluated are adapted to sandy soils in the eastern portions of the state. We are also evaluating a number of flowering species for pollinator use in the right-of-way. With the development of new native seed varieties and a change in seeding specifications, TxDOT has the potential to be a large buyer of native seed on an annual basis. The change in seeding specifications has resulted in TxDOT no longer seeding non-native grasses in rural areas, thereby reducing their spread.

Finally, through the partnership's combined effort to monitor monarch habitat, TNS has been able to gather a greater understanding of where plants are found throughout Texas.

Cooperative funding provided by the Texas Department of Transportation.

Laguna Atascosa Soil and Seed Mix Experiments

John Herschberger, Anthony Falk, and Andrew Grunwald

In spring 2025, the Texas Native Seeds Program (TNS) partnered with Laguna Atascosa National Wildlife Refuge (LANWR) to create two test plantings in the Lower Rio Grande Valley. The objective of these plantings is to test current and future locally-adapted species that grow well across different soil types. The first plot contains saline clay soil, while the second has a clayey bottomland soil. Both soil types are commonly found in the Lower Rio Grande Valley, and have historically been difficult to restore. TNS staff created a site-specific seed mix based on the species' ability to grow well in each soil type. We planted the seed mixes in early March 2025. Three months later, we collected the first data with promising results. The salty soil planting showed 12% native plant cover from seeds, while the clay bottomland soil showed 24% coverage. These growth rates demonstrate great establishment, and are comparable to other successful restoration projects in South Texas. Montgomery Germplasm knotroot bristlegrass was a notable species that grew successfully in both test areas and, hopefully, will soon be commercially available.

TNS plans to visit the project site again this fall and in future years to assess continued growth. The ongoing partnership with LANWR provides valuable data, knowledge, and opportunities for advancing native grassland restoration throughout South Texas, supporting broader conservation efforts in the Lower Rio Grande Valley.

Cooperative funding provided by Laguna Atascosa National Wildlife Refuge.

Texas Horned Lizard Grassland Restoration

John Herschberger, Anthony Falk, Joshua Breeden, Paul Chroniak, and Nikki Tanzer

In 2020, Toyota Motor Manufacturing in San Antonio, Texas, partnered with Texas Native Seeds (TNS) to convert 20 acres of land dominated by non-native Bermudagrass to native grassland. The main goal was to return the area to a native grassland to create a suitable habitat for Texas horned lizards. Over the past four years, TNS staff have worked steadily toward these restoration objectives.

During fall 2024 sampling, native seed cover decreased by 13%, resulting in a 58% seeded native cover. Subsequently, we observed a 16% increase in bare ground during this sampling period. These changes in cover are expected due to drought conditions before sampling. Despite the dry weather, we have continued to see improvement within the restoration area, with native plant diversity increasing by 12%. These results show that, with the right seed mix, native species tend to be more drought-tolerant and resilient than non-natives.

In 2024, an additional 5 acres were added for restoration. The additional acreage has been challenging to restore, largely due to soil erosion, poor soil nutrients, and compaction. To address this, we have ripped sections of the soil to improve water infiltration and planted a summer cover crop to boost soil nutrients. The main goals for this new restoration area are to reduce soil erosion and increase water retention, which will make it possible to establish native grasslands in the fall.

Cooperative funding provided by Toyota Motor Manufacturing.

Monarch Habitat Monitoring on Texas Highways

John Herschberger, Anthony Falk, and Samuel Glinsky

The Texas Native Seeds Program (TNS), working with the Texas Department of Transportation (TxDOT), wrapped up its fifth annual spring survey of monarch butterfly habitat. Since 2020, TxDOT has enrolled all of its land—1.2 million acres—into the Nationwide Monarch Candidate Conservation Agreement with Assurances (CCAA), with 450,000 manageable acres set aside for monarch conservation efforts. The agreement's main focus is to monitor and report monarch habitat conditions along TxDOT rights-of-way.

Every year, TxDOT randomly selects 140 survey points across the state within the monarch migration corridor. This year's sampling found an average of 19.4 milkweed stems per plot (roughly 354 per acre), down by one stem per plot compared to last year. In contrast, nectar-producing plant cover rose by 2.4%, offering more food for migrating monarchs. These shifts reflect the impact of rainfall timing and amounts across the surveyed areas. Staff also identified 28 new plant species, bringing the total observed during sampling to 442 unique species. Of the 140 plots sampled, only 11 did not meet monarch habitat standards and will be resampled this fall. Resampling in the fall will help us determine if the plot was not providing monarch habitat because of rainfall or some other factor. TxDOT will use the data collected to manage current and future vegetation to improve monarch butterfly habitat.

Cooperative funding provided by the Texas Department of Transportation.

Texas lantana in a TxDOT right of way

John Herschberger

South Texas Natives (STN)

STN Update

John Herschberger, Anthony Falk, and Joshua Breeden

The South Texas Native Seeds (STN) Project region, of Texas Native Seeds (TNS), has expanded our seed production and added several new plant evaluation sites this year. As demand for native seeds from the public and commercial growers continues to increase, STN has worked to increase seed production to meet these needs.

To support this goal, over 30,600 individual plants were grown and transplanted this spring for seed production and evaluations. This past year we had strong harvest with more than 300 pounds of seed harvested from 23 species that are currently in production at our South Texas facility. This year we added a new evaluation species, alkali sacaton, and so far, it appears to be a successful evaluation with a future release in the coming years. To expand research across different environments, two new research plantings were added. These locations will help us study how native plants grow in a range of South Texas soils and climates, improving our understanding of which species perform best. The two new plantings will also help us learn how to better restore native grasslands.

As we look back on a successful year, we recognize that our progress wouldn't be possible without strong partnerships. We are deeply thankful to the organizations, landowners, and supporters whose collaboration helps us carry out our mission of restoring native plant communities in South Texas.

Cooperative funding provided by the many generous donors to the South Texas Natives program.

Comparing Native and Non-Native Forages

Natalie Salinas, Greta Schuster, Natasha Mast, and Anthony Falk

Many traditional cattle producers are looking to diversify their income with wildlife enterprises. Native forage species could potentially provide quality forage for beef cattle with lower costs compared to traditional non-native forages, while also providing habitat for wildlife. However, the potential of native grasses to serve as quality year-round forage for beef cattle has historically been underestimated.

We are comparing four native grasses commonly found in South Texas to a commonly used non-native forage species to determine how several key nutritional components change throughout the year. Early results indicate that native species can provide high quality nutrition for beef cattle. However, that quality changes over time, and changes vary between species. Also, by using multiple native species we can have higher quality forage than the single non-native species. This supports past research showing the benefits of diverse native grass stands. If our results show that native species can be utilized as quality forage for beef cattle, it will help lower maintenance costs, increase biodiversity, and create wildlife habitat.


Josh Breeden

Cooperative funding provided by LEADING.

Farming to Native Grasslands

John Herschberger, Anthony Falk, and Joshua Breeden

This spring marks 1.5 years since the Texas Native Seeds (TNS) staff installed a research planting outside of La Gloria in the Rio Grande Valley of South Texas. With increasing water restrictions and droughts, the landowners were looking to provide a native habitat for wildlife that was not previously found on the ranch. The objective of this planting was 2-fold: 1) to convert traditional food plots to native grasslands, and 2) to test new native seed varieties that are currently under evaluation or have been released for commercial production. The seed mix was planted into 2 different soil types on the ranch, allowing us to test different soil types within the same area.

TNS staff sampled the plantings earlier during spring 2025. Both plantings continue to show improvement of seeded native cover and a decrease in non-native species. The first planting, which was planted in a shallow sandy soil, had native seeded cover of 45%, while the second planting had a deeper sandy soil exhibiting 81% seeded native cover. Both plantings show an increase in seeded native cover, and the progression of the project matches that of what we have observed in other restoration projects throughout the program's history. We are thankful for landowners who partner with us, allowing us to evaluate native seeds on their property.

Funding provided by the many generous donors to South Texas Natives program.

Coastal Prairies Native Seeds Project (CPNSP)

CPNSP Update

Hayden Taylor, John Boone, Anthony Falk, and Patrick Brzozowski

Texas Native Seeds Coastal Prairies Region (TNSCP) is steadily expanding and continuing to work towards the goal of making successful native grassland restoration possible on the Texas Coast. This year, TNSCP has conducted evaluations on four different native plant species in three locations across the region. Current evaluations include brownseed paspalum, bushy bluestem, purple lovegrass, and yellow puff. Additionally, TNSCP continues collecting performance data on over 90 different native plant varieties in Bastrop, Texas.

In addition to native plant development, TNSCP continues to increase the volume of seed production for commercial growers. Continued production species include little bluestem, seacoast bluestem, and knotroot bristlegrass. This year, TNSCP added seed production of yellow Indiangrass, big bluestem, and Texas grama. Montgomery Germplasm knotroot bristlegrass is expected to be released in 2025 with commercial seed available in fall 2026.

Landowner outreach continues with three site visits in the region this year, advising on native plant restoration for wildlife habitat. Over the past year, more than 175 native seed collections have been made through collaborations with private landowners and on public lands.

Lastly, collaborative efforts with Harris County Flood Control District have continued with one new seeding for water retention structures. Continued monitoring for four previous plantings will further improve native grassland restoration within the area.

Cooperative funding provided to the many supporters of the Coastal Prairies region of the Texas Native Seeds program.

Hayden Taylor

Native Seeding Performance in Flood Control Basins

Hayden Taylor, John Boone, Anthony Falk, and Kory Nickell

Texas Native Seeds Coastal Prairies (TNSCP) project region continues its partnership with Harris County Flood Control District (HCFCD) to evaluate native seeding performance in water retention basins. Over the last 5 years TNSCP has seeded 4 different projects spread across the county. With each new seeding project TNSCP is testing new commercially available native seed varieties in common HCFCD planting scenarios.

Sampling from the first test site planted during spring 2021 has indicated a successful planting with many of the originally seeded species observed in 2025. Little bluestem, and herbaceous mimosa were the most observed seeded species totaling 35% of composition. However, invasive species percentages have risen to over 50% of observations, potentially due to mowing.

The second planting was seeded during spring 2022 to determine native species for use on side slopes and flat flood plains. Invasive species encroachment at this basin is also being observed, potentially due to a low mowing height. Data collection for this site will continue into 2025.

The third was planted during spring 2024. Data from this site indicate high densities of forbs, including partridge pea, Illinois bundleflower, and Indian blanket, with partridge pea being the only non-seeded native species. Rosettegrass appears to be the dominant seeded grass totaling 50% of species densities. This planting has also achieved extremely high coverage totaling 98%.

Cooperative funding provided by Harris County Flood Control District.

East Texas Native Seeds Project (ETNSP)

Evaluating Cover Crop and Fertility Treatments

Hayden Taylor, John Boone, Anthony Falk, and Kory Nickell

Texas Native Seeds Coastal Prairies Region (TNSCP) continues to work with Harris County Flood Control District (HCFCD) implementing native plant alternatives for water retention basins. Basin P500-04 was seeded during fall 2023 and spring 2024 with four half-acre seeding strategies. Two of the half-acre plots were seeded with 2 different winter cover crops at the same time as the permanent mix. The first cover crop treatment was seeded with Cibolo Germplasm little barley, the second with wheat. The other 2 half-acre plots were seeded with just the permanent mix; however, one was fertilized and one was not.

Recent data collection shows average densities of seeded species coverage to be most successful on the fertilized treatment. Yellow Indiangrass and Indian blanket are the most abundant species, comprising 40% of seeded species composition. Despite high densities of seeded species, western ragweed accounts for 20% of non-seeded species. Unfertilized plots had similar cover, but yielded 5% less of key species.

Cover cropping treatments at the basin display a slight ground cover advantage within the little barley treatment with a 5% difference over wheat. Across both treatments, bare ground comprises over 40% of observations.

Overall, seeded species densities and percent ground cover are significantly better within the fertilized treatment. Potential soil differences are a possibility, and soil fertility has become of interest for new construction basins with these findings at P500-04.

Cooperative funding provided by Harris County Flood Control District.

ETNSP Update

Kendal Martel, Jonathan Edwards, Robert Shadow, and Anthony Falk

The East Texas project region had a productive year. We expanded plant evaluations by adding purple lovegrass to 6 evaluation sites.

Collaboration continued with the East Texas Plant Materials Center to increase the availability of native seed sources. Throughout 2024 and early 2025 we harvested seeds of Gulf Coast Germplasm silver beardgrass and purpletop tridens. Selections of longspike tridens were made for a potential future seed release. Additionally, we added 58 new seed collections to our diverse seed bank ranging from the Blackland Prairie to the Pineywoods.

Rivercane trials are continuing at the Kisatchie National Forest in collaboration with the U.S. Forest Service and will provide culturally important plant material to local tribes. Through these trials, we have learned that rivercane can be produced in full sun and that water availability during establishment has lasting effects on overall growth.

We were fortunate to collaborate with a landowner in the Blackland Prairie on a restoration project focused on providing native forage for livestock. We have also continued our work in Tyler County converting pasture to longleaf pine savannah. We are grateful for the ongoing support of our cooperators, including the U.S. Forest Service, East Texas Plant Materials Center, Boggy Slough Conservation Area, RES, and the Texas Longleaf Initiative, among many others.

Cooperative funding provided by the numerous donors to the East Texas Native Seed Project.

West Gulf Coastal Plain Seed Source Development Project

Kendal Martel, Jonathan Edwards, Thomas Philipps, Alan Shadow, and Anthony Falk

The East Texas project region continues our partnership with the US Forest Service and the East Texas Plant Materials Center (ETPMC) to develop locally adapted seed for commercial availability across the region. This year, we added a new purple lovegrass study at 6 evaluation sites across East Texas and the Coastal Plains region. This is in addition to the current evaluations of blue mistflower, longspike tridens, and bushy bluestem. Seed increases of silver beardgrass and purpletop tridens are being grown and harvested at the ETPMC. Next year will see the first release from the East Texas project region, Gulf Coast Germplasm silver beardgrass. We are also looking forward to establishing a new seed increase plot of Neches Germplasm splitbeard bluestem at Kisatchie National Forest.

We have continued expanding the size of our rivercane propagation trials on the Kisatchie National Forest. In late winter, we propagated and planted 1,800 rivercane rhizomes in the existing orchard. This project has been an incredible opportunity to learn about best practices in weed management, propagation, and water needs for this essential native species.

This partnership has been vital to developing ecotypic seed for the eastern side of our state, and we are fortunate enough to continue this work in the future through a new agreement with the US Forest Service that will continue the partnership through 2030.

Cooperative funding provided by numerous donors of the East Texas Native Seed Project.

Long-Term Restoration Monitoring in East Texas

Kendal Martel, Jonathan Edwards, and Anthony Falk

The East Texas project region has continued to work with East Texas landowners and partners to test restoration techniques using ecotypic native seed sources. These projects help us understand restoration in unique and threatened ecosystems like the Blackland Prairies and Longleaf pine savannahs.

This year, we were fortunate to partner with a new landowner who is passionate about balancing cattle production with conservation. We were able to plant a commercially available native seed mix in one of his pastures in the eastern Blackland Prairie. This planting will help us to understand how these seed sources perform in this unique region.

In 2023, ETN partnered with the Texas Longleaf Initiative and Texas Parks and Wildlife Department on a project to convert a non-native grass hay pasture to longleaf pine savannah using a native understory seed mix. As we continue our long-term monitoring of the 80 acres, challenges have become opportunities to form research and management questions around fire, drought, invasive species, and other variables that affect restoration efforts in East Texas.

In 2019, we partnered with RES to plant a large restoration area at Riverby Ranch. The site consisted of 2 125-acre research seedings containing 30 germplasm varieties of 13 common tall-grass prairie species. This project is the oldest planting we are monitoring and will provide important insight into plant community dynamics and adaptation over time.

Cooperative funding provided by numerous donors of the East Texas Native Seed Project.

CENTRAL TEXAS NATIVE SEED PROJECT (CTNSP)

CTNSP Overview

Meghan Peoples Kanute, Anthony Falk, Colin Shackelford, James Muir, and Brandon Carr

The CTNSP region strives to meet the expanding needs of habitat restoration in Texas. We focus on research, plant evaluation, and eventual release of locally-adapted native seed. Collaboration with federal, state, and private partners, provide the space, resources, and environmental conditions needed to develop appropriate seed sources for the region. Currently we are evaluating 5 grass species including big bluestem, bushy bluestem, Arizona cottontop, switchgrass, and alkali sacaton. We are also evaluating one flowering species, fragrant gallardia.

Seed increase plantings in Stephenville are focused on producing seed from 30 different populations made up of 11 different grass species and one flowering species. Recent CTNS releases of Taylor Germplasm sand dropseed and Burnet Germplasm hooded windmillgrass are commercially available at large scale.

To better understand the performance of seed selections, TNS provides restoration services to strategic partners. In Spring 2025 two sites were drill seeded; a 2-acre site with Dallas Colleges, and a 2-acre site with Pedernales Electric Cooperative. Data collection is ongoing at both sites to determine seeding success and which species are top performers.

The Central Texas program prides itself on being a conservation resource in the region. By making locally-adapted native seed source commercially available, TNS helps increase the success of restoration and reclamation projects across the state.

Cooperative funding provided by the numerous supporters of Texas Native Seeds and the Central Texas Native Seeds project.

Meghan Peoples Kanute

Corridors of Habitat

Meghan Peoples Kanute, Anthony Falk, and Colin Shackelford

Pedernales Electric Cooperative (PEC) manages 300 miles of electrical right-of-way in the Texas Hill Country. These 300 miles encompass 18,000 acres of managed land. Because of their linear nature and proximity to urban areas, electrical rights-of-way are excellent opportunities for conservation in Texas. In addition, electrical corridors have the ability to connect habitats and provide vital resources for local pollinators and wildlife. Planting native grass and wildflower species that stay below 30" tall, allows electrical cooperatives access to maintain their power systems while benefitting the environment. Diverse stands of mid-sized native grasses also reduce the amount of required mowing, and they may also reduce the number of woody species that invade the right-of-way.

With these goals in mind, PEC enlisted the help of the Texas Native Seeds (TNS) Program to establish a plant conservation area in a two-acre right-of-way surrounded by a neighborhood in Cedar Park, Texas. During Spring 2025, TNS drill seeded a native grass and forb mix. TNS staff plan to collect data every spring and fall to evaluate stand establishment, persistence, and ability to reduce the number of woody species. TNS looks forward to building partnerships with organizations like Pedernales Electric Cooperative to help Texas reclaim vital urban habitat.

Cooperative funding provided by the numerous supporters of Texas Native Seeds and the Central Texas Native Seeds program.

The Native Classroom

Meghan Peoples Kanute, Anthony Falk, Colin Shackelford, and John Wilt

The Dallas College system encompasses seven campuses across the Dallas area, representing an urban land holding of 1,400 acres. Mountain View campus in southwest Dallas recently had a groundbreaking for a new high school, which exposed the dumping grounds of campus maintenance crews. Once detritus was cleared and invasive privet cut back and mulched, what was left was a vacant two-acre wasteland.

TNS was recruited to help restore pollinator habitat on the visible site with the goal of inviting the students and community to interact with native habitat. We drill seeded the site in March 2025 with a seed mix that included early and late successional grass and flowering species. The seeding was successful, coinciding with ample rainfall and building on a diverse native seed bank. Seeded grasses that germinated included, 'Earl' big bluestem, 'Ok Select' little bluestem, 'Van Horn' green sprangletop, 'Catarina' plains bristlegrass, and 'Blackwell' switchgrass. Seeded 'Sabine' Illinois bundleflower, mealy blue sage, and lemon horsemint joined naturally-occurring American basket flower, diamond flower, and Indian blanket to fill in between grasses. 'Comanche' partridge pea and 'Guadalupe' white tridens colonized areas of deep mulch, helping to repair soil health. The project site at Mountain View is now a vibrant place of refuge for pollinators, wildlife, and students to escape the city and discover native habitat.

Cooperative funding provided by the numerous supporters of Texas Native Seeds and the Central Texas Native Seeds program.

Eastern gamagrass and Guadalupe Germplasm white tridens becoming re-established.

Meghan Peoples Kanute

Battle of the Seasons

Meghan Peoples Kanute, Anthony Falk, and Colin Shackelford

Located in north Dallas in one of the fastest growing residential areas in the country, Sandbrock Ranch straddles the divide between urban development and conservation in Texas. The Central Texas Native Seeds (CTNS) project region has assisted Sandbrock Ranch with 340 acres of restoration seeding since 2018. In recent years, a combination of factors led to a decline in the success of seeded warm-season grasses. Poor warm-season coverage led to a boom in cool-season non-native competitors like annual ryegrass and arrowleaf clover. When the growing season transitioned, dead cool-season litter hindered the ability of desirable warm-season grass to grow and reproduce. In 2025, CTNS was asked to help remediate these issues. In partnership with ranch managers, Sandbrock received an application of Grazon herbicide in all pastures with heavy clover cover. Grazon targets broadleaf forbs and successfully eliminated the arrowleaf clover. Cattle were then strategically used in high concentration to graze the annual ryegrass. The cattle were removed from all pastures when native warm-season grasses began to emerge. Following treatments, we have seen significant recovery in the warm-season grass community with white tridens, little bluestem, sideoats grama, and eastern gamagrass beginning to reestablish. Sandbrock Ranch continues to be a valuable location for CTNS plant evaluations and research to better create seed blends and restoration protocols catered to the needs of North Central Texas.

Cooperative funding provided by the numerous supporters of Texas Native Seeds and the Central Texas Native Seeds program.

West Texas Native Seeds Project (WTNSP)

Vegetation in the Texas Hill Country

Anthony Falk, John Herschberger, Hagen Meyer, and Tristian Saxon

The Texas Hill Country is a unique region of the state. Its rolling limestone-exposed hills with deep canyons create a landscape like no other. While the region's rugged landscape and generally poor soils have historically kept the region from being developed, that is quickly changing. Changing just as quickly in this region is the number and distribution of grazing animals on the landscape. There are higher numbers and greater diversity of grazers in the Hill Country today then there was historically. Another unique aspect about the Hill Country is its vegetation. While many people know the Hill Country for Ashe juniper and spectacular spring wildflowers, this region actually has large areas dominated by short and mid-grass prairies. Why many of these areas remain largely dominated by native grass, and others are converted to Old World bluestems is currently unknown.

Texas Native Seeds is interested in looking at the vegetation community found throughout the Hill Country, and how elevation, soil depth, aspect, and grazing pressure may impact that community. To start to gain some of these answers we have partnered with several landowners to install grazing exclosures and sample the vegetation on their properties. Through this project we hope to gain a better understanding of the factors that influence the distribution of Old World bluestems and perennial flowering species throughout the Hill Country.

Cooperative funding provided by West Texas Safari Club International, The Kate Fisher Endowment for Central Texas Habitat Restoration and the many numerous supporters of the Texas Native Seeds program.

WTNSP Update

Colin Shackelford, Louis Harveson, and Anthony Falk

Sixty-two populations of alkali sacaton as well as 44 populations of mesa dropseed were planted for initial evaluation in West Texas at the newly completed plant evaluation site on the campus of Sul Ross State University, alongside test plantings of 62 forb species and 37 grass species. These multi-species plantings were designed to evaluate greenhouse performance as well as seed development, production, and harvestability. Small scale plantings like these allow us to make better informed decisions on which plant species to evaluate.

Twenty accessions of Arizona cottontop were planted in advanced evaluations in West Texas, Central Texas, and the Texas Panhandle. We are in the second year of data collection on them, with plans for selection and seed increase in 2026.

Thirteen plant species are currently in seed increase to provide seed for commercial release. These include 9 grasses and 4 forb or shrub species. Six seed releases have been completed and are currently in commercial production. Evaluations for 31 native plant species have been completed or are in progress.

Multiple research plantings have been completed near Alpine, Texas. New restoration test plantings are planned for the evaluation site at Sul Ross State University where we will test different seed mixes to look at seedling survival over time.

Cooperative funding provided by the Texas Department of Transportation, the USDA Natural Resources Conservation Service, Caesar Kleberg Foundation for Wildlife Conservation, ConocoPhillips, National Fish and Wildlife Foundation, A.S. Gage Foundation, Shield Ayres Foundation, Stan Smith, and the Railway Ranch.

WTNSP Research Plantings

Colin Shackelford, Louis Harveson, and Anthony Falk

The West Texas Native Seeds Project region has completed multiple new research and demonstration plantings in partnerships with private landowners, as well as oil and gas operators across the region.

An ongoing research partnership with the Borderlands Research Institute at Sul Ross State University and the Apache Corporation is now in the second year. The project is looking at soil amendments, mechanical discing, seed mixes, and site preparation for the restoration of decommissioned oil pad sites. Treatment installations were completed during late spring 2024. Data collection is ongoing with final results expected in 2026. Early results indicate enhanced establishment of seeded species coming from the use of erosion control matting. Additionally, seed mixes containing newly available, locally adapted, seed varieties have higher establishment rates than traditional seed mixes. Finally, the addition of biochar is not having any effect.

Two new restoration test plantings were completed in Crockett and Val Verde counties. These plantings are testing existing seed release performance in the Western Edwards Plateau.

Over 15 research and demonstration plantings have been completed in West Texas. Results from these plantings guide the recommendations we make to landowners and energy partners interested in grassland restoration. The lessons learned from the multitude of grassland plantings we have across West Texas further our goal to make grassland restoration a possibility for all West Texas landowners and managers.

Cooperative funding provided by the Texas Department of Transportation, the USDA Natural Resources Conservation Service, Caesar Kleberg Foundation for Wildlife Conservation, ConocoPhillips, National Fish & Wildlife Foundation, A.S. Gage Foundation, Shield Ayres Foundation, Stan Smith, and the Railway Ranch.

Jameson Crumpler

Researchers are collecting data at a restoration site previously dominated by the exotic grass, Lehmann lovegrass.

Permian Basin-Panhandle Native Seeds Project (PBPNSP)

PBPNSP Update

Jameson S. Crumpler

The PBPNSP region was initiated in 2017, and it continues to advance the TNS mission in the Permian Basin and Panhandle regions by engaging the energy industry; federal, state, and local governments; landowners; and natural resource managers in the use of native seeds in restoration and reclamation projects.

To date, we have collected seed from 245 wildflower and 380 grass populations throughout the project region. After a wet spring in 2025, PBPNSP staff have many opportunities to make numerous collections of cool season grasses such as western wheatgrass, squirreltail wildrye, and needle-and-thread, as well as numerous wildflower species. In order to make these new collections we are seeking access to private lands with native rangelands that will allow us to collect seeds.

In addition to making new seed collections, PBPNSP staff completed three new evaluation plantings in Bushland, Texas, on the James Bush Farm. A cool season evaluation planting of western wheatgrass, squirreltail wildrye, and little barley was installed in April 2025. In June, we planted 38 accessions of switchgrass and 68 accessions of alkali sacaton. These new evaluations will help us determine the range of adaptability of existing releases and allow us to decide if further germplasm development is needed. To date, PBPNSP has evaluated 96 named varieties, 106 accessions, and 44 native plant species.

Cooperative funding provided by the numerous supporters of the Permian Basin Panhandle Native Seed Project of Texas Native Seeds.

Downtown Midland, Native Plant Demonstration Garden

Jameson S. Crumpler

ConocoPhillips has partnered with the Permian Basin & Panhandle Native Seed Project (PBPNSP) region to establish and maintain a native plant demonstration garden. This demonstration garden is used to showcase native plants grown from seed sources developed by the Texas Native Seeds Program and its partner the Natural Resources Conservation Service Plant Material Centers. The hope for the garden is to show the capability of these native plant varieties to the oil and gas operators, whose offices surround the garden.

The demonstration garden was established during spring 2018, and currently contains 3 species of native wildflowers and 16 species of native grasses. All of these species are currently available on the commercial seed market. Each species is displayed in 10-foot square blocks with five-foot wide rows in between.

There are currently 9 empty blocks. PBPNSP plans to fill in those blocks with newer, regionally-appropriate seed sources that have been made available since 2018. In Fall 2024, PBPNSP staff and ConocoPhillips Quail Ranch Team staff planted 13 new blocks using plants grown from seed sources developed by the Texas Native Seeds over the last 6 years.

PBPNSP hopes to complete work on the updated downtown Midland demonstration garden in multiple phases, in Fall 2025 and Spring 2026. Each new planting will add new species which are quickly becoming commercially available.

Cooperative funding provided by ConocoPhillips.

PBPNSP Completes First Research Planting

Jameson S. Crumpler

The staff at the PBPNSP region completed the first research planting in February 2025. Few research plantings have been done in the South Plains region using commercially available native seed sources. We wanted to determine what is and isn't adapted to this region, and start to determine which season will provide the highest chances of successfully establishing native vegetation.

In February, PBPNSP staff met in Crosby County (east of Lubbock), Texas, and planted a seed mix containing 32 species of native grasses and wildflowers. The planting site was former row-crop land that had been fallow for many years and primarily used for equipment storage. The landowner contacted TNS staff about getting a seed mix recommendation. PBPNSP staff saw an opportunity beyond generating a seed mix and presented the planting idea to the landowner.

Following planting, PBPNSP staff will collect data twice per year for 3 years. The first round of data collection was completed in late May and the early results show some positive signs. The data will allow us to determine regional adaptation of commercially available seed sources, and the effectiveness of a species-diverse seed mix. Of the 32 species in the mix, 27 species are commercially available and 5 species are expected to be available in the next 5 to 10 years from the Texas Native Seeds Program.

Cooperative funding provided by the landowner.

Transplants are sorted and ready for planting at Bushland.

Jameson Crumpler

A rangeland restoration planting is installed along Alamito Creek in Presidio County, Texas.

NFWF West Texas Native Seeds Project Research

Colin Shackelford, Louis Harveson, and Anthony Falk

A two-year project funded by the National Fish and Wildlife Foundation's (NFWF) Pecos Watershed Conservation Initiative program was completed for West Texas and the Panhandle project regions. The project was a partnership between NFWF, 6 major oil and gas producers, the Natural Resources Conservation Service, and the US Fish and Wildlife Service. Through this funding we were able to focus on developing new native seed varieties and installing research plantings throughout the region.

- New seed source research made possible by the project include advanced evaluations of 2 grass species, as well as initial evaluations of an additional 3 grass species, and 1 forb species.
- Seed increase production efforts for 12 species were also made possible through this project.
- Selection of 3 populations for a new release of Canada wildrye were completed. These populations were moved to seed increase in preparation for commercial release.
- The project also allowed for 30 acres of new grassland restoration research plantings to evaluate seed mixes in real world settings.

These plantings not only helped us evaluate species' performances, they created new grassland habitats and supported the commercial native seed industry.

Cooperative funding provided by the Texas Department of Transportation, the USDA Natural Resources Conservation Service, Caesar Kleberg Foundation for Wildlife Conservation, ConocoPhillips, National Fish & Wildlife Foundation, A.S. Gage Foundation, Shield Ayres Foundation, Stan Smith, and the Railway Ranch.

Quail Ranch Lehmann Lovegrass Conversion Research Plantings

Jameson Crumpler, Colin Shackelford, Hagen Meyers, and Jesse Wood

During Spring 2023, Texas Native Seeds staff installed multiple research plantings on the Quail Ranch in Upton County, Texas. These plantings are located in rangeland invaded by exotic Lehmann lovegrass. The purpose of the plantings is to see which native seed mix and which land management treatments can aid in reducing Lehmann lovegrass invasions in native rangelands.

- PBPNSP staff have completed 3 sets of quantitative data collection and 2 sets of photo point data collection. Results from these data show early success with reseeding, and the need for chemical and mechanical control methods will be low.
- Lehmann lovegrass cover varied from 15% with April Spray + June Disk + August Spray treatment to 76% with April Spray + June Spray + June Seed treatment.
- Lehmann lovegrass can exhibit site dominance at varying levels of plant density, making diversification efforts even more challenging.

These findings suggest that longer treatment cycles are needed to control Lehmann lovegrass prior to reseeding with native seed sources.

Cooperative funding provided by ConocoPhillips.

Collecting data at the Quail Ranch.

Jameson Crumpler

Habitat Restoration & Management

Woody Plant Removal and Mammals in Grass Valley, Utah

Katie J. Pennartz, Evan P. Tanner, Michael J. Cherry, and Levi J. Heffelfinger

Grass Valley, located in south-central Utah, is a cold semi-arid system that supports agriculture, recreation, and wildlife. Grass Valley has historically been covered by pinyon-juniper forests in the foothills and sagebrush at lower elevations in the valley. In recent decades the juniper range has expanded, and the shrubs have increased because of changes in climate and disturbance. These increases in woody biomass can heighten the risk of wildfires and alter the quality of habitat for wildlife. To reduce fuel loads and maintain habitat, land managers have used mechanical methods like chaining and harrowing to decrease woody cover. As different people managed the land over time, each designed treatments with varying patch sizes, shapes, and edge ratios. Our study explores how these patterns of treated areas affect wildlife distribution and activity, including species like mule deer, elk, and rabbits. We aim to find out which treatment designs best support a wide range of species and how seasonal changes in habitat requirements affect these relationships. We placed 118 trail cameras in three zones: (1) inside the treated areas, (2) along their edges, and (3) in nearby untreated areas. We will be collecting data every 3 months for the next 2 years to observe species distribution and seasonal activity trends. The results will help guide future management to provide habitat for multiple species while reducing wildfire risk.

Cooperative funding provided by the Bureau of Land Management.

Raziel Flores

Prescribed Fire and Nearest Neighbor Plant Relationships

Forrest C. Fay, Weimin Xi, David B. Wester, and Sandra Rideout-Hanzak

Prescribed fire is a critical tool for restoring native grasslands, but the season in which fire is applied can lead to different vegetation responses. In Texas' coastal prairie we examined how summer and winter burns influenced nearest neighbor relationships—or which plant species grow next to each other.

- At the East Foundation's El Sauz Ranch, we burned large pastures (at least 500 acres each) in either summer or winter.
- We found that plants in burned areas grew closer together than in non-burned patches.
- There was also an increase in positive associations between species after both seasons of burning, that is more species were recorded in pairs growing next to each other.
- We also found that more forb species occurred in the nearest-neighbor pairs after either season of burning than in non-burned patches.
- Additionally, there were no differences between summer and winter burning in maximum fire temperatures.

These findings will provide insights for land managers, aiding in the development of precise prescribed burning prescriptions to meet specific management objectives.

Cooperative funding provided by the East Foundation.

Does Fire Rate of Spread Vary among Grass Species?

Summer Aguilar, Sandra Rideout-Hanzak, and Anthony Falk

The Texas Department of Transportation (TxDOT) must reseed areas disturbed by construction. They typically choose native grass species for roadsides that establish quickly, stabilizing soil and preventing erosion, and remain low growing. We evaluated fire rates of spread (ROS) in various native grass species commonly used by TxDOT to determine grasses that will slow wildfire spread, providing critical time for firefighters and enhancing roadside safety by minimizing smoke hazards.

We burned rows of hooded windmill grass, sideoats grama, slender grama, and pink pappusgrass at the same time to compare downwind ROS.

- Weather conditions at the time: temperature was 87.5 °F, RH was 54.1%, winds were sustained at 7.5 mph with gusts up to 13 mph.
- There were no significant differences in fuel loads or maximum fire temperature.
- Pink pappusgrass had the lowest ROS, requiring 31 seconds to travel one yard.
- Slender grama and sideoats grama had intermediate ROS at 13 seconds and 11 seconds per yard, respectively.
- Hooded windmill grass had the fastest ROS at 7 seconds per yard.

We recommend TxDOT investigate this more fully in various species to determine species that will inhibit ROS.

Cooperative funding provided by LEADING.

New Insights on Managing Whitebrush: Effective Chemical Options for Challenging Conditions

by Katie J. Pennartz, Evan P. Tanner, Megan K. Clayton, Anthony D. Falk

Whitebrush is one of several woody plant species steadily expanding across South Texas rangelands as a consequence of past management practices and changing weather patterns. While this shrub is native and a great resource for pollinators, it can exhibit noxious behavior, forming monocultures that crowd out desirable forbs and grasses. Additionally, its multi-stem growth form and ability to resprout from the root crown make mechanical treatments challenging and often unsuccessful. Unlike more common species such as mesquite or huisache, whitebrush has yet to find many successful herbicide control options for landowners looking to manage whitebrush on their properties, potentially because it's drought deciduous and loses its leaves when conditions are dry. To help fill this gap, we conducted herbicide trials on two ranches in Frio and Webb counties to determine the most effective and efficient methods via chemical control. Our trials had two goals: 1) Test the effectiveness of Invora™ (an herbicide in the picolinic acid family recently approved for use in rangelands) across seasons and 2) Determine if whitebrush can be successfully controlled by newly-approved and traditionally used herbicides during its dormant stage when no leaves are present, which would expand the treatment application window for landowners. In addition to our herbicide trials, we also collected whitebrush seed to measure seed viability across ranches to understand how potential recruitment from the seedbank may affect treatment longevity.

1. Invora™ shows strong results in every season

We tested both broadcast and individual plant application methods of Invora™ and observed very high levels of control—nearly 99% mortality in broadcast treatments and full mortality in individual plant treatments up to two years after application. Treatment success did not differ between seasons, with both Fall and Spring application timings resulting in high mortality. It may be that leaf condition at the time of spray is more important than time of year. This larger treatment window can be a real advantage when trying to coordinate plant condition, labor, weather restrictions, and access logistics for landowners.

2. Dormant season treatments offer moderate to very high levels of control

In addition to Invora™, we trialed three other mixtures commonly used for controlling brush in South Texas rangelands:

- DuraCor™ + Remedy Ultra™
- Milestone™ + Remedy Ultra™
- MezaVue™

All four chemical options resulted in over 99% mortality when applied as individual plant treatments in winter. Results from broadcast treatments were more variable, but Invora™ resulted in the highest observed plant mortality (98.9%), followed closely by MezaVue™ (82.7%), and Milestone™ + Remedy Ultra™ (78.5%). Although DuraCor™ + Remedy Ultra™ was slightly less effective with a 68% mortality in broadcast treatments, it stands out for its accessibility—neither chemical requires a pesticide applicator license and is among the more affordable options per acre.

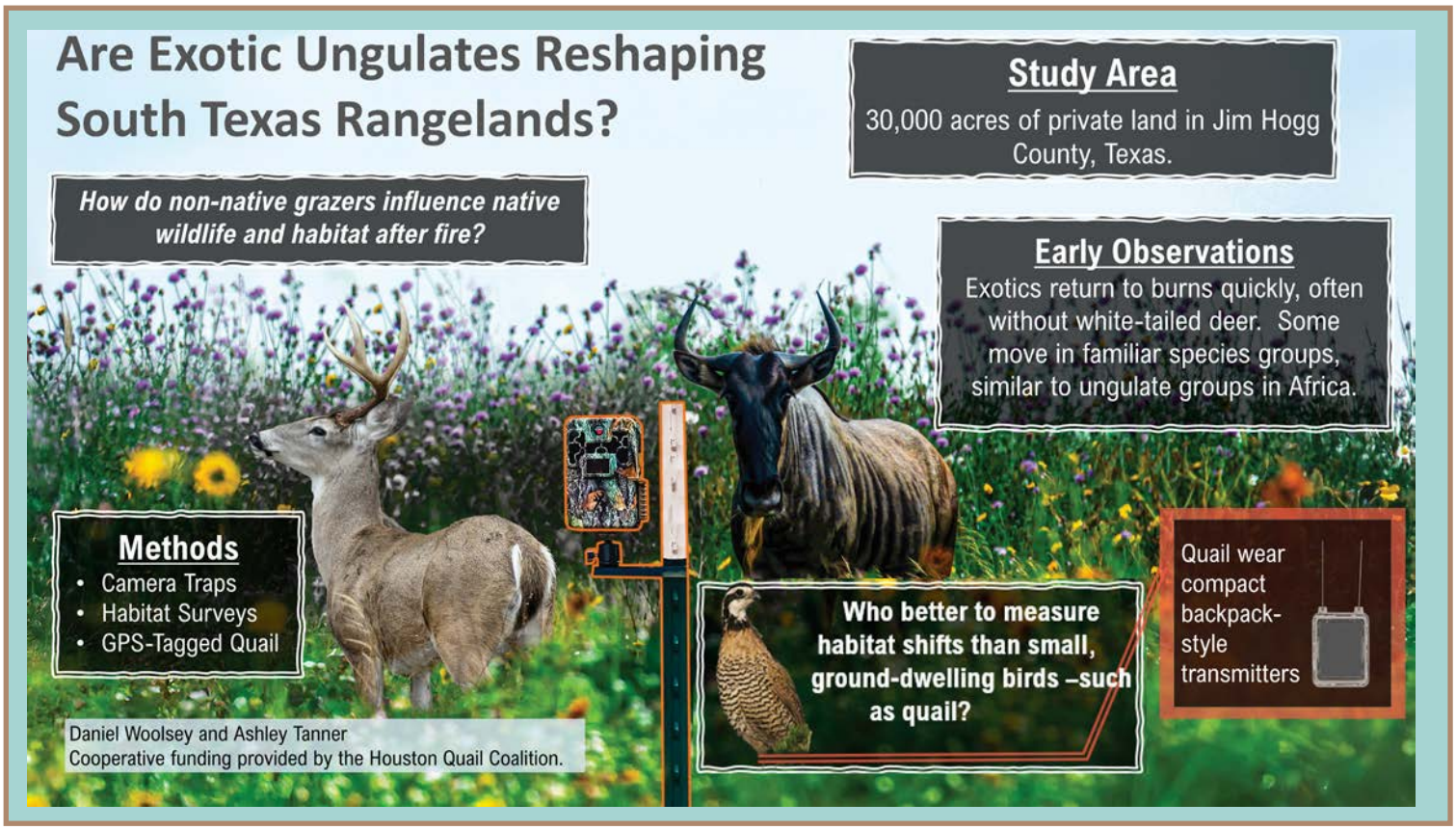
Despite strong overall results, we observed variability in treatment success between locations. Soil type, soil moisture, and recent weather all influence the effectiveness of herbicide applications. As weather patterns continue to shift, having flexible, season-spanning options becomes increasingly important for long-term success. The ability to treat whitebrush effectively during the dormant season could be a game-changer. Historically, many chemical treatments have relied on active leaf growth for uptake, but our findings show that herbicides are able to penetrate the thin bark and provide high levels of control even when plants are leafless. When applying the dormant season treatments, we mixed the herbicides with higher surfactant rates than the industry standard, (IST = 0.25% compared to 1% and 2.5%) to extend the amount of time the chemical can penetrate the bark. Theoretically this should increase the amount of active ingredients able to penetrate the bark, however we found no statistical difference between the different surfactant rates trialed. This could become even more relevant as more frequent and prolonged dormancy of this drought-deciduous shrub occurs from drought stress. Further research should be done to test if shrubs will react the same in their summer dormancy as they did in their winter dormancy and to test whether the surfactant rate needs to be increased at all for dormant season applications to be effective on whitebrush.

3. Understanding Reproduction is Key to Long-Term Control

Whitebrush can spread through both seeds and resprouting from its base. Herbicides that have both foliar and soil residual activity are particularly valuable for limiting regrowth and seedling recruitment after treatment. We found strong differences in seed viability between sites, with higher viability on the ranch with moister conditions located in Frio County. This reinforces the need for site-specific strategies that account for both the current plant population and future recruitment potential. The two-year nature of the study limits our ability to understand long-term treatment responses. Future research should observe the treated areas for longer periods of time to understand the longevity of the treatment effects.

Considerations for Landowners

If whitebrush is becoming a problem on your land, there are now more options than ever before. Our research supports existing herbicide recommendations and expands them by showing that dormant-season applications can be highly effective. Choosing the right product, application method, and timing depends on your goals, site conditions, and budget, but there is now more research-supported options available. While Invora™ had the highest control levels, it also had the highest cost—about 40% more per acre than MezaVue™ under broadcast rates. For some, the difference in price may outweigh the increase in performance. Cost-effectiveness depends on your goals: whether you're targeting complete control or simply looking to reduce density in a cost-conscious way.



The Chronology of Restoring Croplands to Mature Forests

Raziel Flores, Ashley M. Tanner, and Evan P. Tanner

Active reforestation has been occurring in the Lower Rio Grande Valley since the early 1980s to increase native habitat and connectivity for wildlife. These restoration practices involve planting native trees and shrubs on previous croplands. A passive form of reforestation is to allow cropland to go fallow and revert over time to a forest thicket. Research is needed to assess existing reforestation practices and determine how long it takes restored areas to develop important ecological functions, such as supporting wildlife populations of interest. Our research quantifies the chronological development of previous cropland into mature forests by comparing active and passive restoration from 4 periods within 40 years to old growth forest references.

Restoration sites are currently being visited for measurements of forest structure and the composition of plant species. Abiotic conditions of temperature, humidity, light penetration, and soil properties are paired with these restoration sites.

Data collection is still ongoing but preliminary data have already shown unexpected results. Not all restoration sites follow a linear path of development into mature forests. Some of the more recently restored sites are further developed than older sites. This leads to follow-up questions related to what causes some sites to have higher success than others. Our research can identify whether restoration efforts are meeting their intended goals and how to improve them.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service, and the USDA National Institute of Food & Agriculture.

Can Prescribed Fire Reduce Tick Density?

Rachel Walters, Sandra Rideout-Hanzak, Scott Henke, and Alynn Martin

Rangeland managers in southern Texas use prescribed fire to improve forage for livestock, prevent wildfires, and combat woody encroachment. We wondered if this tool may serve as a method to suppress the abundance of pest species, including vectors of disease such as ticks. We hypothesized that tick density and pathogen carriage will be reduced by prescribed burning, and that shorter, 3-year fire return intervals be more effective at reducing ticks than longer, 5-year return intervals. This study uses three randomly assigned prescribed fire treatments on patches of 500 acres or more in the Gulf Prairies and Marshes ecoregion: winter short-interval burns, winter long-interval burns, and non-burned control treatments. Vegetation in each patch is sampled monthly for questing ticks in two landscape types: immediately around tree mottes and through open grassland. We are also identifying all collected ticks to species. We have captured ticks of three species: cayenne ticks, Gulf Coast ticks, and American dog ticks.

Preliminary results indicate that tick density is higher around woody mottes than in grasslands. Woody tree mottes have favorable habitat conditions for ticks; they are cooler and more humid than surrounding grasslands. They also experience higher host utilization. Our results will help rangeland managers along the southern coast of Texas determine the scope of prescribed fire's impact on ticks, as well as guidelines for how it may be used as a component of pest management.

Cooperative funding provided by the East Foundation.

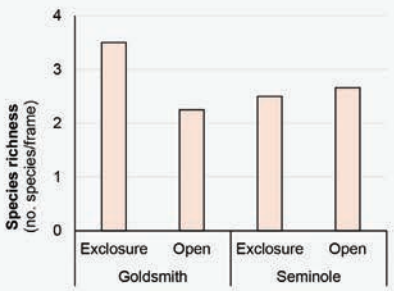
Influence of Small Mammal Herbivory on Rangeland Restoration Success

Problem: Factors such as drought, soil conditions, and disturbances influence the success of rangeland restoration. Small mammals such as jackrabbits, gophers, and rodents are important herbivores, but how they influence the success of native-plant establishment is unknown.

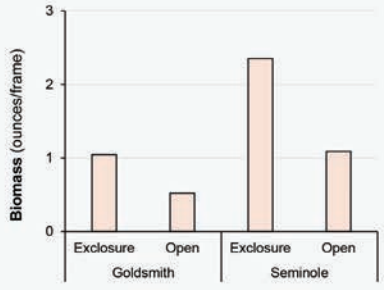
Researchers establishing a small mammal exclosure on a restoration site in western Texas

Question: Does grazing by small mammals such as rodents, cottontails, and jackrabbits reduce plant species richness and biomass on restoration sites?

Data Collection: We established small-mammal exclosures and adjacent unprotected plots on two restoration sites in western Texas (Goldsmith and Seminole). We compared plant species richness and biomass between exclosure and unprotected areas.



Number of plant species did not differ between exclosure and open areas.



However, biomass was higher in exclosures than adjacent open areas.

Preliminary Findings: Small mammals appear to influence plant biomass but not species richness. Reducing small-mammal herbivory may increase restoration success.

Herbert Magobwe, Fidel Hernández, Anthony D. Falk, Alejandro Bazaldua, Kristyn G. Stewart-Murphy, John E. Herschberger, and Benjamin L. Turner;
Cooperative funding provided by Exxon Mobile.

Update on the Distribution of Jamaican Boas in Jamaica

Sean Blundell, Roman Frorchard, Brent Newman, and Scott Henke

Jamaican boas are a US federally-listed Foreign Endangered Species and a Jamaican-protected species. During a 2015 CKWRI survey, Jamaica had about 30% of its forested habitat remaining, and 20 districts out of 63 still had Jamaican boas. Although they were once found on 100% of the island, only 9.1% of Jamaica still had snakes. We recently revisited each district to determine the current status of Jamaican boas.

- Jamaican boas are now only found in 11 of the 20 districts that had snakes in 2015, which are scattered across the island in distant patches ranging in size from 2 to 192 mi^2.
- Jamaican boas are estimated to occur within 281 mi^2 (6.6% of the island), which is a 27% decline in distribution from 2015.
- Cockpit Country, located in the western central part of Jamaica, is still the largest area (68%) where boas are found; however, this area is being mined for bauxite so habitat is at risk.

Jamaicans, overall, have a fear of snakes and often kill boas upon sight, even though they are protected. This fear, combined with habitat loss, will continue to reduce the abundance of Jamaican boas.

Cooperative funding provided by Vrije Universiteit.

Status and Trends in Texas Horned Lizards in the US

Javier Robledo and Scott Henke

Texas horned lizards (THL) are a well-known reptile species found in the southwestern US. We surveyed state wildlife agencies within their known range to determine legal status, current relative abundance, population trends, and distribution of THL during both 2014 and 2024.

- Historically, THL were found within nine states; however, in 2024 they were found in only six states, having been lost from Missouri, Arkansas, and Louisiana.
- Legal status of THL within states did not change from 2014 to 2024. They are state threatened in Texas, protected in Colorado and Oklahoma, and non-game in New Mexico and Kansas.
- Abundance and population trends did change. In 2014, about 36%, 19%, 29%, and 16% of the THL population was considered increasing, stable, decreasing, and gone, respectively, from its historic range. Today, THL population was considered 9%, 41%, 20%, and 30% increasing, stable, decreasing, and gone, respectively, from its historic range.
- Population trends of THL from 2014 to 2024 were: 12% declines from both increasing to stable and stable to decreasing, and 16% of the population removed.
- If current trends hold for THL, < 2% of their population will be increasing, while 17% and 22%, respectively, will be stable and decreasing, and 60% will be gone within 75 years.

We recommend conservation projects and actions to ensure THL will be around for future generations to enjoy.

Testing a Vaccine to Manage Disease in Cottontails

Cole Wzientek, Hannah A. Shapiro, Summer Aguilar, Norelia Solis, Sandra Rideout-Hanzak, Scott Henke, and Alynn Martin

Wildlife diseases pose a large risk to the survival of endangered species. Globally, domestic and wild rabbits are being threatened by the spread of Rabbit Hemorrhagic Disease Virus strain 2 (RHDV2), a highly contagious disease that kills 80-100% of infected rabbits. Although there is no known cure for the disease, a vaccine has been developed to prevent the initial infection with RHDV2. While the vaccine has been successfully used in domestic animals, its use as a management tool in wild rabbits is yet to be tested. In species like the vulnerable Davis Mountain Cottontail Rabbit (DMCR), vaccines may prove to be a crucial tool for ensuring their survival.

Our goal is to measure the immune response generated by the vaccine in eastern cottontails; a close relative of the DMCR and a common species of rabbit found throughout Texas. To accomplish this, we will vaccinate eastern cottontails and conduct regular blood tests to determine the quantity and longevity of the antibodies produced by vaccination. We also plan to vaccinate a subset of pregnant rabbits to assess any unintended side-effects vaccination may have on reproduction and survival. Our results will help us determine if vaccines are a feasible tool to manage the spread of RHDV2 in vulnerable populations of wild rabbits.

Cooperative funding provided by the Texas Parks & Wildlife Department.

A researcher uses telemetry to search for a collared cottontail rabbit in the Davis Mountains.


Alynn Martin


Brian Loflin

Baylisascaris procyonis: The Little-Known Health Threat in Your Backyard

Scott Henke

A zoonotic parasite is one that can be transmitted between animals and humans. Baylisascariasis is a serious parasitic disease caused by a zoonotic parasite. It can cause blindness, paralysis, and death in unlucky hosts. Hosts contract Baylisascariasis by accidently eating Baylisascaris procyonis eggs, which are found in soil contaminated by infected raccoon feces. Herein, I demonstrate the potential risk of exposure to this parasite to a suburban American community with a population of infected raccoons. Soil from 100 properties within neighborhoods of southern Corpus Christi, Texas, USA, was surveyed to determine if viable B. procyonis eggs were present.

- 27% of the residential properties were contaminated.
- Positive soil samples, on average, contained 886,971 B. procyonis eggs/ ounce of soil; of these samples, 92% of the B. procyonis eggs had motile larvae.
- Sites with contaminated soils appeared to be randomly located within residential properties; frequency of contaminated sites was similar between known raccoon defecation sites and random sites.

This study demonstrates that humans living in close proximity to B. procyonis-infected raccoons are potentially exposed to a significant health risk. People should be aware of the seriousness of this parasite.

Cooperative funding provided by the Harry L. Willet Foundation.

Texans' Attitudes about Owning Dangerous Wild Animals (DWA)

Harry Rakosky, Alynn Martin, Sandra Rideout-Hanzak, and Scott Henke

The novelty and thrill of owning an exotic animal often excites people to get one. However, some Texans believe that certain animals are too dangerous to allow as pets. Our objectives were to determine: 1) Texans attitudes, and 2) what species of exotic animals Texans currently maintain as pets.

- We received 600 responses across Texas to a survey. They related closely with the population in cultural background, age, household income, and education level.
- One-third of Texans agreed that individuals should have the right to own and keep a DWA at their home.
- Caucasians and Hispanics with less than a bachelors degree comprised the majority who believed people had the right to own DWAs. People of Asian, African, and Middle Eastern descent, and people with higher education levels had little interest in owning a DWA.
- Of those people who thought individuals should have the right to keep a DWAs, only 20% thought their neighbor was responsible enough to do so.
- Of those who would want a DWA, small cats (e.g., bobcats, ocelots, servals, etc.) were favored over canids (i.e., wolves), non-venomous snakes (e.g., pythons), large cats (lions, tigers), bears, venomous snakes, alligators, and finally monkeys.
- Most Texans believed if DWAs are to be kept, then their housing should be similar to zoo-style areas that are escape-proof.

We concluded that most Texans are poorly informed about DWAs and related laws.

Wildlife Experts Assess the Risks of Owning Dangerous Wild Animals

Harry Rakosky, Sandra Rideout-Hanzak, Alynn Martin, and Scott Henke

We asked 137 wildlife experts throughout the United States to rate the dangers of various species as pets to gain insight about potential of attack, injury, and zoonotic risk of various types of dangerous wild animals. We grouped species (N = 120) that have been documented as pets or confiscated from private owners into one of 16 animal categories (i.e., big cats, small cats, canid, big bear, small bear, raccoon, weasel, mongoose, ape, prosimian, New world monkey, Old world monkey, ungulate, constrictor, venomous, and crocodile). We asked experts to rank each animal category (1 – 4 with 4 being most likely) for likelihood to attack, seriousness of an attack, and potential to transmit zoonotic diseases.

- Within a category of animals, wildlife experts were consistent in danger rankings.
- Nearly two-thirds (64%) rated each animal category as having potential to attack humans, and 80% thought that if any dangerous wild animal attacked, it would require hospitalization and be potentially life-threatening.
- About half of those surveyed (64/137; 47%) thought a zoonotic disease risk is likely from wild animal ownership.

Wildlife experts questioned if the average person had enough knowledge of wild animal care, nutrition, and behavior to justify safe ownership.

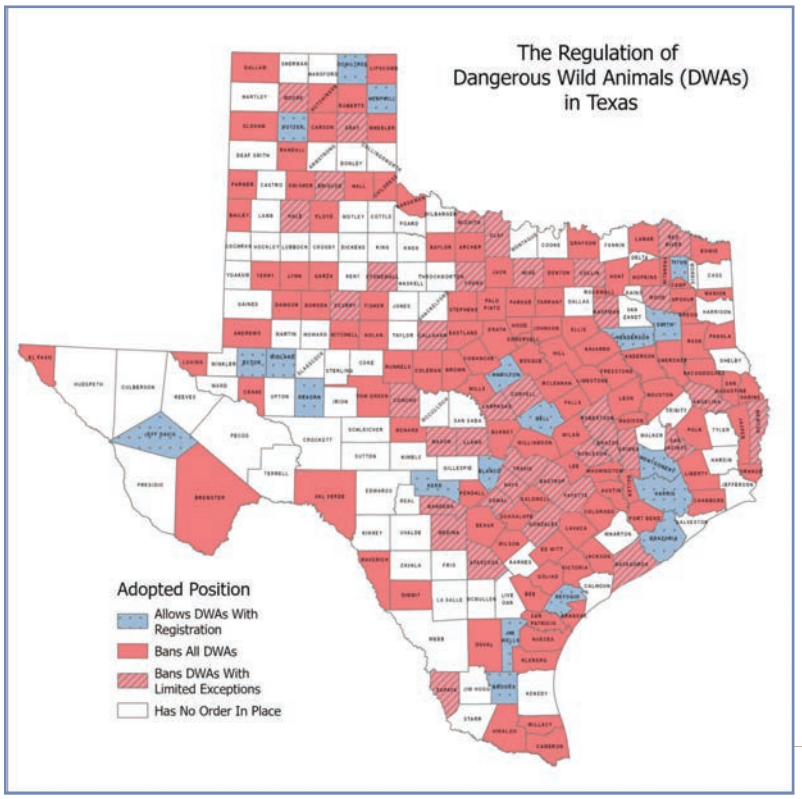
Texas County Laws Pertaining to Dangerous Animals

Harry Rakosky, Sandra Rideout-Hanzak, Alynn Martin, and Scott Henke

We surveyed Texas county commissioners and sheriff departments to determine which counties allow ownership of DWAs, and which are compliant with existing laws.

- We received responses from 252 of Texas' 254 counties (99% response rate).
- 112 (44%) counties stated that they have an outright ban on DWA ownership.
- 81 (32%) counties allow DWA ownership with no required licenses or regulations.
- 39 (15%) counties have a ban against DWAs, but certain species are exempt.
- 22 (9%) counties mandate that licenses are required to maintain a DWA.
- 7 (3%) counties had a discrepancy between the commissioner and sheriff's office.
- 99 counties (39%) were not operating in compliance with existing laws.

We recommend a single source of information regarding regulations that govern the private possession of DWAs.




Brian Loflin

Biology & Ecology

Predator Community in the Texas Hill Country

Miranda Hopper, Michael J. Cherry, Bailey Kleeberg, and Levi J. Heffelfinger

The Texas Hill Country hosts an array of predators, but there are few large predators. When large predators are removed, the abundance of smaller species and how they interact may be affected. Recently, there have been sightings of large predators moving back into the region. Understanding how the predator community is functioning now, and how it might change in the future, is critical for management of predator species.

Since September 2024, we have deployed 93 cameras on 17 properties across the Hill Country, with properties ranging from as far west as Brackettville to as far east as Austin. We are using these cameras to track changes in predator abundance and distribution. In the first 5 months, we recorded 1,198 predator detections. Unlike many other regions, the most detected species was gray fox at 34%, followed by coyote at 28%. Other species detected included northern raccoons (19%), Virginia opossums (4%), skunks (3%), and bobcats (1%). Additionally, 11% of total detections were ringtails, which are generally elusive and thought to be uncommon in the region. We did not detect any mountain lions or black bears.

As the predator community continues to change, our long-term camera monitoring will provide information on trends in species abundance and distribution, even of elusive species, such as ringtails. Additionally, it will allow us to track the potential recolonization of larger predators, such as black bears or mountain lions.

Cooperative funding provided by the Henry Hamman Program for Hill Country Conservation and Management, Amy and Tim Leach, and the Shield Ranch.

Black Bear Movements and Ecology Along the South Texas Border

Caitlin Camp, Amanda Veals Dutt, Levi J. Heffelfinger, Justin French, Louis Harveson, and David G. Hewitt

Black bears once roamed West Texas but because of predator control and habitat changes, were effectively extirpated in the early 1900s. Bears are now recolonizing Texas from Mexico and are returning to a significantly altered landscape, including a host of security measures along the US-Mexico border. To better understand how bears are using resources and moving through this altered landscape, we are capturing and fitting GPS collars to black bears in border counties in western and southwestern Texas. The objectives of this project are to identify resources important to bears and the corridors they use when traveling to and from Mexico. This information will indicate potential impacts of the border barrier system on bear movements. We have captured and fitted GPS collars to 2 females and 1 male. One female had 4 cubs that made it to yearlings the following year, indicating a successful breeding population in these counties. The male bear was caught along Devils River and traveled 100 miles within a month to the Serrianas del Burro mountains in Mexico. He has since made his way back near the Devils River, demonstrating their need to make transboundary movements. Black bears face numerous challenges as they recolonize Texas. Understanding this charismatic species can help ensure their long-term survival and successful re-establishment in the state.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.


Caitlin Camp

Resource Tracking by Coyotes

Kevin T. Lovasik, Miranda L. Hopper, Bryan D. Spencer1, K. Whitney Hansen, Randy W. DeYoung, Aaron M. Foley, J. Alfonso Ortega-Santos, David G. Hewitt, Landon R. Schofield, Tyler A. Campbell, John M. Tomecek, and Michael J. Cherry

In South Texas rangelands, food resources pulse over time, meaning they appear and disappear. Understanding how animals respond to pulsed resources provides information on the decision-making processes of animals and the importance of resources. For coyotes, a pulsed resource is white-tailed deer fawns. We wanted to understand how the birth pulse of fawns changed coyote movements on the landscape.

On the East Foundation's San Antonio Viejo Ranch in South Texas, where no supplemental feeding, predator control, or hunting occurs, we use GPS collars to model fawn availability through time using known birth and death dates from collared fawns. We then used GPS collar data from coyotes to see how the abundance of deer fawns influenced coyote selection of fawning areas and movement. We found that coyote movements were influenced by the pulse of fawns. Coyotes displayed patterns indicative of a searching behavior. They also increased selection of fawning areas when more fawns were present on the landscape. This behavioral response of coyotes to the pulse of white-tailed deer fawns highlights the temporary importance of fawns driving coyote space use.


Miranda Hopper

Cooperative funding provided by the East Foundation.

Cactus Ferruginous Pygmy-Owl Ecology in South Texas

Janice Travis and Ashley M. Tanner

The cactus ferruginous pygmy-owl is a small, threatened bird that lives mainly in dense oak mottes across South Texas rangelands. These owls are rare and persist primarily on private ranches, and while some research was conducted on the species in the 1990's, many aspects of their ecology remain unknown. To help close major knowledge gaps identified in the U.S. Fish and Wildlife Service's Species Status Assessment, we are studying their population, prey availability, and habitat conditions.

We plan to monitor the current population using acoustic recorders and targeted point-count surveys. To help optimize this effort, we are currently building a predictive model using known owl locations to guide survey efforts in 2026. To understand prey dynamics on working landscapes, we aim to assess how prey availability in oak mottes is impacted by grazing and by invasive grasses. Finally, we are exploring the use of historical aerial imagery, dating back to the 1930's, to assess long-term changes in oak motte size and persistence.

This study will help landowners and managers better understand where pygmy-owls are likely to live, and how land use may affect their habitat. We are currently in the planning phase and have started collecting spatial data and evaluating monitoring tools.

Cooperative funding provided by Robert J. Kleberg, Jr. and the Helen C. Kleberg Foundation.

Gray Hawk Ecology in the U.S. Southwest

Michael T. Stewart, Ashley M. Tanner, Bart M. Ballard, Jennifer A. Smith, and Brian A. Millsap

Since January 2019, we have been tracking Gray Hawks, a species listed as Threatened in Texas, in the Lower Rio Grande Valley of Texas using GPS transmitters. So far, we've collected over 600,000 location points to study how these birds use the landscape. By comparing areas that hawks used with areas they avoided, we aim to identify key habitat features that support their survival. We also conduct quarterly surveys to relocate birds we've marked with colored leg bands and track important information such as how many survive and successfully raise young. This helps guide conservation efforts for this Species of Greatest Conservation Need in Texas.

Last summer, we expanded the study into Arizona, where we fitted five migratory Gray Hawks with GPS transmitters. This is the first time their full migration paths will be tracked. We plan to study where they spend the winter, how far they travel, and how large their home ranges are during both the breeding and non-breeding seasons.

In addition, we tracked 30 unpaired Gray Hawks to study how they explored and used habitat patches in a fragmented landscape. We found that males and females used different types of areas, but both preferred patches with a mix of vegetation heights. These small, diverse patches often served as temporary stopovers and may play a key role in helping hawks find future breeding sites.

Cooperative funding provided by the William Burnham Memorial Fund, the US Fish & Wildlife Service, and Michael Stewart.

Michael Stewart

Researchers attach a GPS transmitter to a gray hawk in Arizona. This effort marks the first time migratory movements of this species will be tracked, providing new insights into their migration routes and seasonal habitats.

A brush pile perch that will mimic natural brush piles and attract birds to perch and disperse seeds.

The Seeds of Recovery: Wildlife's Role in Thornscrub Restoration

Kyndra McGovern, Ashley M. Tanner, Evan P. Tanner, and Jon Dale

The Tamaulipan Thornscrub – a rare group of thorny shrubs and trees located in southern Texas and northeastern Mexico – has experienced intense loss. Human development has broken this habitat into small, scattered patches, preventing wildlife movement and seed dispersal, which is crucial for plant reproduction. We will identify how seed dispersal by birds, mammals, and ants is impacted by different degrees of urban, rural, and natural areas.

On top of habitat loss, climate change brings hotter temperatures and less predictable weather, making maintenance of thornscrub forests even harder now and in the future. Using current plant distribution and climate data, we will predict how climate change could impact where thornscrub species could survive in the year 2100.

Restoring thornscrub has also proven difficult, time consuming, and costly. Understanding how this system naturally regenerates via bird seed dispersal and how bird seed dispersal improves seed diversity in the soil bank will help. We will be testing three bird perch designs: a 3-tiered perch in a "T" shape, a single pole, and a mock brush pile – which we know are used by birds already. These perches are cheap, easy to construct, and made with natural materials to allow one-time installation that will encourage birds to use the space.

By examining thornscrub functions, we hope to enhance restoration efforts to create a more diverse and resilient ecosystem capable of withstanding ongoing and future changes in the environment.

Cooperative funding provided by US Customs & Border Protection in partnership with US Fish & Wildlife Service.

Changing Sounds in Grasslands

Laura Beck, Evan P. Tanner, Ashley M. Tanner, Darren Proppe, and Samuel Fuhlendorf

Animal calls evolved to be transmitted best in their native environments—a concept known as the acoustic adaptation hypothesis. However, this relationship is being disrupted by habitat alterations, for example, woody plant encroachment. Encroachment alters acoustic conditions through changes in vegetation structure, temperature, and humidity, potentially creating a communication mismatch for native species.

We conducted research at the Shield Ranch near Austin, Texas, in: (1) high woody density, (2) medium density after partial removal, and (3) grassland. We played and recorded tones and calls from various bird species to measure sound transmission in each environment. Sensors collected temperature and humidity conditions during these recordings.

Early results from our densest woody sites confirm the acoustic adaptation hypothesis. Woodland species' calls maintained clarity and intensity over longer distances, while calls of species native to grasslands degraded more quickly. Higher frequency sounds performed worst overall. These patterns suggest woody encroachment favors woodland birds over grassland specialists.

When acoustic mismatch occurs due to encroachment, species detection drops for both surveyors and the animals themselves. This can bias survey and research results while also impacting a species' capability to survive and reproduce. Understanding these acoustic changes can improve wildlife monitoring and management of species in encroached landscapes.

Cooperative funding provided by the Shield Ranch and the Rotary Club of Corpus Christi Harvey Weil Sportsman Conservationist Award.

The Many Functions of Edwards Plateau Ecosystems

Dakota Moberg, Ashley M. Tanner, and Evan P. Tanner

The Edwards Plateau is experiencing rapid changes from urban growth and land fragmentation. Ashe juniper is a native, but controversial, species that has also altered the landscape. Fire suppression and overgrazing has allowed Ashe juniper to spread from isolated patches to dense stands in areas that were once grasslands. We hope to better understand the role of Ashe juniper in the landscape as part of the Henry Hamman Program for Hill Country Conservation and Management.

'Ecosystem multifunctionality' measures how well a landscape supports different processes and functions at once. Our research focuses on how climate, slope, and different levels of Ashe juniper canopy cover affect these processes and functions. During summer 2025, we collected soil and vegetation data to measure ecosystem multifunctionality from 250 plots across the Edwards Plateau. We also plan to explore how cultural, aesthetic, and economical values of Ashe juniper impact management techniques using focus groups.

Our goal is to identify how Ashe juniper influences ecosystem multifunctionality by combining ecological and social sciences. This knowledge will help guide management techniques that will promote a healthy and resilient landscape for generations to come.

Cooperative funding provided by the Henry Hamman Program for Hill Country Conservation and Management, and by Amy and Tim Leach.

Breanna Green

Investigating SARS-COV-2 Prevalence in Wildlife across Texas

Joseph A. Hediger, Sarah A. Hamer, Gabriel L. Hamer, Walt E. Cook, and Michael J. Cherry

Deer hunting and venison production are major parts of the economy in North America, especially in Texas. Recently, white-tailed deer were found to carry SARS-CoV-2 (the viral agent of COVID-19 in people). Studies in the U.S. and Canada have shown that wild deer can hold many genetic forms of the virus. During fall 2021, we found that over 94% of tested deer on one farm were infected.

There are still many unknowns about how the virus spreads in deer. It may pass from people or other animals and then spread among deer or other species. We also do not yet know how the virus affects deer health. Our team, with broad experience from the COVID-19 pandemic, will study the risk this virus poses to the deer industry and free-ranging deer. We will work with landowners across Texas to find out: (1) how often deer are infected, (2) if the virus moves between deer, livestock, or other wildlife, (3) what virus types exist in deer and how transmission flows, and 4) how infections affect deer health.

While we are continuing to sample across Texas, as of June 2025, we have found 20% of all wildlife sampled (deer, rodents, raccoons, exotics, etc.) tested positive for SARS-CoV-2 antibodies. In white-tailed deer, out of 1,958 deer sampled, 24% tested positive for antibodies. These findings indicate these animals were infected at some point prior to sampling. Our results will guide how to manage disease risk, improve biosecurity, and protect both deer and other animals.

Cooperative funding provided by the USDA.

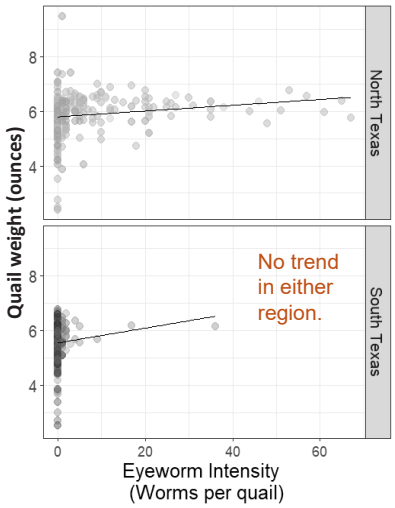
Can Eyeworms Influence Quail Condition and Population Abundance?

Problem: Northern bobwhite populations may seem low even in years with good rainfall. Could eyeworms be a cause for this?

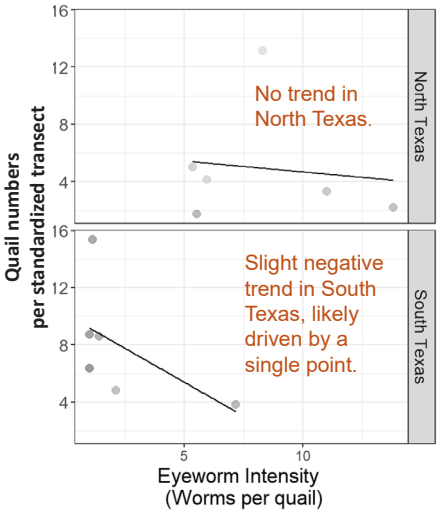
Methods: Using 9 years of bobwhite weights and 12 years of Texas Parks and Wildlife Department population survey data, we addressed two questions regarding eyeworm load.

Take Home Message: Eyeworms do not appear to impact quail condition or population abundance in either North or South Texas.

Question 1: Does eyeworm load influence quail body mass?



Question 2: Does eyeworm load influence quail numbers?



Maedean L. Cardenas, Liza A. Soliz, Alejandro Bazaldua, Alynn M. Martin, Fidel Hernández; Cooperative funding provided by South Texas Quail Coalition.

Insect Diversity and Eyeworm Presence across Texas

Liza A. Soliz, Maedean L. Cardenas, Alejandro Bazaldua, Andrea Esqueda, Fidel Hernández, and Alynn Martin

Northern bobwhite populations are thought to be limited by the presence of parasites, specifically eyeworms, which are more common in bobwhites in northern Texas than southern Texas. However, the reason for differences in eyeworm prevalence in bobwhites between the northern and southern parts of the state remains unclear. Bobwhites are thought to acquire eyeworms by feeding on infected insects (called intermediate hosts), such as grasshoppers and cockroaches. We hypothesize that the distribution of competent insect hosts—species capable of being infected with eyeworms—may be influencing these regional patterns.

We are sampling grasshoppers and cockroaches from northern to southern Texas across eight counties spaced approximately 100 to 150 miles apart. We will compare insect species diversity across the counties and use genetic methods to screen collected grasshoppers, crickets, and cockroaches for the presence of eyeworms. Additionally, no data currently exist on eyeworm occurrence in bobwhites from central Texas (e.g., Mason and Kerr counties). Detecting specific grasshopper species that act as carriers of eyeworms can help identify unsampled areas of Texas (e.g., central Texas) where eyeworms are likely to be present.

Cooperative funding provided by South Texas Quail Coalition and Houston Quail Coalition.

Toxoplasmosis in Southern Texas White-Tailed Deer

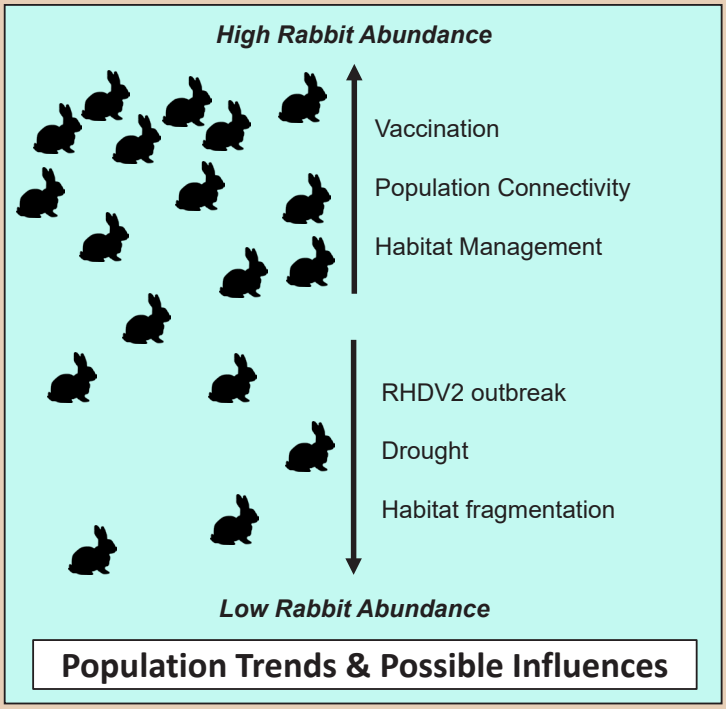
Kendall L. Bancroft, Alynn Martin, Tyler A. Campbell, Randy W. DeYoung, Aaron M. Foley, David G. Hewitt, Clayton D. Hilton, Miranda L. Hopper, Kevin T. Lovasik, J. Alfonso Ortega-S, Jason Sawyer, Landon R. Schofield, Bryan D. Spencer, Ashley M. Tanner, and Michael J. Cherry

Toxoplasmosis, caused by the parasite *Toxoplasma gondii*, is a disease with important implications for human health, but it remains understudied in wildlife. Humans can become infected by eating undercooked meat, yet prevalence data across species are limited. As popular game animals and intermediate hosts, white-tailed deer play a key role in disease ecology and potential human exposure. *T. gondii* is also known to alter host behavior—reducing fear, increasing aggression, and promoting risk-taking—which may influence population dynamics.

From 2020–2023, we captured white-tailed deer on East Foundation's San Antonio Viejo Ranch in South Texas to estimate *T. gondii* prevalence and evaluate effects on behavior, reproduction, and survival. Blood tests showed 49% (29/59) of females were positive. Preliminary movement analyses revealed that during fawning season, infected deer traveled greater cumulative distances and were less averse to roads than uninfected deer, potentially increasing risk and vulnerability. While overall fawn survival remained low across all years and showed no consistent difference based on the mother's infection status, one exception occurred in 2021—a year of above-average rainfall. That year, fawn survival rose to 46% among uninfected mothers but remained low (20%) for fawns from infected mothers.

These findings suggest *T. gondii*-related behavioral changes may have greater consequences under environmental conditions that are favorable for fawn survival. Further analyses are underway to better understand ecological and public health impacts.

Jessica Johnston

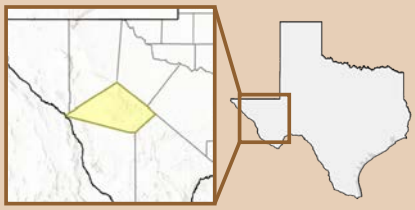


Davis Mountain Cottontail Population Viability

QUESTIONS: How will Rabbit Hemorrhagic Disease Virus 2 (RHDV2) and population isolation impact survival of Davis Mountain Cottontail Rabbits?

METHODS: We will use the computer program VORTEX to estimate population trends in Davis Mountain cottontails through different random events, such as disease and drought.

STUDY AREA: The Davis Mountains in Jeff Davis County, Texas (brighter yellow in the figure to the right).



IMPLICATIONS: Our findings may be applicable to other vulnerable rabbit and hare species.

Cole Wzientek, Hannah A. Shapiro,
Sandra Rideout-Hanzak, Scott E. Henke, Alynn M. Martin

Cooperative funding provided by the Texas Parks & Wildlife Department.

Davis Mountain Cottontails and Rabbit Hemorrhagic Disease Risk

Hannah A. Shapiro, Cole Wzientek, Norelia Solis, Summer Aguilar, Alynn Martin, Sandra Rideout-Hanzak, and Scott Henke

Davis Mountain Cottontail Rabbits (DMCR) were recently listed as a separate species from eastern cottontails. They are only found above 6,000 ft in the Davis Mountains of western Texas, and very little is known about their habitat requirements and behavior. Their populations were at risk of extinction because of climate change and long-term droughts, but are now subject to an additional threat: disease. Outbreaks of the emerging Rabbit Hemorrhagic Disease Virus 2 (RHDV2) disease—a highly lethal strain of RHDV, formerly found in Europe–has raised concerns for DMCR persistence in western Texas.

RHDV2 emerged in the southwestern US during spring 2020 and has spread from New Mexico to western Texas, where it is assumed to have caused high mortality in rabbits and hares. However, impacts of RHDV2 on DMCR remain unknown. This study will attempt to (1) estimate the population size of the DMCR, (2) investigate their movement and habitat use, and (3) look for the presence of antibodies for RHDV2 in them. We will trap DMCRs to collect blood and tissue samples and equip them with GPS telemetry collars to learn their habitat needs and observe their movement. Our results will increase the general knowledge base about DMCR and help land managers develop more effective habitat management actions.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Duston Duffie

Invasive Plants Change Grassland Communities in South Texas

Duston R. Duffie, Andrew J. Mullaney, Cord B. Eversole, Scott Henke, Gabriel Andrade-Ponce, and Fidel Hernandez

In South Texas, grasslands are threatened by the advance of woody plants and the increase of nonnative and invasive grasses. These invasions can lead to changing plant structure and impact wildlife species. We assessed the effects of woody plant advances and invasive grasses on plant communities at the Welder Wildlife Refuge in San Patricio County, Texas, US. In 2024, we measured plant structure and species make-up across 145 plots, and we determined the size of plant communities using aerial photos. We compared these to maps of historical plant communities of the same areas.

- We found a change in plant communities to thicker cover with more woody shrubs across the property over the last 40 years.
- Many plant communities have changed from open areas with low growing shrubs to thicker areas with taller mesquite and huisache trees.
- Old World bluestems, first recorded on the property during the 1980's, have become a dominant species, especially in clay soils. Also, areas with Old World bluestems contained fewer grass and forb species.
- Plant communities on deep sandy soils appear to be more resilient to woody advances and invasive grasses, but shrubs still increased over time.

This work will be used to provide managers information on focused management efforts to control the spread of invasive plants.

Cooperative funding provided by the Rob and Bessie Welder Wildlife Foundation.

Reptile and Amphibian Diversity in Native vs. Invaded Grasslands

Duston R. Duffie, Andrew J. Mullaney, Cord B. Eversole, Scott Henke, Gabriel Andrade-Ponce, and Fidel Hernandez

Reptiles and amphibians can serve as gauges of ecosystem health due to the many feeding roles they fill. However, little is known of their response to invasive plants and habitat change in South Texas. We assessed reptiles and amphibians at the Welder Wildlife Refuge in San Patricio County, Texas, US, from 2020 to 2023. We surveyed areas with (1) native plants, (2) invasive plants, or (3) mixed plant types.

- We recorded 530 captures of 31 reptile species and 6,370 captures of 12 amphibian species.
- Diversity differed between invaded and other plots for reptiles, but not for amphibians.
- Reptile species not captured in invaded plots were typically linked with open prairies.
- Diversity differed between dry years and years with normal or above-average rainfall for both amphibian and reptile species.

In semi-arid grasslands, amphibian species take advantage of periods with heavy rain to breed, so rain may have a bigger effect on diversity than invasive plants. Reptiles appear to be flexible to in-between levels of invasive plants. These in-between levels may be the level to consider for maintaining diversity on grasslands, which can affect the health and conservation of grassland ecosystems.

A western diamondback rattlesnake captured in an area with native plants

Cooperative funding provided by the Rob and Bessie Welder Wildlife Foundation.

Seasonal Activity of Ticks in Southern Texas

Rachel Walters, Ashley Reeves, Scott Henke, Sandra Rideout-Hanzak, and Alynn Martin

Understanding seasonal activity periods for disease-carrying insects is important for assessing human and animal health risks. South Texas is home to several tick species, including the lone star, American dog, and brown dog ticks, all known to carry pathogens that affect both humans and wildlife. Ticks have larval, nymphal, and adult life stages that represent different disease risks to humans and animals. Yet, little is known about their seasonal activity peaks in the Gulf Coast Prairies and Marshes ecoregion.

- We collected over 3,600 ticks during 2 years of monthly surveys.
- Adult activity peaked during fall, while nymphal activity peaked during spring.
- Larval activity peaked in late winter although they remained active through spring.
- Overlap in larval and nymphal activity suggests that multiple life stages may feed simultaneously on the same hosts, which could influence disease transmission.

These findings highlight the need for region-specific tick surveillance and public health strategies.

A nymphal tick in the Amblyomma genus from southern Texas

Cooperative funding provided by the East Foundation.

Novel fungus found in Black Vultures

Michael Kalisek, Ashley M. Tanner, Evan P. Tanner, Clayton Hilton, Christine Hoskinson, Narayan Paul, Richard Sramek, Katherine Garwood, and Michael Bodenchuk

Trichosporon asahii is a naturally occurring fungus that can cause illness in humans with weakened immune systems. It had never been found in vultures before this study. We captured and tested black vultures in South Texas to determine what pathogens they carry.

- Two black vultures tested positive for *T. asahii*, making this the first known detection both in vultures and within their bird order, Accipitriformes.
- This is only the second documented case of this fungus being found in any wild bird.
- Vultures may be exposed to this fungus through their scavenging habits, potentially spreading it over large areas.

With rising human-vulture interactions, future studies are needed to understand how vultures may spread this fungus and the possible risks to public health.

Cooperative funding provided by the USDA Wildlife Services.

Slope Ruggedness and Exotics in the Texas Hill Country

Miranda L. Hopper, Michael J. Cherry, Bailey Kleeberg, and Levi J. Heffelfinger

The Texas Hill Country is characterized by a range of landscape variations, from rolling hills to steep, rugged slopes. It is also home to several non-native wildlife species, which may influence native species, such as white-tailed deer. Landscape features may affect the distribution of these species and the way they interact across space and time.

From January to March 2025, we deployed 63 cameras across slope positions and terrain ruggedness in the central Hill Country area. We used these photos to determine where aoudad, feral hogs, and white-tailed deer were on the landscape and when they were most active.

- Aoudad detections were consistent across slope positions and terrain ruggedness.
- Feral hogs and white-tailed deer detections were lower in rugged and steep slope areas.
- White-tailed deer were generally most active in the morning and evening. Aoudad were most active during the day, with a peak at sunset. Feral hogs showed more uniform activity, but they were generally most active at night.
- White-tailed deer showed relatively high activity overlap with feral hogs and aoudad. They had more overlap with aoudad at low slopes and with feral hogs at mid and high slopes.
- Aoudad and feral hogs showed little overlap in activity patterns.

Our results shed light on how landform and exotic wildlife species may impact native wildlife.

Cooperative funding provided by the Henry Hamman Program for Hill Country Conservation and Management, Amy and Tim Leach, and the Shield Ranch.

Baseline Blood Values for Wild Nilgai in South Texas

Tiffany Pope, Alynn Martin, Miguel Palermo, and Ashley Reeves

Nilgai antelope, native to Asia, have formed large free-ranging populations in southern Texas since their introduction nearly a century ago. Initial stages of disease can often be detected by reviewing blood samples. However, health monitoring in nilgai is limited due to a lack of species-specific diagnostic standards. The most common analyses are (1) complete blood count, which evaluates red blood cells, white blood cells, and platelets, and (2) blood chemistry profiles, which measure indicators of organ function. The results of these tests are then compared to that species' population-based normal intervals to determine if they are experiencing effects of disease.

- We collected blood samples from 146 adult female nilgai.
- We developed baseline values for 20 complete blood cell count values and 19 blood chemistry values.
- Several blood value ranges varied based on pregnancy, lactation, and ranch location, showing how health may change with environment or life stage.
- Comparisons to domestic and wild bovids showed important differences, highlighting the need for species-specific health reference data.
- These reference ranges can be used by landowners, wildlife biologists, and veterinary professionals to detect illness or stress in herds.

This study provides the first health benchmarks for free-ranging nilgai and supports opportunistic disease surveillance to better inform herd health management.

Cooperative funding provided by the East Foundation.

Arrival and Spread of RHDV2 in the Southwestern US

Cole Wzientek, Hannah A. Shapiro, Sandra Rideout-Hanzak, Scott E. Henke, and Alynn M. Martin

Rabbit Hemorrhagic Disease Virus (RHDV) is a fatal virus that first emerged in Europe in the 1970s. By 2007, RHDV spread to a nearly global distribution, killing 250 million domestic and wild rabbits and hares. In 2010, a new strain of the virus, called RHDV2, emerged in France, and in 2016 it was discovered in domestic rabbits in Canada. RHDV2 was quickly determined to be more dangerous than RHDV, as it can infect younger rabbits across a wider range of species and has higher risk of death. RHDV2 was first detected in wild North American rabbits in New Mexico in March 2020 and rapidly spread into neighboring US states and Mexico. We used five years of case data from the Wildlife Health Information Sharing Partnership to analyze spatial and temporal patterns of disease spread.

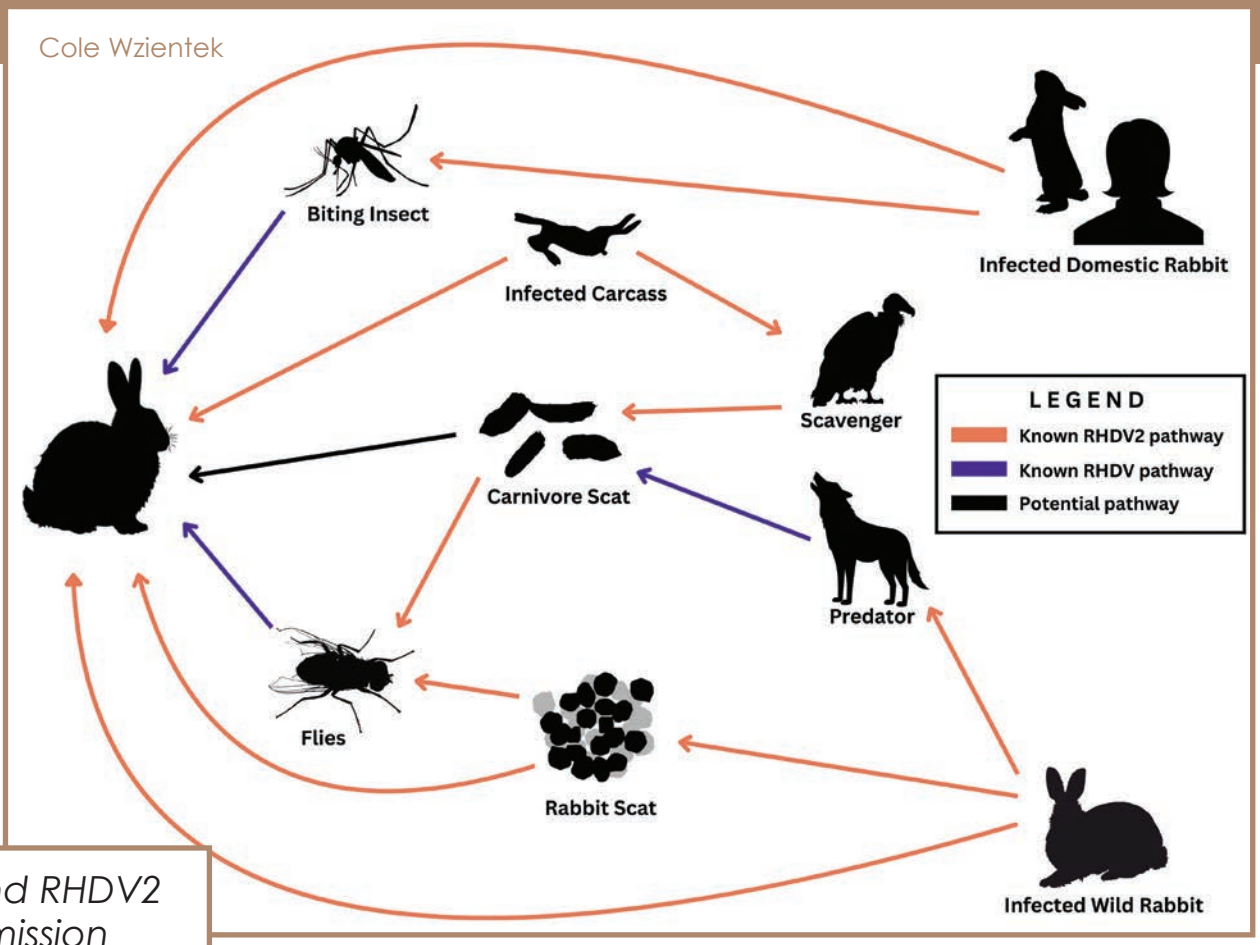
- We found more than 5,000 reported rabbit mortalities and identified several counties in Texas and New Mexico that experienced multiple, distinct outbreaks.
- RHDV2 outbreaks are becoming less common either due to lack of reporting, gaining of natural immunity, or low rabbit populations.
- Outbreaks can occur multiple times per year within a county and occur year-round, but are most common in the spring when rabbit densities are high.

The contagiousness and effects of RHDV2 raise concerns for wild rabbit populations across North America. An effective RHDV2 management strategy should provide options to protect wild rabbits and hares in this region.

Cooperative funding provided by the Texas Parks & Wildlife Department.

A Davis Mountain cottontail rabbit with a GPS collar to track its movement and locations

Cole Wzientek



RHDV and RHDV2 transmission pathways

Davis Mountain Cottontails Post-RHDV2 Outbreak

Hannah A. Shapiro, Cole Wzientek, Alynn M. Martin, Sandra Rideout-Hanzak, and Scott E. Henke

Rabbit Hemorrhagic Disease Virus 2 (RHDV2) invaded North America in 2016 and eventually spread throughout wild, native cottontails and hares in the western United States. There have been several RHDV2 outbreaks in wild rabbit populations across 14 states in the western United States. Documentation of RHDV2 in western Texas in 2020 sparked concern about the potential impact on the Davis Mountain Cottontail Rabbits (DMCR), a species of greatest conservation need. Using nearly 50 years of standardized roadside rabbit and hare survey data collected by the Texas Parks and Wildlife Department, we documented population peaks in Texas.

- We found that peaks occurred every 5 to 7 years with large variability in abundance from 1977 to 2024.
- A noticeable reduction in abundance occurred in 2012, possibly because of unprecedented drought conditions in 2011.
- A second reduction in abundance followed a documented outbreak of RHDV2 in 2020.

We plan to conduct blood testing of DMCR to assess past exposure to RHDV2 and the potential threat of the virus to the population.

Cooperative funding provided by the Texas Parks & Wildlife Department.

Keeping Your Childhood Alive: Management Recommendations for Texas Horned Lizards

By Scott Henke

The Texas horned lizard is an iconic reptile species of the southwestern United States. Most Texans have fond memories of growing up with these miniature dinosaurs. Horned lizards are as Texan as cowboys, longhorns, the Alamo, and listening to coyotes howl at the moon. You'll even find horned lizards in classic movies like Old Yeller. Unfortunately, many young Texans have not experienced the thrill of seeing a horned lizard in their backyard. This is because the Texas horned lizard population has declined in abundance and distribution during the past several decades. Fortunately, many Texans have an intense interest in stopping the decline of Texas horned lizard populations so as to not watch their childhood memories die.

My graduate students and I have been blessed to be able to study Texas horned lizards over the years, and we've learned a few things about their habitat requirements. Here are some recommended actions you can take to entice more horned lizards to your property and help slow their decline.

1. Texas horned lizards are a Threatened species in Texas and a Protected species in Oklahoma. Therefore, throughout most of its distribution, it is illegal to pick up, transport, or possess a Texas horned lizard. Instead, it's best to let the lizard be and watch it from a distance without disturbing it.
2. Avoid the use of broadcast pesticides. Pesticides could kill horned lizards directly by accumulating toxins within their body or indirectly by killing harvester ants, the main food source of adult Texas horned lizards. Without a stable food supply, horned lizards must leave an area or they will die. If pesticides are needed, (e.g., to combat fire ants), then spot treatment is recommended rather than broadcast pesticide application.
3. To improve pasture land for horned lizards, use prescribed fires to remove ground litter. Texas horned lizards avoid areas with substantial ground litter because ground litter can impede their movements. Burning is a useful tool to decrease ground litter; however, it could be directly harmful to lizards. Therefore, conduct your prescribed fire during December through mid-February when horned lizards are underground during their brumation period. Once lizards re-emerge in the spring, ground litter will be gone and allow ease of movement.

4. If you operate cattle, avoid overgrazing your pasture by livestock. Texas horned lizards do not appear to be negatively affected by low to moderate grazing of livestock. However, overgrazing by livestock on rangelands may substantially reduce cover needed by horned lizards for thermoregulation or to escape from predators.

5. Avoid disking or grading roads during the active period of horned lizards. Texas horned lizards are active from mid-March through mid-October and often cross secondary roads and use the roadsides as resting and bedding sites. Disking or grading roads during this period could kill the lizards directly. Also, road maintenance could uncover them if they are using secondary roads for resting, nesting, or bedding sites, thereby exposing them to predators. This may be particularly critical when the ambient temperature is too cool for the lizards to seek protective cover after being disturbed.

6. When driving on secondary or dirt roads, drive slowly and keep an eye out for horned lizards on or crossing the road. Hit-by-vehicles is a substantial mortality factor of Texas horned lizards.

7. Create 1 yd^2 areas devoid of vegetation and ground litter. Being an ectotherm, horned lizards use the sun to regulate their body temperature. Small cleared areas provide horned lizards access to direct sunlight, which is needed to help them maintain optimal body temperature. When their body temperature rises above the preferred level, horned lizards seek shelter. Also, newly-fertilized harvester ant queens seek open areas to establish new colonies. Therefore, the creation of several small open areas per acre of land will serve two beneficial purposes for aiding horned lizards.

8. Create a mosaic habitat of open areas intermixed within dense cover of bunch grasses. Such patchy environment will give horned lizards the proper thermoregulatory mix of habitat and offer sufficient escape cover from predators. Areas where vegetation canopy cover may be up to 100% (i.e., no sunlight reaching the ground) are suitable, as long as the individual stems of plants are not too close together to impede the movement of horned lizards. Bunch grasses form clumps that allow horned lizards to easily move among the grass clumps; whereas carpet grasses form a thick mat that can impede horned lizard movement.

9. Remove feral domesticated predators. Keep in mind that avian predators (i.e., hawks, owls, roadrunners, etc.) are protected by federal law and cannot be killed or trapped. However, feral cats and dogs also are predators of horned lizards and can be removed from an area. Contact the local Humane Society for assistance in removing these domestic predators.

10. Develop a habitat that contains a diversity of native plant species. A diverse community of native plants will attract a diverse community of insects. Although adult Texas horned lizards prefer a diet of harvester ants, a number of other insect species are consumed. Also, juvenile Texas horned lizards appear to eat a greater variety of insects than their adult counterparts. By increasing the amount of prey available for horned lizards to consume, you reduce the chances that lack of food will be the limiting factor governing their abundance.

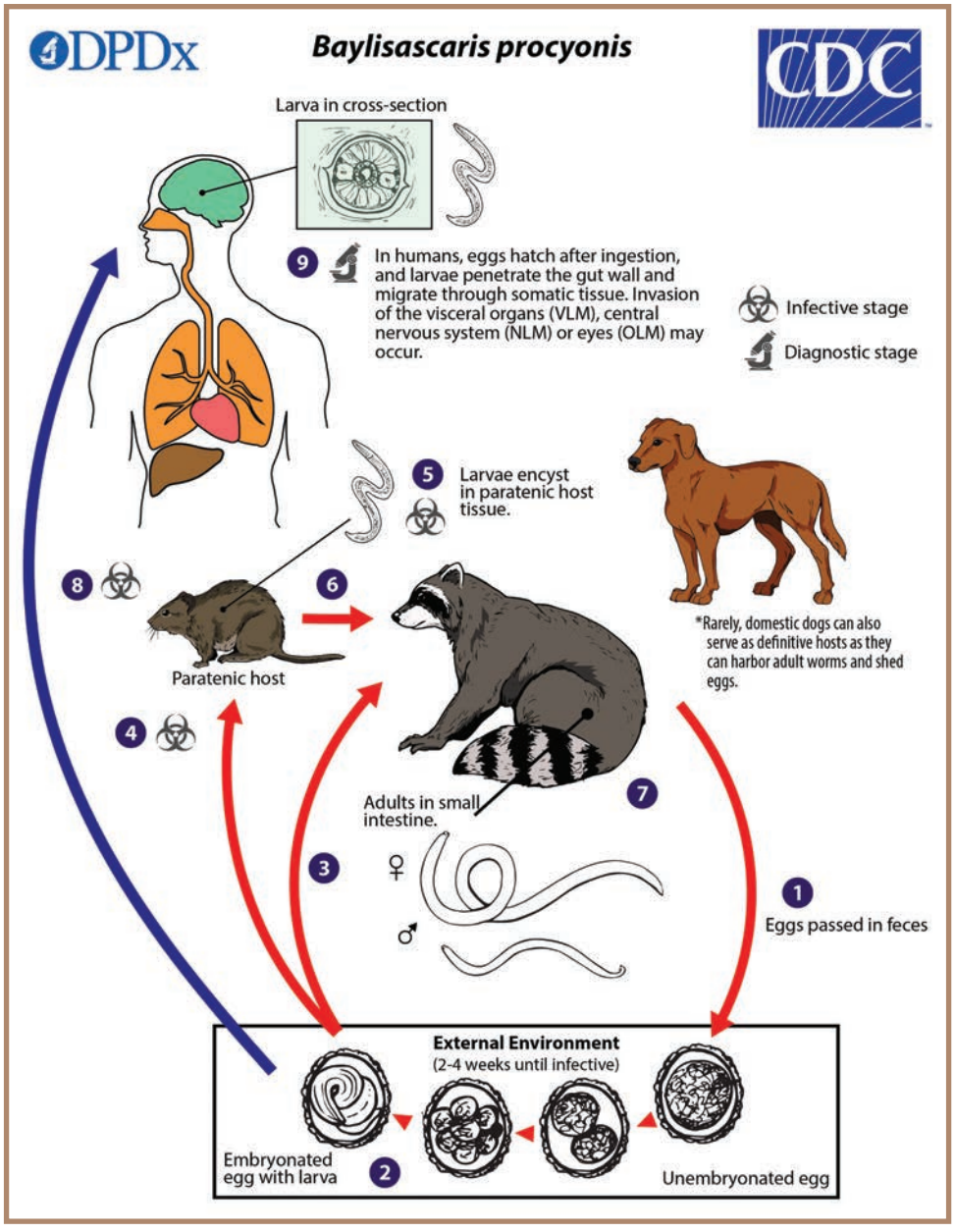
Photos by Scott Henke (left) and Javier Huerta (above)

The Early Bird Catches the Parasite

Scott Henke

Baylisascaris procyonis is an intestinal roundworm found in raccoons. The roundworm eggs hatch into larvae, which can cause a debilitating and potentially lethal condition in a large variety of birds and mammals, including humans. The typical pathway to develop disease is to eat *B. procyonis* eggs from soil where contaminated raccoon fecal matter decayed. I hypothesized that earthworms living in *B. procyonis*-contaminated soils would incidentally eat *B. procyonis* eggs, and if earthworms were then consumed by birds, they would become infected with *B. procyonis* larvae, resulting in brain disease.

- I placed 100 earthworms in *B. procyonis*-infused soil and determined that 92% of earthworms had an average of 7 *B. procyonis* eggs in their digestive systems.



- When *B. procyonis*-infected earthworms were fed to European starlings, 94% (17 of 18) of starlings displayed lack of coordination, head twisting, and paralysis, and 11 of them (61%) died within 22 days.
- The percent of eosinophils, white blood cells that respond to parasitic infections, increased by 25-fold from Day 0 to Day 12 post ingestion.
- Starlings within the control group remained healthy and displayed normal behaviors.

This study highlights an overlooked pathway of baylisascariasis, which has potential as a mortality factor for many species within terrestrial ecosystems.

Cooperative funding provided by the Harry L. Willet Foundation.

Dr. Heather N. Abernathy, Rocky Mountain Elk Foundation
Dr. Gab Andrade-Ponce, Stephen F. Austin State University
Dr. Jason C. Bartz, Creighton University
Ms. Cyrena Bedoian, Oklahoma State University
Mr. Aidan B. Branney, University of Georgia
Mr. Patrick Brzozowski, Lavaca Navidad River Authority
Dr. Tyler A. Campbell, East Foundation
Mr. Brandon Carr, USDA Natural Resources Conservation Service (NRCS) James E. "Bud" Smith Plant Materials Center (PMC)
Mr. Michael L. Casazza, U.S. Geological Survey (USGS)
Ms. Shelly D. Chambers, USDA NRCS E "Kika" de la Garza PMC
Dr. Richard B. Chandler, University of Georgia
Mr. Paul O. Charoniak, Toyota Motor Manufacturing
Dr. M. Colter Chitwood, Oklahoma State University
Dr. Megan Clayton, Texas A&M AgriLife
Mr. Mason H. Cline, New Mexico Game and Fish Department
Dr. Stephanie M. Cobbold, Arizona Game & Fish Department
Dr. Daniel P. Collins, U.S. Fish & Wildlife Service (USFWS)
Dr. Christopher E. Comer, Safari Club International Foundation
Dr. L. Michael Conner, Joseph E. Jones Ecological Research Center at Ichauway
Dr. Warren C. Conway, Texas Tech University
Dr. Walter E. Cook, Texas A&M University
Mr. Jon Dale, American Forests
Dr. Brian W. Davis, Texas A&M University
Dr. Craig A. Davis, Oklahoma State University
Ms. Nicole De Filippo, Oklahoma State University
Mr. Joel Douglas, USDA NRCS
Dr. R. Dwayne Elmore, Oklahoma State University
Dr. David A. Essian, Texas A&M University-Corpus Christi
Dr. Cord B. Eversole, Stephen F. Austin State University
Dr. W. Sue Fairbanks, Oklahoma State University
Dr. Rachel R. Fern, Texas Parks and Wildlife Department (TPWD)
Dr. Mason Fidino, Lincoln Park Zoo
Mr. Owen Fitzsimmons, TPWD
Mr. Justin Foster, TPWD
Dr. Justin T. French, Sul Ross State University
Dr. Roman Frorchard, Vrije Universiteit
Dr. Samuel D. Fuhlendorf, Oklahoma State University
Dr. Beth Gardner, University of Washington
Ms. Elina Garrison, Florida Fish and Wildlife Conservation Commission
Dr. Dale E. Gawlik, Texas A&M University-Corpus Christi
Dr. Richard Gerhold, University of Tennessee Knoxville
Mr. Samuel Glinsky, Texas Department of Transportation (TxDOT)
Mr. Shawn S. Gray, TPWD
Mr. Cody Griffin, Oklahoma State University
Mr. Andrew P. Grunwald, USFWS
Dr. Angela M. Guerrero, Stockholm Resilience Centre
Mr. Derek P. Hahn, Oklahoma State University
Dr. Sarah A. Hamer, Texas A&M University
Dr. Grant Harris, USFWS
Dr. Louis A. Harveson, Sul Ross State University
Dr. Jon S. Horne, Idaho Department of Fish and Game
Dr. Steven B. Jack, Boggy Slough Conservation Area
Dr. Dale James, Rob & Bessie Welder Wildlife Foundation
Mr. Travis Jez, TxDOT
Mr. Brandon N. Jones, USFWS
Dr. Dana Karelus, TPWD
Mr. James K. Kerbow, TPWD
Dr. Alison C. Ketz, University of Wisconsin-Madison
Mr. Charles Kneuper, USDA NRCS
Mrs. Molly Koeck, Oklahoma State University
Dr. Christopher Kozakiewicz, Michigan State University
Mr. Kevin J. Kraai, TPWD
Dr. Peter A. Larsen, University of Minnesota Twin Cities
Dr. Manci Li, University of Minnesota

Mr. Paul T. Link, Louisiana Department of Wildlife and Fisheries
Dr. Jason V. Lombardi, California Department of Fish and Wildlife
Dr. Robert C. Lonsinger, Oklahoma State University
Ms. Missy Lowe, TxDOT
Dr. Ryan Luna, Sul Ross State University
Mr. John W. McLaughlin, TPWD
Dr. Karl V. Miller, University of Georgia
Dr. Brian Millsap, USFWS
Mr. Gary Mizer, New Mexico Department of Game and Fish
Dr. Anna Moeller, Oklahoma State University
Dr. Andrea Montalvo, East Foundation
Mr. Matthew T. Moore, Faith Ranch
Dr. Rodrigo Morales, The University of Texas Health Science Center at Houston, and Universidad Bernardo O'Higgins
Mr. Kevin Mote, TPWD
Dr. James P. Muir, Texas A&M AgriLife
Mr. Andrew J. Mullaney, Texas A&M International University
Mr. Charlie Newberry, TPWD
Dr. Brent C. Newman, Centers for Disease Control and Prevention
Dr. David J. Newstead, Coastal Bend Bays & Estuaries Program
Mr. Kory J. Nickell, Harris County Flood Control District
Dr. Alejandra Olivera-Méndez, Colegio de Posgraduados
Mr. Anthony P. Opatz, TPWD
Mr. Corey T. Overton, USGS
Dr. Humberto Perotto-Baldivieso, Texas A&M University
Mr. Thomas C. Philipps, U.S. Forest Service
Dr. Simona Picardi, University of Idaho
Dr. Darren Proppe, St. Edwards University
Ms. Courtney L. Ramsey, Texas Tech University
Dr. Hunter Reed, TPWD
Dr. Ashley M. Reeves, East Foundation
Dr. Caleb Roberts, Arkansas Cooperative Fish & Wildlife Research Unit, University of Arkansas
Dr. Jason Sawyer, East Foundation
Mr. Marc D. Schwabenlander, University of Minnesota Twin Cities
Mr. Landon R. Schofield, East Foundation
Dr. Maksim Sergeyev, Colorado Natural Heritage Program
Dr. R. Alan Shadow, USDA NRCS East Texas PMC
Dr. Kyle J. Shaney, Texas A&M University-Kingsville
Dr. Michael J. Sheriff, UMass Dartmouth
Dr. David Shindle, USFWS
Mr. Bryan D. Spencer, University of Idaho
Dr. E. Ann Staiger, Texas A&M University-Kingsville
Mr. Stuart W. Stedman, Faith Ranch
Ms. Sabrina H. Szeto, Szeto Geospatial Consulting
Ms. Nikki N. Tanzer, Toyota Motor Manufacturing
Mr. Matthew T. Turnley, Oklahoma State University
Mr. Sergio "Sarge" Vasquez, USFWS
Dr. Amanda Veals Dutt, Sul Ross State University
Dr. Jay A. VonBank, USGS
Dr. H. George Wang, East Central University
Dr. John Wilt, Dallas College
Dr. Tiffany M. Wolf, University of Minnesota Twin Cities
Dr. D. Abraham Woodard, East Foundation
Mr. Jesse S. Wood, ConocoPhillips
Dr. Thomas J. Yamashita, Colorado State University
Dr. John H. Young, Jr., TxDOT
Dr. Julie K. Young, Utah State University

TAMUK Undergraduate Student Co-Authors:

Ms. Summer Aguilar
Ms. Belinda Arnero
Ms. Maedean Cardenas
Ms. Andrea Esqueda
Ms. Megan Guerra
Mr. Miguel Palermo
Mr. Ernie Reyes
Ms. Norelia Solis
Mr. William N. Stephens
Mr. Hunter G. Vasquez

Books

Brennan, L. A. and F. Hernandez. In press. Texas Quails: Ecology and Management. 2nd Edition. Texas A&M University Press. College Station, USA.

Book Chapters and Monographs

DeYoung, R. W., and D. L. Williford. In press. Evolutionary, taxonomic, and genetic relationships of Texas quails. Pages 11–31 in L. A. Brennan and F. Hernandez, editors. Texas Quails: Ecology and Management. 2nd Edition. Texas A&M University Press, College Station, USA.

Diefenbach, D. R., M. J. Cherry, S. D. Côté, R. W. DeYoung, S. A. Gallina Tessaro, B. R. Patterson, and W. D. Walter. 2025. White-tailed Deer *Odocoileus virginianus* (Zimmerman 1780). Pages 661–679 in M. Melletti and S. Focardi, editors. Deer of the World: Ecology, Conservation and Management. Springer Nature, London, UK.

Mittra S., P. A. Townsend, A. Singh. 2025 Factors Affecting Food Insecurity Across Under-Developed Regions of India, Contrasting Indicators of Household-Scale Socioeconomics and Land Cover Change. In: Remote Sensing of Land Cover and Land Use Changes in South and Southeast Asia, Volume 2. Eds: K.P. Vadrevu, C. Justice, G. Gutman. CRC Press, Boca Raton LA. ISBN 978-10-0339-626-0.

Moeller, C. A., S. Perales, W. Rodriguez, A. M. Martin, C. B. Eversole, S. Rideout-Hanzak, P. Crump, C. D. Hilton, and S. E. Henke. 2025. Surveillance of *Mycoplasma agassizii* in Texas tortoises (*Gopherus berlandieri*) for translocation with emphasis on treatment and recovery. Pages 1 – 25 In: A. Gambini, editor. Prime Archives in Veterinary Science. 2nd edition. Vide Leaf Publishing, Hyderabad, India.

Newman, B. C., and S. E. Henke. *Chilabothrus subflavus*, Jamaican Boa. In: R. G. Reynolds and R. W. Henderson (Eds.). Boas of the World. Comstock Publishing Associates, Ithaca, NY. In press.

Scientific Journals and Proceedings

Avila-Sanchez, J. S., H. L. Perotto-Baldivieso, L. Massey, J. A. Ortega-S., L. A. Brennan, and F. Hernández. 2024. Evaluating the use of a thermal sensor to detect small ground-nesting birds in semi-arid environments during winter. Drones 8. https://doi.org/10.3390/drones8020064

Avila-Sanchez, J. S., H. L. Perotto-Baldivieso, L. Massey, J. A. Ortega-S., L. A. Brennan, and F. Hernández. 2024. Fine spatial scale assessment of structure and configuration of vegetation cover for northern bobwhites in grazed pastures. Ecological Processes 13:64. https://doi.org/10.1186/s13717-024-00546-0

Basso, E., J. Ruiz, J. A. Linscott, N. R. Senner, M. W. Weegman, B. M. Ballard, and J. G. Navedo. 2024. Movement ecology during non-breeding season in a long-distance migratory shorebird: are space use and movement patterns sex-biased? Behavioral Ecology and Sociobiology 78:67 https://doi.org/10.1007/s00265-024-03484-1

Benn, J. S., C. M. Nunez, A. Blue-McLendon, S. P. Chaki, T. A. Ficht, A. C. Rice-Ficht, and W. E. Cook. 2024. Lethal toxin neutralizing antibody response induced following oral vaccination with a microencapsulated *Bacillus anthracis* Sterne strain 34F2 vaccine proof-of-concept study in white-tailed deer (*Odocoileus virginianus*). Journal of Zoo and Wildlife Medicine 55:212–218.

Benn, J. S., J. P. Orange, J. P. Gomez, E. T. N. Dinh, B. L. McGregor, E. M. Blosser, N. D. Burkett-Cadena, S. M. Wisely, and J. K. Blackburn. 2024. Culicoides midge abundance across years: Modeling inter-annual variation for an avian feeder and a candidate vector of hemorrhagic diseases in farmed wildlife. Viruses 16:766.

Berigan, L. A., C. S. H. Aulicky, E. C. Teige, D. S. Sullins, K. A. Fricke, J. H. Reitz, L. G. Rossi, K. A. Schultz, M. B. Rice, E. P. Tanner, S. D. Fuhlendorf, and D. A. Haukos. 2024. Lesser prairie-chicken dispersal after translocation: Implications for restoration and population

connectivity. Ecology and Evolution 14: e10871.

Blum, J., A. M. Foley, R. W. DeYoung, D. G. Hewitt, J. Baumgardt, M. Hellickson, H. L. Perotto-Baldivieso. 2024. Evaluation of drone surveys for ungulates in southwestern rangelands. Wildlife Society Bulletin 48:e1515 https://doi.org/10.1002/wsb.1515

Branney A. B., H. N. Abernathy, L. M. Conner, E. P. Garrison, M. J. Cherry. 2024. Photographic documentation of melanism in bobcats (*Lynx rufus*) in the Greater Everglades. Ecology and Evolution 14:e10754.

Branney, A. B., A. M. V. Dutt, Z. M. Wardle, E. P. Tanner, M. E. Tewes, and M. J. Cherry. 2024. Scale of effect of landscape patterns on resource selection by bobcats (*Lynx rufus*) in a multi-use rangeland system. Landscape Ecology 39: 147.

Brooks, G. C., S. J. Goodman, W. Moore, H. C. Chandler, N. M. Caruso, J. A. Smith, T. A. Gorman, and C. A. Haas. 2025. Gopher tortoise (*Gopherus polyphemus*) burrow associate communities are depauperate in modified landscapes. Community Ecology.

Carver S, G.L. Stannard, A.M. Martin. 2024. The distinctive biology and characteristics of the bare-nosed wombat (*Vombatus ursinus*). Online preprint with Annual Review of Animal Biosciences DOI: 10.1146/annurev-animal-021022-042133.

Clements, S., B. M. Ballard, J. P. Loghry, and M. D. Weegman. 2024. Habitat and environmental drivers of American avocet (*Recurvirostra americana*) energy expenditure at two sites within a conservation region. Waterbirds 47: 1-12.

Clevinger, G. B., W. M. Ford, M. J. Kelly, R. S. Alonso, R. W. DeYoung, N. W. Lafon, and M. J. Cherry. 2024. Survival, cause-specific mortality, and population growth of white-tailed deer in western Virginia. Journal of Wildlife Management 88:e22528. https://doi.org/10.1002/jwmg.22528

Cornaby, G. J., C. M. Kiel, E. P. Tanner, S. Rideout-Hanzak, A. M. Tanner, D. B. Wester, A. Montalvo, and T.J. Hibbitts. 2024. Pyric-carnivory: Predation of a Texas tortoise, *Gopherus berlandieri* (Agassiz, 1857), by a Crested Caracara, *Caracara plancus* (Miller, 1777), following a prescribed fire in southern Texas. Herpetology Notes 17:621-624.

Corti P., M. Jimenez-Torres, R. Hamer, A. M. Martin, Radic-Schilling, and M. Ruiz-Aravena. 2025. Buried Truths: How Puma Caching of Carrion Confounds Livestock Mortality Attribution. Animal Conservation 0:1-3, DOI: 10.1111/acv.70027.

Dahl, J., J. E. Larson, C. Duquette, M. E. Fernández-Giménez, E. P. Tanner, D. Rao, and G. Gloeckner. 2025. SRM survey and membership shifts demonstrate "change on the range." Rangelands 47: 161-171.

Dart, M. M., M. T. Turnley, C. M. J. Rickels, E. P. Tanner, M. C. Chitwood, R. W. DeYoung, W. S. Fairbanks, D. P. Hahn, L. J. Heffelfinger, R. C. Lonsinger, H. G. Wang, M. J. Cherry. 2025. Predator-induced injury of a neonatal pronghorn cues abandonment of current reproductive investment. Ecology 106:e70111.

Dentinger, J. E., L. A. Dolan Todt, E. A. Schultz, J. N. Helferich, S. Demarais, R. W. DeYoung, W. T. McKinley, B. K. Strickland, and M. R. Boudreau. 2024. Testing secondary sex ratio bias hypotheses in white-tailed deer in Mississippi, USA. Ecology and Evolution 14, e70296. https://doi.org/10.1002/ece3.70296

Dewez, N. P., W. Xi, D. R. Duffie, M. R. Subedi, T. Chaudhary, S. Rideout-Hanzak, A. O. Anoruo, and T. Estabrook. 2024. Analysis of multispectral imagery and forest inventory data shows disparity in tree mortality and recovery in Texas' national forests. Journal of Forestry (In press).

Edwards, J. T., F. Hernández, D. B. Wester, L. A. Brennan, C. L. Parent, and R. M. Perez. 2024. The effects of habitat, weather, and raptors on northern bobwhite abundance at multiple spatial scales. Journal of Wildlife Management 88: e22598. https://doi.org/10.1002/jwmg.22598

Ellis, C. C., M. J. Cherry, S. S. Gray, R. W. DeYoung, D. G. Hewitt, and L. J. Heffelfinger. 2025. Early-life movement ecology of a cervid: Implications for chronic wasting disease management. Ecological Solutions

and Evidence 6:e70046.

Ellsworth W. H., S. D. Peacor, R. B. Chandler, L. M. Conner, E. P. Garrison, K. V. Miller, M. J. Cherry. 2024. Measuring the benefit of a defensive trait: Vigilance and survival probability. Ecology 105:e4429.

Eversole, C. B., R. A. Ayala, E. D. Rangel, and S. E. Henke. 2024. Cloudy with a chance of survival: Simulating the effects of climate, habitat, and management on the population viability of an at-risk lizard species. Global Ecology and Conservation https://doi.org/10.1016/j.gecco.2024.e03179.

Eversole, C. B., D. R. Duffie, A. J. Mullaney, and S. E. Henke. 2024. Rediscovery of a population of the plains spotted skunk, *Spilogale interrupta*, a species of conservation concern, from southern Texas, USA. Mammalia 89:11-14. https://doi.org/10.1515/mammalia-2024-0092.

Ferreira F. C., T. Pervin, W. Tang, J. A. Hediger, L. Thomas, W. Cook, et al. 2025. Respiratory shedding of infectious SARS-CoV-2 Omicron XBB.1.41.1 lineage among captive white-tailed deer, Texas, USA. Emerging Infectious Diseases 31(2). https://doi.org/10.3201/eid3102.241458.

Foley, A.M., K.R. Gann, D.G. Hewitt, R.W. DeYoung, T.E. Fulbright, J.A. Ortega-S., T.A. Campbell. 2024. Fine-scale phenotypic variation of a large herbivore in a pulsed environment. Ecosphere DOI: 10.1002/ecs2.4921.

Hediger, J.A., B. D. Spencer, M. F. Rice, M. L. Hopper, R. W. DeYoung, J. A. Ortega-Santos, T. E. Fulbright, D. G. Hewitt, A. M. Foley, L. R. Schofield, T. A. Campbell, M. J. Sheriff, and M. J. Cherry. 2024. Physiological carry-over effects of variable precipitation are mediated by reproductive status in a long-lived ungulate. Conservation Physiology, 12(1): coae045 https://doi.org/10.1093/conphys/coae045.

Heffelfinger, L. J. 2025. Book Review: Sexual Segregation in Ungulates: Ecology, Behavior, and Conservation. R. Terry Bowyer. Journal of Wildlife Management 89:id.e2265.

Heffelfinger, L. J., D. G. Hewitt, J. P. Vasquez, T. E. Fulbright, R. W. DeYoung, L. A. Harveson, W. C. Conway, and S. S. Gray. 2025. Cropland restricts occurrence and alters spatial ecology near the mule deer geographical range limit. Movement Ecology 13:1-17.

Henke, S. E. 2025. *Baylisascaris procyonis* (Chromadorea Ascarididae): Case study of the little-known human health threat that is literally in your backyard. Tropical Medicine and Infectious Disease 10:00156; 10.3390/tropicalmed10060156.

Henke, S. E. 2025. Early bird catches the parasite: Role of invertebrates as pathways of Baylisascaris procyonis to songbirds. Journal of Wildlife Diseases 61: (In press).

Henke, S. E., S. Rideout-Hanzak, F. Hernandez, A. M. Martin, D. B. Wester, and S. H. Yu. 2024. Do ethnicity and gender affect students choice of a career? Proceedings of the 22nd Annual Hawaii International Conference on Education 22:950-963.

Kalisek, M. A., A. M. Tanner, E. P. Tanner, C. D. Hilton, C. Hoskinson, N. C. Paul, R. L. Sramek, K. Garwood, and M. J. Bodenchuk. 2025. First documentation of Trichosporon asahii isolation in the obligate scavenging black vulture (Coragyps atratus). The Southwestern Naturalist 69: 1-4.

Kaur S., V. G. Kakani, B. Carver, D. Jarquin, A. Singh. 2024 Hyperspectral imaging combined with machine learning for high-throughput phenotyping in winter wheat. The Plant Phenome Journal. 7, e20111.

Koser T., A. M. Martin, A. Courtemanch, L. Thompson, B. Wise, G. Fralick, S. Dewey, A. Girard, B. Scurlock, J. Rogerson, K. Oyen, and P. Cross. 2025. Winter tick sharing between ungulates in the Greater Yellowstone Ecosystem and implications for apparent competition. Ecosphere 16(1), DOI: 10.1002/ecs2.70129.

Lago A., S. Patel, A. Singh. 2024. Low-cost real-time aerial object detection and GPS location tracking pipeline. ISPRS Open Journal of Photogrammetry and Remote Sensing. 13 – 100069.

Lawrence, A. J., S. A. Carleton, S. J. Oyler-McCance, R. W. DeYoung, C. T. Nichols, and T. F. Wright. 2025. Maintenance of genetic diversity despite population fluctuations in

the Lesser Prairie-Chicken (Tympanuchus pallidicinctus). Ecology and Evolution 15(1): e70879. https://doi.org/10.1002/ece3.70879

Lamberson, A., and J. A. Smith. 2024. Supplementary feeding of birds during the winter influences measures of avian community structure in yards in a subtropical city. PLoSONE 19:e0302007.

Linscott, J. A., E. Basso, R. Bathrick, J. B. de Almeida, A. M. Anderson, F. Angulo-Pratolongo, B. M. Ballard, et al. 2024. The Amazon Basin's rivers and lakes support Nearctic-breeding shorebirds during southward migration. Ornithological Applications 126:duae034.

McCloy, M., K. Andringa, T. Maness, J. A. Smith, and J. Grace. 2024. Promoting urban ecological resilience through the lens of avian biodiversity. Frontiers in Ecology and Evolution 12:1302002.

Moeller, C. A., J. C. Elissetche, S. Perales, W. Rodriguez, S. E. Henke, S. Rideout-Hanzak, D. B. Wester, J. Singhurst, and C. B. Eversole. 2025. Habitat preferences of Texas tortoises, *Gopherus berlandieri* (Agassiz, 1857), in southern Texas, USA. Herpetology Notes 18:259-265.

Moeller, C. A., S. Perales, W. Rodriguez, A. M. Martin, C. B. Eversole, S. Rideout-Hanzak, P. Crump, C. D. Hilton, and S. E. Henke. 2025. Surveillance of Mycoplasma agassizii in Texas tortoises (*Gopherus berlandieri*) for translocation with emphasis on treatment and recovery. Frontiers in Veterinary Sciences 11:1525179. https://doi.org/10.3389/fvets.2024.1525179.

Moeller, C. A., S. Perales, W. Rodriguez, A. M. Martin, C. B. Eversole, S. Rideout-Hanzak, and S. E. Henke. 2025. Is detectability of Texas tortoises, *Gopherus berlandieri* (Agassiz, 1857), affected by time of day or temperature in southern Texas? Herpetology Notes 18:267-272.

Moeller, C. A., S. Perales, W. Rodriguez, S. E. Henke, S. Rideout-Hanzak, and C. B. Eversole. 2024. Playing "hide and seek" with Texas tortoises: Value of a detector dog. Frontiers in Amphibian and Reptile Science 2:1382591. doi:10.3389/famrs.2024.1382591.

Newstead, D. J., S. J. Dinsmore, B. M. Ballard, L. J. Niles, and J. Burger. 2024. Survival of red knots in the northern Gulf of Mexico. Frontiers in Ecology and Evolution 12:1375412. https://doi.org/10.3389/fevo.2024.1375412

Page, M. T., H. L. Perotto-Baldivieso, J. A. Ortega-S, E. P. Tanner, J. P. Angerer, R. C. Combs, B. K. Johnston, M. Ramirez, A. M. Camacho, A. M. DiMaggio, D. Daniels, and T. Kimmet. 2025. Developing large-scale pasture approaches to quantify forage mass in rangelands using drones. Rangeland Ecology and Management 100: 111-120.

Peeling J. A., C. Chen, J. Judge, A. Singh, S. Achidago, A. Eide, K. Tarrio, P. Olofsson 2024. Applications of remote sensing for land use planning scenarios with suitability analysis. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. 17 pp. 6366-6378.

Pennartz, K. J., E. P. Tanner, J. M. Carroll, R. D. Elmore, C. A. Davis, and S. D. Fuhlendorf. 2024. From eradication to conservation: identifying areas for restoration and management of a Pliocene relic in a changing climate. Restoration Ecology 32: doi.org/10.1111/rec.14232

Pennartz, K. J., E. P. Tanner, M. K. Clayton, A. D. Falk, D. B. Wester, and H. L. Perotto-Baldivieso. 2025. An assessment of chemical control options for whitebrush (*Aloysia gratissima*) in South Texas. Rangelands 47: 118-127.

Petracca, L.S., Gardner, B., Maletzke, B.T., and S.J. Converse. 2024. Merging integrated population models and individual-based models to project population dynamics of recolonizing species. Biological Conservation. https://doi.org/10.1016/j.biocon.2023.110340.

Petracca, L. S., B. Gardner, B. T. Maletzke, and S. J. Converse. 2024. Response to Santiago-Ávila et al. (2024). Biological Conservation 110926.

Rangel, E. D., S. E. Henke, R. A. Ayala, C. B. Eversole. 2024. A comprehensive review of the ecology and conservation status of spot-tailed earless lizards (*Holbrookia lacerata* and *Holbrookia subcaudalis*). Frontiers in Amphibian and Reptile Science

2: doi.org/10.3389/famrs.2024.1412860.

Rangel, E. D., C. A. Moeller, R. A. Ayala, S. E. Henke, D. B. Wester, and C. B. Eversole. 2025. Adaptive emergence patterns of spot-tailed earless lizards: Influence of UV light and temperature on diel activity. Ecology and Evolution 15: ECE371814. doi:10.1002/ece3.71814.

Rangel, E. D., R. A. Ayala, S. E. Henke, and C. B. Eversole. 2025. Monthly occurrence Tamaulipan spot-tailed earless lizards (*Holbrookia subcaudalis*) Axtell, 1956, varies by age class in southern Texas. Herpetology Notes 18:277-285.

Reeves, A. M., S. S. Gray, J. C. Campbell, L. A. Harveson, C. D. Hilton, L. J. Heffelfinger, C. M. Springer, D. G. Hewitt, W. C. Conway, and R. O. Dittmar II. 2024. Hematology and biochemical reference intervals and seroprevalence of hemorrhagic disease for free-ranging mule deer (*Odocoileus hemionus*) in West Texas. Journal of Zoo and Wildlife Medicine 55:1019-1031.

Reeves, A. M., W. F. Swanson, C. D. Hilton, T. A. Campbell, L. Schofield, M. E. Tewes, H. M. Swarts, A. Miller, C. Springer, and D. L. Miller. 2024. Semen collection and characterization of normative reproductive traits in free-ranging ocelots (*Leopardus pardalis*) and bobcats (*Lynx rufus*) in southern Texas. Theriogenology Wild 5, 100107.

Rodkey, T., B. M. Ballard, L. Tibbits, and R. Lanctot. 2024. Sod farms drive habitat selection of a migratory grassland shorebird during acritical stopover period. Scientific Reports https://doi.org/10.1038/s41598-024-71216-6.

Rooney, B., R. Kays, M. V. Cove, A. Jensen, B. R. Goldstein, C. Pate, P. Castiblanco, A. Singh, et al. 2025. SNAPSHOT USA 2019-2023: The first five years of data from a coordinated camera trap survey of the United States. Global Ecology and Biogeography 34: e13941.

Schindler, A. R., A. D. Fox, C. K. Wikle, B. M. Ballard, A. J. Walsh, S. B. A. Kelly, L. Cao, L. R. Griffin, and M. D. Weegman. 2024. Differential responses to weather and land-cover conditions explain spatial variation in winter abundance trends in a migratory bird of conservation concern. Journal of Applied Ecology https://doi:10.1111/1365-2664.14804.

Schindler, A. R., A. D. Fox, C. K. Wikle, B. M. Ballard, A. J. Walsh, S. B. A. Kelly, L. Cao, L. R. Griffin, and M. D. Weegman. 2024. Energetic trade-offs in migration decision-making, reproductive effort and subsequent parental care in a long-distance migratory bird. Proceedings Royal Society B 291: 20232016. https://doi.org/10.1098/rspb.2023.2016

Sergeyev, M., D. A. Crawford, J. D. Holbrook, J. V. Lombardi, M. E. Tewes, and T. A. Campbell. 2024. Selection in the third dimension: Using LiDAR derived canopy metrics to assess individual and population-level habitat partitioning of ocelots, bobcats, and coyotes. Remote Sensing in Ecology and Conservation 10(2), 264-278.

Sharma A. K., A. Singh, S. K. Sidhu, L. Zotarelli, L. K. Sharma. 2024. Fresh leaf spectroscopy to estimate the crop nutrient status of potato Solanum tuberosum Potato Research. https://doi.org/10.1007/s11540-024-09766-5

Sharma A. K. , S. K. Sidhu, A. Singh, L. Zotarelli, L. K. Sharma. 2024. Optimizing UAV Hyperspectral Imaging for Predictive Analysis of Nutrient Concentrations, Biomass Growth, and Yield Prediction of Potatoes. American Journal of Potato Research. 101, 394–413.

Silknetter, S. C., A. L. Benson, J. A. Smith, and M. C. Mims. 2024. Spatial extent drives patterns of climate change sensitivity for freshwater fishes of the United States. Ecosphere 15:e4779.

Slovikosky, S. A., L. S. Petracca, L. T. B. Hunter, and J. L. Frair. 2024. Scaling issues in the study of livestock depredation by carnivores. Landscape Ecology 39:131.

Smith, J. A., and J. F. Dwyer. 2024. Assessing range shifts and expansions of crested caracaras over 30 years in Arizona, Texas, and Florida, USA. Journal of Raptor Research 58:153–160.

Smith J. A., M. E. McDaniels, S. D. Peacor, E. C. Bolas, M. J. Cherry, N. J. Dorn, O. K. Feldman, D. L. Kimbro, E. K. Leonhardt,

N. E. Peckham. 2024. Population and community consequences of perceived risk from humans in wildlife. Ecology Letters 27:e14456.

Spencer B. D., M. L. Hopper, R. W. DeYoung, A. M. Foley, J. A. Ortega-Santos, D. G. Hewitt, L. R. Schofield, T. A. Campbell, and M. J. Cherry. 2024. Understanding an ecological tug of war: Disentangling competition between native and domesticated ungulates. Ecosphere 15:e4850.

Stewart M. T., A. M. Tanner, A. Singh, W. S. Clark, and B. A. Millsap. 2025. Home sweet temporary home: Patch use by unpaired gray hawks in a highly fragmented, rapidly changing landscape. Journal of Raptor Research. In press.

Stewart, M. T., A. M. Tanner, S. A. Bilodeau, B. A. Millsap, and W. S. Clark. 2024. A gray hawk's response to wildfire in Santa Ana National Wildlife Refuge. Bulletin of the Texas Ornithological Society 57:1-2.

Tan W. J., S. Carver, A. M. Martin, N. M. Fountain-Jones, K. M. Proft, C. P. Burridge. 2024. Sex and landscape influence spatial genetic variation in a large fossorial mammal, the Common Wombat (*Vombatus ursinus*). Journal of Mammalogy 105: 481-489. DOI: 10.1093/jmammal/gyae017.

Teshome F. T., H. K. Bayabil, B. Schaffer, Y. Ampatzidis, G. Hoogenboom, A. Singh. 2024. Simulating soil hydrologic dynamics using crop growth and machine learning models, Computers and Electronics in Agriculture, 224 – 109186.

Thurman, L. L., K. Alger, O. LeDee, L. M. Thompson, E. Hofmeister, J. M. Hudson, A. M. Martin, et al. 2024. Disease-smart climate adaptation for wildlife management and conservation. Frontiers in Ecology and the Environment DOI: 10.1002/fee.2716.

Troia, M. J., A. V. Javiya, R. N. Doss, S. A. Melzow, and J. A. Smith. 2024. Mapping habitat suitability of invasive crayfish in aridland riverscapes: Virile crayfish (*Faxonius virilis*) in the Lower Colorado River Basin, USA. Science of the Total Environment 955:177069.

Turnley, M. T., W. S. Fairbanks, R. C. Lonsinger, M. J. Cherry, M. M. Dart, R. W. DeYoung, D. P. Hahn, L. J. Heffelfinger, C. M. J. Rickels, E. P. Tanner, H. G. Wang, and M. C. Chitwood. 2025. Harmless tags or hazardous ads? Investigating the potential for ear tags to increase predation on neonatal ungulates. Canadian Journal of Zoology. https://doi.org/10.1139/cjz-2025-0007.

Van Ee, J. J., C. A. Hagen, D. C. Pavlacky Jr., D. A. Haukos, A. J. Lawrence, A. M. Tanner, B. A. Grisham, K. A. Fricke, L. G. Rossi, G. G. Beauprez, K. E. Kuklinski, R. Martin, M. D. Koslovsky, T. B. Rintz, and M. B. Hooten. 2024. Melded integrated population models. Journal of Agricultural, Biological, and Environmental Statistics 1-31.

VonBank, J. A., J. Vasquez, J. Loghry, K. J. Kraai, L. Cao, and B. M. Ballard. 2024. Wetland use by greater white-fronted geese and spatial overlap with waterfowl conservation priority areas in Mexico. Avian Conservation and Ecology 17(2): doi.org/10.5751/ACE-02204-170220

Weinstein B. G., S. Marconi, A. Zare, S. A. Bohlman, A. Singh, S. J. Graves, L. Magee, D. J. Johnson, S. Record, V. E. Rubio, N. G. Swenson, P. Townsend, T. T. Veblen, R. A. Andrus, E. P. White. 2024. Individual canopy tree species maps for the National Ecological Observatory Network. PLOS Biology. 22(7): e3002700.

Yamashita, T. J., H. L. Perotto-Baldivieso, D. B. Wester, K. W. Ryer, R. J. Kline, M. E. Tewes, J. H. Young Jr., and J. V. Lombardi. 2024. A multivariate approach to assessing landscape structure effects on wildlife crossing structure use. Ecological Processes 13(76).

Yamashita, T. J., J. V. Lombardi, Z. M. Wardle, M. E. Tewes, and J. H. Young Jr. In Press. Differences in mammal community response to highway construction across different levels of human land use. Wildlife Biology e01347.

Zheng T., Z. Ye, A. Singh, A.R. Desai, N.S.R. Krishnayya, M.G. Dave, P.A. Townsend. 2024. Variability in forest plant traits along the western Ghats of India and their environmental drivers at different resolutions. Journal of Geophysical Research: Biogeosciences. 129 (3) e2023JG007753.

Popular Articles

Bazaldua, A. and F. Hernández. 2024. Quail Associates 2.0: A new twist to a past program. Caesar Kleberg Tracks 9(1): 12-15.

DeYoung, R. W. 2024. Why are nilgai so wary? Neophobia in nilgai. Wildlife Research 28(1):1–2.

DeYoung, R. W., and A. M. Foley. 2024. Techniques for aging deer aren't aging well. Caesar Kleberg Tracks 9(2):4–7.

Flores, R., A. Tanner, E. Tanner, B. Christoffersen, J. Dale, A. Fierro-Cabo, and S. Najera. 2024. The thorny path to restoration. Tracks Magazine. Quarterly Magazine of the Caesar Kleberg Wildlife Research Institute.

Foley, A., D. Hewitt, A. M. Tanner, E. P. Tanner. 2024. Grassroots research: Understanding the effects of a changing landscape on quail. Covey Rise.

Green, B. R., E. P. Tanner, C. D. Hilton, and M. J. Cherry. 2025. Turning up the heat! How white-tailed deer balance high temperatures and pregnancy demands in South Texas. Texas Wildlife Association Magazine February 2025: 12-15.

Green, B. R., J. A. Hediger, and M. J. Cherry. 2024. Researching chronic wasting disease. Wildlife Research Quarterly Newsletter of CKWRI. 28(3): 3-4.

Hansen, K. W. 2025. Cracking the code on deer drama. Wildlife Research 29(1): 1-2.

Heffelfinger, L. J., C. C. Ellis, and M. J. Cherry. 2024. Rut Behavior and Movement of Texas Panhandle Mule Deer. Texas Wildlife Magazine.

Henke, S., S. Rideout-Hanzak, and A. Martin. 2024. Rabbit fever: Assessing hemorrhagic disease in Davis Mountain cottontails. Wildlife Research 28(2):3.

Hernández, F., E. Grahmann, and T. Fulbright. 2024. The value of pricklypear and other native plants as nesting habitat for chestnut-bellied scaled quail. Wildlife Research 28(4): 1-2.

Hewitt, D.G. 2024. A tale of two Texas predators. Texas Wildlife. 40(1):44-50.

Hewitt, D., M. Cherry, and A. Martin. 2025. Trouble brewing for Texas? Wildlife Research 29(2):3-4.

Hilton, C.D. 2025. What does a wildlife vet really do? Training, testing, and the grey areas. Wildlife Research 29(1):3-4.

Hopper, M., B. Kleeberg, L. Heffelfinger, and M. Cherry. 2025. A picturesque beginning to large mammal research in the Texas Hill Country. Caesar Kleberg Tracks Magazine Spring 2025.

McDaniel, K. G., Nouzille, C. M., Cherry, M. J., and L. S. Petracca. 2024. Wild Felid Association Regional Update-Texas. Wild Felid Monitor.

McDaniel, K. G., Nouzille, C. M., and L. S. Petracca. 2024. The South Texas Lion Project arrives at the CKWRI. Wildlife Research: Quarterly Newsletter of the Caesar Kleberg Wildlife Research Institute at Texas A&M University – Kingsville 28:1. Spring 2024.

McDaniel, K. G., Nouzille, C. M., Petracca, L. S., and M. J. Cherry. 2024. The Ghost Cat of Texas: How Mountain Lions Are Navigating Life in a Transboundary Region. Caesar Kleberg Tracks. Fall 2024.

McGovern, J. M., E. P. Tanner, C. D. Hilton, and B. M. Ballard. 2024. Weather or not: tracking northern pintails through adverse weather during spring migration. Caesar Kleberg Tracks Spring 2024: 8-11.

Moberg, D. R., A. M. Tanner, E. P. Tanner, S. Rideout-Hanzak, F. Hernandez, and A. D. Falk. 2025. Branching out: The changing landscape of the Texas Hill Country. Caesar Kleberg Tracks Spring 2025: 17-19.

Nouzille, C. M., D. G. Hewitt, M. J. Cherry, and L. S. Petracca. 2024. Mountain lion ecology in South Texas. Fair Chase Magazine. Fall 2024.

Rideout-Hanzak, S. 2024. Flames on the Range. East Foundation Annual 2024:36-38.

Ritzell, A. D., J. T. Edwards, A. Montalvo, D. A. Woodard, Z. J. Pearson, F. Hernández, and L. A. Brennan. 2024. A practical and efficient helicopter survey technique to estimate bobwhite abundance on Texas rangelands: An update and review. Caesar Kleberg Wildlife Research Institute Wildlife Management Bulletin No. 12.

Sharma V., U.B.P. Vaddevolu, S. Bhambota, Y. Ampatzidis, H. Bayabil, A. Singh. 2025. Variable Rate Technology

and its application in precision agriculture. EDIS 2025(1) https://doi.org/10.32473/edis-ae607-2025.

Singh, A. 2025. C-SALT. Wildlife Research 29(3):3.

Smith, J. A., A. Foley, and B. Oswald. 2025. Tracking the impact: exploring the effects of invasive guinea grass on northern bobwhite. Texas Wildlife Magazine.

Stewart, M. and A. Tanner. 2024. From nestling to nest – Tracking the lives of gray hawks in the Lower Rio Grande Valley. Texas Wildlife Magazine.

Tanner, E. P., K A. Travis, C. M. McKinney, L. D. Sweeten, M. Ramos-Gonzalez, A. M. Tanner, and J. McLaughlin. 2025. Navigating the fragmented thornscrub: insights from the movements of the chestnut-bellied scaled quail. Caesar Kleberg Tracks Spring 2025: 12-15.

Tanner, A., D. Woolsey, and K. McManus. 2024. All movements great and small. Wildlife Research. Quarterly Newsletter of the Caesar Kleberg Wildlife Research Institute.

Taylor, H. A. Falk, and K. Nickell. 2025. Establishing native grasslands: Relationships between native seedings and invasive species encroachment. Wildlife Research 29(3): 1-2.

Tewes, M. 2025. Droughts threaten ocelot survival. Wildlife Research 29(2):1-2.

Walters, R., S. Rideout-Hanzak, and A. Martin. 2024. Tick talk: Unveiling the potential of prescribed fire in South Texas tick control. Wildlife Research 28(2):1-2.


Jennifer Smith

Cover Photos: Front - Jack Rogers, Back - Evan Tanner
Inside Back - Breanna Green

TEXAS A&M UNIVERSITY KINGSVILLE

Caesar Kleberg Wildlife Research Institute
700 University Blvd., MSC 218
Kingsville, TX 78363-8202

Caesar Kleberg Wildlife Research Institute is a component of Texas A&M University-Kingsville

printed on recycled paper