55th Annual Meeting
of the
Texas Chapter
of The Wildlife Society

Conservation Professionals for the 21st Century and Beyond

21–23 February 2019 **Montgomery, Texas**

2018-2019 Executive Board

Executive Director	Don Steinbach
President	Jena Moon
President-elect	Tyler Campbell
Vice President	John Tomeček
Past President	Corey Mason
Secretary	Annaliese Scoggin
Treasurer	Terry Blankenship
Board Member-at-Large	Mandy Krause
Archivist	Alan Fedynich

Program

Robert Denkhaus and T. Wayne Schwertner

Local Arrangements

Douglas Head, Tiffany Lane, Mary Pearl Meuth, and Penny Wilkerson

Posters

Heather Mathewson and Daniel Price

Meeting Schedule

Wednesday, 20 February 2019

12:00 PM – 5:00 PM	Registration	Registration Area East
12:00 PM – 4:00 PM	Workshop – Hunting Mentor Training	Cannes

Thursday, 21 February 2019

7:00 AM – 1:00 PM	Field Trip – Sam Houston National Forest WMA	Versailles Ballroom
8:00 AM – 5:00 PM	Registration	Registration Area East
8:00 AM – 12:00 PM	Workshop – R and R Studio for Beginners	Europa
8:00 AM – 12:00 PM	Workshop – Fisheries Techniques	Versailles Ballroom
8:00 AM – 12:00 PM	Workshop – Grazing Planning for Wildlife Managers	Vigo
8:00 AM – 12:00 PM	Workshop – Hunting Mentor Training	Cannes
8:00 AM – 5:00 PM	James G. Teer Leadership Institute	Pisa
8:00 AM – 3:00 PM	Poster Session I Setup	Atrium
10:00 AM – 12:00 PM	Executive Board Meeting	Ibiza
1:00 PM – 2:00 PM	Workshop – Cowbird Trapping	Versailles Ballroom
1:00 PM – 3:30 PM	Student Plant ID Contest	Paris
1:30 PM – 3:30 PM	Business Meeting	Americas Ballroom 2
3:30 PM – 5:30 PM	Quiz Bowl	Venice Ballroom
5:30 PM – 6:30 PM	Poster Session I Judging	Atrium
6:30 PM – 10:00 PM	President's Reception and Networking Event	Versailles Ballroom
7:30 PM – 8:30 PM	Borderlands Research Institute Reception	Greenland 1–2
7:30 PM – 8:30 PM	East Foundation Reception	Greenland 3–4
7:30 PM – 8:30 PM	Texas Tech University Reception	Bordeaux

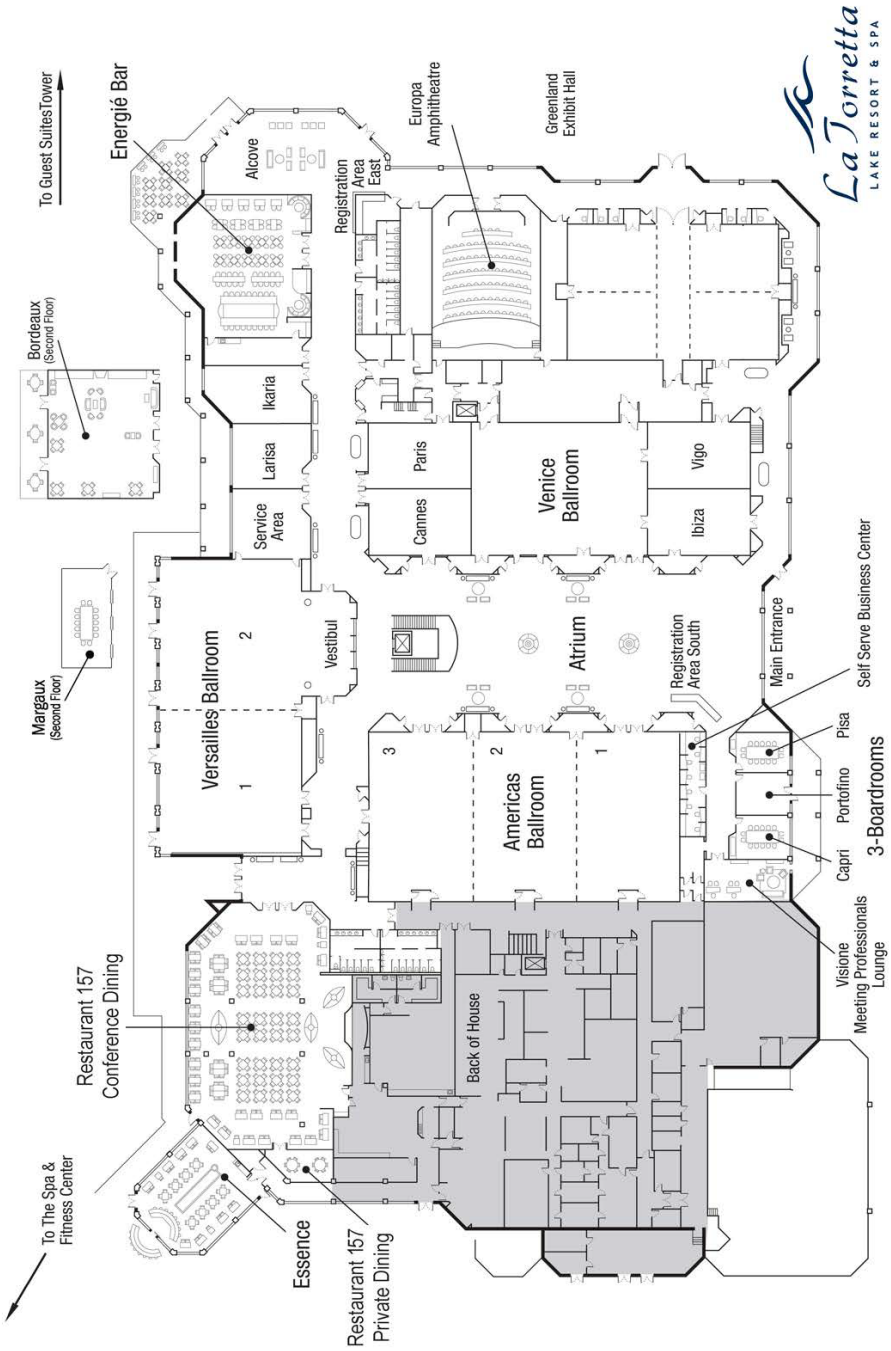
Friday, 22 February 2019

7:30 AM – 8:30 AM	Student Breakfast	Versailles Ballroom
8:00 AM – 9:30 AM	Women of Wildlife Reception	Bordeaux
8:00 AM – 3:00 PM	Professional Plant ID Contest	Paris
8:00 AM – 5:00 PM	Registration	Registration Area East
8:00 AM – 5:00 PM	Presentation Submission	Registration Area East
8:00 AM – 5:00 PM	Raffle and Silent Auction	Versailles Ballroom
8:00 AM – 5:00 PM	James G. Teer Leadership Institute	Pisa
8:00 AM – 10:00 AM	Art and Photo Contest Submission	Versailles Ballroom
8:45 AM – 9:15 AM	Break	Versailles Ballroom
9:15 AM – 11:40 AM	Cottam Award Presentations	Americas Ballroom
10:30 AM – 4:00 PM	Voting for Photo and Art Contest	Versailles Ballroom
11:40 AM – 1:30 PM	Lunch (On Your Own)	
11:40 AM – 12:30 PM	Student Chapter Leadership Lunch (Invitation Only)	Bordeaux
11:40 PM – 1:30 PM	Past-Presidents Luncheon (Invitation Only)	Essence Café
12:30 PM – 1:30 PM	"Wild Texas Film Tour"	Europa

1:30 PM – 5:00 PM	Conservation Affairs Committee	Visione
1:45 PM – 3:00 PM	Plenary Session	Americas Ballroom
3:00 PM – 3:30 PM	Break	Versailles
3:00 PM – 4:00 PM	Poster Session I Removal	Atrium
3:30 PM – 5:00 PM	Technical Session A1	Americas Ballroom 1
3:30 PM – 5:00 PM	Technical Session B1	Americas Ballroom 3
3:30 PM – 5:00 PM	Technical Session C1	Europa
3:30 PM – 5:00 PM	Technical Session D1	Ibiza
3:30 PM – 5:00 PM	Technical Session E1	Vigo
3:30 PM – 5:00 PM	Finding Your Dream Job 1	Venice
4:00 PM – 5:00 PM	Poster Session II Setup	Atrium
4:00 PM – 5:30 PM	Art and Photo Contest Pick-up	Versailles Ballroom
5:30 PM – 7:00 PM	Awards Ceremony	Americas Ballroom
7:00 PM – 10:00 PM	Awards Reception and Networking Event	Versailles Ballroom

Saturday, 23 February 2019

7:00 AM – 7:30 AM	Fellowship of Christian Conservationists	Visione
8:00 AM – 10:00 AM	Registration	Registration Area East
8:00 AM – 9:30 AM	Technical Session A2	Americas Ballroom 1
8:00 AM – 9:30 AM	Technical Session B2	Americas Ballroom 3
8:00 AM – 9:30 AM	Technical Session C2	Europa
8:00 AM – 9:30 AM	Technical Session D2	Ibiza
8:00 AM – 9:30 AM	Technical Session E2	Vigo
8:00 AM – 9:30 AM	Finding Your Dream Job 2	Venice
8:00 AM – 11:30 AM	Poster Session II	Atrium
8:00 AM – 2:00 PM	James G. Teer Leadership Institute	Pisa
9:00 AM – 11:30 AM	TCTWS Executive Board Meeting	Cannes
9:30 AM – 10:00 AM	Break	Versailles
10:00 AM – 11:30 AM	Technical Session A3	Americas Ballroom 1
10:00 AM – 11:30 AM	Technical Session B3	Americas Ballroom 3
10:00 AM – 11:30 AM	Technical Session C3	Europa
11:30 AM	Poster Session II Removal	Atrium
11:30 AM	Adjourn	



VENUE LAYOUT

Friday, 22 February 2019

CLARENCE COTTAM AWARD COMPETITION

AMERICAS BALLROOM

MODERATORS: MATT BUTLER AND JIM MUELLER

9:15 **Welcome and Introduction,** Matt Butler and Jim Mueller

9:20 **Rumen-reticulum Organ Mass and Rumen Mucosa Surface Area of White-tailed Deer Consuming Two Energy Diets,** Sterling G. Spilinek, Floyd W. Weckerly, and Ryan Reitz

9:40 **Use of Moist-soil Management Techniques for Wintering Waterfowl in Fallow Rice Fields on the Upper Texas Coast,** Michael D. Whitson, Warren C. Conway, David A. Haukos, Daniel P. Collins, Jena A. Moon, and Patrick Walther

10:00 **Developing Habitat Suitability Models for Wintering Rio Grande Wild Turkeys in North Texas,** Darrion M. Crowley, Humberto L. Perotto-Baldivieso, William P. Kuvlesky, J. Alfonso Ortega-S, Leonard A. Brennan, Michael T. Page, and Nicholas R. Kolbe

10:20 **Effects of Source Population and Release Strategy on Reintroduced Scaled Quail Mortality and Dispersal,** Rebekah E. Ruzicka, Paul F. Doherty, Jr., and Dale Rollins

10:40 **Ultrasonic Acoustic Deterrents Reduce Bat Fatalities at Wind Turbines in South Texas,** Sara P. Weaver, Cris D. Hein, Ivan Castro-Arellano, and Thomas R. Simpson

11:00 **Population Growth When Carrying Capacities Vary,** Lisa J. Koetke, Adam Duarte, and Floyd W. Weckerly

11:20 **As the Feeder Spins: Aggression Affects Feed Use by White-tailed Deer,** Emily H. Belser, David G. Hewitt, Timothy E. Fulbright, Charles A. DeYoung, David B. Wester, Thomas W. Boutton, and Don A. Dragger

11:40 **Lunch**

WILD TEXAS MINI FILM TOUR
EUROPA AMPHITHEATRE
MODERATOR: LOUIS HARVESON

12:30 **Welcome and Introduction** – Mary Pearl Meuth

12:35 *Lions of West Texas*

12:43 *Return of the Texas Bighorn*

12:53 *Selah: Water from Stone*

1:02 *Pronghorn Revival*

1:09 *Wildlife and the Wall*

1:15 *Q & A Session*

PLENARY SESSION
JAMES G. TEER CONSERVATION LEADERSHIP INSTITUTE
AMERICAS BALLROOM

MODERATOR: ROBERT DENKHAUS

1:45 **Welcome and Introduction,** Jena Moon, President, Texas Chapter of the Wildlife Society

2:00 **Funding Conservation in the 21st Century,** Kyle Brunson, Forrest Cobb, Karrie Kolesar, and Olivia Schmidt

2:30 **Tags, Talks, and Taking the Lead,** Cord Eversole, Maureen Frank, Daniel Price, and David Riley

SESSION A1: AVIAN ECOLOGY AND MANAGEMENT I
AMERICAN BALLROOM 1
MODERATOR: MASI MEJIA

3:30 **Twenty-year Population Trends of Breeding Snowy Plovers on the Southern Great Plains of Texas, New Mexico and Oklahoma,** Kristen M. Heath, Jeffrey S. Beauchamp, Daniel P. Collins, Warren C. Conway, Glen Hensley, William P. Johnson, Sarah T. Saalfeld, and Clint W. Boal

3:45 **Breeding Season Food Habits of American Kestrels in the Southern Great Plains,** Madeleine A. Thornley, Shea D. Mullican, and Clint W. Boal

4:00 **Influences of Changing Rainfall Patterns on the Endangered Attwater's Prairie-chicken,** Jennifer M. Romero, Michael L. Morrison, and Michael E. Morrow

4:15 **Mapping Golden-cheeked Warbler Densities Across the Breeding Range,** James M. Mueller, Steven E. Sesnie, Sarah E. Lehnen, Helen T. Davis, James J. Giocomo, John N. Macey, and Ashley M. Long

4:30 **Swainson's Hawks Select for Open Country While Migrating Through the Rainforests of Central and South America,** Katheryn A. Watson, Clint W. Boal, and James D. Ray

4:45 **Sex Ratios as a Function of Density Dependence in American Kestrels,** Allison M. Kohler, Mary R. Sellars, Erik R. Olson, and Brian Heeringa

SESSION B1: AMPHIBIANS AND REPTILES I
AMERICAS BALLROOM 3
MODERATOR: SCOTT SUMMERS

3:30 **Activity Level and Predation Risk in a Tadpole Guild: Implications for Species' Distributions Along the Hydroperiod Gradient,** Nicholas C. Schiwitz, Christopher M. Schalk, and Daniel Saenz

3:45 **Development and Application of an Environmental DNA Assay for Detection of the Rio Grande Siren,** Krista M. Ruppert, Drew R. Davis, Richard J. Kline, and Md. S. Rahman

4:00 **On the Road Again: Using Citizen Science Data to Understand Patterns of Amphibian and Reptile Road Mortality,** Toby J. Hibbitts, Danielle K. Walkup, Kevin L. Skow, and Wade A. Ryberg

4:15 **Species Co-occurrence Patterns Along Environmental Gradients in Pond Microhabitats,** Christopher M. Schalk, Clay P. Laughrey, Luke M. Bower, and Carmen G. Montana

4:30 **The Influence of Weather and Water Chemistry on Anuran Breeding Activity at Bitter Lake National Wildlife Refuge,** Katherine R. Fikac, Daniel Saenz, Jeff Beauchamp, and James B. Johnson

4:45 **Vacant**

SESSION C1: HUMAN-WILDLIFE INTERACTIONS
EUROPA AMPHITHEATRE
MODERATOR: APRIL A. TORRES CONKEY

3:30 **Assessing Differential Wildlife Use of Road Underpass Structures,** Joshua D. Renner, Michelle Adcock, M. Clay Green, and Thomas R. Simpson

3:45 **Statewide Delivery of Lone Star Healthy Streams Feral Hog Management Programming in Priority Watersheds in Texas,** Josh L. Helcel and Jim Cathey

4:00 **The City Nature Challenge: Leveraging Citizen Science for Conservation in Texas,** Tania Z. Homayoun

4:15 **The Influence of Characteristics and Environmental Factors on the Use of Wildlife Crossing Structures,** Anna D. Rivera Roy, Taylor M. Hopkins, Thomas J. Yamashita, Kevin W. Ryer, John Young Jr., and Richard J. Kline

4:30 **Utilizing the Conservation Delivery Network Model for Landscape Conservation in Northeast Texas,** Jason A. Estrella and Steven K. McKnight

4:45 **Vacant**

SESSION D1: WILDLIFE MANAGEMENT TECHNIQUES
IBIZA
MODERATOR: JENNY SANDERS

3:30 **A Novel Approach to the Analysis of Dynamic Animal Space Use Interactions for Telemetry Data,** Justin T. French, Hsiao-Hsuan "Rose" Wang, William E. Grant, Tyler A. Campbell, and John M. Tomecek

3:45 **Detection Capabilities of Bioacoustic Monitors,** Kathryn L. Burton, Madison K. Midgley, Stephen L. Webb, Mike Proctor, Cresten Sledge, and Heather A. Mathewson

4:00 **Exploring the Potential of Weather Radar for Monitoring Migrations of Insect Pollinators,** James D. Ray, Phillip Stepanian, and Jeffrey Kelly

4:15 **Modeling Foraging Habitat for Shorebirds in the Laguna Madre,** Mikayla M. House, Bart M. Ballard, Selma N. Glasscock, Mitchell D. Weegman, and Humberto L. Perotto-Baldivieso

4:30 **Evaluation of a Black-tailed Prairie dog Restoration Via Translocation in the Trans-Pecos Ecoregion, Texas,** Barbara J. Sugarman, Bonnie J. Warnock, Patricia M. Harveson, and Russell L. Martin

4:45 **Vacant**

SESSION E1: NON-GAME MAMMALS I
VIGO
MODERATOR: ELIZABETH CARY MUNGALL

3:30 **Cattle Grazing Impacts on Small Mammal Populations in South Texas,** Alexis R. Pence

3:45 **Coexistence Among Felids, Cattle and Game species,** Shelby B. Carter, Michael E. Tewes, Humberto L. Perotto-Baldivieso, C. Jane Anderson, Jason V. Lombardi, Amanda M. Veals, and Tyler A. Campbell

4:00 **Mesopredator Occurrence and Distribution in an Urban Environment in the Southern High Plains of Texas,** Christopher R. Carter, Warren C. Conway, Mark C. Wallace, and Robert D. Bradley

4:15 **Structural and Environmental Predictors of Tri-colored Bat Presence and Abundance in Texas Culverts,** Melissa B. Meierhofer, Samantha J. Leivers, Rachel R. Fern, Lilianna K. Wolf, John H. Young, Jr., Brian L. Pierce, Jonah W. Evans, and Michael L. Morrison

4:30 **The Current Status of White-nose Syndrome in Texas and Plans to Assess Potential Movement Through Mexican Karst Systems,** Lilianna K. Wolf

4:45 **Vacant**

SESSION F1: FINDING YOUR DREAM JOB I
VENICE
MODERATOR: MITCH STERNBERG

3:30 **Todd Merendino,** Duck Unlimited

3:45 **Whitney Gann,** Texas Parks and Wildlife Department

4:00 **Ty Bartoskowitz,** MT7 Ranch

4:15 **John Tomecek,** Texas A&M AgriLife Extension

4:30 **Romey Swanson,** Audubon Texas

4:45 **Ricky Linex,** USDA Natural Resource Conservation Service

Saturday, 23 February 2019

SESSION A2: AVIAN ECOLOGY AND MANAGEMENT II
AMERICAN BALLROOM 1
MODERATOR: ANDREW C. KASNER

8:00 **A Review of the Rio Grande Wild Turkey Breeding System,** Amanda K. Beckman

8:15 **Evidence of Genetic Erosion in a Peripheral Texas Population of a North American Game Bird: the Montezuma quail,** J. A. DeWoody, Samarth Mathur, Ashlyn Heniff, Ryan Luna, and John Tomeček

8:30 **Habitat Selection by Northern Bobwhites,** Kelly M. Redmond, Nicole A. Hansen, William L. Lutz, Taylor R. Shirley, Andrew P. Nicholson, Fidel Hernández, Eric D. Grahmann, Leonard A. Brennan, Timothy Anderson, Kirk Feuerbacher, and Michael E. Morrow

8:45 **Quail and Rainfall: Does Management Matter?** Alec D. Ritzell, Fidel Hernández, Eric D. Grahmann, John T. Edwards, and Dale Rollins

9:00 **Vegetation Attributes Providing Thermal Refugia for Northern Bobwhites in South Texas,** Brandon J. Palmer, Timothy E. Fulbright, Eric D. Grahmann, Fidel Hernandez, Michael W. Hehman, and David B. Wester

9:15 **Landscape Connectivity for Lesser Prairie-Chickens on the Southern High Plains of Texas and New Mexico,** Lucas J. Schilder, Lucas J. Heintzman, Nancy E. McIntyre, Samuel Harryman, Christian A. Hagen, Russell Martin, Blake A. Grisham, and Clint W. Boal

SESSION B2: AMPHIBIANS AND REPTILES II
AMERICAS BALLROOM 3
MODERATOR: JESSICA GLASSCOCK

8:00 **Effects of Fire Seasonality on Reptiles and Amphibians in a Rolling Plains Ecosystem,** Joselyn M. Gutierrez, Richard T. Kazmaier, and Matthew W. Poole

8:15 **Habitat Associations and Population Estimates for the Texas Horned Llizard in the Southern High Plains of Texas,** Sara A. van der Leek, and Andrew C. Kasner

8:30 **Herpetofaunal Responses to Time Since Burning in an Eastern Texas Woodland,** Erin E. Stiede, Richard T. Kazmaier, Michelle L. Caruana, and Ashley Tubbs

8:45 **Movements, Home Range, Activity Patterns, and Habitat Selection of the Western Chicken Turtle in Texas,** Brandon C. Bowers, Danielle K. Walkup, Toby J. Hibbitts, Paul Crump, and Wade A. Ryberg

9:00 **Variation in Demographic Trade-Offs for Yellow Mud Turtle Populations in Texas,** Jonathan A. Zenor, Richard T. Kazmaier, Mark J. Lange, and Trevor J. McVay

9:15 **Using Museum and Citizen-science Data to Examine the Range Contraction of a Threatened Lizard Species,** Jared W. Haney

SESSION C2: BIG GAME MANAGEMENT I
EUROPA AMPHITHEATRE
MODERATOR: KRISTYN STEWART

8:00 **Developing Tooth Replacement and Wear Criteria for Aging Free-ranging Axis Deer with Comparisons to the Criteria for Aging White-tailed Deer,** Matthew J. Buchholz, Blake A. Grisham, Thomas L. Arsuffi, and Warren C. Conway

8:15 **Elk Forage Response to Prescribed Fire in a Meadow in Redwood National and State Parks,** Lee H. Williamson and Floyd W. Weckerly

8:30 **Home Range of Translocated Pronghorn in Trans-Pecos, Texas,** Howell A. Pugh, Louis A. Harveson, Carlos Gonzalez, Dana Karelus, and Shawn S. Gray

8:45 **Influence of Agriculture on Pronghorn Movement, Survival, and Diet Composition in the Texas Panhandle,** Gary L. Mizer, Warren C. Conway, Anthony P. Opatz, Timothy E. Fulbright, Randy W. DeYoung, Humberto L. Perotto-Baldivieso, and Shawn S. Gray

9:00 **Land Cover and Resource Selection of Pronghorn in the Texas Panhandle,** Anthony P. Opatz, Timothy E. Fulbright, Gary L. Mizer, Randy W. DeYoung, Humberto L. Perotto-Baldivieso, Warren C. Conway, and Shawn S. Gray

9:15 **Nilgai Antelope Behavior and Movement: Implications for Cattle Fever Tick Eradication,** Lisa D. Zoromski, Randy W. DeYoung, John A. Goolsby, Aaron M. Foley, J. Alfonso Ortega-S., David G. Hewitt, and Tyler A. Campbell

SESSION D2: VEGETATION AND HABITAT MANAGEMENT
IBIZA
MODERATOR: JACOB WHITE

8:00 **Changes in Forage Biomass for Elk and Mule Deer Following 6 Years of Landscape Scale Forest Restoration and Monitoring in the Jemez Mountains, New Mexico,** Sharon E. Smythe, James W. Cain, III, Warren C. Conway, and Mark A. Peyton

8:15 **Ecotypic Seed for Restoration Efforts in the Coastal Prairies Region of Texas,** Douglas L. Jobes, Forrest S. Smith, Anthony D. Falk, Keith A. Pawelek, Aaron D. Tjelmeland, and Garry L. Stephens

8:30 **Seasonal Prescribed Burning Effects on Forage Production and Composition of Gulf Cordgrass Communities,** Jose S. Avila Sanchez, Victoria L. Haynes, Sandra Rideout-Hanzak, David B. Wester, Jose A. Ortega-S, and Tyler A. Campbell

8:45 **Quail Habitat Restoration in Areas Dominated by Non-Native Grasses,** Ellart J. Vreugdenhil

9:00 **Wildlife Community Response to Native-grassland Restoration in the Rio Grande Plains,** Geron G. Gowdy, Ellart J. Vreugdenhil, Brandon J. Palmer, Javier O. Huerta, Fidel Hernandez, Eric D. Grahmann, Timothy E. Fulbright, and Michael W. Hehman

9:15 **Proximity to Disturbance as a Function of African Rue Density,** Sarah J. Turner, Brian L. Pierce, Krysta D. Demere, Frank Cartaya, and Carlos E. Gonzalez

SESSION E2: NON-GAME MAMMALS II
VIGO
MODERATOR: SARAH FRITTS

8:00 **Change of Woody Cover Affects Ocelot Recovery in South Texas,** Jason V. Lombardi, Michael E. Tewes, and Humberto L. Perotto-Baldivieso

8:15 **Withdrawn**

8:30 **Multiseason Occupancy Dynamics of Ocelots in Tamaulipan Thornshrub of South Texas,** Jason V. Lombardi, Michael E. Tewes, Humberto L. Perotto-Baldivieso, Jose M. Mata, and Tyler A. Campbell

8:45 **Ocelot Resource Selection in a Highly Fragmented Landscape,** Amanda M. Veals, AnnMarie Blackburn, Jane Anderson, Michael E. Tewes, Joseph D. Holbrook, Humberto L. Perotto-Baldivieso, Randy W. DeYoung, and John H. Young, Jr.

9:00 **Spatial and Temporal Behavior Patterns of Coyotes in South Texas,** Justin T. French, Tyler A. Campbell, and John M. Tomecek

9:15 **Withdrawn**

SESSION F2: FINDING YOUR DREAM JOB II
VENICE
MODERATOR: MITCH STERNBERG

8:00 **Kevin Malonson,** Texas Parks and Wildlife Department

8:15 **Larry Pierce,** Texas A&M AgriLife Extension

8:30 **Sharon Fuller-Barnes,** US Fish and Wildlife Service

8:45 **John Warner,** Texas Parks and Wildlife Department

9:00 **Tom Boggus,** Texas Forest Service

9:15 **Masi Mejia,** East Foundation

SESSION A3: AVIAN ECOLOGY AND MANAGEMENT III
AMERICAN BALLROOM 1
MODERATOR: JOHN PALARSKI

10:00 **Grassland Bird Diversity and Habitat Associations in the Southern High Plains, Texas,** Sharon L. DeMerritt and Andrew C. Kasner

10:15 **Detection Modeling for 4 Priority Grassland Bird Species in Texas: Northern Bobwhite, Eastern Meadowlark, Dickcissel, and Painted Bunting,** Anna M. Matthews, James J. Giocomo, and M. Clay Green

10:30 **Multi-scale Resource Selection of Sandhill Cranes on the Southern High Plains,** Kathryn J. Brautigam, Blake A. Grisham, William P. Johnson, Daniel P. Collins, Jude Smith, Warren Conway, and Owen Fitzsimmons

10:45 **Resource Selection and Energy Expenditure by Greater White-fronted Geese During Winter,** Jay A. VonBank, Bart M. Ballard, Kevin J. Kraai, Mitch D. Weegman, and Daniel P. Collins

11:00 **Southern Texas Ecosystem Engineers: How the Golden-fronted woodpecker Can Improve avian Biodiversity,** Faith O. Hardin

11:15 **Avian Distribution Across a South Texas Working Ranch Landscape and Implications for Migratory Facilitation,** Allison M. Kohler and Michael L. Morrison

SESSION B3: AMPHIBIANS AND REPTILES III
AMERICAS BALLROOM 3
MODERATOR: MARISSA PENSIRIKUL

10:00 **Community Organization of a Snake Guild in Shortleaf Pine Forests,** Connor S. Adams, Christopher M. Schalk, and Daniel Saenz

10:15 **Correlates of Snake Entanglement in Erosion Control Blankets,** Sarah E. Ebert, Kasey L. Jobe, Daniel Saenz, Cory K. Adams, Christopher M. Schalk, and Christopher E. Comer

10:30 **Microhabitat Variables Drive Within Breeding-season Colonization-extinction Dynamics in a Specialist Lizard,** Danielle K. Walkup, Wade A. Ryberg, Lee A. Fitzgerald, and Toby J. Hibbitts

10:45 **The Massasauga Saga: Habitat Conservation Forecasting for the Western Massasauga,** Wade A. Ryberg, Michelle Lawing, Danielle K. Walkup, and Toby J. Hibbitts

11:00 **Vacant**

11:15 **Vacant**

SESSION C3: BIG GAME MANAGEMENT II
EUROPA AMPHITHEATRE
MODERATOR: SUSANNA HUSBANDS

10:00 **Cattle Grazing and Forb Production for White-tailed Deer Can Be Compatible,** Dillan J. Drabek, J. Alfonso Ortega-S., Timothy E. Fulbright, David G. Hewitt, and David B. Wester

10:15 **Hybridization of Deer in the United States: Tracking the Maternal Lineage,** Emily A. Wright, Emma K. Roberts, Warren C. Conway, and Robert D. Bradley

10:30 **Landscape Use by Male White-tailed Deer After Brush Management,** Jacob L. Dykes, Randy W. DeYoung, Timothy E. Fulbright, J A. Ortega-S, and Dean W. Wiemers

10:45 **The Influence of Agriculture on Mule Feer in a Fragmented Landscape,** Levi J. Heffelfinger, Laura S. Warner, David G. Hewitt, Shawn S. Gray, Warren C. Conway, Timothy E. Fulbright, Randy W. DeYoung, and Louis A. Harveson

11:00 **Variable Precipitation Causes Permanent Cohort Effects on Antler size in South Texas Populations of White-tailed Deer,** Masahiro Ohnishi, Randy W. DeYoung, Charlie A. DeYoung, Bronson K. Strickland, David G. Hewitt, and Don A. Draeger

11:15 **Vacant**

POSTER SESSION I
3:00 PM – 6:30 PM THURSDAY, 21 FEBRUARY
(JUDGING: 5:30 PM – 6:30 PM THURSDAY, 21 FEBRUARY)
8:00 AM – 3:00 PM FRIDAY, 22 FEBRUARY
ATRIUM
ORGANIZERS: HEATHER MATHEWSON AND DANIEL PRICE

1. **Ecological Requirements for 2 Grassland Obligate Birds in the Marfa Grassland, Texas,** Fabiola Baeza-Tarin and Mieke Titulaer
2. **Effect of Weather Conditions on Population Variance and Abundance of Cassin's Sparrow, Horned Lark, Mourning Dove, and Western Meadowlark Populations in a West Texas Shortgrass Prairie,** Jonathon P. Bentley and Clint Boal
3. **Landscape Characteristics Surrounding Ocelot-Vehicle Collision Sites,** AnnMarie Blackburn, Amanda M. Veals, C. Jane Anderson, Michael E. Tewes, Humberto L. Perotto-Baldivieso, Randy W. DeYoung, and John H. Young
4. **Evaluating Nutritional Content of Browse Plants Collected Across a West-East Gradient of the Trans-Pecos, Texas,** Daniel E. Botello, Thomas S. Janke, and Louis A. Harveson
5. **Sorghum Residuals Importance for the Mid-Continent Population of Sandhill Cranes: Future Implications on Winter Diet and Geographic Shifts,** Kathryn J. Brautigam, Blake A. Grisham, William P. Johnson, Daniel P. Collins, Jude R. Smith, Warren C. Conway, and Owen Fitzsimmons
6. **Habitat Characteristics and Use by Texas Horned Lizards and Texas Tortoises on South Texas Rangelands,** Victoria M. Cavazos, and Javier O. Huerta
7. **Accelerated Growth of Tamaulipan Thornscrub Habitat for Ocelots,** Jose G. Cortez, Jr, Sandra Rideout-Hanzak, David B. Wester, Michael E. Tewes, and David E. Ruppert
8. **Evaluation of Loafing Site Characteristics for Rio Grande Wild Turkeys in the Coastal Sand Plains of Texas,** Darrion M. Crowley, Humberto L. Perotto-Baldivieso, William P. Kuvlesky, J. Alfonso Ortega-S, Leonard A. Brennan, and Brandon S. Mitchell
9. **Comparison of Desert Bighorn Sheep Home Ranges Across Different Release Methods,** Taylor S. Daily, Carlos E. Gonzalez, Louis A. Harveson, Warren C. Conway, and Froylan Hernandez
10. **Aboveground Biomass Estimation from Unmanned Aerial Vehicles in Rangelands,** Alexandria M. DiMaggio, Humberto L. Perotto-Baldivieso, Alfonso Ortega-S., Chase Walther, Karelys N. Labrador-Rodriguez, Michael Page, Sandra Rideout-Hanzak, and David B. Wester
11. **Seed Biomass in 2 Different Grazing Regimes in the Marfa Grasslands, Texas,** Margaret G. Downing, Fabiola T. Baeza, and Mieke Titulaer

12. **Mule Deer Feeder Visitation in Relation to Lunar Phases in Trans-Pecos, Texas,** Erica I. Dunn, Thomas S. Janke, and Louis A. Harveson
13. **Exploring Trophic Levels and Landscape Ecology with BeeBot Technology,** Linden S. Eli, Marybeth Green, Humberto L. Perotto-Baldivieso, and April A. Conkey
14. **Using Motion-Sensing Trail Cameras to Monitor Response of Wild Pigs to Control Efforts,** Bethany A. Friesenhahn, Kurt C. Vercauteren, Nathan P. Snow, Bruce R. Leland, and Randy W. DeYoung
15. **Fenceline Ecology: Wildlife Use of Fence Crossings in South Texas,** Megan M. Granger, Lisa D. Zoromski, Randy W. DeYoung, Aaron M. Foley, J. Alfonso Ortega-S, David G. Hewitt, John A. Goolsby, and Tyler A. Campbell
16. **Northern Bobwhite Diet: Searching for Potential Insect Intermediate Hosts in South Texas,** Tessa M. Green, Nicole J. Traub, and Alan M. Fedynich
17. **Correlating Body Condition and Habitat Management of Wintering Duck Populations in Texas Wetlands,** Allison A. Guggenheimer and Jacquelyn K. Grace
18. **Nutritional Differences Between the Genera *Bouteloua* and *Aristida* in the Marathon Basin of Texas,** Katherine E. Haile, Cullom S. Simpson, Bonnie J. Warnock, and Thomas S. Janke
19. **Seasonal and Annual Variation in Raptor Species Presence and Abundance in the Southern Great Plains of Texas,** Jenny R. Harris and Clint W. Boal
20. **Advertisement Calls for Eleven Anuran Species from the Bolivian Gran Chaco,** Hailey A. Hester, Christopher M. Schalk, and Daniel Saenz
21. **Preliminary Analysis of Kit Fox Occupancy in the Trans-Pecos, Texas,** Matthew O. Hewitt, Patricia Moody Harveson, Dana Karelus, Louis A. Harveson, Julie Schmidt, Hunter L. Hopkins, and Russell Martin
22. **Estimating the Expected Rate of Use of Road Mitigation Structures in South Texas: A Preliminary Analysis,** Taylor M. Hopkins, Thomas Yamashita, Anna Rivera, Kevin Ryer, John Young Jr., and Richard Kline
23. **Detection of Herpetofauna Models Using Unmanned Aerial Vehicles,** Javier O. Huerta and Scott E. Henke
24. **Effects of Habitat Restoration on Texas Horned Lizards and Their Prey,** Javier O. Huerta and Scott E. Henke
25. **Effects of Water Quality and Availability on the Consumption of Pelleted Feed by White-tailed Deer,** Austin K. Killam, Clayton D. Hilton, and David G. Hewitt
26. **Pronghorn Preferred Forage Production in Relation to Cattle Grazing Regimes in the Trans-Pecos, Texas,** Jacob C. Locke, Katherine Haile, Carlos E. Gonzalez, Louis A. Harveson, and Shawn S. Gray
27. **Wetland Use and Characterization of Mexico Wetlands Used by Wintering Midcontinent Greater White-fronted Geese,** Jason P. Loghry, Jay A. Vonbank, Kevin J. Kraai, and Bart M. Ballard
28. **Comparison of Telemetry and Occurrence Data to Inform Ocelot Habitat Suitability in South Texas,** Jason V. Lombardi, Michael E. Tewes, Humberto L. Perotto-Baldivieso, Daniel G. Scognamillo, and Tyler A. Campbell
29. **Home Range and Habitat Selection of the Greater Roadrunner on the Welder Wildlife Refuge,** Derek R. Malone, Clint W. Boal, and Terry L. Blankenship

30. **Individual Identification of Nilgai Using Camera Traps at Latrines in South Texas,** Lori D. Massey, Lisa D. Zoromski, Randy W. DeYoung, John A. Goolsby, Aaron A. Foley, J. Alfonso Ortega-S., David G. Hewitt, and Tyler A. Campbell
31. **Reseeding Techniques on the Chilicotal soil, Chihuahuan Desert, Texas, After Treatment with Tebuthiuron,** Carolina Medina-Nava, Bonnie J. Warnock, and Kevin Urbanczyk
32. **Wind Turbine Concentrations and the Threats They Pose to Swainson's Hawks,** Margaret E. Meier, Katheryn A. Watson, Clint W. Boal, and James D. Ray
33. **Old Tricks–New Opportunities: Using Telemetry as a Landscape Analysis Tool to Assess Wild Turkey Habitat in South Texas,** Alison R. Menefee, Humberto L. Perotto-Baldivieso, William P. Kuvlesky, Leonard A. Brennan, and Alfonso Ortega-Santos
34. **Camera Trapping to Identify Waterfowl Use of Stock Ponds in the Oaks and Prairies Ecoregion of East Texas,** Colin C. Merritt, James R. Morel, Samantha S. Kahl, Blake A. Grisham, Kevin J. Kraai, Daniel P. Collins, and Warren C. Conway
35. **Analysis of Allelic Variation in the Prion Protein Gene of South Texas White-tailed Deer,** David Navarro, Randy W. DeYoung, Aaron M. Foley, Charles A. DeYoung, Don A. Draeger, and Tyler A. Campbell
36. **Modeling Woody Vegetation Density with Very High-Resolution Remote Sensing Imagery and Unmanned Aerial Systems,** Michael T. Page, Humberto L. Perotto-Baldivieso, David B. Wester, and Alexandria DiMaggio
37. **Quantifying the Spatial and Temporal Distribution of Thermal Refugia for Northern Bobwhites Using an Unmanned Aerial Vehicle,** Brandon J. Palmer, Timothy E. Fulbright, Eric D. Grahmann, Fidel Hernandez, Humberto L. Perotto-Baldivieso, Michael W. Hehman, Jinha Jung, and Anjin Chang
38. **Transposable Element-based Investigations Into Vesper Bat Genome Evolution and Cryptic Speciation,** Nicole S. Paulat, Jennifer Korstian, David A. Ray, and Roy N. Platt II
39. **A Review of Techniques for Archiving and Sharing Camera Trap Databases,** Cody A. Putman and Thomas S. Janke
40. **Molecular Systematics of Pocket Gophers Based on 2 Nuclear and 2 Mitochondrial Genes,** Emma K. Roberts, Erica Vargas, Sheri Ayers, and Robert D. Bradley
41. **Summer Roosting Ecology of Evening Bats on the Gulf Coast of Texas,** Jacob A. Rogers, Matthew C. Parker, and Sarah R. Fritts
42. **Diet Comparisons Between Nilgai, White-tailed Deer, and Cattle on the East Foundation Ranches,** David Rosales, Dillan J. Drabek, J. Alfonso Ortega-S., Timothy E. Fulbright, David G. Hewitt, and David B. Wester
43. **Evaluation of a Technique to Eliminate Excessive Data in Camera Trap Surveys for Mesocarnivores in the Marfa Grasslands of Texas,** Julie R. Schmidt, Matthew O. Hewitt, Thomas S. Janke, and Patricia Moody Harveson
44. **Distribution and Comparative Nesting Habitat of Riparian Raptors in the Trans-Pecos Region of Texas,** Caroline K. Skidmore, Clint Boal, Ben Skipper, and Russell Martin
45. **Evaluation of Cover Type Use by Nilgai Antelope in Rangelands to Assess Cattle Fever Tick Dispersal,** Kathryn M. Sliwa, Aaron M. Foley, Randy W. DeYoung, Jeremy A. Baumgardt, J. Alfonso Ortega-S., David G. Hewitt, Humberto Perotto-Baldivieso, John A. Goolsby, Adalberto Perez de Leon, and Tyler A. Campbell

46. ***Aspergillus Flavus* Control: The Need to Consider Spores,** Jacobo Soliz, Greta L. Schuster, Scott E. Henke, and Alan M. Fedynich
47. **Comparison of GPS and Iridium Collars on Ocelots and Bobcats in South Texas,** Samuel H. Stone, Jason V. Lombardi, Michael E. Tewes, and Tyler A. Campbell
48. **The Use of Prescribed Fire, Herbicide Application, and Native Plants to Restore Bottomland Blackland Prairie in Constructed Wetlands,** Canaan Sutton and Johanna Delgado-Acevedo
49. **A Survey of Northern Bobwhite Helminths in South Texas from 2016 to 2018,** Nicole J. Traub, and Alan M. Fedynich
50. **Comparing the Detection of Old World Bluestem Distributions in South Texas Using Different Remotes Sensing Platforms,** Justin P. Wied, Humberto L. Perotto-Baldivieso, April A. Torres Conkey, and Leonard A. Brennan
51. **Assessing Changes in Wildlife Road Mortality Hot Spots After the Construction of Wildlife Mitigation Structures on a South Texas Highway,** Thomas J. Yamashita, Trinity D. Livingston, Kevin Ryer, John Young, Jr., and Richard J. Kline
52. **Genetic Structure and Diversity of Nilgai Antelope in Texas,** Lisa D. Zoromski, Randy W. DeYoung, Masahiro Ohnishi, John A. Goolsby, Aaron M. Foley, J. Alfonso Ortega-S., David G. Hewitt, and Tyler A. Campbell

POSTER SESSION II
5:00 PM – 10:00 PM FRIDAY, 22 FEBRUARY
8:00 AM – 11:30 AM SATURDAY, 23 FEBRUARY
ATRIUM
ORGANIZERS: HEATHER MATHEWSON AND DANIEL PRICE

53. **Evaluation of Automated Sprayers Using Entomopathogenic Nematodes to Eradicate Cattle Fever Ticks in Nilgai Antelope,** Jeremy A. Baumgardt, John A. Goolsby, Kathryn M. Sliwa, Randall W. DeYoung, J. Alfonso Ortega-S, David G. Hewitt, and A. Perez de Leon
54. **Parasitological Survey of Lesser Prairie-Chickens in Texas and New Mexico,** Kristin J. Bondo, Mike Whitson, Clint Boal, Markus Peterson, Brad Simpson, Christian Hagen, and Blake Grisham
55. **Population Dynamics Model to Inform Harvest Management of a Small Elk Herd in Central New Mexico,** Matthew J. Butler, Ryan M. DeVore, Mark C. Wallace, and Stewart G. Liley
56. **Accelerated Growth of Tamaulipan Thornscrub Habitat for Ocelots,** Jose G. Cortez, Jr, Sandra Rideout-Hanzak, David B. Wester, Michael E. Tewes, and David E. Ruppert
57. **Population Trends of High Conservation Priority Bird Species Within the Gulf Coast Joint Venture Region,** Stephen J. DeMaso, Joseph P. Sands, Leonard A. Brennan, and William G. Vermillion
58. **Behavioral Responses of White-tailed Deer to Heat Stress,** Jacob L. Dykes, Randy W. DeYoung, Timothy E. Fulbright, David G. Hewitt, Charles A. DeYoung, J A. Ortega-S, Aaron M. Foley, and Tyler A. Campbell

59. **Estimating White-Tailed Deer Population Sizes Using Unmanned Aerial Vehicles,** Jesse Exum, Aaron M. Foley, David G. Hewitt, Randy W. DeYoung, Jeremy Baumgardt, and Mickey W. Hellickson
60. **Oaks and Prairies Joint Venture Fall Bobwhite Population Monitoring and Grassland Restoration Efforts Through the Grassland Restoration Incentive Program (GRIP),** James Giocomo, Anna Matthews, Kenneth Gee, Steve Riley, Derek Wiley, Will Newman, Leah Lowe, Jeff Raasch, and Robert Perez
61. **Survival and Success of Translocated Wild California Quail in Texas,** Elizabeth D. Fortner and Kelly Regna
62. **Aflatoxin Inhibits Phagocytic Activity of Macrophages in Northern Bobwhite and Exacerbates Crippling Loss,** Scott E. Henke, Clayton D. Hilton, and Alan M. Fedynich
63. **Spatial Partitioning of Coyotes and Mesocarnivores in the Marfa Grasslands of Texas,** Hunter L. Hopkins, Matthew O. Hewitt, Thomas S. Janke, Dana Karelus, and Patricia Moody Harveson
64. **Caudates as Prey: Predator Diversity and Size-relationship Patterns,** Kasey L. Jobe, Carmen G. Montana, and Christopher M. Schalk
65. **Fine-scale Movement of the Texas Kangaroo Rat Along Roadsides Dominated by Cropland,** Matthew M. Milholland, Silas L. Ott, Ivan Castro-Arellano, Joseph A. Veech, Thomas R. Simpson, and Jonah Evans
66. **Using GPS Collar Data as Surrogate for Visual Observation,** Elizabeth Cary Mungall and Christian Mungall
67. **Pronghorn in the Texas Panhandle: The Habitat-Cropland Paradox,** Anthony P. Opatz, Timothy E. Fulbright, Gary L. Mizer, Randy W. DeYoung, Humberto L. Perotto-Baldivieso, Warren C. Conway, and Shawn S. Gray
68. **Northern Bobwhite Restoration in Erath County, Texas: Project Proposal,** John D. Palarski, Heather Mathewson, Bradley W. Kubečka,, Dale Rollins, and Thomas W. Schwertner
69. **Assessing Occupancy of Bats on the Gulf Coast of Texas,** Matthew C. Parker, Jacob A. Rogers, and Sarah R. Fritts
70. **Recap of My Experiences While Helping with the Trans-Pecos Kit Fox Distribution Project, Texas,** Peter T. Poulsen, Matthew O. Hewitt, Patricia M. Harveson, Thomas S. Janke, Julie Schimdt, and Hunter Hopkins
71. **Validating the Use of White-tailed Deer Capture Locations for Home-range Scale Habitat Analysis,** Seth T. Rankins, Jacob L. Dykes, Tim E. Fulbright, Alfonso Ortega, Aaron M. Foley, David G. Hewitt, Randy W. DeYoung, and Landon R. Schofield
72. **Trends in Bird-Window Collision on a Local Scale,** Delanie E. Slifka and April A. T. Conkey
73. **Influence of Ashe Juniper on Montezuma Quail in the Edwards Plateau of Texas,** Kristyn G. Stewart, Fidel Hernández, Eric D. Grahmann, Leonard A. Brennan, and Humberto L. Perotto-Baldivieso
74. **Does size matter? A Comparison of Herpetological Communities in 2 Constructed Wetlands in Northeast Texas,** Canaan Sutton, Zachary Delisle, and Johanna Delgado-Acevedo

75. **Winners and Losers: Small Mammal Responses to Tropical Land Use Change,** Jacquelyn M. Tleimat and Sarah R. Fritts
76. **Lesser Prairie-chicken Nest Success and Habitat Selection Response to Various Prescribed Fire and Grazing Regimes,** Michael D. Whitson, Blake A. Grisham, Warren C. Conway, Christian A. Hagen, and Randy Howard
77. **Road Density, Corridors, and Wildlife-Vehicle Collisions in South Texas,** Kelley A. Wood
78. **Using Genomics to Characterize Population Structure, Connectivity, Genetic Variation, and Health of Desert Bighorn Sheep Texas,** Emily A. Wright, Froylan Hernandez, Caleb D. Phillips, Robert D. Bradley, and Warren C. Conway

HOW TO LAND YOUR DREAM JOB

SPEAKER BIOGRAPHIES

Sharon Fuller-Barnes has worked for the U.S. Fish and Wildlife Service for 17 years. Sharon is currently stationed in Austin, working for the Office of Diversity and Inclusive Management for the USFWS. She serves as a Diversity Employment Specialist for USFWS at the national level, allowing her to provide guidance and support to those from all walks of life about careers with USFWS, as well as preparing them to be competitive within the application process. Sharon started her career in the Student Career Experience Program (SCEP). She has worked at several different national wildlife refuges assisting in biology, environmental education, management, maintenance, and staff support. Sharon worked in the Atlanta Regional Office of USFWS for six years in the Visitor Services Program, overseeing student/youth programs as well as facilitating a mentoring program for regional employees. Sharon obtained a B.S. in Wildlife Management from Texas Tech University and a M.S. in Human Dimensions of Wildlife Management from Mississippi State University. Sharon is very passionate about my career and knows that educating the public, especially the younger generation, is an intricate part of wildlife management. Sharon has been married for 8 years to her "high school sweetheart" Ryman (Coach Barnes), and they are raising 3 future conservation leaders: Rylan (12), Ryia (8), and Rysen the outgoing and adventurous 4 year old!

Ty Bartoskewitz is the ranch manager for the MT7 Ranch outside Breckenridge, Texas. The MT7 encompasses 22,500 acres in the cross timbers and prairies and rolling plains eco-regions of Texas. Ty is responsible for planning and supervising ranch operational and capital improvement projects, wildlife, cattle, and habitat management practices, outreach and education opportunities, and managing administrative and day to day operations. He has a team of 11 staff in addition to multiple interns. Ty is in his 10th year as manager at MT7 and has hired 71 interns and multiple full-time staff during that time. His previous experience includes serving as the Technical Guidance Biologist in the PK District (3) of north Texas and as a Private Lands Biologist in south Texas for Texas Parks & Wildlife Department for 9 years. Ty served as a wildlife biologist for Terra Rosa Ranch and La Bandera Ranch in the late 1990's. Bartoskewitz is actively involved in the Texas Wildlife Association, where he serves as a Director, and is a member of their White-tailed Deer Advisory Committee. He also currently serves as member and Vice Chair of the Texas Parks & Wildlife Private Lands Advisory Committee. He is an Official Measurer of the Boone and Crockett Club, past-President of the North Texas Buckskin Brigade, and serves on the Rolling Plains Quail Research Ranch Advisory Committee. Ty earned a B.S. in Range and Wildlife Management from Texas Tech University and a M.S. in Wildlife Management from Texas A&M University-Kingsville.

Tom Boggus serves as the State Forester and Director of Texas A&M Forest Service since 2010, and previously as Interim Director from June 2008. Previously, he was Associate Director of Resource Development and Sustainable Forestry, and Assistant Director, and served on the agency's Executive Team since 1996. Tom was raised in the West Texas town of Fort Stockton. He received his B.S and M.S. in forestry at Stephen F. Austin State University. He joined Texas A&M Forest Service (TFS) in 1980. In the field, he helped deliver urban and rural forest management programs. Tom's career focused on serving the non-industrial private forest landowners of Texas through technical assistance and information. He is actively involved in the National Association of State Foresters and is a Fellow of the Society of American Foresters. He was recognized as a Distinguished Alumni of Stephen F. Austin State University in 2013. He served as Assistant Scoutmaster and Troop Committee Chairman of his son's Boy Scout Troop. Tom has been married to his wife, Charlene, since 1980, and they have one son, Chris, and a daughter-in-law, Becky, and, most importantly, granddaughters Avery Eden, Lydia Grace, and Haddie Faith who all love to go camping.

Whitney Gann is the Project Leader for Texas Parks and Wildlife's South Texas Ecosystem Project (STEP) which includes the Chaparral and James E. Daughtrey WMAs. Whitney is the first female Project Leader for TPWD. As project leader one of Whitney's primary roles is to manage, design, and implement research and biological monitoring projects at the Chaparral WMA and to manage the public hunting program for STEP. Previously she worked as a research scientist on the Pronghorn Restoration Project for the Borderlands Research Institute. Whitney currently supervises 9 TPWD staff and temporary employees. She enjoys working in South Texas and especially with white-tailed deer. She has a B.S. from Texas A&M University, a M.S. from West Texas A&M, and a Ph.D. in Wildlife Science from Texas A&M University-Kingsville. Whitney's goals are to grow as a professional with TPWD and to implement new research projects in her current position. Whitney has been nominated for 2019-2020 Secretary of the Texas Chapter of TWS.

Ricky Linex has worked for the USDA Natural Resources Conservation Service for 37 years in west and north Texas. His current position is as Zone 5 Wildlife Biologist for 51 counties in north-central Texas and is headquartered in Weatherford, Texas. From 1982-2003 he worked as a range management specialist in Goldthwaite, Snyder and Abilene. Ricky is a 1981 graduate from Texas Tech University with a B.S. in Range Management with the Wildlife Habitat option. Ricky is a Certified Wildlife Biologist, a Certified Professional in Range Management and a longtime member of TWS, Texas Chapter of TWS, Society for Range Management and Texas Section, Society for Range Management. Ricky has been involved with the Rolling Plains Bobwhite Brigade since the 2nd Battalion in 1994 serving as an instructor and past camp coordinator. He has served as an instructor for the North Texas Buckskin Brigade since its inception in 2001. He is the author of Range Plants of North Central Texas; A Land User's Guide to Their Identification, Value and Management. He enjoys training NRCS employees and helping landowners better understand the land organism they own and manage.

Since 2013, Kevin Malonson has served as a Texas Game Warden Recruiter. Kevin grew up fishing and bird-hunting with very little knowledge of the Texas Game Warden career path but was interested in a law enforcement career fueled by positive interactions with Texas Game Wardens while fishing and duck-hunting in the Matagorda area. Kevin attended the High School for Law Enforcement & Criminal Justice graduating in 1991, and is a veteran of the U.S. Navy. Kevin completed his Criminal Justice degree at Lamar University in 2000, receiving the top honor of the C. Robert Kemble Award. In July 2000, I was appointed to the 47th Game Warden Academy and upon graduation January 2001, served in Jefferson County until April 2003; served Harris County from 2003-2013. *He focuses his time with his 15-year old daughter, Elise teaching her the importance of conservation while enjoying bonding time during outdoor excursions hunting and fishing

Masi Mejia lives in Laredo, Texas, and has worked with the East Foundation since 2016. She currently serves as the educator and covers seven counties in south Texas (Zapata, Jim Hogg, Brooks, Duval, Webb, Dimmit, and La Salle). Masi deploys hands-on educational programs related to natural resources in the classroom and on East Foundation lands. Masi has always had a passion for wildlife and outdoors. As a child her, family visited state parks and she spent summers and vacations with her *abuelos* and family in Encinal, Texas. She was mesmerized with their stories of working the land, cattle, and wildlife as *vaqueros*. Masi received a B.S. in Environmental Conservation of Natural Resources and a M.S. in Wildlife, Aquatic, and Wildlands Science and Management from Texas Tech University. Prior to her position at the East Foundation, Masi was pursuing a Ph.D. in Wildlife Science at the University of Idaho as the Graduate Mentor for the Doris Duke Conservation Scholars Program.

Todd Merendino has worked for Ducks Unlimited for 11 years (2008 – present) as the Manager of Conservation Programs, overseeing the implementation of habitat conservation programs throughout Texas, Oklahoma, and New Mexico. Previously, he was the project leader for TPWD's Central Coast Wetlands Ecosystem Project for 11 years (1996-2008) and was responsible for 13 staff positions on 7 wildlife management areas on the Texas Mid-Coast. He began his career in 1992 as the area biologist for TPWD's Peach Point WMA (Justin Hurst WMA) and worked hands-on with research, public hunting, and habitat management. During his career he has hired many biologists, technicians, and administrative personnel. Todd has a B.S. in Wildlife Management and an M.S. in Wildlife Science from Texas Tech University, and a Ph.D. in Zoology from the University of Western Ontario in Ontario, Canada. He has served as an adjunct advisor on graduate student committees at Texas A&M – Kingsville and College Station. Todd participates on the board of two land trusts and Chairs the Central Flyway Habitat Subcommittee.

Larry W. Pierce, Jr. received a B.S. in Animal Science in 1997 and a M.S. in Wildlife Science in 2010 from Texas A&M University. He has been employed with Texas A&M AgriLife Extension Service since 1997 serving as County Extension Agent in Atascosa, Dimmit, and Washington counties. Larry worked closely with new landowners guiding them on land management decisions. Also, he recruited and trained volunteers to develop educational programs, and fostered youth to become future leaders in agriculture and natural resources. Since 2014, Larry has served 44 counties in East Texas as the Regional Program Leader for Agriculture and Natural Resources and 4-H Youth Development. In this role, he provides training and support to new county Extension agents, works closely with agents and Extension specialists to develop innovative educational programs, and advances partnerships for the agency. He serves as a director for the Texas Wildlife Association and is past-President of Texas Brigades' Youth Wildlife Leadership Development Program. Larry, his wife and two children reside in Elysian Fields, Texas, on his family's farm.

Romey is the Director of Conservation Strategy with Audubon Texas where he works with landowner, university, non-profit, and agency partners to affect conservation at both the species and landscape scales. Romey received his B.S. from Texas State University in 2007, and his M.S. from Texas State University in 2009. He has been engaged and held numerous positions in the Texas Chapter of TWS since 2006, the SW Section of TWS, Land Trust Alliance, Texas Wildlife Association, Texas Ornithological Society, and the Texas Herpetological Society. Romey previously worked as Senior Wildlife Biologist (Plateau Land and Wildlife) and Conservation Project Manager (Hill Country Conservancy). He is currently Chair for the Conservation Affairs Committee of Texas Chapter of TWS, and is a Fellow in the James G. Teer Conservation Leadership Institute. He enjoys being a mentor to wildlife students and early professionals while continuing to learn on the council from his mentors. Romey is also very interested in public policy and decision making as it relates to our conservation interests in Texas.

Romey has been nominated for 2019-2020 Vice President of the Texas Chapter of TWS. Romey enjoys hunting, birdwatching, "herping", backpacking, camping, hiking, photography, and writing.

Dr. John M. Tomeček is an Assistant Professor and Extension Wildlife Specialist with the Department of Wildlife and Fisheries Sciences at Texas A&M University. In his role for Texas A&M AgriLife Extension service, Dr. Tomeček coordinates with Extension staff, governmental, NGO, and private partners to advance education and best management practices for wildlife across Texas. Much of his work addresses issues of wildlife damage and diseases, including wild pig management. Dr. Tomeček also serves on a number of advisory committees for government and private organizations, including serving as Co-chairman of the Texas Wild Pig Task Force. He serves a number of professional organization committees, and is currently the Vice President of the Texas Chapter of TWS. Dr. Tomeček received his Ph.D. from Texas A&M University. He enjoys hiking, hunting, fishing, training horses, and travel.

Jonathan Warner has worked for Texas Parks and Wildlife Department for 2 years. His current position is Alligator Program Leader. His office is located at the J.D. Murphree WMA in southeast Texas but he travels frequently across the state as part of his duties involving the American Alligator. The TPWD Alligator Program Leader is responsible for overseeing the spring and fall alligator hunting seasons, nuisance alligator control, alligator farming and egg collection, education and outreach, and the facilitation of alligator-related research in Texas. He also sits on the national Alligator Working Group with other state alligator program leaders. His day-to-day work schedule is highly variably, and involves everything from handling alligator permitting issues to handling alligators in the field. Before taking this position, Jonathan received a B.S. from the University of Illinois, an M.S. from the University of the Witwatersrand, and a Ph.D. from the University of KwaZulu-Natal in South Africa. He enjoys hunting, fishing, "herping", travelling, and reading. He's passionate about the management of alligators as both a sustainable natural resource and key ecological component in the marshes, lakes and bayous of Texas.

ABSTRACTS

Alphabetical Order by First Author

Community Organization of a Snake Guild in Shortleaf Pine Forests

CONNOR S. ADAMS, *Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

CHRISTOPHER M. SCHALK, *Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

DANIEL SAENZ, *Southern Research Station, USDA Forest Service, Nacogdoches, TX, 75965, USA*

ABSTRACT Land-use practices such as intensive silviculture and fire suppression are especially common in shortleaf pine forests of eastern Texas, where high demands for timber, large-scale fluctuations in land ownership, and increased urbanization are continually altering forest management practices and disturbance regimes. These practices have contributed to the significant loss of the shortleaf pine ecosystems that were once widespread throughout the pinewoods region. Similar to longleaf pine systems of the southeast, fire-climax shortleaf forests are characterized by a well-developed herbaceous understory and are known to support a high diversity of plant and animal species. Here we present the preliminary results from a mark-recapture study investigating community organization of a snake guild in an intensively fire managed shortleaf pine forest. Ten traditional box traps equipped with drift fences were deployed at the Temple Foundation's Boggy Slough Conservation Area from May–July 2018. 390 trap nights resulted in 79 individual captures represented by 14 snake species. Utilizing the ecological and life-history traits of snake consumers, we examined ecological patterns in the context of the functional traits of snakes and their prey to investigate the hypothesis that a forest under a high-intensity management regime may increase the type and size of prey available to snake consumers as well as the availability of habitat and thermal environments these snakes can utilize. Quantifying functional trait diversity in this snake guild, with respect to relative abundance and species diversity, we predict that snakes will be functionally diverse in this system.

Seasonal Prescribed Burning Effects on Forage Production and Composition of Gulf Cordgrass Communities

JOSE S. AVILA SANCHEZ, *Department of Animal, Rangeland and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

VICTORIA L. HAYNES, *Texas Parks & Wildlife Department, Port O'Conner, TX, 77982, USA*

SANDRA RIDEOUT-HANZAK, *Department of Animal, Rangeland and Wildlife Sciences, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID B. WESTER, *Department of Animal, Rangeland and Wildlife Sciences, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOSE A. ORTEGA-S, *Department of Animal, Rangeland and Wildlife Sciences, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Gulf cordgrass (*Spartina spartinae* [Trin.] Merr. ex Hitchc.) is a perennial bunchgrass found along the coast of the Gulf of Mexico. As it matures, its leaves become coarse and low in nutritive value and

palatability. Removal of old growth by burning or shredding improves forage quality. Our objective was to determine the optimal season of burning in gulf cordgrass rangelands for increased forage production and species richness. We studied effects of winter and summer prescribed burning in 8 burn (2 each in winter and summer 2016 and 2017) and 2 control pastures that are at least 200 hectares each. We recorded plant density by species in permanently-placed quadrats. Density data were grouped into plant type (native, introduced, forb, grass, etc.) to determine season of burning effects on diversity, similarity, and time since burning. To measure above-ground biomass we clipped randomly-placed 1-m^2 quadrats. Rainfall and soil moisture before and after burning appear to be more important than season of burning on regrowth of biomass. While there was no significant difference between winter and summer burning in the amount of biomass at 90 days after burning ($P = 0.292$ for 2016 burns, $P = 0.3203$ for 2017 burns), during the 90 days following 2017 summer burns soil moisture averaged 35% and biomass regrew more quickly than it did during the 90 days following winter burning when soil moisture averaged only 15%. Since drought is a common phenomenon in south Texas, it is important to consider soil moisture before conducting a prescribed burn.

Ecological Requirements for 2 Grassland-Obligate Birds in the Marfa Grassland, Texas

FABIOLA BAEZA-TARIN, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

MIEKE TITULAER, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

ABSTRACT Grassland birds have declined more rapidly than any other avian group in North America. Declines have been linked to decrease of suitable habitat for grassland obligate species. Baird's sparrow (*Centronyx bairdii*) and grasshopper sparrow (*Ammdramus savannarum*) are among the species with the strongest negative population trends with an approximate annual decline of –2.6% and –2.8%, respectively. Given the fact that habitat plays a crucial role in the persistence of grassland obligate species, the main objective of this project is to evaluate bird-habitat relationships relative to habitat conditions for Baird's sparrows and grasshopper sparrows in the Marfa grasslands, Texas. Grassland birds were captured and fitted with very high frequency (VHF) radio transmitters during the winter of 2017–2018. Vegetation was assessed at bird points and an evenly spaced grid of points using a 5-m radius circle to obtain estimated percent cover of shrub, herb, grass, Russian thistle (*Salsola* sp.), bare ground, and other cover within the study area. With these data we developed a suitability model of the study area using boolean rasters for these 2 grassland obligates based on their habitat preferences from published literature. A better understanding of the ecological requirements of the birds will lead to better management operations.

Evaluation of Automated Sprayers Using Entomopathogenic Nematodes to Eradicate Cattle Fever Ticks on Nilgai Antelope

JEREMY A. BAUMGARDT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOHN A. GOOLSBY, *Cattle Fever Tick Research Laboratory, USDA Agricultural Research Service, Edinburg, TX, 78541, USA*

KATHRYN M. SLIWA, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDALL W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

A. PEREZ DE LEON, *Knipling-Bushland U.S. Livestock Insect Research Laboratory and Veterinary Pest Genomics Center, USDA Agricultural Research Service, Kerrville, TX, 78028, USA*

ABSTRACT Cattle fever ticks (CFT; *Rhipicephalus microplus* and R. *anulatus*) are a vector for bovine babesiosis, a parasitic disease that can be fatal to effected cattle. The last major outbreak of bovine babesiosis in the United States occurred early in the 20th century and affected 14 southern states. The U.S. was able to eradicate the disease by eliminating CFT through an intensive program lasting over 80 years. Recently, CFT have been detected in 13 counties in Texas outside of a permanent quarantine area. This expansion was likely facilitated by the expansion of nilgai (*Boselaphus tragocamelus*), an exotic bovid ungulate that also act as hosts to CFT. We are conducting a study to test the efficacy of remotely activated sprayers that applicate a solution containing entomopathogenic nematodes for eradicating cattle fever ticks on nilgai. The nematodes (*Steinernema riobrave*) are native to south Texas and infect CFT in all life stages. We will capture and release 30 nilgai with GPS collars and up to 50 with ear tags within the current CFT infestation zone in Cameron and Willacy Counties. We will deploy 160 sprayers at wildlife fence crossings and use remote cameras at sprayer site to estimate frequency of treatment for each marked animal. We will recapture marked animals approximately 3 months after initiation of the study and compare changes in the number of ticks per individual relative to the number of detected treatments received. Our results will help direct efforts to eradicate CFT by USDA, APHIS, and the Texas Animal Health Commission.

A Review of the Rio Grande Wild Turkey Breeding System

AMANDA K. BECKMAN, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77845, USA*

ABSTRACT As Rio Grande wild turkey (*Meleagris gallopavo intermedia*) numbers have increased in the last 100 years, many studies have investigated population structure and habitat-use. Despite their impressive looks and courtship displays, less attention has been directed at the breeding behavior of the Rio Grande wild turkey (RGWT). I will review published literature to determine if enough data exists to fully define the RGWT breeding system for females and males. First, using natural history data such as sex ratios, basic predictions can be made about the breeding system and opportunity for sexual selection. Next, I will review the breeding behavior (adult vs 1st year reproductive success and renesting) of female RGWTs. Last, I will discuss the definitions of cooperative coalitions and lek mating systems, and available data of male RGWTs will be used to determine if the male breeding system can be defined. Last, future directions for data collection will be discussed to further define the RGWT breeding system. Defining the breeding system is the first step in determining if the breeding behavior of RGWTs can be used as an indicator of management success.

As the Feeder Spins: Aggression Affects Feed Use by White-tailed Deer

EMILY H. BELSER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

CHARLES A. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID B. WESTER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

THOMAS W. BOUTTON, *Texas A&M University, College Station, TX, 77843, USA*

DON A. DRAEGER, *Comanche Ranch, Carrizo Springs, TX, 78834, USA*

ABSTRACT Providing pelleted feed for white-tailed deer (*Odocoileus virginianus*) is a common management practice in Texas. However, dominance hierarchies among deer may limit accessibility to supplemental feed for some groups, particularly does and fawns. Social exclusion may become exacerbated with increasing deer density. Increasing feeder density may provide more opportunities for subordinate deer to access feed. To test these hypotheses, pelleted feed was provided year round, *ad libitum* within three, 81-ha enclosures on 2 ranches in south Texas with the following numbers of deer and feeders, respectively: 20/1, 60/1, and 60/3. We used ratios of carbon stable isotopes in deer tissues to estimate supplemental feed in deer diets during March and December. We conducted a video camera survey to determine each deer's dominance rating based on aggressive interactions at the feeders. A linear mixed model was used to determine the relationship between a deer's dominance rating and supplemental feed in the diet for each treatment. For all treatments, as a deer's dominance rating increased, the percent of supplemental feed in the diet also increased. The slopes of the 60/1 and 60/3 treatments were similar, suggesting additional supplemental feed sites may not have a large impact on supplemental feed use by subordinate animals. Subordinate animals in the 60-deer treatments consumed more supplemental feed than subordinate animals in the 20-deer treatment. Rather than increased competition with an increasing number of deer, the theory of economic defendability may be occurring. As deer densities increase, the costs appear to outweigh the benefits of defending the supplemental feed site.

Effect of Weather Conditions on Population Variance and Abundance of Cassin's Sparrow, Horned Lark, Mourning Dove, and Western Meadowlark Populations in a West Texas Short Grass Prairie

JONATHON P. BENTLEY, *Department of Natural Resource Management, Texas Tech University, Lubbock, TX, 79409, USA*

CLINT BOAL, *Department of Natural Resource Management, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT The loss of short-grass prairie ecosystems throughout the central United States has led to population declines across many species of grassland birds, both migratory and native. As such, it is important to understand how factors, such as precipitation and temperature, influence variance in population across these species. This study will look at how changes in precipitation and temperature affect population variance and abundance in Cassin's sparrows (*Peucaea cassinii*), horned larks (*Eremophila alpestris*), mourning doves (*Zenaida macroura*), and western meadowlarks (*Sturnella neglecta*) from 2012 through 2017. Data were collected at 49 different points using call counts inside of 635 acres of native shortgrass prairie near Lubbock, Texas. Observers spent 5 minutes at each point listening for calls and then visually confirming where the birds were, recording distances and number of species observed. Two rounds of call counts were conducted at each of the points during the breeding season, 1 in May and 1 in June. At the time of each observation, ambient temperatures were recorded. These data will be analyzed using program Distance in order to develop population density estimates for each year. Only the 4 aforementioned species will be analyzed, due to sample size limitations on other species observed. These population variance and abundance estimates will then be correlated with temperature and precipitation measurements taken from the West Texas Mesonet, and analyzed to determine how the factors influence each other.

Landscape Characteristics Surrounding Ocelot-Vehicle Collision Sites

ANNMARIE BLACKBURN, *Caesar Kleberg Wildlife Research Institute, Texas A&M-Kingsville, Kingsville, TX, 78363, USA*

AMANDA M. VEALS, *Caesar Kleberg Wildlife Research Institute, Texas A&M-Kingsville, Kingsville, TX, 78363, USA*

C. JANE ANDERSON, *Caesar Kleberg Wildlife Research Institute, Texas A&M-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M-Kingsville, Kingsville, TX, 78363, USA*

JOHN H. YOUNG, *Environmental Affairs Division, Texas Department of Transportation, Austin, TX, 78701, USA*

ABSTRACT Increasing urbanization in the last century has become a leading threat to biodiversity worldwide. The development of roads has widespread negative impacts on wildlife populations such as habitat fragmentation, decreased landscape connectivity, and wildlife-vehicle collisions. Roads can act as artificial boundaries and influence the spatial ecology and population sizes of species of conservation concern. The ocelot (*Leopardus pardalis*) is a federally endangered wild felid found in the Lower Rio Grande Valley (LRGV) of south Texas, with a population of <80 individuals. The LRGV is one of the fastest growing population centers in the country, resulting in rapid urban sprawl and increasing infrastructure development further fragmenting habitat and landscape connectivity. Previous research has found that vehicle collisions are the highest direct source of mortality for the LRGV ocelot population. This study aims to understand whether land cover spatial structure is related to ocelot road mortalities. Using LANDSAT 30-m resolution classified

imagery we examined the amount and distribution of vegetation cover surrounding 29 ocelot-vehicle collision locations during 1984–2017 and compared them to random road locations using landscape metrics (e.g. percent cover, mean patch area, patch density, edge density, and aggregation index). These metrics were quantified at 2 spatial scales (150-m and 1108–1638-m) based on daily movement lengths of ocelots in the LRGV. This information will give conservation planners a better understanding of the landscape features correlated with ocelot road mortality and thus can be used to guide the placement of future wildlife crossing structures designed for ocelot recovery.

Parasitological survey of Lesser Prairie-Chickens in Texas and New Mexico

KRISTIN J. BONDO, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

MIKE WHITSON, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

CLINT BOAL, *USGS Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX, 79409, USA*

MARKUS PETERSON, *Department of Biological Sciences, University of Texas at El Paso, El Paso, TX, 79968, USA*

BRAD SIMPSON, *Texas Parks and Wildlife Department, Canyon, TX, 79015, USA*

CHRISTIAN HAGEN, *Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR, 97331, USA*

BLAKE GRISHAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT Parasites and infectious agents can contribute to population declines of wildlife via regulating host abundance or extirpating small, isolated populations. It is unknown if new pathogens have emerged in lesser prairie chickens (*Tympanuchus pallidicinctus*) since the last surveys were conducted in the late 1990s. From March–April 2018, we conducted a parasitological survey of lesser prairie chickens across the southern portion of their range in sand shinnery oak prairies in Texas and New Mexico. We collected blood from live-captured individuals and fresh fecal and cecal droppings from booming grounds. We examined blood for hemoparasites and examined fecal and cecal droppings for eggs and cysts of nematodes, cestodes, and protozoa. *Plasmodium pedioecetti*, the agent of avian malaria, was identified in 20% (3/15) of blood smears. Eggs and cysts of nematode worm parasites were detected in 44% (17/39) of cecal and no fecal droppings. Key findings include the detection of 5 species of nematodes in cecal droppings, 3 (*Trichostrongylus* spp., *Syngamus* spp., and *Capillaria* spp.) of which have not been reported in this species previously. The potential impacts of these parasites on survival and reproduction in lesser prairie chickens is unknown, but *Trichostrongylus cramae* has been suggested to have the potential to regulate prairie grouse populations. These results provide important baseline information on the parasites that are currently infecting lesser prairie chickens in this region. This information is needed to determine if parasites and pathogens are becoming more prevalent or emerging over time and to inform conservation and management decisions and help mitigate threats in this species.

Evaluating Nutritional Content of Browse Plants Collected Across a West-East Gradient of the Trans-Pecos, Texas

DANIEL E. BOTELLO, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

THOMAS S. JANKE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

LOUIS A. HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT Woody plants eaten by wildlife in the Trans-Pecos region of Texas are found in different mountain ranges of varying elevation. Areas at higher elevations tend to receive more rainfall and precipitation in Texas increases from west to east. The goal of this project is to document nutritional content of browse across a west-east gradient of the Trans-Pecos. Beginning in April 2018, plant samples were collected, dried, ground, and sent off for analyses. The entire study focused on 12 study sites across the Trans-Pecos and on ≥100 plant species. This individual project, which looks at differences across a west-east gradient, focuses on 3 study sites and 5 plant species. Those 5 species are gray oak (*Quercus grisea*), netleaf hackberry (*Celtis reticulata*), honey mesquite (*Prosopis glandulosa*), sotol (*Dasylirion leiophyllum*), and prickly pear (*Opuntia* spp.). The 3 study sites, from west to east, are the Chinati Mountains, Elephant Mountain, and the Sanderson area. Preliminary results suggests that there was an increase in % crude protein and a decrease in %NDF across a west to east gradient for theses 5 species during the 2018 hot/dry Season. More samples and further analyses are needed to form a conclusion and understand these differences in nutritional content. The findings of this project will help with decisions regarding adequate nutrition and management of big game species such as mule deer (*Odocoileus hemionus*) and desert bighorn sheep (*Ovis canadensis nelsoni*).

Movements, Home Range, Activity Patterns, and Habitat Selection of the Western Chicken Turtle in Texas

BRANDON C. BOWERS, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

DANIELLE K. WALKUP, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

TOBY J. HIBBITTS, *Biodiversity Research and Teaching Collection, Texas A&M University, College Station, TX, 77843, USA*

PAUL CRUMP, *Texas Parks and Wildlife Department, Austin, TX, 78744, USA*

WADE A. RYBERG, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

ABSTRACT Little is known about the western chicken turtle (WCT; *Deirochelys reticularia miaria*) in Texas. Past research suggests it is potentially rare in the state with a patchy distribution, and its habitat is under threat from increasing urbanization. For these reasons, and because there is a lack of formal protection for the subspecies and its habitat, the U.S. Fish and Wildlife Service issued a 90-day finding that states listing the subspecies as threatened or endangered may be warranted and requests information on current and future threats to WCT populations and habitat throughout its range. We designed a GPS telemetry study to characterize the movements, home range, activity patterns and habitat selection of the WCT in a Texas population under threat from urbanization. Data from these 4 behavioral traits will be used to differentiate between aquatic movements among wetland habitats and terrestrial movements during nesting and estivation. Understanding the factors that influence movement patterns and habitat selection in both aquatic and terrestrial environments is central to managing or conserving this subspecies, especially given the identified potential threats posed by

anthropogenic activities. Here, we present preliminary results on these 4 behavioral traits from our first, ongoing field season at Katy Prairie Conservancy. Collectively, these data will provide a greater understanding of broad- and fine-scale habitat relationships for this subspecies that 1) inform the development of standardized survey protocols for the subspecies, 2) allow quantitative estimates of current habitat, and 3) identify conservation priorities and assist regional conservation planning for the subspecies.

Multi-scale resource selection of Sandhill Cranes on the Southern High Plains

KATHRYN J. BRAUTIGAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

BLAKE A. GRISHAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

WILLIAM P. JOHNSON, *U.S. Fish and Wildlife Service, Canyon, TX, 79015, USA*

DANIEL P. COLLINS, *U.S. Fish and Wildlife Service, Albuquerque, NM, 87103, USA*

JUDE SMITH, *U.S. Fish and Wildlife Service, Muleshoe, TX, 79347, USA*

WARREN CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

OWEN FITZSIMMONS, *Texas Parks and Wildlife Department, San Marcos, TX, 78667, USA*

ABSTRACT Resource selection analyses often integrate data from Global Positioning Systems (GPS) to facilitate fine-scale assessments of habitat selection for a highly mobile species. Using satellite-telemetry relocations of lesser sandhill cranes (*Antigone canadensis canadensis*) from the Mid-continent Population (MCP), we assessed overwinter habitat selection at 3 orders, subspecies range within population range, individual home ranges within subspecies range, and patches selected within home ranges. We used a Design II for first order analyses, and Design III for second and third orders. Cranes were captured during winters (2014/15 and 2016/17) and fitted with Platform Transmitter Terminals (PTT) that recorded up to 5 daily locations. We developed 74 crane-winter home ranges from 35 cranes across 3 winters, using a Brownian Bridge Movement Model 95% probability contour. Results from the first order showed no significant differences in landscape composition ($P = 0.95$), in a landscape dominated by shrublands, grasslands, and croplands. For second-order selection, cranes selected cropland and wetlands (coastal and interior) at proportions greater than available and avoided forests and shrublands. Home ranges were typically placed in areas with ~50% cropland, while crops covered only ~12% of the landscape. Third-order selection showed even greater selection for wetlands and croplands, specifically herbaceous wetlands, open water, cotton, sorghum, and winter wheat. This population has highly variable winter fidelity rates (0–95%), and made large within-winter movements across ecoregions, suggesting the entire population has potential for a substantial geographic shift to follow ample resources in the face of limited resources on the Southern High Plains.

Sorghum Residuals Importance for the Mid-Continent Population of Sandhill Cranes: Future Implications on Winter Diet and Geographic Shifts

KATHRYN J. BRAUTIGAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

BLAKE A. GRISHAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

WILLIAM P. JOHNSON, *U.S. Fish and Wildlife Service, Canyon, TX, 79015, USA*

DANIEL P. COLLINS, *U.S. Fish and Wildlife Service, Albuquerque, NM, 87103, USA*

JUDE R. SMITH, *U.S. Fish and Wildlife Service, Muleshoe, TX, 79347, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

OWEN FITZSIMMONS, *Texas Parks and Wildlife Department, San Marcos, TX, 78667, USA*

ABSTRACT Approximately 90% of the Mid-Continent Population of sandhill cranes (*Antigone canadensis*) overwinter on the Southern High Plains (SHP), foraging on residual grain crops post-harvest. Recent data combined with preliminary evidence from our study suggest individuals are capable of accumulating sufficient energy reserves prior to migration to facilitate shorter stays at stopover sites. Sorghum (*Sorghum bicolor*) is the dominant grain selected by cranes and can constitute 97% of winter diet of cranes in the region. To measure irrigated and dryland sorghum residuals, we randomly sampled fields (6 irrigated = 395 ha, 8 non-irrigated = 370 ha) immediately following harvest and replicated 2 additional times at ~7-week intervals. We expected higher residuals for early samples and irrigated fields than later samples and dryland fields. Time of winter and irrigation type affected residual densities (both $P < 0.0001$), following our predictions. Normal farming operations proceeded during field season facilitating the opportunity to test effects on residuals. Our late winter sample followed disking at 2 dryland fields, and disking and dragging at another. These activities did not affect the temporal trend ($P = 0.03$) for drylands. Irrigation for sorghum will likely decrease as aquifer depletion continues in the region. Migratory populations have exhibited large geographic shifts during winter following crop changes. Within the SHP, relatively few foraging opportunities exist on public land and as such, management in the future may benefit from collaborating with local producers to create foraging opportunities for cranes in grain fields in close proximity to saline lakes and playa wetlands.

Developing Tooth Replacement and Wear Criteria for Aging Free-Ranging Axis Deer with Comparisons to the Criteria for Aging White-Tailed Deer

MATTHEW J. BUCHHOLZ, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

BLAKE A. GRISHAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

THOMAS L. ARSUFFI, *Llano River Field Station, Texas Tech University, Junction, TX, 76849, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT The ability to accurately age wildlife is critical to wildlife population management and modeling. Without developed aging criteria for axis deer (*Axis axis*), biologists have resorted to using tooth replacement and wear criteria developed for white-tailed deer (*Odocoileus virginianus*). Our goals were to 1) develop tooth replacement and wear criteria for aging axis deer and 2) assess if aging axis deer using criteria for white-tailed deer was accurate. We collected jawbones from 51 free-ranging axis deer and submitted teeth for cementum annuli analysis to obtain the true age of each axis deer. We also attempted to build a baseline age structure for these axis deer jawbones using patterns of tooth replacement and wear criteria for white-tailed deer. Cementum annuli analysis revealed true ages of axis deer jawbones from 0 to 12 years old. We were able to identify criteria for aging axis deer up to 36 months old using tooth replacement, while tooth wear revealed patterns to >10 years old. Estimates of axis deer age using white-tailed deer aging criteria were younger ($P = 0.007$) than their true age. White-tailed deer replacement and wear criteria provide inaccurate, and unreliable age estimates for axis deer. We are refining the axis deer tooth replacement and wear criteria, which will facilitate more accurate and precise measures of axis deer age in Texas.

Detection Capabilities of Bioacoustic Monitors

KATHRYN L. BURTON, *Department of Wildlife, Sustainability, and Ecosystem Sciences, Tarleton State University, Stephenville, TX, 76402, USA*

MADISON K. MIDGLEY, *Department of Wildlife, Sustainability, and Ecosystem Sciences, Tarleton State University, Stephenville, TX, 76402, USA*

STEPHEN L. WEBB, *Noble Research Institute, Ardmore, OK, 73401, USA*

MIKE PROCTOR, *Noble Research Institute, Ardmore, OK, 73401, USA*

CRESTEN SLEDGE, *Noble Research Institute, Ardmore, OK, 73401, USA*

HEATHER A. MATHEWSON, *Department of Wildlife, Sustainability, and Ecosystem Sciences, Tarleton State University, Stephenville, TX, 76402, USA*

ABSTRACT Bioacoustic autonomous recording units (ARU) are used for analyzing sound complexity of bats, frogs, birds, and marine mammals. They are also used for biodiversity assessment and species identification. ARUs can provide an economical and less labor-intensive replacement for human collection of data while also recording multiple species. The objective of this study was to evaluate ARU detection capabilities for northern bobwhites (*Colinus virginianus*). We conducted this study in Ardmore, Oklahoma and Stephenville, Texas. At randomly generated points, we established 2–4 transects that traversed low, medium, and high vegetation cover. At each point, we placed a Wildlife Acoustics Song Meter SM4 and a human observer. Along intervals on the transects, we played pre-recorded northern bobwhite calls, emitted at 100 dB to imitate natural calls using a FoxPro Game Caller. Both the human observer and the ARU recorded the pre-recorded calls. Wind speed, and tree and brush density influenced detection of calls by humans and ARUs. We used Raven Lite audio software to sort and cluster data by frequency. Higher frequency noise, including various species of birds and crickets, tended to mask lower frequency noise, which restricted ability to isolate sounds. We are currently determining detection probabilities for bobwhite when using ARUs. Data from this study could contribute to

future research efforts by providing an understanding of detection capabilities of ARUs, allowing for more efficient methods of surveying.

Population Dynamics Model to Inform Harvest Management of a Small Elk Herd in Central New Mexico

MATTHEW J. BUTLER, *U.S. Fish and Wildlife Service, Albuquerque, NM, 87103, USA*

RYAN M. DEVORE, *Montana Fish, Wildlife, and Parks, Broadus, MT, 59317, USA*

MARK C. WALLACE, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

STEWART G. LILEY, *New Mexico Department of Game and Fish, Santa Fe, NM, 87507, USA*

ABSTRACT Crop depredation by wildlife is a frequent concern for natural resource managers and mitigation of this issue is often an important task for wildlife agencies. Elk (*Cervus elaphus*) and other ungulate species have depredated corn at Bosque del Apache National Wildlife Refuge, New Mexico, USA, interfering with the ability of the Refuge to provide sufficient supplemental nutrition to overwintering sandhill cranes (*Antigone canadensis*) and geese. We estimated annual adult survival and calf recruitment rates of elk from 2011–2013 at Bosque del Apache National Wildlife Refuge. Natural adult survival (excludes human-related mortalities) was high at 98.3%. Calf recruitment was lower than in some populations, and ranged from 13.0 to 36.7 (mean = 21.9) calves:100 cows at time of recruitment (March and April). Using this information, we constructed a harvest management model to determine annual harvest quotas required to stabilize the growth of the elk herd on the Refuge. The female segment of the herd is growing at an annual rate of 9.1%. To stabilize the growth rate of the female elk population, 8.0% of the cows would need to be harvested annually. We estimated an adult elk abundance of 40 (SE = 4.57) in 2012 and 61 (SE = 7.21) in 2013. Our harvest management model provides Refuge staff, who ultimately intend to improve corn yield, with valuable information needed to stabilize the elk herd. Further, our approach outlines a simple, easily implemented modeling technique that can be used for the management of other ungulate herds.

Coexistence Among Felids, Cattle and Game Species

SHELBY B. CARTER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

C. JANE ANDERSON, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JASON V. LOMBARDI, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

AMANDA M. VEALS, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Interspecific interaction play important roles in determining population dynamics and species distribution. Spatial overlap between species is a fundamental component of spatial ecology for species. In southern Texas, ocelots (*Leopardus pardalis*), occur in 2 small breeding populations on private and public lands in Willacy, Kenedy and Cameron counties. The East Foundation's El Sauz Ranch in Willacy County has the largest known breeding population of ocelots in the United States. Interactions with livestock and large ungulates have not been examined. The East Foundation's mission is to support wildlife conservation and other public benefits of ranching and private land stewardship. The El Sauz Ranch is a unique privately owned property that integrates ranching, management of game species, and wildlife conservation. We are using a seven-year camera trap data set (2011–2018) to identify relative abundance and activity patterns for species of interest. We focused our efforts on ocelots, bobcats (*Lynx rufus*), cattle, nilgai (*Boselaphus tragocamelus*), feral hogs (*Sus scrofa*), and javelina (*Pecari tajacu*). Preliminary results indicate that nilgai and cattle did not have similar abundance and activity patterns. Small game species displayed similar patterns. Future analysis will consist of estimating occupancy of ocelots, cattle and nilgai. Our project can be used to develop programs that balance ocelot conservation and economic production on private ranches in southern Texas.

Mesopredator Occurrence and Distribution in an Urban Environment in the Southern High Plains of Texas

CHRISTOPHER R. CARTER, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

MARK C. WALLACE, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

ROBERT D. BRADLEY, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT Urban landscapes provide valuable habitat to several mesocarnivores, however, few studies have been performed to determine what environmental features influence mesocarnivores presence and occupancy within urban areas. We used game cameras dispersed throughout portions of the city of Lubbock, Texas to characterize presence of coyote (*Canis latrans*), domestic cat (*Felis silvestris catus*), domestic dog (*Canis lupus familiaris*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), and Virginia opossum (*Didelphis virginiana*). Presence was correlated with environmental factors including grasslands, croplands, and human disturbance using a geospatially explicit supervised classification within ArcGIS. These features were measured in areas around cameras deployed throughout the Lubbock city limits. For those species with sufficient detections, preliminary analyses suggest that cat occupancy decreases with increases in open grasslands; gray fox occupancy increases with decreases in open vegetation; and coyote occupancy is positively related to increases in open grasslands. Virginia opossum occupancy increases in areas of human development and dogs currently show no correlation with any of these factors analyzed, despite a naïve occupancy of 39%. Previous analyses focused on grouping cameras into clusters, however current analyses are building upon that work, and including individual camera approaches to refined correlation interpretation at smaller scales. Further

analysis will include other local scale habitat features, and socioeconomic factors to ideally improve model performance.

Habitat Characteristics and Use of Texas Horned Lizards and Texas Tortoises on South Texas Rangelands

VICTORIA M. CAVAZOS, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville Kingsville, TX, 78363, USA*

JAVIER O. HUERTA, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville Kingsville, TX, 78363, USA*

ABSTRACT The Texas horned lizard and Texas tortoise are reptiles indicative of the semi-arid rangelands of southern Texas. Both species have been in drastic decline, therefore being listed as threatened in the state of Texas. Reasons for decline are different for the species; however, a common threat is habitat loss via urbanization. Both species appear to be abundant and well-protected on private lands that are managed for white-tailed deer and northern bobwhite. Therefore, working with private landowners becomes crucial for studying these threatened reptiles. Our objectives are to determine 1) abundance of Texas horned lizards and Texas tortoises on 3 privately owned pastures within southern Texas, and 2) habitat characteristics important to both species. Via mark and recapture, we will map habitat use, and classify each site as either bare, light herbaceous, heavy herbaceous, or woody. This project will assist south Texas landowners by including threatened reptiles into their wildlife management plans.

Bat Acoustic Activity During Fall at Wind Turbines in South Texas

DANIELLE A. CORDANI, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

SARA P. WEAVER, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

NEVIN DURISH, *ESE Partners, Austin, TX, 78731, USA*

IVAN CASTRO-ARELLANO, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT *Tadarida brasiliensis*, primarily a cave and structure roosting species, incurs high fatalities at wind turbines within their range. Despite their high abundance in Texas, the largest producer of wind energy in the U.S., there is little knowledge on their activity patterns and behavior at wind turbines. Such knowledge is important for designing species-specific impact reduction strategies. Our objective was to identify patterns in *T. brasiliensis* activity at wind turbines and high-risk periods for informing impact reduction strategies. From 7 August to 28 October 2017, we monitored bat activity at 3 wind turbines in Starr County, Texas. At each turbine we deployed an acoustic detector on the nacelle and conducted weekly fatality searches within established search plots. Here we present preliminary acoustic detector and fatality results. We recorded 65,002 total bat passes, with the greatest activity occurring on 4 September (1,338 passes per detector night). We classified 74% of total bat passes to a low frequency group and the remaining 26% to species. We confirmed 19% of total bat passes as *T. brasiliensis*. We documented differences in activity among turbines and assessed weather covariates. Bat activity was positively associated with increasing Julian date, humidity, and temperature, and negatively associated with increasing wind speed (all *P*-values <0.001). Nightly bat activity was unimodal, primarily occurring from 2200 to 0400. In addition, bat acoustic activity reflected patterns of fatality at the site.

Although preliminary, these results provide information on bat activity and behavior at wind turbines in a region with little publicly available data.

Accelerated Growth of Tamaulipan Thornscrub Habitat for Ocelots

JOSE G. CORTEZ, JR, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville Kingsville, TX, 78363, USA*

SANDRA RIDEOUT-HANZAK, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville Kingsville, TX, 78363, USA*

DAVID B. WESTER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville Kingsville, TX, 78363, USA*

DAVID E. RUPPERT, *University of Maryland, College Park, MD, 20742, USA*

ABSTRACT Loss of habitat is a major issue contributing to the declining number of ocelots (*Leopardus pardalis*) in the Lower Rio Grande Valley. Ocelots within this region are limited to 2 breeding populations, located in Willacy and Cameron Counties, with large areas of land used for urban and agricultural development separating them. The objectives of this project are to test various management techniques on both 1) newly-planted and 2) established thornscrub plants to identify which treatments are most successful in growing high-quality thornscrub habitat for ocelots as quickly as possible. The first phase of the project has already begun; it involves applying treatments to naturally growing thornscrub saplings and recording their effects on growth and plant shape over time. Treatments will simulate mechanical disturbance on individual plants of 3 species by either 1) clipping plants, 2) mulching plants, or 3) both clipping and mulch. Exclosures will also be placed around several plants in each species and treatment combination to determine the impact browsers have on growth and development. In the second phase we will plant seedlings of 7 species that are important components of ocelot habitat. These seedlings will receive the clipping, mulching, or combination of treatments at the time of planting. Results from both phases will allow us to determine effective treatments for enhancing the growth and multi-stemmed habit of young thornscrub plants. It will also help determine when treatments should occur—at the time of planting or a few years later.

Developing Habitat Suitability Models for Wintering Rio Grande Wild Turkeys in North Texas

DARRION M. CROWLEY, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

WILLIAM P. KUVLESKY, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

LEONARD A. BRENNAN, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

MICHAEL T. PAGE, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

NICHOLAS R. KOLBE, *Texas Military Department, Austin, TX, 78703, USA*

ABSTRACT Habitat suitability models (HSMs) are useful tools for identifying areas that meet a species food, water, and cover requirements. This study focuses on the development HSMs for Rio Grande wild turkeys (*Meleagris gallopavo intermedia*) in northeast Texas. The goal of this project is to develop habitat suitability models for wild turkeys in north Texas using the gradient concept of landscape structure. We developed 3 HSM models for food, water, and cover for wild turkeys. We acquired and classified daily satellite imagery (Planet.com) into 4 land cover types (woody, herbaceous, water, and bare ground) and used a moving window analysis to quantify landscape metrics that describe wild turkey habitat. The metrics analyzed were percent land cover, edge density, patch density, and mean patch area. The metrics were then classified into suitable (1) and non-suitable (0) areas for wild turkey habitat and compiled to give an overall suitability model for the habitat components. We were able to obtain the amount and spatial distribution of the different requirements for both species of wild turkey. We used known locations of wild turkeys obtained from concurrent surveys to validate our model. We compared road survey known locations to our food model and found that 97% of the points were in areas that met the requirements for the model. We then compared our winter roost surveys to our cover model and found that 40% of the points were found in areas that met all of the habitat requirements. These models can be useful for habitat management plans, conservation planning, and optimizing survey routes for population estimates.

Evaluation of Loafing Site Characteristics for Rio Grande Wild Turkeys in the Coastal Sand Plains of Texas

DARRION M. CROWLEY, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

WILLIAM P. KUVLESKY, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

LEONARD A. BRENNAN, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

BRANDON S. MITCHELL, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ABSTRACT Recent global climate models predict significant and rapid changes in temperature and precipitation. These changes can have a negative impact on wildlife due to potential heat stress this may cause animals. Many studies are being done globally to better understand how animals counteract and adapt to rising temperatures. One adaptive avoidance behavior often displayed by gallinaceous birds is loafing, which is using high, wide canopy woody mottes to escape the heat. The goal of this study is to quantify and identify landscape attributes that may influence loafing behavior and compare at different spatial scales the landscape structure between used loafing locations and random points. We obtained loafing site locations of Rio Grande wild turkeys during summer of 2016 in south Texas and compared them to randomly generated sites in the area. We then obtained 2016 NAIP 1-m imagery and classified the area into woody, herbaceous, bare ground, and water. We created buffer sites around each loafing and random location (10-m, 20-m, 30-m, 40-m, and 50-m) and analyzed metrics that describe landscape structure: percent land cover (PLAND), patch density (PD), mean patch area (MPA), edge density (ED), largest patch index (LPI), Euclidean nearest neighbor (ENN), and

aggregation index (AI). We found that loafing sites had higher percent woody cover (PLAND: $\bar{x}$ = 43.95%; SE = 2.11%) with fewer (PD: $\bar{x}$ = 7114.61 patches/100 ha, SE = 468.653 patches/100 ha), larger woody patches (MPA: $\bar{x}$ = .008567 ha, SE =0.0006797 ha) and higher edge density (ED: $\bar{x}$ = 1760.60 m/ha, SE = 77.32) than random sites (PLAND: $\bar{x}$ = 20.33%, SE = 2.88; PD: $\bar{x}$ = 8531.90 patches/100 ha, SE = 772.57 patches/100 ha; MPA: $\bar{x}$ = 0.00388 ha, SE = 0.000790; ED: $\bar{x}$ = 1354.31 m/ha, SE = 131.43). Identifying landscape structure to increase and or maintain loafing sites can be important to provide wild turkey habitat in south Texas to mitigate potential hyperthermia during periods of peak heat in summer.

Comparison of Desert Bighorn Sheep Home Ranges Across Different Release Methods,

TAYLOR S. DAILY, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

CARLOS E. GONZALEZ, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

LOUIS A. HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

FROYLAN HERNANDEZ, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

ABSTRACT Historically, desert bighorn sheep (*Ovis canadensis*) were a prevalent species throughout the Trans-Pecos ecological region of Texas. However, they were extirpated by the 1960s due to unregulated hunting, habitat loss, predation, and disease transmission from livestock. Restoration efforts have been successfully conducted by Texas Parks and Wildlife Department to increase population numbers of resident desert bighorn (i.e., animals that currently populate a region of interest) at Black Gap Wildlife Management Area (BGWMA) through the use of translocations. In winter 2017–2018, we radioed and released 30 resident (8 M, 22 F) and 70 translocated desert bighorn (36 M, 45 F). Of the 70 translocated, 28 (12 M, 16 F) were hard released (i.e., translocated animals immediately released onto landscape) and 42 (24 M, 18 F) soft released (i.e., released into an enclosure before the entire landscape). Preliminary home range size estimates are being delineated, for each individual desert bighorn, using kernel density estimates, and are being compared among the resident, hard, and soft released sheep. We hypothesize that home range size will be different for translocated desert bighorn and residents at 1-year post release. An analysis of variance will be used to compare for difference. These preliminary results will provide wildlife biologists with knowledge pertaining to first year movements of translocated and resident desert bighorn at BGWMA, as well as provide insight into approaches for future translocation efforts.

Population Trends of High Conservation Priority Bird Species Within the Gulf Coast Joint Venture Region

STEPHEN J. DEMASO, *U.S. Fish and Wildlife Service, Lafayette, LA, 70506, USA*

JOSEPH P. SANDS, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

LEONARD A. BRENNAN, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

WILLIAM G. VERMILLION, *U.S. Fish and Wildlife Service, Lafayette, LA, 70506, USA*

ABSTRACT Estimating abundance and trends of wildlife populations is an important aspect of wildlife management and conservation. However, before implementing a new monitoring program it is always important to evaluate current monitoring programs to see if data from the existing survey can be used to fulfill the new monitoring obligation. We used simple linear regression with a natural logarithm transformation of the Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) data to analyze trends. We then conducted a power analysis using BBS and CBC data to estimate 80% power to detect trends at 3, 5, 10, and 20-year intervals (two-tailed test at $\beta = 0.20$) based on ±1%, ±3%, ±5%, and ±10% rate of annual population changes. Our power analysis indicated that the existing BBS data can reliably estimate trends for 4 species of birds [brown-headed nuthatch (*Sitta pusilla*), northern bobwhite (*Colinus virginianus*), Swainson's warbler (*Limnothlypis swainsonii*), and wood thrush (*Hylocichla mustelina*)] and the existing CBC data can reliably estimate trends for 2 species of birds [loggerhead shrike (*Lanius ludovicianus*) and ring-necked duck (*Aythya collaris*)] in the Gulf Coast Joint Venture (GCJV) geography.

Grassland Bird Diversity and Habitat Associations in the Southern High Plains, Texas

SHARON L. DEMERRITT, *Wayland Baptist University, Plainvew, TX, 79072, USA*

ANDREW C. KASNER, *Wayland Baptist University, Plainview, TX, 79072, USA*

ABSTRACT Birds were surveyed in winter (Dec 2017–Feb 2018; Floyd County, Texas) and summer (May–June 2018; Cochran, Terry, Yoakum counties, Texas) to determine diversity, abundance and habitat associations in the Southern High Plains agricultural landscape. Winter surveys utilized roadside point-counts in farmland and grassland and mist-net capture in brushy canyonlands. Summer surveys utilized 100-m transects established in 4 habitats (mesquite, sand sage, treated shin oak, and untreated shin oak) in Yoakum Dunes Wildlife Management Area (YDWMA). Three species totaling 124 birds were detected during winter point-counts in Floyd Co., and number of sparrows at points was negatively correlated ($P = 0.01$) with distance from points to the nearest playa bottom (most were dry). Ten species were captured in the canyonland site, increasing observed winter sparrow richness to 11 species. In summer at YDWMA, 31 species totaling 310 birds were detected. Average number of birds was similar between mesquite and sand sage and between untreated and treated shin oak; however, average number of birds was higher in mesquite and sand-sage than in either of the shin-oak habitats ($P < 0.001$). Species richness varied among habitats (mesquite = 23, sand sage = 16, untreated shin oak = 8, treated shin oak = 6). Shannon's Index of Diversity was highest in mesquite (2.73) and lowest in treated shin-oak (1.2). Mesquite bird community was least similar to the other 3 habitats (Jaccard's Coefficient of Similarity CCj: sand-sage = 0.39, untreated shin oak = 0.15, treated shin oak = 0.12), while the shin oak habitats were most similar (CCj = 0.56). Although treated shin oak had low species richness, lesser prairie chicken was present in this habitat, which is the management objective for shin-oak reduction.

Evidence of Genetic Erosion in a Peripheral Texas Population of a North American Game Bird: The Montezuma Quail

J. A. DEWOODY, *Purdue University, West Lafayette, IN, 47907, USA*

SAMARTH MATHUR, *Purdue University, West Lafayette, IN, 47907, USA*

ASHLYN HENIFF, *Purdue University, West Lafayette, IN, 47907, USA*

RYAN LUNA, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

JOHN TOMEČEK, *Texas A&M University, Department of Wildlife & Fisheries Sciences, College Station, TX, 77840, USA*

ABSTRACT Population extirpations are often precursors to species extinctions. The Montezuma quail (*Cyrtonyx montezumae*) is a gallinaceous game species that is considered vulnerable to extirpation in Texas, but populations in Arizona and New Mexico are robust and have the potential to serve as a source for active management actions such as assisted gene flow or genetic rescue. We sequenced, assembled, and annotated the Montezuma quail genome then developed a single nucleotide polymorphism (SNPs) assay to quantify genetic variation, effective population sizes, signatures of natural selection, and population structure. We generated a 1.02 Gb draft genome assembly (~94% complete), annotated 17,573 genes, and discovered more than 3 million SNPs. A curated SNP panel of 192 markers was developed from both gene deserts and from genes associated with fitness traits; we used this panel to genotype 188 individuals from Arizona, New Mexico, and Texas. Our SNP results indicate the isolated Texas population exhibits a very small effective population size, is genetically distinct from our Arizona and New Mexico samples, and has reduced heterozygosity at fitness-related markers. Thus, our samples from West Texas exhibit several symptoms of genetic erosion that could exacerbate the future risk of local extirpation.

Aboveground Biomass Estimation from Unmanned Aerial Vehicles in Rangelands

ALEXANDRIA M. DIMAGGIO, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ALFONSO ORTEGA-S., *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

CHASE WALTHER, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

KARELYS N. LABRADOR-RODRIGUEZ, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

MICHAEL PAGE, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

SANDRA RIDEOUT-HANZAK, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

DAVID B. WESTER, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ABSTRACT The application of unmanned aerial vehicles (UAVs) in the monitoring and management of rangelands has exponentially increased in recent years due to the miniaturization of sensors, pictures with high spatial resolution, lower altitude platforms, and the ease of flying UAVs in remote environments. UAVs could be used to provide a more exact estimate the vegetation biomass that can be incorporated into management decisions. The methods of field data collection widely used for decades to estimate above ground biomass do not account for the real-life variability that commonly occur in rangelands. The aim of this research is to estimate vegetation biomass in rangelands using high-resolution imagery derived from the UAV. The specific objectives are to 1) evaluate the feasibility of quantifying biomass in semi-arid rangelands with high-resolution imagery and 2) determine altitude for optimal pixel resolution of UAV imagery. Imagery at very high resolution

(<5 cm) resolution will be acquired by flying an UAV at altitudes of 30, 40, and 50 m above ground level at a site located in Duval County, Texas. The imagery will produce 3D models of the study site to estimate volumes of vegetation. Biomass data collected in the field is used to calibrate and assess accuracy the 3D biomass production model derived from exceptionally high resolution imagery at each level of altitude.

Seed Biomass in 2 Different Grazing Regimes in the Marfa Grasslands, Texas

MARGARET G. DOWNING, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

FABIOLA T. BAEZA, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

MIEKE TITULAER, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT Knowledge about the relative importance of seed availability can be an important tool for the management of desert grasslands and grassland species that are granivorous. Seed availability in the soil likely has a direct impact on grassland bird populations making this an important factor. The objective of this study was to determine the difference in seed biomass between a moderate-density rotational grazing vsa low-density continuous grazing regime. During the winter season of 2017–2018, Baird's and grasshopper sparrows were trapped, fitted with a very high frequency (VHF) transmitter, and released. Soil samples were collected at bird locations and random points in each grazing regime to estimate seed availability in the seed bank. Sixty soil seed bank samples were collected in bird locations from the VHF-fitted birds, and sixty in random grid points, half in each grazing regime, giving us a total of 120 samples. In the laboratory, seeds were sorted from the soil samples using a 3-level sieve. Once all the macro seeds were retrieved, they were weighed (g) to calculate the total biomass of the sample. Using a two-sample t-test we determined that there was a significant difference ($P < 0.05$) between the means of the 2 pastures with the rotational pasture showing a mean of 0.12 g ($\pm$0.25742) and the continuous pasture with a mean of 0.04 g ($\pm$0.04185). The results from this study will aid landowners, managers, and biologists in bettering their understanding of the effects that different grazing regimes have on seed resources in the desert grassland ecosystems.

Cattle Grazing and Forb Production for White-tailed Deer Can Be Compatible

DILLAN J. DRABEK, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S., *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID B. WESTER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Cattle grazing has been recommended as a tool used to improve wildlife habitat, but research that is available is not conclusive and sometimes contradictory. Forbs are an important part of a white-tailed deer (*Odocoileus virginianus*) diet and reduction of grass by cattle grazing can potentially confer a competitive advantage to forbs resulting in increased forb standing crop. Forb standing crop is strongly influenced by rainfall and soil properties. Our objectives were to determine the relationship between grass disappearance resulting from herbivory and forb standing crop on the East Foundation ranches. We selected 6 2,500 ha study sites located on the East Foundation ranches in south Texas. Fifty 1.5-m^2 grazing exclosures were randomly placed in the 6 study sites. At the end of the autumn growing season, we sampled vegetation within exclosures as well as at an outside paired plot. We then stored the collected samples in a portable drying room trailer maintaining a temperature of 45^{o} Celsius, which results into achieving a plant dry weight (kg). Forb standing crop was optimized 326 kg/ha when grass disappearance was at 1000 kg/ha, which correspond to a 50% grass utilization by herbivores. This study provides the scientific bases to support the hypothesis that cattle grazing may be used to optimize forb production for wildlife in south Texas. Managers can now sufficiently be able to determine a certain threshold of grazing levels in order to maintain increased white-tailed deer forb productions.

Mule Deer Feeder Visitation in Relation to Lunar Phases in Trans-Pecos, Texas

ERICA I. DUNN, *Borderlands Research Institute, Sul Ross State University , Alpine, TX, 79832, USA*

THOMAS S. JANKE, *Borderlands Research Institute, Sul Ross State University , Alpine, TX, 79832, USA*

LOUIS A. HARVESON, *Borderlands Research Institute, Sul Ross State University , Alpine, TX, 79832, USA*

ABSTRACT There are countless opinions and interpretations when it comes to moon or lunar phases in relation to animal activity and behavior. Studies have been conducted on the relationship between lunar phase and deer in other regions of the world, but limited information exists on lunar phases in relation to mule deer (*Odocoileus hemionus*) feeder visitation in Texas. Objectives of this study were to determine 1) if mule deer feeder visitation differ with varying lunar phases, 2) which lunar phases mule deer visit feeders most and least often, and 3) if there is a difference between daytime and nighttime feeder visitation in relation to lunar phase. Between October 2017 and April 2018, 12 trail cameras collected motion activated pictures at protein feeders on a private ranch located in Brewster County, Texas. These pictures were sorted by species. The mule deer pictures were then sorted by lunar phase (new moon, waxing half-moon, full moon, and waning half-moon) and sub-sorted by the number of deer in each picture. The results indicate that the deer are feeding more often at night during the full moon and first quarter lunar phases. The results of this study will help researchers, managers, landowners, hunters, and mule deer enthusiasts better prepare management implications, such as spotlight surveys and harvest recommendations, in relation to lunar phases.

Landscape Use by Male White-Tailed Deer After Brush Management

JACOB L. DYKES, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J A. ORTEGA-S, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DEAN W. WIEMERS, *Southwest Texas Junior College, Uvalde, TX, 78801, USA*

ABSTRACT Habitat selection by ungulates is influenced by the perceived cost–benefit of resources in terms of forage quality and availability vspredation risk and cover. Commonly, cervids are faced with the trade-off between quality forage and cover. The effects of such trade-offs become more apparent after large-scale habitat disturbances, like brush management. Brush management is used to increase herbaceous vegetation, manage undesirable plant species, and alter wildlife habitat, but results in spatial variation of resources across the landscape. In summer 2008, root-plowing was implemented in a strip-motte pattern within a 440-ha block of dense regrowth mesquite on a ranch in south Texas. Mottes and brush outside of the root-plowed strips were left undisturbed; post-treatment habitat classes comprised 46% brush strips (~85-m wide), 51% root-plowed strips (~95-m wide), and 3% brush mottes (~0.1–0.4 ha). We evaluated use of mottes, brush, and root-plowed area by 10 GPS-collared male white-tailed deer (*Odocoileus virginianus*) from October 2008 to August 2009. Ivlev's Electivity Index for mottes was 4 times higher than brush, even though mottes comprised only 3% of the study area. Deer selected brush, 46% of study area, but avoided the root-plowed area. This is likely a response to both the cover and vegetation regrowth. Land managers are often presented with the task of balancing objectives and cost when manipulating the landscape. Motte creation is time consuming and make follow-up treatments more difficult, thus understanding landscape use of wildlife species after brush management is an important consideration when developing management regimes.

Behavioral responses of white-tailed deer to heat stress

JACOB L. DYKES, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

CHARLES A. DEYOUNG, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J A. ORTEGA-S, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

AARON M. FOLEY, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Heat stress is a common threat to the homeostasis of endotherms. Behavioral adaptations to alleviate heat stress, like seeking shade, wind, or altering activity patterns, are often less costly than physiological changes but may cause competition for thermal cover. Need for thermal cover may differ by sex, age class, or physiological status. For instance, peak lactation in most species of large mammals typically occurs during the hottest months. Thus, females are forced to forage and process foods during the heat to meet their nutritional requirements. The goals of this study are to evaluate behavioral adaptations of white-tailed deer (*Odocoileus virginianus*) to heat stress and assess competition for thermal cover with cattle. We will deploy 40 GPS collars (30 deer, 10 cows) equipped with black-globe thermometers across the East Foundation's El Sauz Ranch in south Texas. Collars will record location and operative temperature at 30-minute intervals. We will also deploy black-globe thermometers across the landscape to monitor fluctuations of operative temperature with variation in herbaceous and woody cover and orientation relative to wind. Temperature and GPS data will be analyzed using resource selection functions and remote sensing will be used to identify important habitat characteristics.

Knowledge of deer movements, resource selection, and competition for thermal cover will further our understanding of how heat affects deer and cattle and what landscape features mitigate this stress. The results of this study will enable managers to design habitat management regimes that may assist in mitigating the effects of heat stress on deer.

Correlates of Snake Entanglement in Erosion Control Blankets

SARAH E. EBERT, *Department of Biology, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

KASEY L. JOBE, *Department of Biology, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

DANIEL SAENZ, *Southern Research Station, USDA Forest Service, Nacogdoches, TX, 75965, USA*

CORY K. ADAMS, *Southern Research Station, USDA Forest Service, Nacogdoches, TX, 75965, USA*

CHRISTOPHER M. SCHALK, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

CHRISTOPHER E. COMER, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

ABSTRACT In road construction projects across the United States, erosion control methods (e.g., erosion control blankets [ECBs]), are mandated to stimulate seedbed regeneration and prevent soil loss. Anecdotal reports have suggested that snakes are vulnerable to entanglement in ECBs. We conducted a literature review, field surveys, and an entanglement experiment to examine what factors increase a snake's risk of ECB entanglement. Our literature review produced reports of 175 reptiles entangled in mesh products, 89.1% of which were snakes, with 43.6% of snake entanglements occurring in erosion control products. During our field surveys, we found 10 entangled snakes (n = 2 alive; n = 8 dead). From our experiment, we found that ECBs that contain fixed-intersection, small-diameter mesh comprised of polypropylene were significantly more likely to entangle snakes compared to ECBs with larger diameter polypropylene mesh or ECBs that have woven mesh made of natural fibers. Snake body size was also associated with entanglement; for every 1 mm increase in body circumference, the probability of entanglement increased 4%. These results can help construct a predictive framework to determine those species and individuals that are most vulnerable to entanglement.

Exploring Trophic Levels & Landscape Ecology with BeeBot Technology

LINDEN S. ELI, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MARYBETH GREEN, *Department of Educational Leadership and Counseling, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

APRIL A. CONKEY, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT The application and retention of multiple interwoven STEM concepts that fit to both state and national grade school standards can be a daunting achievement. But, the creation and use of high quality interdisciplinary lessons may help meet these needs. The objectives of this study were to 1) Develop an original interdisciplinary curriculum for 2nd graders incorporating concepts of ecological trophic levels, robotic programing, landscape ecology, map interpretation skills and wildlife professions. 2) Administer curriculum over a 6-wk period in a classroom setting. 3) Access changes of ecological trophic level knowledge, perception of wildlife scientists, landscape interaction knowledge, and map interpretation skills. We hypothesized that the students involved with the curriculum would score higher on a post-test card-sort activity, after lessons and activities, compared against their pre-test card-sort activity scores. Research participants were 2nd grade students from Santa Gertrudis ISD (n = 31) and Driscoll ISD (n = 25). Students were given a pre-test card-sort activity, then received 4 weeks of lessons involving both on- and offsite activities, and finally received a post-test card-sort activity. Student scores on post-test material improved significantly by an average of 9.8 points out of 30 possible. The interdisciplinary curriculum engaged students in hands-on learning, enabling them to apply their lessons directly with immediate and direct feedback. Implementation of curriculum improved student knowledge of ecological trophic levels, map interpretation, and professional responsibilities.

Utilizing the Conservation Delivery Network Model for Landscape Conservation In Northeast Texas

JASON A. ESTRELLA, *Texas Parks and Wildlife, Tyler, TX, 75707, USA*

STEVEN K. MCKNIGHT, *Lower Mississippi Valley Joint Venture, Tyler, TX, 75707, USA*

ABSTRACT The Northeast Texas Conservation Delivery Network(CDN) was created in 2012 with the goal of facilitating enhanced and increased on-the-ground conservation practices though coordination of state, federal and non-profit conservation organizations. The objectives of a CDN are 1) facilitate effective communication, coordination, and collaboration among conservation organizations working to positively impact landscapes for wildlife populations, and 2) facilitate effective coordination between the biological planning/conservation design functions and priorities of those responsible for conservation delivery. The Northeast Texas CDN developed a decision support tool in 2015 to identify priority areas within the area of the CDN, by evaluating key conservation issues, habitats, and available data sets of the 9+ government and non-government agencies encompassing the Network. Based on the results of this tool, sub-geography working groups were established to better facilitate conservation projects within a priority landscape. Since 2017, the CDN has provided nearly $240,000 in grants to private landowners for on-the-ground conservation projects on 2,500 ac. For 2018-2019, over $196,000 in grant funds have been approved for 5,400 ac. of projects.

Estimating White-Tailed Deer Population Sizes Using UAVs

JESSE EXUM, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

AARON M. FOLEY, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JEREMY BAUMGARDT, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICKEY W. HELLICKSON, *Orion Wildlife Management Services, Corpus Christi, TX, 78426, USA*

ABSTRACT Estimates of population sizes, recruitment, and sex ratios are essential for managing wildlife populations. Helicopters are commonly used to conduct surveys of white-tailed deer on south Texas rangelands. However, helicopter surveys are expensive, risky, and not always practical for small ranches (< 1,000 ha). Camera surveys and spotlight counts can be used to generate population estimates but require significant time and labor. Unmanned aerial vehicles (UAVs) are a novel technology that has yet to be fully evaluated for wildlife surveys. We will conduct UAV-based surveys on 5 ranches with known numbers of marked deer. Approximately 20% of deer on each ranch were marked, based on deer densities provided by previous helicopter surveys. These densities ranged from 2 to 12 ha/deer. The UAV surveys will be conducted during November and January to assess whether population estimates vary with changes in canopy coverage (leaf-fall). Further, surveys will be conducted at pre-dawn and during post-dawn on each ranch to evaluate variation in counts under different visibility. We will use UAVs equipped with 2 video cameras, 1 thermal and 1 optical, with the goal of detecting heat signatures on the thermal imagery, then identifying the sex and age (fawn/adult) of the deer via the optical imagery. Our UAV-based estimates will be compared with estimates from trail camera surveys and helicopter surveys; preliminary results will be discussed.

The Influence of Weather and Water Chemistry on Anuran Breeding Activity at Bitter Lake National Wildlife Refuge

KATHERINE R. FIKAC, *West Texas A&M University, Canyon, TX, 79015, USA*

DANIEL SAENZ, *Southern Research Station, USDA Forest Service, Nacogdoches, TX, 75965, USA*

JEFF BEAUCHAMP, *Bitter Lake National Wildlife Refuge, US Fish and Wildlife Service, Roswell, NM, 88201, USA*

JAMES B. JOHNSON, *West Texas A&M University, Canyon, TX, 79015, USA*

ABSTRACT The reproductive patterns of frogs and toads (anurans) is influenced by factors which are intrinsic to the local wetland (e.g. salinity and pH) as well as extrinsic factors such as weather (e.g. precipitation). Understanding the influence of these factors is critical for the management of anurans in the Southwest US, where limited and unpredictable rainfall patterns and increased water salinity due to anthropogenic activities is a growing concern. Our objective was to correlate weather patterns and wetland water chemistry with anuran breeding activity at Bitter Lake National Wildlife Refuge in Chaves County, New Mexico. We placed 10 automated recorders at 10 separate wetlands throughout the Refuge. From the recordings we documented anuran breeding choruses. Once monthly, we monitored salinity, pH, conductivity, and water temperature at each wetland. Data for daily precipitation, humidity, and air temperature was obtained from the National Weather Service. Data were analyzed using a linear model with calling activity being dependent on weather patterns and water chemistry. Our results suggest that precipitation has the strongest influence on anuran breeding activity with water chemistry having a more localized, wetland specific role.

Survival and Success of Translocated Wild California Quail in Texas

ELIZABETH D. FORTNER, *College of Agricultural Sciences and Natural Resources, Texas A&M University Commerce, Commerce, TX, 75428, USA*

KELLY REYNA, *College of Agricultural Sciences and Natural Resources, Texas A&M University Commerce, Commerce, TX, 75428, USA*

ABSTRACT For >50 years, the northern bobwhite (*Colinus virginianus*) population has steadily declined in the state of Texas. The primary factors driving the decline of bobwhites are changing land use practices (e.g., high intensity agriculture) and climate (e.g., drought). To aid in quail conservation, many landowners have restored quail habitat; however, no resident quail exist for repopulation. To add to research data related to the northern bobwhite, our research will evaluate translocating California quail (Callipepla californica) to northeast Texas by measuring their survival, home range, and breeding success through radio telemetry and GPS tracking. The California quail was chosen because of their adaptability to changing landscapes and drought conditions. The data from this project should help us learn more about the hardiness of California quail, how their reactions to environmental changes differ from that of the native bobwhite populations, and contribute to quail translocation knowledge. A bonus to the project is that it will provide an additional quail species for the northeast Texas public to enjoy.

A Novel Approach to the Analysis of Dynamic Animal Space Use Interactions from Telemetry Data

JUSTIN T. FRENCH, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

HSIAO-HSUAN "ROSE" WANG, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

WILLIAM E. GRANT, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

JOHN M. TOMECEK, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

ABSTRACT Animal space use is a dynamic phenomenon, emerging from the movements of animals responding to a dynamic environment. Interactions between animals are reflected in patterns of joint space use, which are also dynamic. However, common analyses of joint space use treat these as static over relatively long periods, masking potentially important details. Furthermore, linking interaction dynamics to covariates has remained cumbersome. High frequency sampling associated with GPS telemetry provides detailed data that captures these dynamics. We propose a novel method for analyzing the dynamics of animal space sharing that permits straightforward incorporation of covariates. This method builds upon tools already employed by researchers, including kernel density estimators, utilization distribution intersection metrics, and extensions of linear models. We treat the intersection of the utilization distributions of 2 individuals as a time series. The series is linked to covariates using copula-based marginal beta regression, an alternative extension of linear models to generalized linear models. This approach accommodates temporal autocorrelation and the bounded nature of the response variable. Parameters are easily estimated with maximum likelihood and it allows separate

modeling of trend and error structures. We demonstrate the approach with simulated data, as well as field data from 2 coyotes (Canis latrans) responding to a carrion resource in south Texas. We show an increase in spatial interactions that persists long after the depletion of the carrion resource. While still under development, this approach is flexible, easily interpretable, and represents a marked advance towards tenable analysis of a complex phenomenon."

Spatial and Temporal Behavior Patterns of Coyotes in South Texas

JUSTIN T. FRENCH, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

JOHN M. TOMECEK, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

ABSTRACT Despite repeated calls in the literature for further research into basic coyote (Canis latrans) behavior, understanding of these topics remains limited. Most literature treats coyote behavior as binary, with individuals exhibiting either territorial or transient behaviors. This represents a broad, but largely untested assumption. Several authors have identified alternative behavior modes, but inconsistencies between them make broader interpretation difficult. Our objectives were to quantify and explain patterns in activity cycles and behavioral syndromes. We used 40 GPS telemetry collars on coyotes in south Texas, and analyzed the resulting data using multivariate techniques. We used a suite of simple movement metrics to identify unique spatial behavior modes and evaluated the relationships among spatial behavior, sex, and body mass of coyotes. We then assessed temporal activity patterns of the telemetered coyotes based on the autocorrelation in movement velocity, and evaluated relationships between temporal behavior, sex, and body mass. Finally, we tested for associations between spatial and temporal behavior modes. We found support for 5 spatial and 3 temporal behavior modes. Spatial behavior modes were unrelated to body mass (R^2 = 0.03, P = 0.712) or sex (R^2 = 0.16, P = 0.154). Temporal behavior was weakly correlated with body mass (R^2 = 0.22, P = 0.049). Spatial and temporal behavior patterns were uncorrelated (R^2 = 0.08, P = 0.628). Our results suggest a more nuanced pattern of behaviors than previously considered for coyotes. While territorial status represents a large dichotomy in their life history, binary treatment of coyote behavior is insufficient.

Using Motion Sensing Trail Cameras to Monitor Response of Wild Pigs to Control Efforts

BETHANY A. FRIESENHAHN, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

KURT C. VERCAUTEREN, *U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Fort Collins, CO, 80521, USA*

NATHAN P. SNOW, *U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Fort Collins, CO, 80521, USA*

BRUCE R. LELAND, *U.S. Department of Agriculture, Animal and Plant Health Inspection Services, Wildlife Services, San Antonio, TX, 78201, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Wild pigs (*Sus scrofa*) are an invasive species in the U.S. and cause billions of dollars in agricultural damage annually. Wild pigs are nocturnal and elusive, making it challenging to monitor pig movements or evaluate success of removal efforts. The purpose of this study is to determine if trail cameras are a reliable method to monitor intrusion into agricultural fields and response to control efforts. Our objectives are 1) quantify response to lethal control efforts in terms of frequency detections and abundance of wild pigs and 2) assess the change in daily activity patterns, for instance wild pigs becoming more or less nocturnal to avoid control efforts. We placed cameras at a corn field in Eagle Lake, TX, and a wheat field in Cooper, TX, from May to September 2018. Cameras were situated on trails leading from woody cover to crops, and near water resources on the edge of the fields containing pig wallows. The cameras were set for motion-activated, high sensitivity, 1-sec delay between images, 30 pictures per trigger, and 5-sec delay between triggers. We performed 3 phases of monitoring: 1) pre-treatment, 10 days of no lethal control efforts; 2) treatment, shooting after dark with the aid of night-vision; 3) post-treatment monitoring. We will record number, age, and sex of wild pigs in each photo, and compare estimates of wild pig abundance and intrusion during each of the 3 phases. The results of this study will allow us to quantify the effect of lethal control methods for the reduction of crop damage by wild pigs.

Oaks and Prairies Joint Venture Fall Bobwhite Population Monitoring and Grassland Restoration Efforts Through Grassland Restoration Incentive Program

JAMES GIOCOMO, *Oaks and Prairies Joint Venture, American Bird Conservancy, Round Rock, TX, 78665, USA*

ANNA MATTHEWS, *Oaks and Prairies Joint Venture, American Bird Conservancy, San Marcos, TX, 78666, USA*

KENNETH GEE, *Oaks and Prairies Joint Venture, American Bird Conservancy, Ardmore, OK, 73401, USA*

STEVE RILEY, *Oaks and Prairies Joint Venture, Texas Parks and Wildlife Department, Georgetown, TX, 78628, USA*

DEREK WILEY, *Oaks and Prairies Joint Venture, Pheasants Forever Inc./Quail Forever, Throckmorton, TX, 76483, USA*

WILL NEWMAN, *Oaks and Prairies Joint Venture, Pheasants Forever Inc./Quail Forever, Floresville, TX, 78114, USA*

LEAH LOWE, *Oaks and Prairies Joint Venture, National Wild Turkey Federation, Ada, OK, 74820, USA*

JEFF RAASCH, *Texas Parks and Wildlife Department, Austin, TX, 78744, USA*

ROBERT PEREZ, *Texas Parks and Wildlife Department, Austin, TX, 78744, USA*

ABSTRACT Texas Parks and Wildlife is working with other Oaks and Prairies Joint Venture (OPJV) partners on a multi-year grassland bird population monitoring program to assess the impact of coordinated grassland bird habitat restoration efforts in select areas of the OPJV region in Texas. With northern bobwhite (*Colinus virginianus*) as the flagship species, the Grassland Restoration Incentive Program (GRIP) improved habitat for grassland wildlife on over 70,000 acres (28,328 Ha) of working lands in focus areas throughout the OPJV geography since it was created in 2013. Fall bobwhite population monitoring started in 2012 at randomly

selected roadside points located in one designated grassland bird focus area and a corresponding reference area in Colorado and Austin Counties following National Bobwhite Conservation Initiative (NBCI) protocols. The focus area represented an area of enhanced conservation delivery efforts through cooperation with the Wildlife Habitat Federation local landowner cooperative. A nearby reference area was chosen to represent an area that had no targeted habitat restoration efforts. A total of 124 covey call point counts were conducted 2012-2018 in the focus area with a mean of 1.53 (*SD* = 1.66) covey detections per point. In the reference area, there were 82 points surveyed and the mean number of covey detections was 0.99 (*SD* = 1.32). Covey detections were significantly higher in the focus area when tested via a 2-sample *t*-test ($P = 0.0098$; $a = 0.05$). Plans are to continue these monitoring efforts for the next 3 years as a part of the NBCI efforts to implement coordinated grassland bird monitoring.

Wildlife Community Response to Native-Grassland Restoration in the Rio Grande Plains

GERON G. GOWDY, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ELLART J. VREUGDENHIL, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

BRANDON J. PALMER, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JAVIER O. HUERTA, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

FIDEL HERNANDEZ, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ERIC D. GRAHMANN, El Coyote Ranches, Riviera, TX, 78379, USA

TIMOTHY E. FULBRIGHT, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL W. HEHMAN, *Hixon Ranch, Cotulla, TX, 78014, USA*

ABSTRACT Throughout the world, non-native invasive species of both plants and animals are degrading community diversity. One species that has a significant ecological impact on southwestern rangelands is buffelgrass (*Pennisetum ciliare*). Millions of ha have been planted with or invaded by buffelgrass, creating near monocultures. These monocultures have shown to reduce diversity of birds, small mammals, and butterflies. We conducted a restoration study on a private ranch in La Salle County, Texas to evaluate if large-scale restoration of buffelgrass-dominated rangeland could be a viable solution to increase biological diversity. The restoration process involved a prescribed burn (February 2014), repeated discing and herbicide spraying of emerging seedlings of non-native grasses to exhaust the seed bank (2014–2016), followed by planting of a diverse mix of native grasses and forbs (October 2016). Two control sites were selected; a non-native grassland site with no restoration treatment and a native thornscrub site. We hypothesized that as native plants become established over time, the diversity of birds, small mammals, and butterflies would increase. Data were collected pre- (2014), during (2015–2016), and post-restoration (2018–present). We conducted avian point counts during summer (June) and winter (December) and conducted small-mammal trapping during the spring (March). We also conducted line-transect surveys for butterflies during autumn (October). Preliminary results suggest that diversity and richness of the wildlife community temporally tracks establishment of the native-plant community. This study will continue for another year (2019) and will provide a more complete picture of the wildlife community response to native-grassland restoration.

Fenceline Ecology: Wildlife Use of Fence Crossings in South Texas

MEGAN M. GRANGER, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

LISA D. ZOROMSKI, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

AARON M. FOLEY, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

JOHN A. GOOLSBY, *USDA Agricultural Research Service, Cattle Fever Tick Research Laboratory, Edinburg, TX, 78541, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT In south Texas, land is primarily used as rangelands, with net-wire fencing being the most common fence type throughout the region. Many wildlife species are incapable of passing over fences. As an alternative, these species use fence crossings, which are areas of the fence where an animal has pushed up or dug underneath the bottom wire. Crossings are beneficial for the movement of wildlife species and population connectivity. However, wildlife that use these crossings to travel between ranches can spread diseases or parasites. For example, in south Texas, the spread of cattle fever ticks (*Rhipicephalus annulatus* and *R. microplus*) from Mexico is becoming a problem in the cattle industry and a challenge for the Cattle Fever Tick Eradication Program. These ticks, along with other wildlife diseases, can be transferred to new locations via movement of wildlife through fence crossings. There is limited information on type, abundance, or frequency of wildlife species that use fence crossings. We are using remote cameras at 20 fence crossing sites at 2 private ranches in south Texas. We will analyze the visitation and frequencies by wildlife species that used these fence crossings during a 6-month period. Our preliminary results indicate that crossings were used by many species, including but not limited to white-tailed deer (*Odocoileus virginianus*), nilgai antelope (*Boselaphus tragocamelus*), feral hogs (*Sus scrofa*), and coyotes (*Canis latrans*). Our results will be important for better understanding the movement of wildlife species which can help prevent the spread of wildlife diseases and disease vectors.

Northern Bobwhite Diet: Searching for Potential Insect Intermediate Hosts in South Texas

TESSA M. GREEN, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

NICOLE J. TRAUB, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ALAN M. FEDYNICH, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Although an essential component of the quail diet, insects can serve as intermediate hosts for helminth parasites. Helminths of northern bobwhites in south Texas utilize indirect lifecycles, meaning the parasites require more than one host species to complete all life stages. Bobwhites are the definitive (final) host and several insects are believed to act as the intermediate, or first, host(s). We examined the crops of 136

hunter-donated bobwhites during the 2016–2017 hunting season to determine which insects are being consumed by bobwhites and have the potential to be utilized as intermediate hosts for the cecal worm (*Aulonocephalus pennula*) and eye worm (*Oxyspirura petrowi*). Nineteen crops had insect species present at the time of necropsy. Insects were identified to order and stored in 95% ethanol for further investigation. Six different orders were present (n = 165). Order Coleoptera (n = 94, 57%) was most dominant followed by Hemiptera (n =, 4%), Hymenoptera (n =, 7%), Lepidoptera (n =, 13%), Orthoptera (n = 30, 18%), and Parasitiformes (n =, 1%). The most abundant insect (n = 79) found was a larval Coleoptera species of the Chrysomelidae (leaf beetle) family. Insects found will be examined for larval parasites to determine if they serve as intermediate hosts for bobwhite helminths. This information is crucial if we hope to fill in the knowledge gaps regarding bobwhite helminth lifecycles and their impact on bobwhite populations.

Correlating Body Condition and Habitat Management of Wintering Duck Populations in Texas Wetlands

ALLISON A. GUGGENHEIMER, *Texas A&M University, College Station, TX, 77840, USA*

JACQUELYN K. GRACE, *Texas A&M University, College Station, TX, 77840, USA*

ABSTRACT Texas is a critical stopover and wintering location for waterfowl. Poor body condition on wintering grounds can have long-term impacts on populations via survival and later breeding success. My study seeks to understand the trends and factors affecting body condition in green-winged teal (*Anas carolinensis*), blue-winged teal (*Anas discors*), northern pintail (*Anas acuta*), gadwall (*Anas strepera*), and northern shoveler (*Anas clypeata*). I hypothesize that 1) ducks at highly managed native wetland habitats will be in the best body condition; 2) body condition trends throughout the winter (November–January) will be species, sex, and age-dependent, but will generally be stable until the spring equinox in March when mass will increase for migration; and 3) ducks collected after extreme weather events will be in poorer body condition than those collected after a milder season. Using over 1000 bodies salvaged from hunters from 2017–2019 we are analyzing morphometric measurements, mass, gizzard fat, corticosterone (the primary avian stress hormone), and stable isotopes to form a picture of body condition and diet shifts. This information will be compared to habitat variables and management techniques where birds were collected. The results of this study have the potential to impact land management practices on waterfowl wintering grounds throughout the Southwest, providing benefits to both waterfowl hunters/land managers and waterfowl populations. Physiological condition can provide an early signal of long-term population trends, thus, this research could shed light on hidden threats to waterfowl.

Effects of Fire Seasonality on Reptiles and Amphibians in a Rolling Plains Ecosystem

JOSELYN M. GUTIERREZ, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

RICHARD T. KAZMAIER, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

MATTHEW W. POOLE, *Matador Wildlife Management Area, Texas Parks and Wildlife Department, Paducah, TX, 79248, USA*

ABSTRACT Fire is a natural process in grasslands, which makes controlled burning an extremely important management tool. However, research has generally focused on shorter-term responses to fire. From 2004–2009, we explored short-term responses to seasonality of fire on small vertebrates in a sandsage prairie ecosystem. In 2018, we reinitiated research in the same study plots to begin evaluating longer-term effects in the system. Drift fence arrays with pitfall traps were used to sample herpetofauna in a randomized complete block design with 5 blocks and 3 treatments (summer-burned, winter-burned, and unburned) during early and late season sampling periods. We regressed year of sampling against abundances and community metrics to evaluate linear responses to the different burning regimes over this time period. In the early season, green toads tended to increase over time with winter-burning ($P = 0.095$), but six-lined racerunners, plains narrowmouths, and most community metrics tended to increase over time with summer-burning ($P < 0.092$). Both six-lined racerunners and plains blind snakes increased over time in both burning treatments ($P < 0.004$), while both species diversity and species richness trended to slightly increase over time with winter-burning ($P < 0.101$) in the late season. Trends detected were generally weak, perhaps because of a long-term severe drought that has persisted in the region and could be masking treatment effects. Continued monitoring should elucidate treatment effects. However, our results suggest that summer-burning may be more beneficial to herpetofaunal communities than other treatments.

Nutritional Differences Between the Genera *Bouteloua* and *Aristida* in the Marathon Basin of Texas

KATHERINE E. HAILE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

CULLOM S. SIMPSON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

BONNIE J. WARNOCK, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

THOMAS S. JANKE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT Two common grass types in the Trans-Pecos grassland regions are gramas (*Bouteloua* spp.) and threeawns (*Aristida* spp.). Their occurrence is important to land managers when determining rangeland health and forage availability. Gramas are typically viewed as more valuable than threeawns in terms of nutritional content. The objective of this project was to quantify any nutritional differences between these genres during the warm-wet growing season (July–October) of the Trans-Pecos region. The study site for this project was located on The Nature Conservancy's Marathon Grassland Preserve, located northeast of Marathon, Texas. Samples were collected following the rotation of the cattle herd through the 3 pastures on the property. Dry matter was determined by recording sample weights in the field after collection and again in the lab once they were dried. Samples were then ground and analyzed for digestibility by examining neutral detergent fiber (NDF), acid detergent fiber (ADF), and ash. We also calculated crude protein by for each sample. These aspects were selected for testing because they are the primary indicators of a forage's nutritional content. After performing nutrition tests, we found no significant difference between these 2 genera for NDF ($P = 0.705$), ADF ($P = 0.092$), and ash ($P = 0.100$). However, there was a significant difference between sideoats grama (*Bouteloua curtipendula*) and annual threeawn with regards to protein content ($P = 0.016$). With this information, land managers will have a better understanding of the value of available forage on their property in regards to gramas and threeawns.

Using Museum and Citizen-Science Data to Examine the Range Contraction of a Threatened Lizard Species

JARED W. HANEY, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT The monitoring of species' geographic range is necessary to implement impactful conservation strategies. I used museum and citizen-science databases to observe the range dynamics of a species that is suspected to have experienced a significant contraction in recent decades, the Texas horned lizard (*Phrynosoma cornutum*). In ArcMap 10.6, I integrated the spatial data from VertNet.org and iNaturalist.org and segregated observations into discrete time periods. For each time period, I generated a minimum convex polygon (MCP) to enclose all observations and then regarded the MCPs as proxies for the *P. cornutum* range during each time span. I calculated several metrics to characterize the size and location of the P. cornutum range over time. To test for any directionality component to the supposed contraction, I divided each MCP into 4 directional quadrants and then, using the centroid of the historic range as a reference point, I calculated the average distance of observations and the average distance of points along the range edge in each time period. From the historic to the current time period, MCP area declined 10%. The eastern quadrant was the only range portion to experience a steady decline in mean edge distance ($P = 0.015$) and mean observation distance ($P < 0.00001$) from the historic to the current time period. My study also illustrates a method that could be applied to other species that may be undergoing range contraction or expansion. The use of citizen science and museum records provides a level of data collection necessary for monitoring broad-scale range dynamics.

Southern Texas Ecosystem Engineers: How the Golden-fronted Woodpecker Can Improve Avian Biodiversity

FAITH O. HARDIN, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

ABSTRACT Woodpecker species have long been known as ecosystem engineers. As primary cavity nesters, their abandoned cavities provide crucial nesting sites for secondary cavity-nesting birds. Furthermore, the holes they create in dead and decaying trees encourage burrowing insects to colonize these trees, providing forage for all insectivorous birds. Currently, there is a lack of information on the ecology of golden-fronted woodpeckers (GFWO) in southern Texas. My goal was to determine if areas around GFWO nests had differing avian species richness and abundance than areas with similar vegetation, but without GFWO nests. My study was conducted on the East Foundation's San Antonio Viejo Ranch in 2018. I surveyed randomly selected grids, and located 32 breeding pairs and 18 active nests. Each location was paired with a site with similar vegetation but no observed woodpecker activity. I conducted 3 rounds of point counts on all sites. Avian species richness and abundance were higher in areas where GFWOs were present than areas where GFWOs were absent. The positive relationship between GFWOs and secondary cavity nesting bird species richness was greater in open areas than heavily forested areas ($P < 0.02$). These findings suggest the importance of primary cavity nesters in areas with limited natural cavities. Determining how woodpeckers impact the avian community will assist landowners and managers in their management of avian populations in southern Texas.

Seasonal and Annual Variation in Raptor Species Presence and Abundance in the Southern Great Plains of Texas

JENNY R. HARRIS, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

CLINT W. BOAL, *US Geological Survey, Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT The Southern Great Plains of Texas is occupied by a diverse array of raptors that, depending on species, are present year-round, breeding season only, and winter only. Additionally, other species migrate through the area each autumn and spring. The diversity of this raptor community and how it varies among seasons in known only in qualitative terms, and annual variation has not been assessed. We used data from monthly point counts conducted in a native prairie and agricultural mosaic in Lubbock County, Texas to investigate these questions. Since September 2011, we have been collecting survey data 3 times per month at sampling points in our study area. Across these 7 years, we have recorded more than 4,000 detections of 14 different raptor species. American kestrels (*Falco sparverius*), red-tailed hawks (*Buteo jamaicensis*), and burrowing owls (*Athene cunicularia*) were the most commonly detected species, and highest detections rates for raptors occurred during autumn migration. We are assessing seasonal patterns of species-specific abundance, and community indices of diversity, richness, and overlap among years, and assessing these in context on seasonal weather patterns. Additionally, these data will be useful in examining patterns of association with trends in prey species populations, such as lagomorphs, cotton rats (*Sigmodon hispidus*), and northern bobwhite (*Colinus virginianus*).

20-year Population Trends of Breeding Snowy Plovers on the Southern Great Plains of Texas

KRISTEN M. HEATH, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

JEFFREY S. BEAUCHAMP, *Bitter Lake National Wildlife Refuge, Roswell, NM, 88201, USA*

DANIEL P. COLLINS, *Region 2 Migratory Bird Office, U.S. Fish and Wildlife Service, Albuquerque, NM, 87103, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

GLEN HENSLEY, *Salt Plains National Wildlife Refuge, U.S. Fish and Wildlife Service, Jet, OK, 73749, USA*

WILLIAM P. JOHNSON, *Division of Biological Sciences, National Wildlife Refuge System, U.S. Fish and Wildlife Service, Canyon, TX, 79015, USA*

SARAH T. SAALFELD, *Migratory Bird Management, US Fish and Wildlife Service, Anchorage, AK, 99503, USA*

CLINT W. BOAL, *U.S. Geological Survey Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT Previous research from 2007–2009 estimated that breeding snowy plovers (*Charadrius nivosus*) at saline lakes in Texas experienced a ~75% population decline in the preceding decade. Negative population

trends of interior snowy plovers on the Southern Great Plains (SGP) are generally attributed to human disturbance, high predation rates, declining groundwater, stochastic weather events and potential heavy metal contamination. Our objectives were to evaluate current population trends of snowy plovers on the SGP. To determine long-term trends of breeding plovers of the SGP of Texas, we conducted weekly surveys of private saline lakes in Texas in 2017/2018. We also analyzed 20-year survey data from Bitter Lake National Wildlife Refuge (BLNWR) in New Mexico and annual survey data from 2013-2017 at Salt Plains National Wildlife Refuge (SPNWR) in Oklahoma, and performed weekly distance-sampling surveys in 2017/2018 at SPNWR. Snowy Plovers have continued to decline over the last 2 decades, with a 44% decline at 2 saline lakes in Texas ($P < 0.001$) and a 63% decline at BLNWR ($P < 0.001$) in New Mexico. Surveys at SPNWR indicate that population trends are stable ($P > 0.05$), with reliable detection probabilities ~1.0, mirroring previous detection estimates in Texas. Long-term declines of breeding snowy plovers in Texas and New Mexico, coupled with stable trends in Oklahoma, indicate that regional persistence may only be maintained by plovers occurring at SPNWR, further emphasizing the hemispheric importance of SPNWR for interior snowy plovers.

The Influence of Agriculture on Mule Deer in a Fragmented Landscape

LEVI J. HEFFELFINGER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

LAURA S. WARNER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

SHAWN S. GRAY, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

WARREN C. CONWAY, *Texas Tech University, Lubbock, TX, 79409, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

LOUIS A. HARVESON, *Borderlands Research Institute, Alpine, TX, 79830, USA*

ABSTRACT Conversion of native rangeland to row-crop farming is one of the largest forms of habitat fragmentation in the United States. Moreover, as the human population grows, demand for agricultural land for food production will increase. Understanding how species react to such landscape alterations will prove important for conservation and management. Mule deer (*Odocoileus hemionus*) populations have been stable throughout the western United States, but have increased in the Texas Panhandle, an area of extensive row-crop agricultural production. We evaluated the influence of agriculture use by mule deer on rump fat, body mass, lactation, and antler size using 74 bucks and 81 does with GPS radio collars. Agriculture use had no effect on rump fat or body mass for either sex during our study, and was not a predictor of the following years' antler size for male mule deer. However, agriculture use had a positive relationship with the probability that an adult female would be lactating the following autumn ($\beta = 12.08$, $P = 0.02$), demonstrating the importance of croplands in providing nutrition to support rearing young. In addition, observed fawn survival was 9% greater

(66% vs 57%) in study sites where agriculture use by adults was greater (12.4% vs 0.0% use). Fawn production and survival is often the limiting factor in ungulate populations, thereby highlighting the importance of cropland for mule deer in the Texas Panhandle. Our baseline population measures will aid in establishing an adaptive management plan for mule deer in the Panhandle as the rangeland-cropland juxtaposition continues to change.

Statewide Delivery of Lone Star Healthy Streams Feral Hog Management Programming in Priority Watersheds in Texas

JOSH L. HELCEL, *Texas A&M Natural Resources Institute, Burnet, TX, 78611, USA*

JIM CATHEY, *Texas A&M Natural Resources Institute, College Station, TX, 77843, USA*

ABSTRACT Outreach efforts to relay science-based information related to wild pig (*Sus scrofa*) management remains an important component of fostering private lands stewardship. The Texas A&M AgriLife Extension Service has offered educational materials by conventional and non-traditional methods to maximize our reach to audiences in Texas and beyond. From 1 October 2008 to present, we accomplished this task through funding by the Texas State Soil and Water Conservation Board (TSSWCB) and the San Antonio River Authority. Through TSSWCB consecutive projects, direct outreach efforts included 379 face-to-face community presentations (26,159 attendees). Post-program evaluations showed 98.7% participant reported knowledge gained concerning feral hog biology, legal control options, efficient trap and bait techniques, and types and extent of feral hog damage. We also conducted 116 in-person technical guidance site visits. Additional outreach includes 26 extension publications (8 translated to Spanish), 91 "Wild Wonderings" blog articles (224,167 views), 50 news releases; 43 media interviews (TV, radio, newspaper), 11 magazine articles; 94 external articles about project activities, 49 educational videos (500,000+ views), 9 editions of the "Wild Pig Newsletter" (343 subscribers and an online reach of 6,514 readers), the development of web-based statewide feral hog reporting tool, 2 wild pig distance education courses, 5 wild pig distance education lessons, a "Coping with Feral Hogs" website (562,191 page-views and 278,709 unique visitors), a Feral Hogs Community of Practice website (320,145 unique page-views), a feral hog smartphone application, and dedicated social media campaigns (Twitter and Facebook) that have reached over 500,000 people and received 50,000 clicks on shared resources since 2015.

Aflatoxin Inhibits Phagocytic Activity of Macrophages in Northern Bobwhite and Exacerbates Crippling Loss

SCOTT E. HENKE, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

CLAYTON D. HILTON, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ALAN M. FEDYNICH, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT An increasingly common practice in the United States is baiting roads with grains to facilitate northern bobwhite harvest. However, baiting roads might have a negative impact on northern bobwhite survival resulting from aflatoxin exposure. Aflatoxins are potent carcinogenic, mutagenic, teratogenic, and

immunosuppressive agents. Also it is estimated that 30–50% of northern bobwhite beyond those killed during the hunting season get wounded but not killed ("feathered" is the hunting term), the prognosis of which is unknown. We investigated the likelihood of survival of wounded northern bobwhites that were exposed to aflatoxin. Initially we estimated the number of wounded northern bobwhites via capture-mark-recapture on a 100-ha pasture within a ranch in Duval County, Texas immediately before and after the autumn hunting season. Pre- and post-harvest populations were estimated to be 88.1 (95% CI = 73.8–109.3) and 28.4 (95% CI = 21.8–40.6) northern bobwhite, respectively. Fifty-four northern bobwhites were shot, of which 41 were hunter-retrieved. Five (38%) of the 13 non-retrieved birds were recaptured 7–30 days post hunt with 1.6 ± 0.4 pellets ($\bar{x}$ ± SE; range = 1–3 pellets). After which, 20 wild-caught northern bobwhite of equal sex ratio were randomly divided into 2 treatment groups, those that received a single oral dose equivalent to 100ppb aflatoxin and those that received 100 uL of DMSO solvent as a control group during the same timeframe. After which, we surgically implanted each bird with one pellet of number 6 shot into the peritoneal cavity. Peritoneal cavities of each bird were washed 5 days later, macrophages collected and counted, plated on chamber slides, and infected with *Candida albicans*. Two hundred macrophages from each sample were examined and any macrophage containing at least one yeast was considered phagocytic. The above experiment was repeated sans the *Candida* and macrophage washing to determine mortality of birds. Northern bobwhite within the control group produced more macrophages ($\bar{x}$ ± SE; 1.5 ± 0.1 x 106/bird), had a greater percent of phagocytic macrophages (24.1 ± 0.5%), and internalized more yeast cells per macrophage (1.8 ± 0.2/macrophage) than those birds of the 100 ppb aflatoxin group (1.0 ± 0.04 x 106/bird, 16.2 ± 0.2%, and 1.1 ± 0.3/macrophage, respectively). Nine of 10 birds within the aflatoxin group died from infection within 12 days of implantation with a shotgun pellet, while only 3 of 10 birds within the control group died. Aflatoxin in combination with wounding during hunting season increases the probability of crippling loss.

Advertisement Calls for Eleven Anuran Species from the Bolivian Gran Chaco

HAILEY A. HESTER, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

CHRISTOPHER M. SCHALK, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

DANIEL SAENZ, *Southern Research Station, U.S. Forest Service, Nacogdoches, TX, 75962, USA*

ABSTRACT Anuran advertisement calls play a vital role in sexual selection and species recognition. Male anurans produce species-specific calls that serve to attract females for mating opportunities. These calls are also an important character to help define taxonomic entities. Here we describe the advertisement calls of 11 anuran species from the Gran Chaco ecoregion of Bolivia. We then compare the calls of the Bolivian Chaco species to calls of conspecifics in other regions of South America to explore geographic variation in call parameters. Call recordings were collected in the field using SM2 song meters deployed at 7 different ponds from January to October 2011 and analyzed using Kaleidoscope and Raven Pro 1.5. Call parameters measured included call duration, dominant frequency, number of notes per call, number of pulses per note, pulse rate, and number of harmonics. To our knowledge, the calls of 2 species, *Phyllomedusa sauvagii* and *Pleurodema guayapae,* are described here for the first time. The calls of the other 9 species, *Rhinella major, Rhinella schneideri, Ceratophrys cranwelli, Scinax nasicus, Leptodactylus bufonius, Physalaemus albonotatus, Physalaemus biligonigerus, Odontophrynus americanus*, and *Dermatonotus muelleri*, have been previously described from other localities. The results showed that call parameters of the Bolivian Chaco frogs overlapped in the range of the call parameters of conspecifics

from other localities. Results from this study provide the first descriptions of call parameters for these species in this region. These results provide characters that can be used in future studies that use an integrative approach to understanding evolutionary relationships and their classification.

Preliminary Analysis of Kit Fox Occupancy in the Trans-Pecos, Texas

MATTHEW O. HEWITT, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

PATRICIA MOODY HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

DANA KARELUS, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

LOUIS A. HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

JULIE SCHMIDT, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

HUNTER L. HOPKINS, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

RUSSELL MARTIN, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT The kit fox (*Vulpes macrotis*) is a small fox species endemic to the desert grasslands of the western United States and northern Mexico. To date no research has been conducted on the Texas population, resulting in a lack of understanding about the distribution and abundance of kit fox in this region. We used trail cameras on a 3-km grid across suitable kit fox habitat in the Trans-Pecos region to gather presence and absence data. Surveys were conducted on private ranches in Presidio, Jeff Davis, Culberson, Hudspeth, El Paso, and Pecos counties beginning in March 2018. Trail cameras were used to survey each site for 13 consecutive days then moved to a new site. We placed a wooden stake extending 40 cm above the ground 5 m in front of each camera to serve as a size reference for animals captured in photos and as an elevated post for a fatty acid sent attractant. We also staked a can of wet cat food to the ground near the wooden stake to serve as an additional sent attractant. We labeled the species in photos in Adobe Bridge and organized our presence/absence data in program R using the package 'camtrapR'. We analyzed our data using occupancy models which allowed us to estimate the distribution of kit foxes while taking into account imperfect detection. Occupancy and detection rates were estimated in program R.

On the Road Again: Using Citizen Science Data to Understand Patterns of Amphibian and Reptile Road Mortality

TOBY J. HIBBITTS, *Natural Resources Institute, Texas A&M University and Biodiversity Research and Teaching Collection, Department of Wildlife and Fisheries Sciences, College Station, TX, 77840, USA*

DANIELLE K. WALKUP, *Natural Resources Institute, Texas A&M University, College Station, TX, 77840, USA*

KEVIN L. SKOW, *Natural Resources Institute, Texas A&M University, College Station, TX, 77840, USA*

WADE A. RYBERG, *Natural Resources Institute, Texas A&M University, College Station, TX, 77840, USA*

ABSTRACT Transportation planning is complicated by natural resource and environmental issues. Project planning and delivery are more efficient when environmental impacts are known early. Many environmental impacts involve state and federally listed threatened and endangered (TE) species. GIS-based habitat models can overestimate TE species' occurrence in environmental impact assessments. Overestimated TE species' occurrence can lead to ineffective prioritization and allocation of resources. Wildlife-vehicle collision (WVC) data can improve environmental impact assessments for TE species. Accurate WVC data has been collected for amphibian and reptile species on Texas roadways since 2012, in the form of observations in the "Herps of Texas" project on the citizen science platform iNaturalist. These data were used to create a database of species of greatest conservation need (SGCN) recorded and verified in the state that was joined with Texas road data from the Texas Department of Transportation (TxDOT) and used to evaluate SGCN species on and near roads. Our approach was to use previous collisions to find "hotspots" or seasonal collisions to find "hot moments" of conflict. These predictions can improve accuracy and effectiveness of transportation environmental impact assessments and mitigation for TE species over species distribution modeling approaches, because they are based on evidence that the species was actually present and struck by a vehicle.

The City Nature Challenge: Leveraging Citizen Science for Conservation in Texas

TANIA Z. HOMAYOUN, *Wildlife Diversity Program, Texas Parks and Wildlife Department, Austin, TX, 78744, USA*

ABSTRACT Texas presents unique opportunities and challenges to large-scale monitoring of native species populations. With diverse habitats hosting over 1,300 Species of Greatest Conservation Need, >85% of the state's population lives in its major metropolitan areas, where rapid urbanization and habitat fragmentation threaten natural areas and resources. The Texas Nature Trackers program engages naturalists of all interest and ability levels in tracking the status and distribution of wild populations of plants and animals throughout the state, with the goal of generating high-quality data for inclusion in the Texas Natural Diversity Database. With the goal of increasing both research-grade observations from urbanizing areas and engagement with local citizen science monitoring, we facilitated participation of major metropolitan areas across the state in the City Nature Challenge, a 4-day global event hosted on the iNaturalist platform. In 2018, 7 major metro areas in Texas encompassing 43 counties generated more than 88,800 observations on over 5,800 species. Of these, 51% of all observations were research grade quality, including over 1,800 records for 127 Species of Greatest Conservation Need. Overall iNaturalist engagement (number of observations, number of participants, and number of species logged) was significantly higher ($P < 0.05$) than the same weekend in 2017. Based on these outcomes, City Nature Challenge has the potential to be a powerful entry point for engagement with our mission and projects; we hope to increase depth and breadth of future participation with the goal of moving participants along a continuum towards long-term involvement with data collection and conservation action.

Estimating the Expected Rate of Use of Road Mitigation Structures in South Texas: A Preliminary Analysis

TAYLOR M. HOPKINS, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

THOMAS YAMASHITA, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

ANNA RIVERA, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

KEVIN RYER, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

JOHN YOUNG JR., *Environmental Affairs Division, Texas Department of Transportation, Austin, TX, 78701, USA*

RICHARD KLINE, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

ABSTRACT The endangered ocelot (*Leopardus pardalis*) is estimated to have fewer than 80 individuals remaining in the United States. Within this population, 40% of known ocelot deaths are due to vehicle collisions. Texas Department of Transportation (TxDOT) constructed 11.5 km of wildlife fencing and eighteen wildlife guards along State Highway 100 to prevent additional road mortalities. To maintain landscape connectivity, 5 wildlife crossing structures were modified or constructed. Camera trap arrays at each road mitigation structure monitor wildlife movement through crossings and at wildlife guards. The objective of this study was to determine expected rate of use for wildlife crossing structures using control sites within native vegetation surrounding crossings. Twenty-four control sites were established and categorized by vegetation and distance to road surface. Wildlife presence at these sites was compared to wildlife utilizing the crossings. Results from this analysis found that wildlife present at wildlife crossings and control sites were not significantly different; however, wildlife presence at control sites and wildlife guards was significantly different. Vegetation was also a significant factor for wildlife presence. Performance ratios, or the likelihood that an individual would use a crossing over a control site, showed that most species exclusively used control sites, but for species observed at both crossings and control sites they preferred crossings. Distance from road surface was not a significant factor, indicating control sites were likely within the road-effect zone. Estimates of wildlife expected rates of use will provide a baseline for measuring the effectiveness of wildlife crossings in future studies.

Spatial Partitioning of Coyotes and Mesocarnivores in The Marfa Grasslands of Texas

HUNTER L. HOPKINS, *Borderlands Research Institute Sul Ross State University, Alpine, TX, 79832, USA*

MATTHEW O. HEWITT, *Borderlands Research Institute Sul Ross State University, Alpine, TX, 79832, USA*

THOMAS S. JANKE, *Borderlands Research Institute Sul Ross State University, Alpine, TX, 79832, USA*

DR. DANA KARELUS, *Borderlands Research Institute Sul Ross State University, Alpine, TX, 79832, USA*

DR. PATRICIA MOODY HARVESON, *Borderlands Research Institute Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT With the elimination or vast reduction of most large predators, coyotes (*Canis latrans*) now function as the apex predator in many ecosystems including the grasslands of west Texas. However, there are many other smaller carnivores such as the bobcat (*Lynx rufus*), American badger (*Taxidea taxus*), kit fox (*Vulpes macrotis*), striped skunk (*Mephitis mephitis*) gray fox (*Urocyon cinereoargentus*), raccoon (*Procyon lotor*), and western spotted skunk (*Spilogale gracilis*) that claim residency to the same areas and share food resources with the coyote. Because of these sympatric components, positive or negative relationships can occur between coyotes and these mesocarnivore species. The objective of this study was to assess the spatial partitioning of habitat by sympatric mesocarnivores in the Marfa grasslands. Beginning in March of 2018, we set out trail cameras at ranches in Presidio, Jeff Davis, Culberson, Hudspeth, El Paso, and Pecos counties in west Texas. At each site, up to 25 cameras were placed 3 km apart and operated for 13-day survey periods. We tested for correlations between the number of coyote detections and the number of detections for each mesocarnivore

per camera survey and site. Correlations between the occurrence of coyotes and sympatric mesocarnivore species provides insight into the spatial partitioning of habitat where these mammals coexist.

Modeling Foraging Habitat for Shorebirds in the Laguna Madre

MIKAYLA M. HOUSE, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

BART M. BALLARD, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

SELMA N. GLASSCOCK, *Welder Wildlife Foundation, Sinton, TX, 78387, USA*

MITCHELL D. WEEGMAN, *University of Missouri, Columbia, MO, 65211, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT The Laguna Madre is a hypersaline lagoon located on the lower Texas coast that provides stopover opportunities for migratory birds. It is one of the most important stopover areas for migratory shorebirds in the western hemisphere. To better inform conservation and management in the area, we are working to develop a temporal-spatial model that delineates shorebird foraging habitat in the Laguna Madre during spring migration. The model will be constructed from publicly available geospatial datasets along with habitat data collected from the field. Tidal fluctuation within the Laguna Madre is primarily wind driven, so we will inform the model with tide and weather data from 5 tide and 5 weather stations placed throughout the lagoon. We will assess the performance of our model with known locations of foraging habitat based on surveys of foraging flocks of shorebirds as well as water depth measurements at key foraging areas. The ability to model the spatial and temporal dynamics of shorebird foraging habitat will allow managers to prioritize areas for conservation, and be informed of potential environmental impacts of future development in and around this critical migratory stopover site.

Detection of Herpetofauna Models Using Unmaned Aerial Vehicles

JAVIER O. HUERTA, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

SCOTT E. HENKE, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Determining species presence and abundance is critical to the ecology and conservation of reptiles. Numerous active and passive capture techniques have been developed to determine reptile presence in an area. Recent use of unmanned aerial vehicles (UAV) has aided in detection and management of wildlife. However, the species detected have been of larger scale which are readily depicted through UAV imagery. Technological advances within the field of remote sensing have increased resolution and detail. We propose the use of unmanned aerial vehicles as a passive method to detect reptiles of a smaller scale such as those within semi-arid environments. In this study we use herpetofauna models to the scale and coloration of herpetofauna within south Texas. Our objectives were to 1) evaluate if UAV technology can detect small scale herpetofauna models, 2) determine an ideal elevation and speed to identify models, and 3) to assess viewer identification and detection of herpetofauna models through survey. We determined a flight height of 4 m and a speed of 1 kph to detect models. Surveyors observed 23.6 (range = 10–40 items) of the 62 models ($\bar{x}$ = 38.0%) that were

placed on the road, of which they correctly identified, on average, 10.5 items (range = 1–19 items) or 44.5% (range = 4.5–59.4%) of the models they saw. Therefore, the average surveyor correctly observed only 16.9% (range = 1.6–30.6%) of the models placed on the road. There was a significant difference between the model shapes surveyors correctly identified, with 50% of the surveyors identifying the can-shaped and 34% identifying snake-shaped models, the rest of the models (turtles/tortoise, lizard, other items and frog/toad) falling under 25% identification. We detected no statistical difference between the species that surveyors could correctly identify. This study indicates that small-scale herpetofauna models can be identified down to individual shape, of which some shapes are better recognized than others. However, species identification of model shapes falls short.

Effects of Habitat Restoration on Texas Horned Lizards and Their Prey

JAVIER O. HUERTA, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

SCOTT E. HENKE, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Texas horned lizards (*Phrynosoma cornutum*) were once a widespread and abundant species forming many fond memories for Texans. Over the past few decades the species has drastically declined presumably due to 1) widespread use of broadcast pesticides, 2) over-collection for the pet trade industry and by children and tourists, 3) loss of habitat to suburban sprawl and the conversion of native land into agricultural crops, and 4) the introduction of the red imported fire ant (*Solenopsis invicta*), that outcompetes harvester ants (*Pogonomyrmex* spp.), the preferred diet of Texas horned lizards. Consequentially the species was a first to be listed by the state of Texas as threatened on 18 July 1977. Recent attempts to translocate Texas horned lizards from viable populations to areas of suitable habitat demonstrated that translocation of wild individuals is not a feasible option. It has been speculated that habitat restoration practices, which return formally native grasslands back to their original state could help rebound lizard numbers; however, this concept has yet to be tested. On small restoration treatments conducted on the Hixon Ranch during 2008–2015, both harvester ants and Texas horned lizards have recolonized uninhabitable treated areas. Unfortunately, this observation has not been substantiated by quantitative data. Therefore, my objective is to determine the response of Texas horned lizards and their prey to sites where a native grassland is being restored. To date, a total of 58 lizards have been caught from 3 sample sites (29 from the restored native grassland, 25 from the control buffelgrass [*Cenchrus ciliaris*] encroached pasture, and 4 from the second native thorn-scrub control). From 100 transects (50 transects for both the restored and encroached buffelgrass pasture), we have documented 49 harvester ant mounds on the restored site and 6 mounds on the control. From are sampling it appears that Texas horned lizards and harvester ants are abundant throughout the study site and appear to be doing well on the restored native grassland site.

Caudates as Prey: Predator Diversity and Size-Relationship Patterns

KASEY L. JOBE, *Department of Biology, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

CARMEN G. MONTANA, *Department of Biological Sciences, Sam Houston State University, Huntsville , TX, 77341, USA*

CHRISTOPHER M. SCHALK, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

ABSTRACT Predators play important roles in ecological communities that can affect both their structure and function. Salamanders are prey to a variety of predators that differ in their foraging tactics (e.g. specialists vs generalists), morphology, behavior, and ecology. Salamanders are an ideal group to explore and quantify patterns that may affect the evolution and persistence of defensive strategies. Here we examined patterns of predator diversity and body-size relationships of salamander species and its predators. We compiled observations predator-prey interactions using natural history notes from Herpetological Review (1975–2018) and Herpetology Notes (2008–2017). Our database contains 156 salamander predator-prey interactions comprised of 68 salamander species that were preyed upon by 88 predator species from 30 orders. Snakes were the most frequently reported predators (35% of predations reported), followed by salamander predators (24% of predations reported), and birds (16% of predations reported). Exploring the body-size relationship of the salamander prey, and both snake and salamander predators were consistently eating salamander prey that were smaller than themselves. This pattern is likely attributed to the fact that both types of predators are gape-limited, and are unable to eat prey that attain a certain size refuge. These patterns can serve to help generate hypotheses on the defensive strategies of salamanders.

Ecotypic Seed for Restoration Efforts in the Coastal Prairies Region of Texas

DOUGLAS L. JOBES, *Caesar Kleberg Wildlife Research Institute, Texas Native Seeds, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

FORREST S. SMITH, *Caesar Kleberg Wildlife Research Institute, Texas Native Seeds, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ANTHONY D. FALK, *Caesar Kleberg Wildlife Research Institute, Texas Native Seeds, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

KEITH A. PAWELEK, *Caesar Kleberg Wildlife Research Institute, Texas Native Seeds, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

AARON D. TJELMELAND, *The Nature Conservancy, Texas City Prairie Preserve , Texas City, TX, 77590, USA*

GARRY L. STEPHENS, *Wildlife Habitat Federation, Cat Spring, TX, 78933, USA*

ABSTRACT Commercially available native seed has become an increasingly popular choice for both restoration and reclamation projects throughout the coastal prairies region of Texas. The Texas Native Seeds Coastal Prairies Project is a collaborative effort designed to develop ecotypic native seed supply for use in large-scale restoration and reclamation projects. The focus of the Coastal Prairies Project is collecting native seed germplasm, identifying suitable restoration populations of prairie and grassland species, and increasing and licensing these seed selections for commercial seed production. Currently, seed source evaluations for little bluestem (*Schizachyrium scoparium*) and knotroot bristlegrass (*Seteria parviflora*) are being conducted at 2 sites within the region. With the development of locally adapted seed, Texas Native Seeds Coastal Prairies Project will provide readily available and reliable seed sources for land managers and natural resource professionals interested in restoring native grasslands within the Texas Gulf Coast region.

Effects of Water Quality and Availability on the Consumption of Pelleted Feed in White-Tailed Deer

AUSTIN K. KILLAM, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

CLAYTON D. HILTON, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ABSTRACT Droughts are frequent in the southwestern United States, reducing the availability of surface water and causing wildlife to rely on pumped ground water or rapidly evaporating pools of water that may have only have poorer quality water that may have high salinity and dissolved solids. Water quality and availability may affect the nutritional plane of white-tailed deer (*Odocoileus virginianus*) by influencing the amount of pelleted feed an individual will consume. For this study, we will be focusing on salinity, the main cause of poor-quality water. During spring, summer, and fall, when the nutritional needs of both males and females are elevated, it is important for individuals to be able to consume their optimal amount of forage and pelleted feed. To assess the impact of water quality and availability on feed consumption of white-tailed deer, we plan a series of studies at the Alkek Ungulate Facility, Kingsville, Texas. We will provide different amounts of water to individuals to find the optimal amount they need to drink to optimize their intake of pelleted feed. We will also provide an equal quantity of water at different salinity levels to discover the threshold at which white-tailed deer will drink and observe how it effects their intake of pelleted feed. The goal of this study is to improve the management of water resources for white-tailed deer, a poorly-understood factor for the species.

Population Growth When Carrying Capacities Vary

LISA J. KOETKE, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ADAM DUARTE, *Oregon Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR, 97331, USA*

FLOYD W. WECKERLY, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT State-space models allow for carrying capacities (K) of populations to be estimated, but the effects of variation in K across populations on the maximum growth rate (r_{max}), strength of density dependence in the growth rate, and demographic variance (random variation in individual survival and fecundity) have not been explored. At a small, landscape level, population growth parameters (i.e. K, r_{max}) and variance in population abundance can be estimated using naturally defined populations, and K has been shown to vary greatly. We used population survey data from 7 American elk (*Cervus elaphus*) populations in relatively mild and stable habitats, so density-independent factors should be minimal and K estimable. We used hierarchical models in a state-space formulation to account for observer error, and fit the Ricker and logistic models using Bayesian statistics. We also conducted a simulation to explore the fit of the models to elk population data under various conditions, and we explored the relative influence of demographic and environmental variance in populations with different K. Our results indicate that when temporal process variation is high, the Ricker model is a better approximating model due to its parsimony and precise parameter estimates. Our results also reveal that where density-independent variance is minimal, changes in K will impact the strength of density dependence, not r_{max}. Populations with larger K may fluctuate around K due to weak density-dependence, but populations with smaller K may fluctuate around K due to the large amount of demographic variance driving their population fluctuations.

Sex Ratios as a Function of Density Dependence in American Kestrels

ALLISON M. KOHLER, *Texas A&M University, College Station, TX, 77840, USA*

MARY R. SELLARS, *Northland College, Ashland, WI, 54806, USA*

ERIK R. OLSON, *Northland College, Ashland, WI, 54806, USA*

BRIAN HEERINGA, *United States Forest Service, Washburn, WI, 54891, USA*

ABSTRACT American kestrels (*Falco sparverius*), the smallest falcon in North America, have been experiencing population declines across their range in recent decades. The reasons for the decline are unknown, and little is known about their productivity. To examine potential influencing factors of the decline, we installed 55 nest boxes from 2015 to 2018 within Ashland and Bayfield Counties, Wisconsin. Boxes were placed on private agricultural lands (N = 23) and public lands within the Moquah Barrens of the Chequamegon-Nicolet National Forest (N = 32). Our data suggest that female sex ratios (number of female offspring per nest box relative to males) may be a function of density (number of nest boxes per square kilometer). We found that female sex ratios decreased significantly as density increased, and the ratio was higher on private lands (69% female) compared to public lands (53% female) from 2015 to 2018. Although we observed a 70% female-biased sex ratio in 2015 across our study site, the ratio became less female-biased over time (59% in 2018). Future research efforts include further examination of nest box productivity relative to density to provide potential insights that could be influencing the decline of American kestrels.

Avian Distribution Across a South Texas Working Ranch Landscape and Implications for Migratory Facilitation

ALLISON M. KOHLER, *Texas A&M University, College Station, TX, 77840, USA*

MICHAEL L. MORRISON, *Texas A&M University, College Station, TX, 77840, USA*

ABSTRACT Migratory birds have been declining faster than resident species on a global scale, with the lead hypothesis to explain this phenomenon being climate-induced changes that disrupt timing of life events. Of the 338 Nearctic-Neotropical avian migrants in North America, 98.5% have been documented in Texas. Therefore, almost all migratory species in America depend on migratory routes across the state of Texas, where 85% of the land is privately managed by farmers and ranchers. Few studies have been published on research to determine which ranching practices could facilitate avian migration. The goal of this study was to determine how ranchers across Texas could support migratory birds by making slight modifications to their landscapes. Point-count grids were established across the 140,000-acre landscape of the San Antonio Viejo Ranch, Jim Hogg County, part of the East Foundation. Over the course of 6 years, point counts were taken 5 days a week from April to July. 170 confirmed species were recorded, with the most abundant species being northern mockingbird, northern bobwhite, Bewick's wren and northern cardinal. The woody forest vegetation type harbored the most species, followed by the wetlands vegetation type and the open grassland vegetation type. The management implications of this research are to provide Texas ranchers with recommendations on how they can modify their landscape to help migratory birds that depend on their property for a successful migration.

Pronghorn Preferred Forage Production in Relation to Cattle Grazing Regimes in the Trans-Pecos, Texas

JACOB C. LOCKE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

KATHERINE HAILE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

CARLOS E. GONZALEZ, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

LOUIS A. HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

SHAWN S. GRAY, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

ABSTRACT Pronghorn (*Antilocapra americana*) have evolved in grasslands with a diet in which they prefer forage composed of highly nutritional forbs. However, grassland habitat for pronghorn has been lost throughout North America due to habitat fragmentation and degradation. Additionally, effects on how cattle grazing affect forb production are not well known in west Texas. Because of this, there is a need for a better understanding of how cattle grazing regimes affect forb production. To assess the effects of different cattle grazing regimes on forbs, we sampled vegetation during the growing season in the month of September. Our hypothesis was that there is a difference in forb production between a rotationally grazed pasture, a continuously grazed pasture, and a non-grazed pasture. We randomly sampled all grazing regimes using 96 (rotational grazing), 100 (continuous grazing), and 64 (non-grazed) with 1 m^2 plots. We collected all forbs in each plot and analyzed differences in biomass production, species diversity, and nutritional composition. Results from this study will compare which grazing regimes produce the most biomass and highest diversity of forbs. The knowledge gained from this study may be used by wildlife biologists and landowners alike in order to improve the suitability of pronghorn habitat by utilizing different cattle grazing regimes.

Wetland Use and Characterization of Mexico Wetlands Used by Wintering Midcontinent Greater White-Fronted Geese

JASON P. LOGHRY, *Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JAY A. VONBANK, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

KEVIN J. KRAAI, *Texas Parks and Wildlife Department, Canyon, TX, 79015, USA*

BART M. BALLARD, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Greater white-fronted geese (*Anser albifrons frontalis*, hereafter GWFG) use both agricultural and wetland habitat throughout winter with changes in use exhibited temporally and in relation to environmental and landscape factors. Currently, GWFG winter primarily in Texas, Louisiana, and Arkansas. Additionally, an unknown proportion of GWFG winter in Mexico, largely in Tamaulipas and Vera Cruz along the Laguna Madre, and in the Central Highland states of Zacatecas and Durango, where little information regarding wintering ecology is known. During the winters of 2016–2018, we captured and placed GPS/GSM transmitters on adult GWFG throughout Texas. We characterized wetland-use by 7 GWFG (n = 3 in 2016–2017, n = 4 in 2017–2018) that migrated into several regions of Mexico during winter. These GWFG used the Central Highlands, Coastal, and Interior Plains ecoregions of Mexico in the states of Tamaulipas, Nuevo Leon,

Durango, Zacatecas, and Jalisco. Dominant wetland characteristics including size and shape of wetlands used by GWFG were measured, as well as distance to developed areas and to agricultural fields used for foraging. Diurnal and nocturnal wetland use were also considered. We used USGS Landsat 8 satellite imagery in programs ArcMap and Erdas Imagine to extract wetland characteristics used by GWFG. These variables were then analyzed in relation to use by GWFG using the number of GPS locations in each wetland. Wetlands in Mexico are being degraded and destroyed at a rapid rate, and information such as this is important for future management and conservation planning efforts for wetland-dependent species such as GWFG throughout Mexico.

Change of Woody Cover Affects Ocelot Recovery in South Texas

JASON V. LOMBARDI, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT The Rio Grande Delta (10,065 km^2) of south Texas has become one of the fastest urbanizing regions in the United States. This region is also noted for productive agriculture and rangeland, while still retaining the distinction as a rich biodiverse region in Texas. Since the early Twentieth Century, conversion of woody cover for agricultural use and human development has become one of the main drivers of the decline of ocelots (*Leopardus pardalis*) in Texas. We classified LANDSAT imagery from 1987 to 2016 to quantify different rates of land cover change and used housing density scenarios to project woody cover change until 2050 based on 5 landscape metrics. From 1987 to 2016, woody cover increased 11.8%–15.1% along with patch density and edge density, whereas mean patch area, patch size and Euclidean distance to nearest patch decreased. Closer inspection revealed that woody cover increases were due to increase in small patches (<1 ha) by a magnitude of 4, with an observed significant skewness and kurtosis in the frequency distribution of patch size across years. This information suggests woody cover increases are due to the establishment of small woody patches. Urbanization will have the largest impact on woody cover, thereby impacting ocelot recovery in south Texas over the next 32 years. By 2050, the largest patches of woody cover will be located on private lands >60 km north of the United States-Mexico border. These results provide important information for predicting future woody cover fragmentation to focus efforts for connectivity of ocelot populations.

Multiseason Occupancy Dynamics of Ocelots in Tamaulipan Thornscrub of South Texas

JASON V. LOMBARDI, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOSE M. MATA, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT About 80% of the known breeding population of ocelots (*Leopardus pardalis*) in the United States occurs exclusively on ranches in south Texas. This area supports several large contiguous patches of dense Tamaulipan Thornscrub which is preferred by ocelots. Past studies have indicated ocelots in Texas select for woody areas with 95% canopy cover, 85% vertical cover and require large patches of thornscrub to survive. However, little is known regarding other factors which influence occupancy, colonization and localized extinction dynamics. From 2011-2018, we used camera traps on a private ranch to assess how different climatic, macrohabitat and microhabitat factors influence ocelot occupancy of Tamaulipan Thornscrub scrub in south Texas. We observed a negative correlation between initial occupancy and increasing distance to inland sand dunes. The probability of ocelots colonizing new areas was positively influenced by increasing density of woody patches. However, close proximity to paved roads increased the likelihood of localized extinction. This information suggests that greater densities of dense thornscrub communities adjacent to coastal inland sand dunes provide important habitat for ocelots in south Texas. Potential benefits of habitat preservation or restoration efforts need to evaluate potential risks of nearby roads.

Comparison of Telemetry and Occurrence Data to Inform Ocelot Habitat Suitability in South Texas

JASON V. LOMBARDI, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DANIEL G. SCOGNAMILLO, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75965, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Modeling habitat suitability can be an important aspect in the ecology and management of endangered species; however, data collection can be time-consuming and expensive. There is no real consensus on the best forms of data to use for these models, especially when it comes to endangered carnivores. In south Texas, the ocelot (*Leopardus pardalis*) is an endangered neotoprical felid that occurs in 2 small populations in Willacy, Kenedy and Cameron counties. Habitat loss, fragmentation, and road mortality have led to losses in genetic diversity across populations. The purpose of this study is to determine which type of occurrence data will be the best predictor of ocelot habitat suitability across south Texas. Using telemetry data collected from 2011–2018 in Willacy and Kenedy counties, we aim to compare VHF data, low and high frequency GPS data, and other occurrence data (cameras, confirmed locations, and capture locations) to help inform habitat suitability models for ocelots. This study has implications for ocelot recovery because it will indicate which environmental variables and types of spatial data best predict suitability. Information from this study will help researchers identify potential areas of occurrence, future habitat restoration, and where future populations can be established.

Home Range and Habitat Selection of the Greater Roadrunner on the Welder Wildlife Refuge

DEREK R. MALONE, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79416, USA*

CLINT W. BOAL, *U. S. Geological Survey Texas Cooperative Fish & Wildlife Research Unit, Texas Tech University, Lubbock, TX, 79409, USA*

TERRY L. BLANKENSHIP, *Welder Wildlife Foundation, Sinton, TX, 78387, USA*

ABSTRACT The greater roadrunner (*Geococcyx californianus*) is an understudied but charismatic cursorial avian predator that requires a combination of open areas for foraging and brush for perches and nesting locations. Greater roadrunners occur throughout much of the Southwestern United States, occupying arid to semi-arid regions from California eastward into some parts of Louisiana. We are assessing how coastal prairie restoration efforts on the Welder Wildlife Refuge, in San Patricio County, Texas, may influence roadrunners by comparing home range and habitat use of radio-tagged birds on a 144-ha treatment plot to an untreated 216-ha control plot, as well as the refuge as a whole. We captured and outfitted 10 roadrunners with VHF backpack style transmitters in 2018. We obtained triangulated location estimates for each roadrunner approximately twice a day to calculate estimates of home range. Analysis of home range size and habitat selection are currently underway using programs LOAS and the home range tool in ArcGIS. Habitat selection data will be collected using ArcGIS. Our goal is to understand how prairie restoration efforts can contribute toward grassland bird community recovery, while also accounting for species, such as the Greater Roadrunner, that require a mixture of vegetation communities.

Individual Identification of Nilgai Using Camera Traps at Latrines in South Texas

LORI D. MASSEY, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

LISA D. ZOROMSKI, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOHN A. GOOLSBY, *USDA Agricultural Research Service, Cattle Fever Tick Research Laboratory, Edinburg, TX, 78541, USA*

AARON A. FOLEY, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S., *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Nilgai antelope (*Boselaphus tragocamelus*) are an exotic species native to Pakistan, India, and Nepal. Nilgai were introduced to the U.S. as zoo animals and were released on private ranches in south Texas during the 1920s–40s. Little research has been done on nilgai, but there is urgent pressure for basic ecological information because nilgai can carry cattle fever ticks (CFT: *Rhipicephalus annulatus* and *R. microplus*). Cattle fever ticks can transmit a deadly cattle disease called bovine babesiosis, directly affecting the U.S. beef industry. To effectively control CFT, treatment methods are needed for wildlife hosts of CFT, including nilgai. Nilgai do not use feed or bait, but use latrines, repeated defecation at a localized site, often forming large piles of defecation. The identification of individual nilgai via camera traps would allow us to estimate an overall number of nilgai using latrines so that we can properly administer treatment measures for CFT. We are analyzing photos of nilgai visits at latrines on the East Foundation's El Sauz ranch for 1,080 trap nights taken over the course of 3 months. We will use phenotypic characteristics, such as scarring, to determine the proportion of identifiable nilgai. The results will play an important role in understanding nilgai latrine ecology and determine if camera traps would be an effective tool for the identification of individual nilgai. Also, this study will provide an estimate of the efficacy of latrine sites as target locations for treatment of CFT in south Texas.

Detection Modeling for Four Priority Grassland Bird Species in Texas: Northern Bobwhite, Eastern Meadowlark, Dickcissel, and Painted Bunting

ANNA M. MATTHEWS, *Oaks and Prairies Joint Venture, American Bird Conservancy, San Marcos, TX, 78666, USA*

JAMES J. GIOCOMO, *Oaks and Prairies Joint Venture, American Bird Conservancy, Round Rock, TX, 78665, USA*

M. CLAY GREEN, *Aquatic Resources Program, Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT In Texas, many grassland species have declined due to the loss of native grassland. Four of these were selected for study by the Oaks and Prairies Joint Venture due to their importance as priority species. These species are the northern bobwhite (*Colinus virginianus*), eastern meadowlark (*Sturnella magna*), dickcissel (*Spiza americana*) and painted bunting (*Passerina ciris*). Due to their decline, correcting counts using detection probabilities is critical for accurate density estimates. This 6-year study identified covariates that influence detection using data collected from 13,852 points across 20 Texas counties. Points were visited once per year from 2013 to 2018 in May and June, and 5-min point counts were performed using distance sampling protocols. Covariates examined included: ambient noise, wind speed, Julian date, time-of-day, observer, and year. Detection models were fit using gdistsamp from the package "unmarked" in R, and model selection was performed with AIC. Only observer affected detection for all species. For bobwhites, dickcissels, and buntings, ambient noise decreased detection probability ($P < 0.02$ for all), and year had varying impacts on detection. Increasing wind increased detection for bobwhites and meadowlarks, while decreasing it for buntings ($P < 0.001$ for all). Detection increased from May to June for bobwhites, dickcissels, and buntings ($P < 0.001$ for all), and only bobwhites were influenced by time, which showed the highest probability around dawn ($P < 0.001$). This study clarifies survey limits that could achieve more accurate counts and emphasizes the importance of accounting for variables that likely impact detection for all species.

Reseeding Techniques on the Chilicotal Soil, Chihuahuan Desert, Texas, After Treatment with Tebuthiuron

CAROLINA MEDINA-NAVA, *Sustainable Ranch Management, Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

BONNIE J. WARNOCK, *Sustainable Ranch Management, Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

KEVIN URBANCZYK, *Rio Grande Research Center, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT Grasslands are important economically and ecologically, because they provide land for cattle grazing, wildlife habitat, and carbon sequestration. Because of this, efforts to improve desert grasslands have been ongoing for the last century. Due to its positive results, Tebuthiuron (Spike 20P) has become a popular restoration tool to control brush species such as creosote bush (*Larrea tridentata*) in the Trans-Pecos, Texas. In 2013, more than 3,000 ha in 3 different soil types were treated with Spike 20P to reduce brush encroachment in the Green Valley, Texas. However, grass establishment was not equal in all soil types. The Chilicotal soil had less grass recruitment 5-year post treatment compared to other soil types. The specific goal of the restoration project was to evaluate native grass reestablishment in treated Chilicotal soil by identifying and ameliorating recruitment limitations such as seed source, herbivory, soil moisture, and temperature. I used a mixture of 6 grasses; Oso Hall's panicum (*Panicum hall*i), La Salle Arizona cottontop (*Digitaria californica*), Van Horn green sprangletop (*Leptochloa dubia*), Santiago silver bluestem (*Bothriochloa saccharoides*), Permian whiplash pappusgrass (*Pappophorum vaginatum*), and chino grama (*Bouteloua ramosa*), placed at 3 microsites – bare ground, nurse plants, and microtopography. On each microsite, control points and 5 reseeding techniques (seedballs, seedballs covered with burlap, burlap tubes, seed broadcasting, and seed broadcasting covered with burlap) were implemented. Because we need more management-minded scientists and more science-minded managers, the results of the study will help future land stewards to understand how best to improve soil types with significant limitations.

Wind Turbine Concentrations and the Threats They Pose to Swainson's Hawks

MARGARET E. MEIER, *Department of Natural Resource Management, Texas Tech University, Lubbock, TX, 79409, USA*

KATHERYN A. WATSON, *Department of Natural Resource Management, Texas Tech Univeristy, Lubbock, TX, 79409, USA*

CLINT W. BOAL, *Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX, 79409, USA*

JAMES D. RAY, *Consolidated Nuclear Security, LLC, USDOE/NNSA Pantex Plant, Amarillo, TX, 79120, USA*

ABSTRACT Wind energy is a hazard for flying animals, and migrating species may be at increased risk of encountering wind energy structures. Swainson's hawks (*Buteo swainsoni*) migrate annually between North America and Argentina. We equipped 24 adult Swainson's hawks with satellite transmitters to assess potential risk due to wind energy development during migration. We obtained wind farm locations from the U.S. Geological Survey for the United States, but also needed wind farm locations for 16 countries across the

migration pathway. We used coarse wind energy location data from TheWindPower.net to narrow down a search area in the remaining pathway. We then downloaded and visually scanned 169 Sentinel-2 satellite images for patterns that match known wind farms in the U.S. We found 3,438 turbines, with the highest concentrations in Mexico and Uruguay. We added collision risk buffers of 100 m (high risk) and 1 km (low risk) around turbine points and assessed risk by season. Birds were at high risk of colliding with a turbine during the breeding season 0.2% of the time and at low risk 15.7% of the time. During migration, high risk was <0.1% and low risk was 0.2%. During winter, high risk was <0.0% and low risk was <0.1%. Currently, Swainson's hawks are at highest risk of encountering turbines while in the U.S. Wind energy is probably not an important hazard for migrating hawks outside of the U.S., though risk will increase if turbines are built in core migration pathways.

Structural and Environmental Predictors of Tri-Colored Bat Presence and Abundance in Texas Culverts

MELISSA B. MEIERHOFER, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*

SAMANTHA J. LEIVERS, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

RACHEL R. FERN, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*

LILIANNA K. WOLF, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

JOHN H. YOUNG, JR., *Environmental Affairs Division, Texas Department of Transportation, Austin, TX, 78701, USA*

BRIAN L. PIERCE, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

JONAH W. EVANS, *Nongame and Rare Species Program, Texas Parks and Wildlife Department, Boerne, TX, 78006, USA*

MICHAEL L. MORRISON, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*

ABSTRACT The tri-colored bat (*Perimyotis subflavus*) is being reviewed for listing under the Endangered Species Act by the United State Fish and Wildlife Service. It is also listed as a species of greatest conservation need by the Texas Parks and Wildlife Department due to population declines caused by white-nose syndrome (WNS) in other states. Several colonies of hibernating tri-colored bats have been documented using roosting in culverts. Because culverts are widespread in Texas as part of roadway infrastructure, our objective was to understand and quantify which structural and environmental factors best explain culvert use and abundance of hibernating tri-colored bats in Texas. We surveyed 207 culverts across 10 of 12 Texas level III ecoregions for tri-colored bat presence during the winters of 2016–17 and 2017–18, and recorded environmental and structural features at each site. We used penalized maximum likelihood estimation and zero-inflated Poisson regression to identify which culvert features best explained presence and abundance of hibernating tri-colored bats. We found that culvert length, external temperature, portal opening area and vapor pressure deficit predicted presence of bats, whereas a greater abundance of bats was found in culvert sites with more sections. We present important structural and environmental characteristics that predict bat presence and abundance at culverts. With the current threats to tri-colored bat populations, there is a need to consider management of bat

populations within culvert roosts, and to further investigate the potential susceptibility to WNS of culvert-roosting bats at more southern latitudes for local and regional planning efforts.

Old Tricks-New Opportunities: Using Telemetry as a Landscape Analysis Tool to Assess Wild Turkey Habitat in South Texas

ALISON R. MENEFEE, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

WILLIAM P. KUVLESKY, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

LEONARD A. BRENNAN, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ALFONSO ORTEGA-SANTOS, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Radiotelemetry is a common tool used to locate and track many different forms of wildlife. However, triangulation errors occur as a result of location error, signal bounce, animal movements, distance effects, and observer error. Confidence ellipses have been used to combat inaccuracies in triangulations, yet there is little research on the effects of the size and shape of these ellipses on error estimates. We used error ellipsoids derived from telemetry triangulations to obtain estimated wild turkey locations. There were approximately 1,400 initial error ellipses derived from locations taken on 90 turkeys during breeding and wintering seasons over a two-year span. We classified 40 digital aerial images from the Texas Natural Resources Information System into 3 classes: woody, herbaceous, and bare ground. We will use the classified imagery to assess landscape structure within selected ellipsoids. The metrics we will use to assess landscape structure are percent woody cover (P-LAND, %), largest patch index (LPI, m^2), mean patch area (MPA, ha), aggregation index (AI), edge density (ED, m/ha), patch density (PD, patches/100 ha), and Euclidean nearest neighbor distance distribution (ENN_MN). Landscape metrics used in this study link vegetation spatial patterns and provide information on the spatial structure for wild turkey habitat. This is the first step in building spatial models to quantify and assess breeding and wintering habitat for wild turkeys in south Texas.

Camera Trapping to Identify Waterfowl Use of Stock Ponds in the Oaks and Prairies Ecoregion of East Texas

COLIN C. MERRITT, *Texas Tech University, Lubbock, TX, 79409, USA*

JAMES R. MOREL, *Texas Tech University, Lubbock, TX, 79409, USA*

SAMANTHA S. KAHL, *Texas Tech University, Lubbock, TX, 79409, USA*

BLAKE A. GRISHAM, *Texas Tech University, Lubbock, TX, 79409, USA*

KEVIN J. KRAAI, *Texas Parks and Wildlife Department, Canyon, TX, 79015, USA*

DANIEL P. COLLINS, *United States Fish and Wildlife Service , Albuquerque , NM, 87102, USA*

WARREN C. CONWAY, *Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT Primary wintering waterfowl habitat across coastal and inland wetlands of Texas have suffered significant changes in both quality and abundance, reducing the capacity for over-wintering waterfowl in the state. Stock ponds, an often overlooked habitat, could be an important wintering habitat for waterfowl with >15 million ha comprising nearly 500,000 stock ponds occurring within the Oaks and Prairies ecoregion. We observed waterfowl occurrence on stock ponds (n = 46) within the Oaks and Prairies ecoregion using camera traps (n = 61) during migration and winter, 2016–2017. Specifically, we wanted to identify timing of use (seasonality, time of day), species use, species abundances, and trap efficacy. Preliminary data suggest greatest waterfowl use between December and January, with ring-necked duck (*Aythya collaris*), American wigeon (*Mareca americana*), and gadwall (*M. strepera*) occurring most frequently. However, ~70–80% of waterfowl observed could not be accurately identified from the camera trap photographs, due to camera trap distance from targets, and sun angle causing glare or shadowing which limited clear visibility. We believe the methods and data provide an accurate analysis of migration timing and overall use of waterfowl throughout the migration and wintering periods. However, identifying species-specific use was less reliable than traditional waterfowl survey methods.

Fine Scale Movement of the Texas Kangaroo Rat Along Roadsides Dominated by Cropland

MATTHEW M. MILHOLLAND, *Biology Department, Texas State University, San Marcos, TX, 78666, USA*

SILAS L. OTT, *Biology Department, Texas State University, San Marcos, TX, 78666, USA*

IVAN CASTRO-ARELLANO, *Biology Department, Texas State University, San Marcos, TX, 78666, USA*

JOSEPH A. VEECH, *Biology Department, Texas State University, San Marcos, TX, 78666, USA*

THOMAS R. SIMPSON, *Biology Department, Texas State University, San Marcos, TX, 78666, USA*

JONAH EVANS, *Texas Parks and Wildlife Department, Austin, TX, 78744, USA*

ABSTRACT The Texas kangaroo rat (*Dipodomys elator*) is endemic to a small region in north-central Texas and is currently known from only 5 counties. Knowing the habitat use of this species is crucial to make needed management decisions given the restricted range and relative scarcity of this species. Previous surveys have revealed individuals existing in landscapes dominated by cropland where sometimes the only natural cover is a thin strip of vegetation along the roadside. Despite considerable research on this species, no study has used tracking techniques to quantify nightly foraging movement. We used radio-telemetry to obtain data on nightly movement, general activity, and burrow usage at 3 roadside locations. We followed 16 individuals for an average of 5–6 nights and obtained a total of 480 fixes. Over period of several days, individuals used from 2 to 6 burrows with inter-burrow distance up to 400 m, although most movements were restricted around burrows while foraging (mean distance from fix to nearest burrow ranged from 2 to 21.9 m). A relatively high number of fixes (30 to 100%) represented individuals inside burrows, indicating that kangaroo rats spend a lot time in their burrows each night. Foraging individuals tended to remain within 10 m of the roadside habitat strip with minimal incursions into cropland and no use of rangeland. Our findings indicate the potential relevance of thin roadside vegetation strips as habitat for this species and perhaps as corridors to connect populations.

Influence of Agriculture on Pronghorn Movement, Survival, and Diet Composition in the Texas Panhandle

GARY L. MIZER, *Department of Natural Resources Management Texas Tech University, Lubbock, TX, 79409, USA*

WARREN C. CONWAY, *Department of Natural Resources Management Texas Tech University, Lubbock, TX, 79409, USA*

ANTHONY P. OPATZ, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

SHAWN S. GRAY, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

ABSTRACT Pronghorn (*Antilocapra americana*) occur in 27 of the 56 counties in the Texas Panhandle Wildlife District. Pronghorn are known to primarily feed on forbs, but little is known about how crops may be incorporated into their diet. Pronghorn may make seasonal tradeoffs when selecting between agricultural and rangeland environments. We are studying movements, home range, and response(s) to the rangeland – agricultural landscape using satellite collars deployed on 64 pronghorn in 2 study areas. We are also examining dietary components of these study animals, to more closely identify how they are using these habitats from a nutritional perspective. We are initiating a dietary component to the collaborative research project on pronghorn movements and resource selection, using DNA metabarcoding of pronghorn fecal samples. To date, we have collected 102 fecal samples, 40 from native rangeland, 53 from croplands, 9 samples from unknown origin, and at 6 different sampling periods. Fifty samples from bucks, 37 from does and 15 were unknown sex. Samples were collected fresh from individuals after observed defecations, with site characteristics and GPS location noted. From 34 samples sent to Northern Arizona University for analysis, we detected 58 plant genera. We will analyze the differences between diet and food habits between male and females, spatiotemporally to more clearly identify how pronghorn utilize food resources in both landscapes. These data will be useful to identify plant species or genera that appear most frequently in pronghorn fecal samples that may help guide land managers in making regional pronghorn management decisions.

Mapping Golden-Cheeked Warbler Densities Across the Breeding Range

JAMES M. MUELLER, *U.S. Fish and Wildlife Service, Marble Falls, TX, 78654, USA*

STEVEN E. SESNIE, *U.S. Fish and Wildlife Service, Albuquerque, TX, 87103, USA*

SARAH E. LEHNEN, *U.S. Fish and Wildlife Service, Albuquerque, NM, 87103, USA*

HELEN T. DAVIS, *American Bird Conservancy, San Marcos, TX, 78656, USA*

JAMES J. GIOCOMO, *American Bird Conservancy, Round Rock, TX, 78665, USA*

JOHN N. MACEY, *U.S. Army, Fort Hood, TX, 76544, USA*

ASHLEY M. LONG, *Louisiana State University, Baton Rouge, LA, 70803, USA*

ABSTRACT The U.S. Fish and Wildlife Service and American Bird Conservancy surveyed for golden-cheeked warblers (*Setophaga chrysoparia*, hereafter warbler) across the 67,000 km² breeding range in the Edwards Plateau and Cross Timbers in Spring 2018. The objectives of this project are to 1) delineate potential warbler habitat using multidate multispectral imagery, 2) develop a fine-grain density model using avian point count surveys, and 3) quantify population size across the breeding range and areas of conservation interest. We conducted an unlimited-radius point count survey at each sampling location. The sample frame was a grid of points spaced ≥300-m apart and clipped to areas where we received permission to conduct surveys. We obtained permission to survey on 69 sites spanning 2,112 km². Using leaf-on and leaf-off 4-band digital aerial photographs, we created tree cover classifications (broadleaf, juniper, and other) at a 1-m pixel resolution. To ensure adequate geographic representation across previously reported latitudinal and longitudinal density gradients, we stratified the allocation of survey effort among 5 geographic regions. Within each geographic region, we used Neyman Allocation and GRTS sampling to develop a random, spatially balanced sample design with proportionally more surveys allocated to higher quality habitat. Surveys began 26 March and continued for 6 weeks. We surveyed for 5 minutes, and recorded for each initial detection of a singing male warbler the distance and time from start of survey. We completed 1,817 point count surveys and detected 810 warblers. We will discuss candidate models and preliminary results.

Using GPS Collar Data as Surrogate for Visual Observation

ELIZABETH CARY MUNGALL, *Second Ark Foundation, Kerrville, TX 78028, and Department of Biology, Texas Woman's University, Denton, TX, 76204, USA*

CHRISTIAN MUNGALL, *Second Ark Foundation, Kerrville, TX, 78028, USA*

ABSTRACT Although visual checks are indispensable for behavior study, GPS collar data provide continual numerical information. The combination greatly facilitates identification of long-term social dynamics. Analysis software was designed to give 2D and 3D movement displays step-by-step or day-by-day. Groups were automatically identified along with information on group shape, area, and (when travelling) the order of the animals. An entire pasture population of 6 male and 7 female African dama gazelles (*Nanger dama ruficollis*) was collared and studied for 1 year in 202 ha on the Edwards Plateau, Texas. Lotek 3300S collars were programmed to record locations every 3 hours. Graphics illustrate the following. While the females were with one familiar adult male (study period one), all ordinarily stayed in 1 group. Without an adult male (study period two), the norm became 2 groups. After 3 new adult males were added (study period three), there were 2 groups, each with an attendant male, and occasionally a temporary third group. One to 15 "excursions" were noted per month. A single individual left its group and then returned, spending at least 3 location time steps. Most lasted less than a day (47), some 1 to 2 days (15), and occasionally more (4). A strange female added at the start took 4½ months to transition to group membership. Added at the same time, a strange adult male took only 4 days. Thus, dama gazelles may not always remain together. This may be expected for pasture exotics as well as for animals for African reintroductions.

Analysis of Allelic Variation in the Prion Protein Gene of South Texas White-tailed Deer

DAVID NAVARRO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

AARON M. FOLEY, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

CHARLES A. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DON A. DRAEGER, *Comanch Ranch, Carrizo Springs, TX, 78834, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Chronic Wasting Disease (CWD) is a fatal neurodegenerative disease, classified as a transmissible spongiform encephalopathy. Spread by infectious prion proteins, CWD has become a major management concern for North American cervids. Currently there is no cure or resistance to CWD, but some cervids have genetic mutations that can affect susceptibility and incubation time of the disease. In white-tailed deer (*Odocoileus virginianus*), mutations at codon 96 of the Prion Protein gene (Prnp) confer partial resistance and delay the progression of CWD. However, this period of latency also makes detection of CWD more difficult. Furthermore, infected deer may live longer but continue to spread the misfolded prion proteins. The main objective of this study is to determine the occurrence of mutations within codons of the Prnp gene in white-tailed deer throughout south Texas. We amplified and sequenced the Prnp gene from tissue samples collected at 5 ranches throughout the south Texas region. Our preliminary results revealed 9 synonymous and 2 non-synonymous mutations, with unknown significance, not previously reported in cervids. Twenty-seven of 30 (90%) white-tailed deer had nucleotide substitutions at codon 96 that result in substitution of the amino acid Glycine with Serine, 15 homozygotes and 12 heterozygotes. The frequency of individuals with at least one copy of Serine at codon 96 is up to 4 times higher than previously found in white-tailed deer populations. By understanding which Prnp alleles are present in southern deer population, we can determine the susceptibility and detectability of the disease for informed management decisions.

Variable Precipitation Causes Permanent Cohort Effects on Antler Size in South Texas Populations of White-Tailed Deer

MASAHIRO OHNISHI, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

CHARLIE A. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

BRONSON K. STRICKLAND, *Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Starkville, MS, 39762, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DON A. DRAEGER, *Comanche Ranch, Carrizo Springs, TX, 78834, USA*

ABSTRACT Antler size is considered an indicator of good genes. However, environmental factors also influence antler characteristics. For instance, the effect of precipitation on current-year antler growth is well-known. Conditions during early life also may lead to permanent effects on antler growth. As part of a long-term study of culling on the Comanche Ranch in south Texas, we evaluated the influence of early life conditions on antler growth later in life in a wild population of white-tailed deer (*Odocoileus virginianus*). Each autumn during 2006–2016, we captured male deer, estimated age, and measured antler characteristics. We evaluated cohort effects on antler traits associated with precipitation during the year of birth and during the 1st year of antler growth. We recorded 5,488 captures of 2,937 individual males. Precipitation during the 1st year of life had a small but statistically significant effect (0.01–0.07 antler points per inch of precipitation) on antler points for bucks 1.5–4.5 years old, and a larger influence on the Boone and Crockett score (GBC) for bucks ≥5.5 years old (0.529–0.770 GBC per inch of precipitation). In arid south Texas, where precipitation is highly variable, conditions during early in life may have permanent effects on antler growth. The results of this study will have important implications for managers.

Land Cover and Resource Selection of Pronghorn in The Texas Panhandle

ANTHONY P. OPATZ, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

GARY L. MIZER, *Department of Natural Resources Management Texas Tech University, Lubbock, TX, 79409, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

WARREN C. CONWAY, *Department of Natural Resources Management Texas Tech University, Lubbock, TX, 79409, USA*

SHAWN S. GRAY, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

ABSTRACT The North American prairie ecosystem is rapidly being replaced by urban expansion and agricultural activities. Native shortgrass and mixed-grass prairie land cover classes are regarded as important habitat for pronghorn (*Antilocapra americana*). The effects of expanding agriculture development on pronghorn in the Texas Panhandle are unknown. In February 2017, we attached satellite GPS collars with 2-hour fix intervals to 64 pronghorn in study areas near Dalhart and Pampa, Texas, each with 32 collars evenly distributed between sexes. We used the Texas Ecological Mapping System provided by the Texas Parks and Wildlife

Department to determine land cover classes within our study area. We calculated the 90th percentile of step lengths between successive points of collared pronghorn to be 1,266 m. We then paired each used GPS point (n = 399,402) with a random point within 1,266 m and compared land cover classes between used and available points. Pronghorn in the Dalhart study area selected mixed-grass prairies and Conservation Reserve Program–Improved grasslands over other classes, including agricultural fields (30%) and sand prairies (25%) that were proportionally more available. Pronghorn in the Pampa study area selected agricultural fields and sandy shrublands, while mixed-grass prairie (33%) and shortgrass prairies (18%) were proportionally more available. Selection for land cover classes varied among seasons and between sexes. For example, females selected classes containing more native land cover than males did during the fawning season. Although agricultural fields are used by pronghorn, availability of natural vegetation appears important throughout the annual cycle of pronghorn on the Texas landscape.

Pronghorn in the Texas Panhandle: The Habitat-Cropland Paradox

ANTHONY P. OPATZ, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

GARY L. MIZER, *Department of Natural Resources Management Texas Tech University, Lubbock, TX, 79409, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

WARREN C. CONWAY, *Department of Natural Resources Management Texas Tech University, Lubbock, TX, 79409, USA*

SHAWN S. GRAY, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

ABSTRACT Increases in the demand for agricultural products globally is threatening native habitat for wildlife species. Native prairie ecosystems in the Texas Panhandle occupy areas with fertile soil that are ideal for cultivation if irrigation is available. We collared 64 adult pronghorn (*Antilocapra americana*) in the Panhandle of Texas, 32 near the town of Dalhart and 32 near the town of Pampa. Collars were set to record a GPS fix every 2 hours and upload fixes to a web service daily. In 2017, 5,700 (19%) of GPS fixes were recorded in agricultural fields, where 85% of fields used were winter wheat or fallow fields. A severe drought occurred throughout the Panhandle beginning in December 2017 and lasted >100 days. In 2018, GPS fixes increased by 250% (20,500 points) in crop lands compared to 2017, where pronghorn used alfalfa and corn crops as well as winter wheat and fallow fields Use was greatest during January through June, when crops are in early developmental stages. Active irrigation can potentially provide a consistent, nutritious food source for wildlife on the landscape especially when drought conditions occur. Increasing conversion of native rangeland in the Texas Panhandle to agricultural crops presents a paradox for pronghorn; it results in habitat loss yet crops could benefit this species nutritionally during certain seasons and prolonged periods of drought.

Modeling Woody Vegetation Density with Very High-Resolution Remote Sensing Imagery and Unmanned Aerial Systems

MICHAEL T. PAGE, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID B. WESTER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ALEXANDRIA DIMAGGIO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Recent studies have shown that woody cover structure can be used as thermal refuge for various wildlife species. Quantifying thermal refuge over large scales can significantly improve our ability to assess habitat for wildlife species, particularly in south Texas. Incorporating woody cover structure into wildlife habitat models is critical for development of successful habitat management strategies. The aim of this project is to develop new methodologies and approaches to quantify woody cover structure of southern Texas rangelands. The specific objectives of this project are 1) to capture, process, and quantify woody vegetation density from UAS imagery, 2) to combine UAS imagery with Planet Labs imagery to develop a spatial model between woody cover structure (UAS) and imagery spectral information (Planet Labs), and 3) to validate these over large areas of southern Texas rangelands. We will use 2 locations for our study: the Tio & Janell Kleberg Wildlife Research Park and South Pasture. At each location we will have 2 study sites (n = 4 sites). We will fly study sites 4 times a year at an altitude of 100 feet performing a double grid pattern using a Phantom 4 Pro UAV. Imagery will be processed to generate a 2 cm resolution ortho-mosaic for each site. We will validate created regression models to other parts of south Texas and utilize densitometers to compare density data to model. This project will improve our understanding of how woody vegetation structure can be modelled at large scales and how it can be implemented in spatially based methodologies for habitat assessment.

Northern Bobwhite Restoration in Erath County, Texas: Project Proposal

JOHN D. PALARSKI, *Department of Wildlife, Sustainability, and Ecosystem Sciences, Tarleton State University, Stephenville, TX, 76401, USA*

HEATHER MATHEWSON, *Department of Wildlife, Sustainability, and Ecosystem Sciences, Tarleton State University, Stephenville, TX, 76401, USA*

BRADLEY W. KUBEČKA, *Tall Timbers Research Station, Tallahassee, FL, 32312, USA*

DALE ROLLINS, *Rolling Plains Quail Research Foundation, Rotan, TX, 79546, USA*

THOMAS W. SCHWERTNER, *Department of Wildlife, Sustainability, and Ecosystem Sciences, Tarleton State University, Stephenville, TX, 76401, USA*

ABSTRACT The gradual decline of northern bobwhites (*Colinus virginianus*; hereafter bobwhites) has resulted in local extinctions and isolated pockets of quail populations throughout their historic range. Within the Cross

Timbers ecoregion of Texas, similar declines have been observed. Isolated populations of bobwhites remain; however, natural recolonization may not be sufficient to revitalize them. Translocation has been successful in reestablishing populations of many different gamebirds, including bobwhites in the southeastern U.S. The objectives of this research project are to evaluate the feasibility of translocation to reintroduce wild bobwhites to isolated habitat in the Cross Timbers ecoregion and further refine our understanding of the effectiveness of translocation efforts. We will translocate 100–200 bobwhites per annum for 2 consecutive years to a 1,011 ha area in Erath County near Desdemona, Texas. We will select source sites with stable quail populations and within 350 km of the recipient site. We will radio-mark hens and monitor movement and demographic rates. In addition, we will conduct on-site habitat evaluations of the recipient site throughout the study to quantify attributes that may or may not be conducive for quail translocation. Findings from this study will be used to aid managers who wish to restore bobwhite populations via translocation.

Vegetation Attributes Providing Thermal Refugia for Northern Bobwhites in South Texas

BRANDON J. PALMER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ERIC D. GRAHMANN, *El Coyote Ranches, Riviera, TX, 78379, USA*

FIDEL HERNANDEZ, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL W. HEHMAN, *Hixon Ranch, Cotulla, TX, 78014, USA*

DAVID B. WESTER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT The northern bobwhite (Colinus virginianus) often lives at the edge of its thermal tolerance in semi-arid portions of its distribution. Summer daytime temperatures in these regions are predicted to increase in association with climate change projections, which emphasizes the need for managers to provide thermal cover for bobwhites. The specific structural characteristics that create microenvironments conducive to bobwhite survival are unknown. Our objective was to determine the vegetation structural attributes contributing to suitable thermal refugia for bobwhites during summer. We radiotracked 73 bobwhites, locating them 2–3 times/week from April–September, 2017–2018. Upon locating each bird, we collected black globe and ground surface temperatures as well as estimated percent shade at used and paired random locations. After each tracking day, we measured height of woody and herbaceous vegetation at the paired locations, along with canopy density, and total woody and herbaceous cover. We found that shade ($P < 0.0001$) was the main component influencing temperatures. Using logistic regression, we found that bobwhites selected for total woody cover ($P < 0.0001$), herbaceous height ($P = 0.0373$), and canopy density ($P < 0.0001$) in addition to percent shade ($P < 0.0001$). Woody plant species influencing probability of use of locations by bobwhites were mesquite, granjeno, lotebush, whitebrush, and prickly pear ($P < 0.0001$). Our results indicate that microsite selection by bobwhites during summer is driven primarily by structural characteristics associated with cooler temperatures, and secondarily by structural characteristics that may be associated with other life history requirements such as predator avoidance.

Quantifying the Spatial and Temporal Distribution of Thermal Refugia for Northern Bobwhites Using an Unmanned Aerial Vehicle

BRANDON J. PALMER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ERIC D. GRAHMANN, *El Coyote Ranches, Riviera, TX, 78379, USA*

FIDEL HERNANDEZ, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL W. HEHMAN, *Hixon Ranch, Cotulla, TX, 78014, USA*

JINHA JUNG, *Texas A&M University-Corpus Christi, Corpus Christi, TX, 78412, USA*

ANJIN CHANG, *Texas A&M University-Corpus Christi, Corpus Christi, TX, 78412, USA*

ABSTRACT Northern bobwhites (*Colinus virginianus*) are often exposed to thermal conditions beyond their tolerance in south Texas, where extreme heat events and droughts are expected to increase in frequency and intensity in association with climate change projections. This has placed greater emphasis on determining optimal thermal conditions across landscapes to drive brush management decision-making. However, quantifying the distribution of suitable thermal cover is often energy intensive and impractical with in situ field methods. Unmanned aerial vehicles (UAV's) may provide a more practical alternative to assessing thermal heterogeneity. The aim of our study was to quantify the distribution of thermal cover for bobwhites using a UAV. We conducted flights over a 16-ha pasture using a 3DR X8 drone with a FLIR Vue Pro thermal camera. We flew the UAV at an altitude of 80 m at 1400, 1600, and 1800 hrs on 5 October 2016. We also placed 11 black globes across the site to record operative temperature. We then utilized a linear regression analysis assessing the relationship between black globe temperature and thermal reflectance values acquired from UAV imagery. We used this regression to estimate operative temperature across our site. After processing the images, we found that about 2%, 13%, and 94% of our study pasture was thermally suitable during the 1400, 1600, and 1800 hr flights, respectively. This information can be useful for managers to design landscape-scale brush management plans to maintain and increase suitable thermal cover for bobwhites during thermally extreme periods of the day.

Assessing Occupancy of Bats on the Gulf Coast of Texas

MATTHEW C. PARKER, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

JACOB A. ROGERS, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

SARAH R. FRITTS, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT The Texas gulf coast boasts a diverse array of habitat types, but many native habitats on which wildlife are dependent are fragmented and shrinking from human development and climate change. Few studies have researched bats in this region and none have examined the drivers of occupancy for high frequency (>35

kHz; HiF) and low frequency (<35 kHz; LowF) bats. San Bernard National Wildlife Refuge (SBNWR) lies on the Texas gulf coast and is dominated by saline prairie, upland prairie and bottomland hardwood forest. The objective of this study was to identify drivers that influence the occupancy of HiF and LowF bats on the SBNWR. We monitored bats using Pettersson D500x acoustic devices from May to August 2018. We surveyed 18 upland prairie, 21 saline prairie and 26 bottomland forest sites and collected 94,706 files with bat call characteristics. The drivers we examined were salinity, insect abundance and diversity, forest stand size, and vegetation structure. We sampled invertebrates using Townes-style malaise traps, collecting over 10,000 insects with the most abundant orders being Lepidoptera, Hemiptera and Diptera. We predicted that occupancy would be greatest in bottomland hardwood forest and lowest in saline prairie habitat, with increased salinity levels and low insect diversity being the most influential drivers negatively impacting bat presence. We will continue to monitor bat occupancy on the SBNWR during summer 2019.

Transposable Element-Based Investigations into Vesper Bat Genome Evolution and Cryptic Speciation

NICOLE S. PAULAT, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

JENNIFER KORSTIAN, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

DAVID A. RAY, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

ROY N. PLATT, II, *Genetics Department, Texas Biomedical Institute, San Antonio, TX, 78227, USA*

ABSTRACT Among vesper bats, *Myotis* is the most species-rich genus. However, it includes many species that are morphologically nearly indistinguishable. Multiple approaches have led to reclassification of several species and subspecies. Recent molecular studies have found evidence of cryptic speciation within the several currently recognized taxa including *M. albescens* and *M. nigricans*, among others. Possibly related, *Myotis* is also one genus of vespertilionid bats that has experienced an unorthodox transposable element history. Transposable elements (TEs) are DNA sequences that mobilize, expanding within a host genome. Vesper bat genomes are unique among mammals in harboring many active DNA transposons, which continue to shape their genomic landscapes. The exact scope of this impact is still unclear, but recent data suggests that TEs contribute to higher mutation rates via low-fidelity DNA repair mechanisms. We are investigating TE biology and the genus *Myotis* at 2 levels. First, we are examining transposon polymorphisms in *Myotis* to reveal the how such activity has impacted mutation rates of nearby genes. Increased mutation rates could correlate with differences in the evolution of orthologous genes among closely related species and contribute to our understanding of the evolution of this exceptionally diverse clade. Second, we are exploring the use of computationally identified TE polymorphisms to investigate cryptic speciation. TE-based phylogenies can identify and resolve cryptic relationships while also identifying branches of the phylogeny that have been impacted by rapid or reticulate speciation patterns. The identification of such events will allow more informed wildlife management decisions in the future.

Cattle Grazing Impacts on Small Mammal Populations in South Texas

ALEXIS R. PENCE, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*

ABSTRACT Livestock grazing is known to affect ecosystems and alter wildlife composition. Small mammals are one taxa that respond quickly to environmental change and are known to be indicator species for ecosystem quality. The goal of our project was to determine how various cattle grazing regimes affect small mammal communities in southern Texas rangeland that is dominated by Tamaulipan Thornscrub and Coastal Sand Plain. We conducted a mark-recapture study of small mammals over 4 consecutive years (2014–2018), cattle were deferred during Year 1, whereas cattle were grazed following 4 different grazing treatments Years 2–4. Throughout February and March, Sherman traps were arranged into grids at several locations across the East Foundation's San Antonio Viejo Ranch. Substantial changes in the small mammal populations due to overgrazing could have cascading effects on the ecosystem since they are an important food source for larger, carnivorous animals and can be a sign of declining rangeland health. Understanding how grazing pressure affects the small mammal community will allow landowners and managers to successfully manage their rangelands. Our findings suggest that following years of grazing, abundance and overall species compositions differs with varying levels of grazing pressure. These baseline data will be useful for further studies aiming to understand the community impacts on small mammal populations of various grazing regimes.

Recap of My Experiences While Helping with the Trans-Pecos Kit Fox Distribution Project, Texas

PETER T. POULSEN, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

MATTHEW O. HEWITT, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

PATRICIA M. HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

THOMAS S. JANKE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

JULIE SCHIMDT, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

HUNTER HOPKINS, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

ABSTRACT During the 2018 Summer One semester (30 May–5 July), I worked with the kit fox team on the Trans-Pecos kit fox distribution study. I was able to do this through the Borderlands Research Institute and the Borderlands Undergraduate Mentorship Program (BUMP), combined with an internship class offered by Sul Ross State University. The goal of my internship was to assist the kit fox team with their fieldwork and lab work, and to learn the techniques used in the processes. During my internship, I worked in Jeff Davis and Culberson counties setting up baited camera traps. Cameras were set up near predetermined GPS points and baited with cat food and a fatty acid scent tablet. We would return 13 days later to retrieve the cameras and offload the photos for later sorting. While in the lab, I learned to use Adobe Bridge to label photos based on what animals were in them. While I was in the lab I sorted photos from cameras placed in Presidio County. Over the course of the internship, I logged over 100 hours of work, was able to visit numerous ranches, sorted and labeled 118,316 photos, and came away with new skill sets. Knowledge and technical skills gained during my internship will help me on future studies or projects that I may work on.

Home Range of Translocated Pronghorn in Trans-Pecos, Texas

HOWELL A. PUGH, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

LOUIS A. HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

CARLOS GONZALEZ, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

DANA KARELUS, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79830, USA*

SHAWN S. GRAY, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

ABSTRACT Within the Trans-Pecos region of Texas, pronghorn (*Antilocapra americana*) were once as numerous as 17,000 individuals. However, population declines began to occur in the 1980s. From 2008–2012, a historic declined occurred with numbers falling from 10,000 to below 3,000. This significant population decline was due to a combination of factors including brush encroachment, drought, barriers to movement, predation, and disease. In 2011, restoration efforts were initiated through translocating pronghorn to supplement declining populations. Through 2017, 5 translocations have been completed moving 668 pronghorn from the Panhandle to the Trans-Pecos, Texas. While translocation strategies have helped to increase pronghorn numbers in the Trans-Pecos thus far, translocations of large ungulates can be challenging. To evaluate translocation outcomes and movement post-release during restoration events, 30-60% of adult females in each translocation were affixed with Global Positioning System (GPS) collars. We are using the GPS data from multiple translocations to establish home range estimates of translocated pronghorn in the Marfa Plateau and the Marathon Basin. Preliminary results show seasonal variations in home ranges in one section of the Marfa Plateau ranging from a mean of 95.33 km^2 (SE = 21.15) for the acclimation period, to 76.87 km^2 (SE = 30.31) for the wet season, and 110.54 km^2 (SE = 40.77) in the dry season. Further analyses of all translocations will allow us to compare home ranges of transplanted pronghorn to those in other regions of North America. These data will help state agencies make future decisions on translocations, stocking densities, and amount of habitat needed for successful transplants.

A Review of Techniques for Archiving and Sharing Camera Trap Databases

CODY A. PUTMAN, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

THOMAS S. JANKE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT Camera traps have drastically changed the way researchers are able to study wildlife since they were first used in the early 20th century. Camera trap studies produce large amounts of data, which generally go unused once the study is finished. If these data archives were better integrated, then researchers could perform more comprehensive and robust studies, while at the same time cutting the amount of effort required. The objective of this project was to review and compare techniques of archiving and sharing camera trap data. For our data collection and comparison, individuals from various research agencies, programs, universities, and related industries were interviewed about which programs and systems they use to store or share camera trap photos (or similar data). An overview of storage capacity, ease of use, costs, and practicality for each of the programs and systems are included in the results. Findings from this review will allow researchers, landowners, and managers to more easily determine the best option(s) for storing or sharing their data archives, while at the same time hopefully encourage increased integration between camera trap studies.

Validating the Use of White-Tailed Deer Capture Locations for Home-Range Scale Habitat Analysis

SETH T. RANKINS, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JACOB L. DYKES, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIM E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ALFONSO ORTEGA, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

AARON M. FOLEY, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

LANDON R. SCHOFIELD, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Wildlife managers are often interested in understanding the relationship between vegetation characteristics and condition of white-tailed deer (*Odocoileus virginianus*). Understanding how deer respond to differing vegetative communities helps us further are understanding of deer ecology, which is the basis for management decisions. For instance, south Texas rangelands consist of varying degrees of grassland and brush depending on soil texture. As sand content in the soil increases, average body and antler size of deer decreases. Presumably, this relationship is nutritionally mediated. To elucidate these relationships, we will be combining metrics of plant quantity and quality with metrics of deer morphometrics, such as antler size, body size and mass, and body condition. Here we use re-capture data from an 8-year deer capture-and-release study to define spatial scale of habitat use on 4 ranches of the East Foundation in south Texas. Deer are large, vagile animals, thus it is important to understand how capture locations correspond to their home ranges when making these inferences. Deer on our study sites exhibited high site fidelity, as 90% were recaptured within 3 km of their original capture locations. Furthermore, we confirmed that capturing deer with netguns from helicopters and releasing them on site does not shift the re-capture locations out of their original home ranges. The results from this study validate our vegetation sampling scheme and study design for examining how microhabitat influences the phenotypic quality of white-tailed deer in south Texas.

Exploring the Potential of Weather Radar for Monitoring Migrations of Insect Pollinators

JAMES D. RAY, *Consolidated Nuclear Security, LLC, U. S. Department of Energy-National Nuclear Security Administration Pantex Plant, Amarillo, TX, 79120, USA*

PHILLIP STEPANIAN, *Plains Institute, University of Oklahoma, Norman, OK, 73072, USA*

JEFFREY KELLY, *Plains Institute, University of Oklahoma, Norman, OK, 73072, USA*

ABSTRACT Long-term declines in insect pollinators, such as monarch butterflies, have contributed to concern about the conservation of these species and pollination as an ecosystem function. A primary limitation in conservation planning is that accumulating standardized data on the abundance of these pollinators while they are migrating is difficult. The national network of weather surveillance radars (NEXRAD) provides near-comprehensive surveillance of the airspace over the contiguous United States, with sub-kilometer spatial resolution and temporal updates every 5 minutes. An unanticipated benefit of the high sensitivity of weather radars is routine detection of aerial insects engaging in migration or dispersal flights, and these systematic observations have long attracted the attention of the entomological community. While the taxonomic identity of these insect signals had long been ambiguous, technological advances in the early 1980s demonstrated that radar systems capable of making dual-polarization measurements could obtain information regarding the size, shape, and aspect ratio of insects aloft, providing the first step toward taxonomic classification. Using measurements from the NEXRAD network over the south-central USA during fall of 2018, we demonstrate this capability for large-scale aerial monitoring of insect migration and highlight the importance of synoptic weather conditions on insect flight.

Habitat Selection by Bobwhites

KELLY M. REDMOND, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

NICOLE A. HANSEN, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

WILLIAM L. LUTZ, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

TAYLOR R. SHIRLEY, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ANDREW P. NICHOLSON, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

FIDEL HERNÁNDEZ, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ERIC D. GRAHMANN, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

LEONARD A. BRENNAN, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

TIMOTHY ANDERSON, *U.S. Fish and Wildlife Service, , Corpus Christi, TX, 78411, USA*

KIRK FEUERBACHER, *The Nature Conservancy, Victoria, TX, 77905, USA*

MICHAEL E. MORROW, *Attwater Prairie Chicken National Wildlife Refuge, Eagle Lake, TX, 77434, USA*

ABSTRACT Northern bobwhite (*Colinus virginianus*) populations have declined throughout their geographic range. Declines can be attributed mostly to the loss, fragmentation, and degradation of their habitat. Understanding the vegetation composition bobwhites select is important in making habitat management decisions to improve quail habitat. The Gulf Coast Prairie is a unique ecoregion for which conflicting information exists regarding bobwhite demography and habitat use. Despite more than 5 decades of bobwhite population monitoring and several habitat studies in the Coastal Prairie of Texas, managers currently face numerous quail conservation challenges in this ecoregion. Our objective was to quantify habitat-suitability bounds of vegetation characteristics known to be important for bobwhite. Our study was located on 3 private ranches (1,000-ha units on each) in Goliad and Refugio Counties. We used radio telemetry to determine exact locations of bobwhites from April–August 2017 and 2018. We collected vegetation data at a subsample of

bobwhite locations and paired-random locations. Using a 0.25 m² Daubenmire frame, we estimated percentages of woody cover, grass and grasslike cover, forb and subshrub cover, litter, rock, and exposed bare ground. Using these data, we created continuous selection functions to identify habitat-suitability bounds for each vegetation attribute. This study will provide key information to help guide bobwhite habitat management in this ecoregion.

Assessing Differential Wildlife Use of Road Underpass Structures

JOSHUA D. RENNER, *Wildlife Ecology Program, Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

MICHELLE ADCOCK, *Aquatic Resources and Integrative Biology Program, Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

M. CLAY GREEN, *Wildlife Ecology Program, Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

THOMAS R. SIMPSON, *Wildlife Ecology Program, Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT Texas' landscapes contain a length of over 500,000 km of roads. With increasing human population growth and subsequent increasing habitat fragmentation, the ecological effects of roads have become a large area of study. Road Ecologists study a variety of road effects such as erosion, hydrological effects, soil chemistry alterations, direct road mortality, and consequences to wildlife at the local and population level. Direct impacts to wildlife include fragmentation of habitat as well as road mortality. One of the mitigation strategies designed to reduce both habitat fragmentation and wildlife-vehicle collisions is the engineering of a permeable road. This study assesses biodiversity within the road-effect zone and qualitatively assesses the permeability of a south Texas highway. Six road underpasses were monitored on a 24-km stretch of a bifurcated highway over the course of 10 months. Two types of established underpasses were monitored: bridge (n = 3) and culvert (n = 3). Camera arrays were deployed at each underpass to maximize the detection of wildlife utilizing the underpass as well as the surrounding road-effect zone habitat. A total of 33 Reconyx Hyperfire PC900 Professional camera traps were placed in the area. Species counts were taken for individuals "committed" to the crossing, where commitment was an account of an individual in the interior of the crossing. We found higher wildlife traffic under bridges where cohesive habitat remains intact in the road easements and medians. Species diversity was similar across both crossing types, although the particular species varied between crossing type . Observing wildlife use of crossings and possible variation of use between crossing types will give us insight for implementation of wildlife crossing structures on new roads and potential redesign of existing crossing structures.

Quail and Rainfall: Does Management Matter?

ALEC D. RITZELL, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

FIDEL HERNÁNDEZ, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ERIC D. GRAHMANN, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOHN T. EDWARDS, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DALE ROLLINS, *Rolling Plains Quail Research Foundation, Roby, TX, 79543, USA*

ABSTRACT Rainfall is a strong driver of quail populations on southwestern rangelands and may account for a large portion (70–90%) of variability in regional quail production and abundance. Landowners have attempted to modulate these boom-and-bust fluctuations via management, but presently it is unknown whether quail management can increase or stabilize northern bobwhite (*Colinus virginianus*) populations on semi-arid rangelands subject to highly variable rainfall amounts. The objective of our research is to evaluate the efficacy of bobwhite management in mitigating the effects of rainfall within semi-arid rangelands. This study is being conducted in the Rio Grande Plains (n = 6 ranches; ~20,000 ha total) and Rolling Plains (n = 4 ranches; ~15,000 ha total) of Texas. Quail density is being estimated on each ranch during December 2014 through 2018 using helicopter surveys within a distance-sampling framework. For this analysis, we quantified management intensity on each study site using landowner surveys designed to gather information on quail-management practices (e.g., stocking rate, prescribed fire, harvest, etc.). Study sites were categorized as low, moderate, or high management intensity based on their respective quail management program (e.g., number of quail management practices and how intensively they are implemented). Also, we collected annual rainfall data for each study site. Preliminary results suggest that management may increase quail density beyond that of less managed properties but may not completely eliminate inter-annual population fluctuations attributed to rainfall. These findings provide critical guidance to landowners regarding the effectiveness of management for increasing quail abundance and reducing population variability.

The Influence of Characteristics and Environmental Factors on the Use of Wildlife Crossing Structures

ANNA D. RIVERA ROY, *University of Texas Rio Grande Valley, Brownsville, TX, 78521, USA*

TAYLOR M. HOPKINS, *University of Texas Rio Grande Valley, Brownsville, TX, 78521, USA*

THOMAS J. YAMASHITA, *University of Texas Rio Grande Valley, Brownsville, TX, 78521, USA*

KEVIN W. RYER, *University of Texas Rio Grande Valley, Brownsville, TX, 78521, USA*

JOHN YOUNG JR., *Environmental Affairs Division, Texas Department of Transportation, Austin, TX, 78701, USA*

RICHARD J. KLINE, *University of Texas Rio Grande Valley, Brownsville, TX, 78521, USA*

ABSTRACT The major impacts of roads on wildlife behavior and survival can have detrimental effects on populations and in time, biodiversity. To facilitate movement and prevent vehicle-caused mortalities, mitigation structures, such as fencing and wildlife crossing structures (WCS), specifically under- and overpasses, have been developed as mitigation measures. However, little is known about the relationship between structural and environmental attributes of WCS and wildlife use. Along State Highway 100 in Cameron County, Texas, 11.4 km of exclusionary fencing and 5 WCS have been constructed or modified to mitigate wildlife road mortalities. To understand the effectiveness of these WCS, camera trap arrays placed at the openings of each monitor use of the structures by wildlife. We examined differences in species use of WCS in relation to openness ratio,

substrate, presence of permanent water, and distance to nearest native vegetative cover. This research will aid in advising which attributes of WCS are most suitable for specific wildlife species or groups of species.

Molecular Systematics of Pocket Gophers Based on Two Nuclear and Two Mitochondrial Genes

EMMA K. ROBERTS, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

ERICA VARGAS, *Las Palmas Medical Center, El Paso, TX, 79902, USA*

SHERI AYERS, *Cellmark Forensics, Farmers Branch, TX, 75234, USA*

ROBERT D. BRADLEY, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT The biodiversity of pocket gophers has increased dramatically over the last few decades. Of the 12 North American gopher species, 9 are distributed in Texas. Pocket gophers, like other fossorial rodents, have a profound impact on ecosystems, from consuming vegetation to altering the soil physically. Gopher excavations generate a dynamic mosaic of nutrients and soil conditions that promote diversity in both plants and animals, and maintain disturbance-dependent components of communities. Despite their ecological importance, phylogenetic relationships among members of this genus, *Geomys*, have been difficult to discern due to a lack of diagnostic morphological characters. Early studies of chromosomes and allozymes generated a few phylogenetic hypotheses, but most were hindered by taxonomic sampling and low resolving power of characters due to homoplastic events. In recent years, DNA sequence data were obtained from 2 mitochondrial genes: 12S ribosomal RNA and cytochrome-b, and one nuclear gene: retinoid-binding protein 3, and used to construct a *Geomys* phylogeny. Herein, for a more resolved phylogeny of *Geomys*, our dataset includes a second nuclear marker, the coding region of the alcohol dehydrogenase gene. All 4 genetic markers from 11 currently recognized species of *Geomys* and one species of *Cratogeomys* as the outgroup taxon were used for this study and although preliminary, the data appear to strengthen previous molecular findings and produce a robust and well-supported phylogeny. Investigating phylogenetic relationships and biodiversity of fossorial mammals leads to a greater understanding of ecosystem biodiversity, conservation, and management of these species.

Summer Roosting Ecology of Evening Bats on the Gulf Coast of Texas

JACOB A. ROGERS, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

MATTHEW C. PARKER, Department of Biology, Texas State University, San Marcos, TX, 78666, USA

SARAH R. FRITTS, Department of Biology, Texas State University, San Marcos, TX, 78666, USA

ABSTRACT Bats spend more time roosting than any other activity and do so in various natural and anthropogenic structures. Few studies have examined bats of the Gulf Coast of Texas and none have analyzed roost selection of evening bats (*Nycticeius humeralis*), a widely distributed species on the southern edge of its range. Evening bats occupy roosts in cavities of live and dead trees, behind exfoliating bark, in tree foliage, buildings, and other locations. Our objective was to determine roost selection of evening bats on the Gulf Coast of Texas. From May to August 2018 we mist-netted in bottomland hardwood tracts on San Bernard National Wildlife Refuge and radiotracked 6 evening bats to 5 different roosts: 2 buildings and 3 tall, large-

diameter live oaks (*Quercus virginiana*) (height: 27–31 m; dbh: 107–200 cm) located in urban areas. Bats were utilizing the protected areas for foraging yet roosting in urban neighborhoods. Colony size ranged from approximately 48 to >500 bats. One building roost was shared with Brazilian free-tailed bats (*Tadarida brasiliensis*). All bats stayed in roosts for the full life of the transmitter (5–21 days) and no roost switching occurred. Understanding the complex roosting strategies of evening bats could aid in the conservation of this species, in what is possibly an area of low bat diversity (3 captured species). We plan to radiotrack more evening bats during summer 2019 to further examine roost selection and make comparisons with evening bats from more northern populations.

Influences of Changing Rainfall Patterns on the Endangered Attwater's Prairie-Chicken

JENNIFER M. ROMERO, *U.S. Fish and Wildlife Service, Eagle Lake, TX, 77434, USA*

MICHAEL L. MORRISON, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*

MICHAEL E. MORROW, *U.S. Fish and Wildlife Service, Eagle Lake, TX, 77434, USA*

ABSTRACT The Attwater's prairie-chicken (*Tympanuchus cupido attwateri*), which once inhabited prairies along the Gulf Coast of Texas and Louisiana, was listed as endangered by the U.S. Fish and Wildlife Service in 1967. The decline of the species is largely attributed to habitat loss, and a majority of the 2.4 million ha of habitat have been converted to urban and agricultural uses. Today, approximately 80,000 ha of fragmented coastal prairie remains, and an estimated 26 Attwater's prairie-chickens exist in 2 wild populations. Heavy rainfall events have resulted in flooded nests during the past 5 breeding seasons, and Hurricane Harvey resulted in a high mortality of adult prairie-chickens during 2017. We analyzed National Weather Service data from weather stations around Houston from 1976 to 2018 to determine if various measures of rainfall have changed over time in the area. Population estimates for the Attwater's prairie-chicken were collected from historical survey data, and the number of individuals have ranged from as high as 422 to as low as 8 during the 43-year period. The population data and the weather data were then correlated to determine if the effect of rainfall had varying levels of significance on the population during different periods of time. Species with very small populations like the Attwater's prairie-chicken are highly susceptible to becoming extinct due to a catastrophic event, and understanding how the prairie-chicken population responds to fluctuations in rainfall over time will help managers recover a species that likely faces a future with a changing climate and more large storm events.

Diet Comparisons Between Nilgai, White-Tailed Deer, and Cattle on the East Foundation Ranches

DAVID ROSALES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DILLAN J. DRABEK, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S., *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TIMOTHY E. FULBRIGHT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID B. WESTER, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT South Texas has been home to Nilgai (*Boselaphus tragocamelus*) since the King Ranch released them in the 1930s. Since then, nilgai, white-tailed deer (*Odocoileus virginianus*), and cattle (*Bos* spp.) have coexisted in the same habitat. All 3 species can compete for forbs, grasses, and woody species at different times of the year. Visual observations limit the authentication of what exactly these species are consuming and the percentage break down of the species' diet. Our objective is to conduct a study by using fecal samples to determine the diet comparisons of nilgai, white-tailed deer, and cattle. Our 2,500 hectare study sites are on 2 different East Foundation ranches and located in the Willacy and Kenedy counties of south Texas. The method for this project was to collect fresh fecal samples (3–7 days old) of all 3 species throughout different areas of the ranch sites. The fecal samples were dried at 45^{o} Celsius and homogenized into a powder using an oscillating mill for further analyses. A database was used to match plant species that were found within each fecal sample and all matches of those plant species were accumulated and proportioned based upon individual plants. The data will show what each species was consuming and what percentages of the plants in the area consisted in their diet. This study will demonstrate the interaction between each herbivore species and will assist managers to facilitate in any management decisions that deal with habitat and any of these 3 herbivores.

Development and Application of an Environmental DNA Assay for Detection of the Rio Grande Siren

KRISTA M. RUPPERT, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

DREW R. DAVIS, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

RICHARD J. KLINE, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

MD. S. RAHMAN, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

ABSTRACT Environmental DNA (eDNA) assays have become a major aspect of amphibian surveys in the past decade. These methods are highly sensitive, making them well-suited for monitoring rare and cryptic species. Current efforts to study the Rio Grande Siren in the Lower Rio Grande Valley (LRGV) have been hampered due to the cryptic nature of these aquatic salamanders. Arid conditions in the LRGV further add to the difficulty in studying this species, as many water bodies they inhabit are ephemeral, constraining sampling efforts to a short window after heavy rain. Additionally, sirens are known to cease activity and reside underground when breeding ponds are dry. Conventional sampling efforts require extensive man-hours to be effective, which is not always possible within the required sampling window. Here, we discuss the development of a novel eDNA assay technique for this elusive species using qPCR. Simultaneous trapping efforts were compared to eDNA results at multiple sites to assess the relative effectiveness of the procedure. Additionally, we discuss potential citizen science applications, as well as applications in the determination of siren habitat preferences. This methodology gives great promise for the assessment of Rio Grande Sirens in the LRGV and has potential for use on other south Texas amphibians resident to these unique water bodies.

Effects of Source Population and Release Strategy on Reintroduced Scaled Quail Mortality and Dispersal

REBEKAH E. RUZICKA, *Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO, 80523, USA*

PAUL F. DOHERTY, JR., *Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO, 80523, USA*

DALE ROLLINS, *Rolling Plains Quail Research Foundation, Roby, TX, 79543, USA*

ABSTRACT Declines of scaled quail (*Callipepla squamata*) as a result of habitat fragmentation have been well documented in the last 25 years and translocation has been increasingly implemented as a means to reestablish populations. Yet translocation success remains variable and factors contributing to success are often poorly understood. We sought to test hypotheses concerning the influence of source population and variation in delayed release strategy (1–9 weeks) on mortality and dispersal of wild-caught, translocated scaled quail. We trapped and translocated scaled quail over 2 years (2016–2017) from source populations in the Edwards Plateau and Rolling Plains ecoregions to a large contiguous (>40,000 ha) release site in Knox County, Texas. We evaluated hen survival and dispersal as a function of release treatment, source population, age, release location, and year using a multi-state model that incorporated state uncertainty. We found no effect of source population on mortality and dispersal. Quail with longer release treatments had higher mortality, but lower dispersal rates. Future reintroduction efforts should be cognizant of source population and the effect of release strategy on the balance between mortality and dispersal.

The Massasauga Saga: Habitat Conservation Forecasting for the Western Massasauga

WADE A. RYBERG, *Texas A&M University Natural Resources Institute, College Station, TX, 77845, USA*

MICHELLE LAWING, *Texas A&M University Natural Resources Institute, College Station, TX, 77845, USA*

DANIELLE K. WALKUP, *Texas A&M University Natural Resources Institute, College Station, TX, 77845, USA*

TOBY J. HIBBITTS, *Texas A&M University Natural Resources Institute, College Station, TX, 77845, USA*

ABSTRACT An understanding of past climate-driven changes in western massasauga (*Sistrurus tergeminus*) distribution can offer a perspective on how resources might best be allocated to achieve the greatest future conservation benefits for the lowest cost and therefore maximize return-on-investments. Past projections or hindcasting of species distribution models (SDMs) across the range of *S. tergeminus* through the Last Glacial Maximum more than 20,000 years ago when ice sheets were at their maximum extent showed dramatically decreased areas of suitable habitat in most of the US, but increased areas of suitable habitat in Mexico. As climate changed through the mid-Holocene 7,000 to 5,000 years ago to present day conditions, the distribution of *S. tergeminus* suitable habitat and populations expanded. Future projections or forecasts of SDMs across the range of *S. tergeminus* show a continued expansion and northward shift of suitable habitat by 2050 and 2070. These model results suggest that *S. tergeminus* was fully capable of tracking changes in the distribution of their habitat in response to past climate change. By extension, these results also suggest that *S. tergeminus* should be able to track changes in the distribution of their habitat in response to future climate change, if anthropogenic barriers to dispersal do not dominate future landscapes. As such, investing resources in landscape conservation

strategies that focus on corridors and habitat linkages, rather than fixed boundary-protected areas, should help preserve the connectivity of *S. tergeminus* populations under future climate change and therefore provide a better return-on-investment.

Habitat Characteristics of Henslow's and Leconte's Sparrow Flush Points in a Small Blackland Prairie in Southeastern Texas

RICHARD R. SCHAEFER, *USDA Forest Service, Southern Research Station, Nacogdoches, TX, 75965, USA*

CRAIG RUDOLPH, *USDA Forest Service, Southern Research Station, Nacogdoches, TX, 75965, USA*

HOWARD WILLIAMSON, *USDA Forest Service, Southern Research Station, Nacogdoches, TX, 75965, USA*

JOSH B. PIERCE, *USDA Forest Service, Southern Research Station, Nacogdoches, TX, 75965, USA*

CLIFFORD E. SHACKELFORD, *Texas Parks and Wildlife Department, Nacogdoches, TX, 75965, USA*

ABSTRACT Many small and isolated blackland prairies occur on the Sam Houston National Forest (SHNF) in southeastern Texas. Much of the prairie vegetation has either disappeared or been heavily altered by fire suppression, grazing, development, and agriculture. A more recent threat comes from the establishment of the invasive King Ranch (KR) bluestem (*Bothriochloa ischaemum*), a native grass of Europe and North Africa. Prairie restoration efforts initiated on the SHNF in 2004 have reestablished prairie plant communities at many sites. Several species of grassland-dependent sparrows overwinter on these prairies. Notable among them are LeConte's sparrow (*Ammospiza leconteii*) and Henslow's sparrow (*Centronyx henslowii*), both formerly in the genus *Ammodramus*. During the winters of 2012, 2013, 2014, and 2017, we measured several habitat variables at each point where individual sparrows were initially flushed at 9 prairies on the SHNF, ranging in size from 0.8 ha to 6.4 ha. We measured the same variables at random points in each prairie. Using multinomial logistic regression, we attempted to distinguish among LeConte's and Henslow's sparrow flush points, and random points, based on habitat variables. Only one prairie (4.5 ha) produced sufficient numbers of both species during all years for analyses. Points with greater litter depth, greater herbaceous (combined grasses and forbs) height, and a lower percentage of KR bluestem within the grasses were more likely to have been Henslow's sparrow points than random points. Points with greater herbaceous height, less canopy height, and reduced canopy closure were more likely to have been LeConte's sparrow points than random points. Points with greater canopy height, greater vertical vegetative cover between ground level and 0.5 m, less litter depth, and reduced canopy closure were more likely to have been LeConte's sparrow points than Henslow's sparrow points. The mean distance between Henslow's Sparrow points (28.9 m) and the nearest prairie edge was significantly less than that for LeConte's Sparrow points (40 m, $P = 0.001$).

Species Co-Occurrence Patterns Along Environmental Gradients in Pond Microhabitats

CHRISTOPHER M. SCHALK, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

CLAY P. LAUGHREY, *Department of Biological Sciences, Sam Houston State University, Huntsville, TX, 77341, USA*

LUKE M. BOWER, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*

CARMEN G. MONTANA, *Department of Biological Sciences, Sam Houston State University, Huntsville, TX, 77341, USA*

ABSTRACT Microhabitat use reflects a tradeoff between maximizing access to resources while minimizing exposure to antagonistic interactions. Understanding the microhabitats utilized by various organisms is essential in determining how interactions between coexisting species scale up to affect organization of ecological communities. Herein we present results from microhabitat surveys in 2 east Texas fishless ponds, which vary in their habitat heterogeneity. From January 2017 to December 2017, we used a pipe sampler to survey larval amphibians and macroinvertebrates along gradients of water depth and substrate diversity. We measured 10 abiotic factors and quantified species richness and abundance at each microhabitat sample. Species richness and abundance were higher in Pond 1, which had greater microhabitat heterogeneity and less canopy cover. In both ponds, tadpole abundance and biomass increased with increasing water depth. We found that large-bodied predators (Order Odonata) occurred in microhabitats with deeper water, dense aquatic vegetation, and flat/sandy substrates. Shallow microhabitats typically contained small-bodied tadpoles. The large-bodied predator species may be displacing the smaller-bodied and more vulnerable organisms to shallower microhabitats. Our findings suggest that water depth, substrate type, and indirect effects by predators may influence distributions of co-existing species in lentic environments. Diversity is likely maintained via the diversity of microhabitats these species are able to utilize, facilitating their coexistence.

Landscape Connectivity for Lesser Prairie Chickens on the Southern High Plains of Texas and New Mexico

LUCAS J. SCHILDER, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

LUCAS J. HEINTZMAN, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

NANCY E. MCINTYRE, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

SAMUEL HARRYMAN, *Texas Parks and Wildlife Department, Lubbock, TX, 79415, USA*

CHRISTIAN A. HAGEN, *Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR, 97331, USA*

RUSSELL MARTIN, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

BLAKE A. GRISHAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

CLINT W. BOAL, *Texas Cooperative Fish and Wildlife Research Unit, US Geological Survey, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT The lesser prairie chicken (*Tympanuchus pallidicinctus*) is a species of conservation concern on the Southern High Plains, where its habitat is currently a juxtaposition of grassland patches interspersed within large sections of agriculture and energy development. Fragmentation has isolated formerly contiguous habitat, suggesting that dispersal through a heterogeneous landscape may be constrained within a patch network. The objective of this study was to understand how connectivity for lesser prairie chicken on the Southern High

Plains was potentially altered by landscape conversion that created a patch network. We used graph theory (network modeling) to quantify structural landscape connectivity for lesser prairie chicken on the Southern High Plains. Our results suggest that there was a 34.6 km coalescence distance of the network (farthest nearest-neighbor distance), as well as a suite of other connectivity metrics that indicated a high degree of clustering among leks (n = 1,087 leks). Six leks were identified as cutpoints within the network, meaning if these leks and associated habitat were fragmented or abandoned, birds and associated habitat near the remaining leks may become isolated. Other results identified several leks that were also important for maintaining overall population connectivity for lesser prairie chicken on the Southern High Plains. We used circuit theory to quantify functional landscape connectivity and model potential movement through the landscape. Our results suggest that connectivity was reduced by agriculture and energy development and facilitated by the Conservation Reserve Program within the region. Future plans include incorporating genetic data from the ecoregion to improve our modeling and assess genetic isolation.

Activity Level and Predation Risk in a Tadpole Guild: Implications for Species' Distributions Along the Hydroperiod Gradient

NICHOLAS C. SCHIWITZ, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

CHRISTOPHER M. SCHALK, *Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, Nacogdoches, TX, 75962, USA*

DANIEL SAENZ, *Southern Research Station, U.S. Forest Service, Nacogdoches, TX, 75965, USA*

ABSTRACT The activity rate-predation risk tradeoff is pervasive amongst all animals. Increasing activity levels permits greater food intake for use towards growth and reproduction, consequently increasing predation risk. Larval anurans are model organisms to examine this tradeoff as they occupy a variety of lentic habitats. Ephemeral ponds have a low abundance and diversity of predators, allowing tadpole species to have high foraging rates for rapid development. Stable, permanent ponds possess a greater diversity and abundance of predators, with those tadpoles having a low activity rate or chemical defenses to minimize predation risk. The objective of this research is to examine how interspecific variation in activity rate corresponds to distributions of tadpole species along the hydroperiod gradient, and the influence of predation risk on the activity rate. We conducted a series of laboratory experiments where we quantified activity of 12 species of larval anurans native to east Texas. We further quantified how activity level changed through the addition of predator chemical cues, followed by alarm cues produced from a consumed conspecific. We found not all species altered their activity in the presence of predator cues or conspecific alarm cues. Species that maintained a high activity level, despite the threat of predation, utilize ephemeral ponds, where species that maintained low activity levels utilize permanent ponds. These results highlight that this tradeoff can have consequences on the life histories of these, and other, species, providing insight to how it affects the organization of ecological communities.

Evaluation of a Technique to Eliminate Excessive Data in Camera Trap Surveys for Mesocarnivores in the Marfa Grasslands of Texas

JULIE R. SCHMIDT, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

MATTHEW O. HEWITT, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

THOMAS S. JANKE, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

PATRICIA MOODY HARVESON, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT Camera trapping has grown in popularity as a non-invasive method used by researchers and managers to monitor and study wildlife. Though there are many benefits to camera trapping, the collection of excessive and irrelevant photos can add up quickly. When conducting studies on mesocarnivores (species that are typically most active during crepuscular and nighttime hours), daytime captures are typically going to consist of non-target species. In grassland ecosystems, the movement of grass by wind and changes in ambient temperature easily trigger cameras to take photographs, resulting in large numbers of empty photos captured during daytime hours. Elimination of excessive daytime photos could prove beneficial in cutting down effort needed to analyze camera photo data. When eliminating photos, a concern is raised about data that could be lost, and which species could go undetected. To evaluate our technique, 20 cameras were placed throughout Presidio County during March 2018. All sites were baited with canned cat food, and cameras were set to capture a photo every 3 seconds if movement was detected. Photos were labeled and sorted using Adobe Bridge. We categorized nighttime survey photos as those taken after 1600 and before 1000 Central Standard Time. This nighttime window included a minimum of 2 hours before sunset and 2 hours after sunrise to ensure all nocturnal and crepuscular activity were captured. For analyses, we compared species detected during daytime and nighttime hours to determine which species may have been missed using this dataset reduction technique.

Distribution and Comparative Nesting Habitat of Riparian Raptors in the Trans Pecos Region of Texas

CAROLINE K. SKIDMORE, *Texas Cooperative Fish and Wildlife Research Unit, US Geological Survey, Texas Tech University, Lubbock, TX, 79409, USA*

CLINT BOAL, *Texas Cooperative Fish and Wildlife Research Unit, US Geological Survey, Texas Tech University, Lubbock, TX, 79409, USA*

BEN SKIPPER, *Angelo State University, San Angelo, TX, 76906, USA*

RUSSELL MARTIN, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

ABSTRACT Riparian woodlands in desert landscapes are important areas for wildlife conservation. Three raptors, the common black hawk (*Buteogallus anthracinus*), gray hawk (*Buteo plagiatus*), and zone-tailed hawk (*Buteo albonotatus*) are state listed as threatened in Texas and are riparian zone obligate or semi-obligate species. Other raptor species, such as the Cooper's hawk (*Accipiter cooperii*) and Swainson's hawk (*Buteo swainsoni*) may also occupy riparian zones during the breeding season. As top trophic level predators with different food habits, this group of species may serve as indicators of biological community health of riparian zones. However, little information is available as to 1) their presence and distribution in the Trans Pecos region of Texas, 2) nearest neighbor distances, and 3) comparative nesting habitat selection in riparian systems. We surveyed for nesting raptors in accessible riparian systems across Jeff Davis, Brewster, and Presidio Counties, Texas in 2018. This included a total of 28.28 linear kilometers of riparian zones searched with 12 sampling areas. We determined nesting attempts by 5 common black hawk pairs, 5 Cooper's hawk pairs, 8 gray hawk pairs, and 12 zone-tailed hawk pairs. At each nest located, we conducted vegetation surveys to quantify nest tree and riparian site characteristics. We found there was not a statistical difference between species in nest tree heights, however zone-tailed hawks placed nests significantly higher in trees; additionally, zone-tailed hawks appear to select for older, larger diameter trees within riparian groves compared to the other raptor species.

Trends in Bird-Window Collisions on a Local Scale

DELANIE E. SLIFKA, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

APRIL A. T. CONKEY, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Bird carcasses were recorded at several buildings on the Texas A&M University-Kingsville (TAMUK) campus to document mortality of birds due to window-strikes in a rural environment. Five buildings were monitored from 2013–2017. These buildings were classified based on window area, number of stories, and overall building area. Surveys were carried out by Dr. April Conkey and undergraduate students in the RWSC 4385 Human-Wildlife Conflict Resolution course at TAMUK for at least 21 days during each fall semester. Each building averaged one kill per fall survey period. In total, 37 mortalities were recorded throughout the study. Of the bird mortalities, 58% of the species were residents, which include birds like the great-tailed grackle and the house sparrow; the remaining 42% were migratory species, such as the yellow-billed cuckoo and the tropical kingbird. Out of the 5 buildings surveyed, the Student Recreation Center had the highest occurrence of mortalities (62% of total mortalities); this was attributed to bright interior floodlights kept on at night, large windows, and nearby lawn area. U.S. Fish and Wildlife estimates that approximately 6 million birds are killed annually due to collision with building glass alone. Popular mitigation techniques include stickers and turning off both interior and exterior lights at night. Stickers can be placed on windows to break up the reflection. This can help the birds differentiate the natural landscape from window reflections, therefore reducing the number of bird-window collisions.

Evaluation of Cover Type Use by Nilgai Antelope in Rangelands to Assess Cattle Fever Tick Dispersal

KATHRYN M. SLIWA, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

AARON M. FOLEY, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JEREMY A. BAUMGARDT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S., *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOHN A. GOOLSBY, *USDA Agricultural Research Service, Cattle Fever Tick Research Laboratory, Edinburg, Edinburg, TX, 78541, USA*

ADALBERTO PEREZ DE LEON, *USDA Agricultural Research Service, Knipling-Bushland U.S. Livestock Insects Research Laboratory, Kerrville, TX, 78028, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Cattle-fever ticks (CFT; *Rhipicephalus microplus* and *R. annulatus*) are vectors of the protozoan parasites responsible for bovine babesiosis, an economically important disease in the livestock industry. Cattle are the preferred host for these ticks. However, wild ungulates, including nilgai antelope (*Boselaphus tragocamelus*), can carry CFT, potentially contributing to the spread of disease. Nilgai, an exotic species native to India, Pakistan, and Nepal, were first introduced to south Texas in 1924. Populations since have increased and are presently widespread throughout south Texas. In the borderlands of south Texas, wildlife have free access to Mexico, where bovine babesiosis is endemic, increasing the risk for disease transmission. Nilgai are a major concern as a host species due to their large home range sizes and ability to make long-distance movements. With the frequent invasion of CFT, understanding nilgai movement and habitat selection will provide key information needed to eradicate this vector and prevent introduction of this serious livestock disease. In this study, we will assess the impact of land cover type on the movement and distribution of nilgai on coastal rangelands. Using GPS locations from 16 collared nilgai combined with remotely sensed imagery, we will classify land cover and identify areas used by nilgai over the course of a year. The objectives of this research are to 1) quantify land cover within nilgai home ranges, and 2) assess the spatial and temporal distribution of nilgai in relation to vegetation type cover. These data will help identify focal areas for targeted nilgai-CFT treatment programs.

Changes in Forage Biomass for Elk and Mule Deer Following 6 Years of Landscape Scale Forest Restoration and Monitoring in the Jemez Mountains, NM

SHARON E. SMYTHE, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

JAMES W. CAIN III, *New Mexico Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Department of Fish, Wildlife, and Conservation Ecology, New Mexico State University, Las Cruces, NM, 88003, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79416, USA*

MARK A. PEYTON, *Valles Caldera National Preserve, National Park Service, Jemez Springs, NM, 87025, USA*

ABSTRACT Due to historical land use and fire suppression, forests in northern New Mexico are at abnormally high risk for catastrophic wildfires. In response, a coalition of agencies under a USDA Collaborative Forest Landscape Restoration Project began restoring 210,000 ha in the Jemez Mountains via forest thinning and prescribed fire. As part of these restoration efforts, we are monitoring responses of radio-collared Rocky Mountain elk (*Cervus canadensis*) and mule deer (*Odocolius hemionus*) relative to changes in their forage biomass following restoration or wildfire. Since 2013, we have collected data from 200 vegetation plots (60–70 monthly in summer and seasonally; 130–140 annually in summer) randomly stratified within 6 dominant stand types (aspen, grassland, oak, pinyon-juniper, ponderosa, mixed conifer). Within each plot, we established a 200-m transect and measured herbaceous biomass, shrub biomass, shrub height, tree density, ungulate herbivory, and collected samples for nutritional content analyses. We developed regression models for estimating herbaceous biomass using disc meters as well >40 species-specific basal diameter regressions for shrubs. Our preliminary

results suggest that herbaceous biomass increases initially for 1–4 years following treatment or wildfire before subsiding, but there is substantial variability among stand and treatment type. Similarly, changes in shrubs biomass vary across stand and treatment types, but biomass within shrub-heavy stands increased over time. These results are crucial to evaluating the success of the larger restoration project while providing local and state managers with a rare long-term monitoring dataset to aid their management of ecologically and economically valuable species.

Aspergillus flavus Control: The Need to Consider Spores

JACOBO SOLIZ, *Department of Agriculture, Agribusiness, and Environmental Sciences, Texas A&M University-Kingsville, Kingsville, Texas 78363, USA, Kingsville, TX, 78363, USA*

GRETA L. SCHUSTER, *Department of Agriculture, Agribusiness, and Environmental Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

SCOTT E. HENKE, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ALAN M. FEDYNICH, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT A 10% bleach solution often has been recommended for controlling pathogens at bird feeders. Although this treatment may kill fungal colonies of *Aspergillus flavus*, it is unclear whether spores remain viable after treatment, thereby allowing repopulation. We tested 10%, 12%, and 14% Clorox® bleach solutions (from bottle containing 8.25% active ingredient of sodium hypochlorite) and a water control to determine if spores were killed. All fungal colonies of *A. flavus* were killed (100%) at each bleach treatment level. None of the spores from the control group were killed, while 10%, 12%, and 14% bleach solutions killed 89%, 96%, and 100% of the spores, respectively. Viable spores in the 10 and 12% treatments re-established a fungal colony within 5 d. Although *A. flavus* colonies may be killed by a 10% bleach solution, it is not sufficient to reliably kill spores, which can lead to rapid repopulation.

Rumen-Reticulum Organ Mass and Rumen Mucosa Surface Area of White-Tailed Deer Consuming Two Energy Diets

STERLING G. SPILINEK, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

FLOYD W. WECKERLY, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

RYAN REITZ, *Texas Parks and Wildlife Department, Hunt, TX, 78024, USA*

ABSTRACT The rumen-reticulum can adjust to dietary changes in at least 3 ways; elasticity, organ mass, and absorptive capacity. The organ mass must be enough to generate the force needed for rumen motility. We measured organ mass and absorptive capacity. White-tailed deer (*Odocoileus virginianus*) at the Kerr Wildlife Management Area, Texas, were fed an *ad libitum* pelleted diet of 1.77 or 2.67 kcal/gm digestible energy from the time deer were weaned. In December, 2017, 4.5 and 5.5 year-old deer were euthanized, the rumen-reticulum extracted, thoroughly rinsed, then rung out and weighted. Four, 1 × 3 cm samples were cut from the atrium ruminis, dorsal and ventral sacs, and caudal-dorsal blind sac regions of the rumen. The samples were fixed in ExCell plusTM for 24 hours, then preserved in 70% ethanol until measured. For each sample, we measured

papillae density and length and width of 10 randomly selected papillae. For each sample a surface enlargement factor (SEF) was calculated and averaged across the 4 samples for each animal. For an indicator of tooth wear and food intake, we also measured first molar height on the right side of the jaw. Diet consumed by deer was unbeknownst to the measurer until after all measurements were taken. Analyses of general linear models indicated that deer consuming the low energy diet had higher food intake, heavier rumen-reticulum organs, and lower rumen SEF than deer consuming the high energy diet. White-tailed deer adjust rumen-reticulum morphology to maintain digestive functions when diets vary in energy content.

Influence of Ashe Juniper on Montezuma Quail in the Edwards Plateau of Texas

KRISTYN G. STEWART, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

FIDEL HERNÁNDEZ, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ERIC D. GRAHMANN, *Bass Ranches, Encino , TX, 78353, USA*

LEONARD A. BRENNAN, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Montezuma quail (*Cyrtonyx montezumae*) are a secretive and understudied bird inhabiting the southwestern United States (Texas, Arizona, and New Mexico) that inhabit pine (*Pinus*)-oak (*Quercus*) savannahs at high elevations (~1,000–2,000 m). Montezuma quail populations have been declining for the past century throughout their geographic range. In the Edwards Plateau ecoregion of Texas, overgrazing and fire suppression have resulted in the dramatic increase of Ashe juniper (*Juniperus ashei*) and concomitant decrease in Montezuma-quail habitat. However, recent changes in land-management practices (i.e., clearing of Ashe juniper), resulting from changes in land ownership, have led to an in increase in sightings of the species. The objectives of our research are to determine bounds of habitat suitability for Ashe juniper (density, percent cover, and height) and other vegetation characteristics at the micro- (16-m radius) and macro- (350-m radius) scale in the Edwards Plateau. Preliminary analysis at the micro-scale indicates that Montezuma quail occupy areas possessing considerably less juniper cover (10%) and lower juniper density (377.5 plants/ha) than available on the landscape (33% and 1,406.3 plants/ha, respectively). This study will provide land managers/owners and biologists with important information that will aid habitat management for the species.

Herpetofaunal Responses to Time Since Burning in an Eastern Texas Woodland

ERIN E. STIEDE, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

RICHARD T. KAZMAIER, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

MICHELLE L. CARUANA, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

ASHLEY TUBBS, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

ABSTRACT Fire is a habitat driver and can impact species in both positive and negative ways. Although fire ecology research is widespread, relatively few studies have addressed the impacts of certain aspects of fire on herpetofaunal communities. Literature on the relative influence of time since burn on herpetofauna is particularly scant. We used drift fence arrays with pitfall and funnel traps to assess herpetofauna on 27 different sites with various days since burn on Gus Engeling Wildlife Management Area in Anderson County, Texas, in 2013–2014 and 2016–2017. Sampling was conducted between 10 and 6,388 days post burn. We then regressed various community characteristics (abundance, species richness, species diversity, and species evenness) against days since burn. We detected 424 individuals of 21 taxa. When examining individual species or total reptiles as a separate group, we detected no significant response to time since burn ($P > 0.153$). However, abundance of amphibians approached having a slight positive response to increasing time since burn ($P = 0.130$). In contrast, the community variables of species diversity, species richness, and species evenness all had negative relationships with time since burn ($P < 0.037$). This suggests that a mosaic management strategy is warranted to accommodate the majority of species; leaving patches that go longer without burning but also selective burning to reduce overall habitat heterozygosity. However, our sampling made it apparent that continued data collection on the site is warranted to further explore these relationships.

Comparison of GPS and Iridium Collars on Ocelots and Bobcats in South Texas

SAMUEL H. STONE, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JASON V. LOMBARDI, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Global positioning system (GPS) telemetry is a widely used research technique to understand spatial, behavioral, and population ecology of carnivores across the world. Over the last few years, the introduction of GPS collars with iridium now allows for more accurate location data and ability to view locations in real time. Reliability of GPS collars in a variety of habitat types is important for conducting statistical analyses and making informed conclusions regarding an animal's behavior. The ocelot (*Leopardus pardalis*) is a habitat specialist which prefers dense thornscrub habitats in south Texas. Bobcats (*Lynx rufus*), are habitat generalists and co-occur with ocelots in thornscrub communities in south Texas. From 2005-2010, we collared 2 ocelots on the Frank D. Yturria Ranch and from 2011–2017 we collared 9 ocelots and 5 bobcats on the East Foundation's El Sauz Ranch in Willacy County, TX with Televilt POSREC-science GPS, Lotek Minitrack GPS, and Lotek Litetrack Iridium collars. The purpose of this study was to compare the fix transmission rate for satellite and GPS collars for ocelots, compare GPS fix transmission rate for each species and explore if extrinsic factors (e.g., vegetation, animal behavior, number of satellites) influence GPS collar performance. Preliminary data for ocelots ($n = 1$) and bobcat ($n = 1$) indicated ocelots had a 79.4% success

rate, whereas bobcats had a 94.6% success rate. Data from this research is essential for understanding ocelot and bobcat ecology and making informed decisions regarding ocelot recovery in south Texas.

Evaluation of a Black-Tailed Prairie Dog Restoration Via Translocation in the Trans-Pecos Ecoregion, Texas

BARBARA J. SUGARMAN, *Borderlands Research Institute, Department of Natural Resource Management, Sul Ross State University, Alpine, TX, 79830, USA*

BONNIE J. WARNOCK, *Department of Natural Resource Management, Sul Ross State University, Alpine, TX, 79830, USA*

PATRICIA M. HARVESON, *Borderlands Research Institute, Department of Natural Resource Management, Sul Ross State University, Alpine, TX, 79830, USA*

RUSSELL L. MARTIN, *Texas Parks and Wildlife, Midland, TX, 79703, USA*

ABSTRACT Prairie dog (*Cynomys* spp.) populations in North America have declined over the past few centuries due to a combination of sylvatic plague (*Yersinia pestis*), shooting, poisoning, and habitat conversion. To combat the decline of this keystone species, wildlife managers have used translocation to help restore prairie dogs to areas of extirpation. In this study, we translocated black-tailed prairie dogs (*C. ludovicianus*) to a site on private property 59 km south of Alpine, TX. Vegetation was measured pre-translocation and will be measured at the same time of the year post-translocation to assess the ecological impacts that prairie dog reintroduction has on the ecosystem. We installed nesting boxes, tubes, and retention baskets at the restoration site to prevent the immediate dispersal of translocated prairie dogs. Two-hundred and fifteen black-tailed prairie dogs were captured: 156 from Marathon, TX and 59 from Lubbock, TX. All 215 prairie dogs were translocated to the same site. Fecal samples from prairie dogs were taken to measure glucocorticoids during the capture of 153 prairie dogs from Marathon, TX and at various time periods post-translocation at the translocation site in order to observe the effects of translocation on the stress level of the prairie dogs. The prairie dog population at the translocation site was regularly monitored post-translocation and predators were removed from the site. This study will help wildlife managers with future translocations of prairie dogs and will aid in the restoration of black-tailed prairie dogs to their extirpated habitat in the Trans-Pecos ecoregion.

The Use of Prescribed Fire, Herbicide Application, and Native Plants to Restore Bottomland Blackland Prairie in Constructed Wetlands

CANAAN SUTTON, *Department of Biological and Environmental Sciences, Texas A&M University – Commerce, Commerce, TX, 75428, USA*

JOHANNA DELGADO-ACEVEDO, *Department of Biological and Environmental Sciences, Texas A&M University – Commerce, Commerce, TX, 75428, USA*

ABSTRACT The Blackland Prairie of Texas, once covering approximately 4.2 million ha, now exists mainly in fragments <10 ha encompassing less than 1% of its original total area. Increasing awareness of the importance of the Blackland Prairie region and the ecosystem services provided therein has promoted

restoration of prairie remnants and establishment of prairie plant assemblages in constructed systems. We use a randomized block design to measure levels of short-term phenological success and biomass gain of eastern gamagrass (*Tripsacum dactyloides*) and lowland switchgrass (*Panicum virgatum*) in constructed wetlands containing encroaching woody and invasive competitor species. We establish 3 treatments: herbicide, prescribed burn, and herbicide and prescribed burn. Each treatment will contain plots with species 1, plots with species 2, and plots with both species 1 and 2 to compare isolated and co-occurrence growth success. Here we compare the existing species composition, diversity, and abiotic factors at 2 constructed prairie wetlands with mixed land use and management histories. We hypothesize that a combination method of herbicide/prescribed burn will have the greatest negative effect on invasive re-emergence and the greatest positive effect on native plant growth. Results from this study will provide baseline data for native plant success and future management strategies in constructed prairie wetlands, and may be integrated into future bottomland prairie restoration designs.

Does Size Matter? – A Comparison of Herpetological Communities in Two Constructed Wetlands in Northeast Texas

CANAAN SUTTON, *Department of Biological and Environmental Sciences, Texas A&M University – Commerce, Commerce, TX, 75428, USA*

ZACHARY DELISLE, *School of Forestry and Natural Resources, College of Agriculture, Purdue University, West Lafayette, IN, 47907, USA*

JOHANNA DELGADO-ACEVEDO, *Department of Biological and Environmental Sciences, Texas A&M University – Commerce, Commerce, TX, 75428, USA*

ABSTRACT In response to widespread wetland degradation, conservation agencies have made efforts to create constructed wetlands. These types of wetlands, like their natural counterparts, are efficient sinks for biodiversity. We trapped and compared the herpetofaunal communities at 2 constructed wetlands (Cooper Lake Wildlife Management Area, Texas A&M University – Commerce Wetland) that differed in size, but shared similarities in vegetation, hydrology, and locality. We set drift fence and pitfall trap arrays at both sites every third week from April 2017 through September 2018 for a total of 3,236 trap nights. We captured a total of 1,445 individual herpetofauna (Cooper = 1017, TAMUC = 428) among 28 total species. We captured 1,176 anurans (Cooper = 940, TAMUC =236), 182 squamates (Cooper = 71, TAMUC = 111), and 82 testudines (Cooper = 6, TAMUC = 76). Our cumulative trap success was 0.45 captures/trap night. Preliminary results show higher capture abundance among the larger constructed wetland (Cooper), yet higher species diversity and equitability index values at the smaller constructed wetland (TAMUC). Though more trapping is planned for Spring 2019, these results indicate that small and fragmented constructed wetlands could support diverse herpetofaunal communities comparable to those within larger constructed wetlands.

Breeding Season Food Habits of American Kestrels in the Southern Great Plains

MADELEINE A. THORNLEY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

SHEA D. MULLICAN, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

CLINT W. BOAL, *Texas Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT American kestrel (*Falco sparverius*) populations are generally declining across their North American distribution. However, the species appears to be stable or increasing in the southern Great Plains region, an area that likely had very low natural presence of the species pre-European settlement. In 2011 we initiated a nest box program to study kestrel ecology in short/mixed grass prairies of Texas. One line of inquiry was assessing how population dynamics may be influenced by regional dietary habits. We recorded over 3,100 prey deliveries during 4-week brood-rearing periods at nest boxes in 2017. Average prey delivery rates/hour increased from 0.84/hr and 0.96/nestling/hr during the first week to 2.65/hr and 0.57/nestlings/hr during the fourth week of brood rearing. The breeding season diet was dominated by reptiles (71.3%). Prairie racerunners and common spotted whiptails (*Aspidoscelis sexlineata viridis* and *A. gularis*) accounted for 38.3% and Texas horned lizards (*Phrynosoma cornutum*) accounted for 13.0% of prey deliveries. Mammalian (5.4%), avian (2.3%), and invertebrate (21.0%) prey were difficult to identify beyond genus, family, and order, respectively, but a minimum of 30 different prey species were identified. Prey as large as juvenile cottontails (*Sylvilagus floridanus*) and cotton rats (*Sigmodon hispidus*) were delivered to nest boxes. Biomass assessments are underway for complete presentation of breeding season prey use of kestrels in our study, with comparison to data from other regions.

Winners and Losers: Small Mammal Responses to Tropical Land Use Change

JACQUELYN M. TLEIMAT, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

SARAH R. FRITTS, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT Bornean forests are rich in biodiversity, yet they are subject to some of the highest deforestation rates in the world. As of 2010, 15% of Sabah, a Malaysian state within Borneo, has been converted to oil palm. Borneo is home 245 species of small mammals, 89 of which are non-volant. Due to small home-range size and increased susceptibility to predation under loss of vegetation cover, many species of small mammals are sensitive to land use change. As many small mammals are seed dispersers, insectivores, and prey for larger predators, it is necessary to understand how these species are responding to disturbance. Our objective was to compare small mammal species composition in agricultural and old-growth forest areas within the Crocker Range Biosphere of the Tambunan Valley in Sabah, Malaysia. We hypothesized that agricultural sites would yield fewer species, all being generalists whereas forested sites would yield a greater number of species, including specialists. To investigate small mammal composition, we sampled 3 agriculture sites and 3 old-growth sites near Tambunan, Sabah, Malaysia. The species evenness in agriculture and old-growth were the same (0.78), and Shannon-Wiener diversity was similar (1.4 in agriculture and 1.5 in old-growth). Our findings suggest that some species of small mammals may be expanding their ranges, as some species captured in agricultural plots were unexpected based on prior research. More research is needed to understand how land use change is impacting small mammals in Borneo, especially as large deforestation rates persist primarily for conversion to oil palm plantation.

A Survey of Northern Bobwhite Helminths in South Texas from 2016–2018

NICOLE J. TRAUB, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ALAN M. FEDYNICH, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT The northern bobwhite (*Colinus virginianus*) has been experiencing a long-term decline throughout Texas, and it is unclear what role parasitism plays, if any. To learn more about the bobwhite-parasite system in south Texas, we are conducting a multi-year (2012–2019) helminth survey using hunter donated bobwhites in conjunction with a systems-based holistic approach to determine if helminth community structure and patterns are affected by variables such as precipitation, insect abundance, quail age, and quail sex. We evaluated a 2-year period (hunting seasons of 2016–2017 and 2017–2018) to determine if helminth community structure and patterns changed between 2 years of similar rainfall conditions. We report our findings and discuss the potential impact parasites may have on bobwhites as well as indicate areas that need further study to fully understand the unique bobwhite-parasite system found in south Texas.

Proximity to Disturbance as a Function of African Rue Density

SARAH J. TURNER, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

BRIAN L. PIERCE, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

KRYSTA D. DEMERE, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

FRANK CARTAYA, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

CARLOS E. GONZALEZ, *Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA*

ABSTRACT Disturbance has been shown to promulgate invasion, and increased frequency and/or severity of disturbances can facilitate higher densities of invasive species with increasing proximity to the disturbance origin. African rue (*Peganum harmala* L.) is an extremely invasive, non-native perennial plant occurring in arid and semi-arid deserts of the United States that is highly toxic to humans and livestock. Our goal was to determine if the density of African rue stems decreased with increasing distance from the origin of disturbance on Holloman Air Force Base in the Chihuahuan Desert of New Mexico. We sampled the count of African rue stems in 29 belt transects (25 m × 6 m) located perpendicular to paved roadways in August 2017. Preliminary analysis of plots with positive rue detections showed a mean of 1.50 stems/m^2 between 0 and 5 meters from pavement's edge (n = 720), with mean density of stems per 5-meter increment (30 m^2 block) decreasing with increasing distance from pavement's edge. Over half of all stems were located within 10 meters of the roadway (53.62%, n = 1,333). The observed negative correlation of stem density to distance from disturbance indicates that the reduction of disturbance events could lessen the successful propagation of African rue, an important management strategy to consider in the quest to decrease the impact of this competitively superior and management-tolerant invasive species.

Habitat Associations and Population Estimates for the Texas Horned Lizard in the Southern High Plains of Texas

SARA A. VAN DER LEEK, *Wayland Baptist University, Plainview, TX, 79072, USA*

ANDREW C. KASNER, *Wayland Baptist University, Plainview, TX, 79072, USA*

ABSTRACT The Texas horned lizard (*Phrynosoma cornutum*) is a threatened species within Texas. Population abundances and habitat use analyses are vital to conservation efforts. This study was conducted from May–September 2016, July–October 2017, and April–September 2018 using transects and systematic searches to locate Texas horned lizards in Hale and Floyd counties, Texas. Lizards were captured, and morphological and habitat measurements were taken. In 2017 and 2018, PIT tags were inserted subcutaneously in lizards with SVL > 40mm. The Schnabel Index indicated that the population estimate for adult and juvenile lizards at the Hale County site in 2018 was 135 markable (SVL > 40mm) individuals. Including hatchlings (that could be identified as individuals), the population estimate is 178. Using the Schnabel Index result there is a density of 36 lizards per hectare at the Hale County site. Habitat at male and female lizard locations was not different. Habitat at hatchling, juvenile, and adult locations was not different. Lizard locations had a lower percent grass ($P = 0.0472$), lower percent forb ($P = 0.0004$), higher percent bare ground ($P < 0.0001$), and a lower vegetation height ($P < 0.0001$) than did transect sample points without lizards. At the Floyd County site, disturbance from heavy, short-term grazing had an impact on horned lizard numbers (2016, pre-grazing = 21; 2017, during grazing = 6; 2018 post-grazing = 5). However, there were no significant differences in horned lizard location habitat between years at this site. Horned lizards select for specific habitat in the Southern High Plains. Intense, short-term grazing has a negative impact on horned lizard abundance.

Ocelot Resource Selection in a Highly Fragmented Landscape

AMANDA M. VEALS, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ANNMARIE BLACKBURN, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JANE ANDERSON, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MICHAEL E. TEWES, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOSEPH D. HOLBROOK, *Haub School of Environment and Natural Resources, University of Wyoming, Laramie, WY, 82072, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOHN H. YOUNG, JR., *Environmental Affairs Division, Texas Department of Transportation, Austin, TX, 78701, USA*

ABSTRACT Wildlife species across the globe are faced with landscapes that are becoming increasingly impermeable to movement as the result of habitat loss and degradation. Road networks are widespread and influence wildlife populations in profound ways. The ocelot (*Leopardus pardalis*) is an endangered felid in the United States, with a remnant population of <80 individuals in the Lower Rio Grande Valley of Texas. This area is one of the fastest growing population centers in the United States, resulting in high amounts of vehicle collisions and fragmentation of available habitat for ocelots. Despite the increases in ocelot-vehicle collisions, it remains unclear 1) what environmental factors influence collisions and 2) how ocelots adjust their behavior relative to roads. To address these issues, we paired remotely sensed data with telemetry locations of ocelots and implemented resource selection functions. We examined a preliminary subset of data to determine resource selection by ocelots (n = 9; 4 males, 5 females; with ≥68 total locations) from 1982–-1988 at the home range scale. We tested a set of a priori models that included vegetation cover and road or traffic covariates for each individual. We found that ocelots selected woody vegetation cover more frequently than other land cover types (males = 56%, females = 67%). Our preliminary results support previous work on ocelot-habitat relationships, where individuals spent most of their time in thick woody cover. This project aims to inform the placement of future road crossing structures to decrease ocelot-vehicle collisions and increase landscape permeability for this endangered species.

Resource Selection and Energy Expenditure by Greater White-Fronted Geese During Winter

JAY A. VONBANK, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

BART M. BALLARD, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

KEVIN J. KRAAI, *Texas Parks and Wildlife Department, Canyon, TX, 79015, USA*

MITCH D. WEEGMAN, *University of Missouri, Columbia, MO, 65211, USA*

DANIEL P. COLLINS, *U.S. Fish and Wildlife Service, Albuquerque, NM, 87102, USA*

ABSTRACT Historically, the state of Texas wintered a large portion of the midcontinent population of greater white-fronted geese (*Anser albifrons frontalis*; white-fronts). Recently winter population surveys have shown changes in distribution and abundance of white-fronts in Texas and the overall winter distribution has shifted northeastward. Changes in land use, climate, and resource availability are likely drivers of the perceived distribution shift, yet the degree to which these drivers effect the change in distribution is unknown. We captured 63 adult white-fronts during winters 2015–2017 and attached GPS/ACC/GSM tracking devices. We used GPS information to determine specific habitat use and selection patterns made by white-fronts spatially and temporally, and used accelerometer-derived behaviors and energy expenditure metrics to further inform habitat selection throughout the wintering period. Tracking devices collected 100,112 GPS locations and >6 million ACC measurements on white-fronts wintering in Texas, Louisiana, Arkansas, Mississippi, Alabama, and Kansas. Habitat use of geese changed monthly and by ecoregions important to white-fronts, where differences in land use vary considerably. Agricultural crops including sorghum, rice, peanuts, and wetland types including freshwater unconsolidated shore/bottom and scrub-shrub were used most frequently, but habitat selection varied temporally with high-energy crops positively selected for early in winter, shifting to neutral selection probabilities as winter progressed and white-fronts utilized different habitat types. Behaviors and energy expenditure also varied spatially, temporally, and in relation to habitat types. Understanding the drivers of habitat selection and patterns of behavior and energy expenditure will aid in determining future management practices throughout the range of white-fronts.

Quail Habitat Restoration in Areas Dominated by Non-Native Grasses

ELLART J. VREUGDENHIL, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ABSTRACT Non-native grasses, particularly buffelgrass (*Pennisetum ciliare*) and Old-World bluestems (*Dichanthium* and *Bothriochloa* spp.), have been planted in Texas since the 1930s for cattle forage and erosion control. These grasses have invaded native rangeland in southern Texas and northern Mexico and are a leading cause of quail habitat loss and fragmentation. A pilot study showed that non-native grass stands could be reduced and diversified via repeated disking and/or glyphosate application (to remove non-native) and subsequent planting of ecotypic natives. In 2014, we began a study to replicate this treatment at a 121-ha scale. Our study is composed of 2 sites: a restoration (treatment area) and a control. The restoration site was repeatedly disked and sprayed during 2014–2016 to remove non-native grasses and to deplete the soil seed bank. A diverse assemblage of native plants was sown in October 2016. We sampled herbaceous and woody cover along 80 transects during March, June, and October 2013–2018 using Daubenmire frames and the line-intercept method. Both the control site and the restoration site initially had >75% non-native vegetation cover. Since 2014, non-native cover on the treatment site has been reduced to <5%, where it has remained over the last 4 years. Native cover and diversity have gradually increased since the restoration efforts began but have varied with soil series and precipitation. These methods can be used to successfully replace non-native grasses with native plants in the short term, creating bobwhite habitat which could potentially help reversing quail decline in south Texas.

Microhabitat Variables Drive Within Breeding Season Colonization/Extinction Dynamics in a Specialist Lizard

DANIELLE K. WALKUP, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

WADE A. RYBERG, *Natural Resources Institute, Texas A&M University, College Station, TX, 77843, USA*

LEE A. FITZGERALD, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77843, USA*

TOBY J. HIBBITTS, *Natural Resources Institute, Biodiversity Research and Teaching Collections, Texas A&M University, College Station, TX, 77843, USA*

ABSTRACT The persistence of habitat specialists at the landscape scale is strongly tied to the persistence, configuration, and quality of habitat. Dunes sagebrush lizard (*Sceloporus arenicolus*) is a habitat specialist endemic to the Mescalero-Monahans Sandhills ecosystem of West Texas and southeastern New Mexico. Interconnected subpopulations of *S. arenicolus* are made up of demographic "neighborhoods" that are influenced by the configuration of landscape features. Understanding the linkages between microhabitat used by the lizards and landscape scale features may help us to better understand what ultimately determines the distribution of *S. arenicolus* across broad landscapes, as well as dispersal and diffusion processes. We trapped lizards during 4 years (April–August 2012–2015) in 2 large "super-grids" consisting of 324 pitfalls arranged in a grid of 36 sub-grids that covered 13.69 ha. Microhabitat data collected at each trap included slope, substrate compaction, and percent cover for different substrates (i.e., sand, oak, yucca, forb, grass, caliche, shrub). Trapping data were aggregated for use in a multi-season occupancy model to examine microhabitat use in relation to colonization/extinction dynamics for *S. arenicolus*. Results indicate that extinction and colonization dynamics

across the landscape are linked to slope, substrate compaction, percent cover oak, and percent cover sand at the microhabitat scale.

Swainson's Hawks Select for Open Country While Migrating Through the Rainforests of Central and South America

KATHERYN A. WATSON, *Department of Natural Resource Management, Texas Tech University, Lubbock, TX, 79411, USA*

CLINT W. BOAL, *Texas Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Texas Tech University, Lubbock, TX, 79409, USA*

JAMES D. RAY, *Consolidated Nuclear Security, LLC, USDOE/NNSA Pantex Plant, Amarillo, TX, 79120, USA*

ABSTRACT Habitat selection may be an important driver of survival during migration. Swainson's hawks (*Buteo swainsoni*) travel over 10,000 km between their summer and winter ranges, stopping to rest at night and sometimes stopping for multiple days. On the summer and winter ranges, Swainson's hawks inhabit grasslands and croplands, but we do not know if they select for similar habitats while migrating. We examined habitat selection by fitting 24 Swainson's hawks with solar-powered GPS Platform Transmitter Terminals (PTT) on backpack-style harnesses. We selected locations with altitudes at or near the ground and performed 2nd and 3rd order compositional analyses using 95% dynamic Brownian bridge movement model contours as available area and the GlobCover V2.2 dataset for land cover classes. The landscape available to travelling birds was mostly rainforest, with a mix of grassland, crops, and forest, and smaller proportions of water, shrubland, and other land covers. Both analyses revealed selection for grassland and crops and selection against rainforest, water, and other, with forest and shrubland being selected against at the 2nd order and selected for at the 3rd order. In addition to grass and crops, moving birds selected for forest, while stopped birds selected for shrubland. Our results show that despite the range being 45% rainforest, this species selects for open spaces throughout migration, especially when stopped, which may facilitate resting and foraging to improve survivability during travel.

Ultrasonic Acoustic Deterrents Reduce Bat Fatalities at Wind Turbines in South Texas

SARA P. WEAVER, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

CRIS D. HEIN, *National Renewable Energy Laboratory, U.S. Department of Energy, Golden, CO 80401 USA*

IVAN CASTRO-ARELLANO, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

THOMAS R. SIMPSON, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

JONAH W. EVANS, *Texas Parks and Wildlife Department, Austin, TX 78744 USA*

ABSTRACT The need for renewable energy resources to reduce climate change impacts has never been more pronounced. Wind energy is a necessary component of the global renewable energy portfolio. However, wind energy facilities have long been known to cause bat fatalities at wind turbines worldwide, and, as a result, pose a risk for species extinction. Ultrasonic acoustic deterrents (hereafter, deterrents), as a bat impact reduction

strategy, are a promising solution, but little field testing exists. Our objective was to assess effectiveness of a newly developed deterrent for reducing bat fatalities at a wind energy facility in Starr County, Texas. We equipped 16 wind turbines with deterrents, and randomly assigned 8 turbines as controls and 8 as treatments on a nightly basis from 31 July through 30 October in 2017 and 2018. To quantify bat fatalities, we searched all turbines daily within established 100-m radius plots, and assessed effectiveness of deterrents with generalized linear mixed models (glmm) for all bats and by species. We completed 2,560 wind turbine searches for both seasons combined, and discovered 628 bat fatalities comprised of 7 species. Results of the glmm indicate deterrents significantly reduced overall bat fatality ($\beta = -0.6$, SE = 0.14, $z = -4.1$, $P < 0.001$) by 50% (95% CI: 38–61%). Reductions were most pronounced for hoary bats with an overall reduction of 78%, followed by Brazilian free-tailed bats at 54%. However, they did not reduce fatalities for northern yellow bats. Based on our results, deterrents are a promising tool for reducing bat fatalities at wind turbines.

Use of Moist-Soil Management Techniques for Wintering Waterfowl in Fallow Rice Fields on the Upper Texas Coast

MICHAEL D. WHITSON, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79404, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

DAVID A. HAUKOS, *Kansas Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Kansas State University, Manhattan, KS, 66506, USA*

DANIEL P. COLLINS, *U.S. Fish and Wildlife Service, Albuquerque, NM, 87103, USA*

JENA A. MOON, *U. S. Fish and Wildlife Service, Winnie, TX, 77655, USA*

PATRICK WALTHER, *Texas Chenier Plain National Wildlife Refuge Complex, U.S. Fish and Wildlife Service, Anahuac, TX, 77514, USA*

ABSTRACT Wetlands on the Texas coast are important winter habitat for millions of waterfowl, crucial stopover sites for migrating shorebirds, year-round habitats for mottled ducks (*Anas fulvigula*), and summer breeding habitats for a variety of other avifauna. Moist-soil management (MSM) is effectively used in other regions to improve wetland habitats and promote seed producing plants, by varying inundation seasonality, depth, duration, and drawdown lengths. The extended growing season on the upper Texas coast provides an opportunity to implement a variety of MSM strategies for waterfowl. We conducted a two-year research project in 21 fallow rice fields (~260 ha) on Anahuac National Wildlife Refuge in Jefferson County, Texas, that were subjected to variations in inundation seasonal timing, duration, depth, drawdown and pre-flooding soil preparation. We quantified plant community composition, seed production, and winter invertebrate biomass to measure responses to these MSM strategies to estimate waterfowl food production and duck use days (DUDs). Highly desirable plant species (65%) dominated early season inundated fields, and accounted for 50% of the cover in fields subjected to fast drawdown treatments, and greatest total plant biomass occurred in field that were not disked prior to flooding. Measured MSM plants produced enough seeds and subsequent energy for nearly 20,000 DUDs, where winter macroinvertebrate biomass could provide nearly 45,000 DUDs on our 21 MSM fields. Collectively, this research provides strong support for MSM implementation on fallow rice on the upper Texas coast that will provide substantial waterfowl benefits and support regional waterfowl goals.

Lesser Prairie-Chicken Nest Success and Habitat Selection Response to Various Prescribed Fire and Grazing Regimes

MICHAEL D. WHITSON, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79402, USA*

BLAKE A. GRISHAM, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79402, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79402, USA*

CHRISTIAN A. HAGEN, *Oregon State University, Bend, OR, 97702, USA*

RANDY HOWARD, *Bureau of Land Management, Roswell, NM, 88201, USA*

ABSTRACT The lesser prairie-chicken (*Tympanuchus pallidicinctus*) is an iconic endemic species of the North American plains. Historically, free ranging herbivore grazing and wildfire events directed plant community composition while creating heterogeneous mosaics of habitats that met the species annual life cycle requirements. Lesser prairie-chicken ranges have severely decreased since the 19th Century, now occupying <10 % of their historic range, and populations have followed similar trends. Anthropogenic alteration of natural disturbances regimes, row-crop agricultural expansion, wind energy and hydrocarbon production, infrastructure development, and urban expansion, combined with invasive species encroachment and severe drought conditions have resulted in habitat fragmentation, alteration, and degradation. These reductions in habitat quality and quantity have increased the efficacy, and efficiency needs of management decisions to optimize available habitats. In eastern New Mexico lesser prairie-chicken populations occupy areas of the Sand Shinnery Oak (*Quercus havardii*) Prairie Ecoregion, dominate vegetation being sand shinnery oaks, sand sage brush (*Artemisia filifola*), mixed-grass, and short-grass assemblages. While habitat selection and nesting success of the species in eastern New Mexico has been documented; species response to prescribed fire and various grazing systems used to manage and direct plant community composition has not been thoroughly researched. Our research uses 22-g GPS satellite telemetry transmitters to monitor nesting success and habitat selection of ~30 female lesser prairie chickens. We will quantify habitat response to prescribed fires and various grazing regimes by estimating standing herbaceous biomass, develop herbaceous vegetation production models, quantifying plant community composition and cover type, and estimate invertebrate assemblages and biomass.

Comparing the Detection of Old World Bluestem Distributions in South Texas Using Different Remote Sensing Platforms

JUSTIN P. WIED, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

HUMBERTO L. PEROTTO-BALDIVIESO, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

APRIL A. TORRES CONKEY, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

LEONARD A. BRENNAN, *Caesar Kleberg Wildlife Research Institute, Kingsville, TX, 78363, USA*

ABSTRACT The expansion of nonnative herbaceous species can alter the function and productivity of native ecosystems by altering soil nutrient cycles, fire regimes, and hydrology of sites where they become established.

These disruptions can create feedback loops which favor the invasive species through competitive exclusion of native species and can create long-term deleterious effects on wildlife. King Ranch bluestem (*Bothriochloa ischaemum*) and Kleberg bluestem (*Dichanthium annulatum*), hereafter Old World bluestems, were introduced to Texas in the first half of the 20th century for forage production and erosion control on degraded rangelands. Forage production of Old World bluestems and other invasive grasses may be desirable for ranchers. However, Old World bluestems may decrease habitat suitable to wildlife, especially cover and available food resources. This has important implications for wildlife biologists who manage economically important game species. Photosynthetic organisms have distinct spectral signatures in visible and near-infrared spectra. These signatures have been used to map tanglehead (*Heteropogon contortus*), an invasive, native grass species in south Texas, but no research has been conducted to map the distribution of Old World bluestems. We are conducting an unsupervised classification on 3 remotely sensed multispectral images stacked with a normalized difference vegetation index (NDVI) layer and a red-green-blue to intensity-hue-saturation (IHS) layer. Imagery were collected for 2 sites in south Texas using aerial photography from the National Agriculture Imagery Program (biannual 1-m resolution) and satellite imagery from RapidEye (monthly 5-m resolution) and PlanetScope (daily 3-m resolution) platforms. Field data is being collected to compare accuracy using confusion matrices and kappa-coefficients.

Elk Forage Response to Prescribed Fire in a Meadow in Redwood National and State Parks

LEE H. WILLIAMSON, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

FLOYD W. WECKERLY, *Department of Biology, Texas State University, San Marcos, TX, 78666, USA*

ABSTRACT Prescribed fire often increases forage biomass for large herbivores but the response depends on the local environmental setting. Usually the response of forage to prescribed fire is examined from a single burn which limits the possibility of examining how environmental heterogeneity might influence forage response to burning. Across 14 years in a 51-ha meadow in Redwood National and State Parks, California, prescribed fires occurred every 1–4 years in a portion of or the entire meadow. Burns occurred in September, shortly before the rainy season began, and biomass of grasses, forbs and shrubs palatable to elk (forage) was measured each January in 240 quarter m^2 plots dispersed throughout the meadow. Additionally, elk abundance was measured in January and in October, precipitation and low temperature was recorded. Relative to forage biomass 3–4 years later, forage biomass increased marginally the following January, biomass peaked one year later, and then declined but biomass was still marginally higher. None of the additional predictors influenced forage biomass, perhaps because elk abundance was low and the climate in the area was mild and wet. To promote forage biomass for elk, burning at a 3–4 year rotation is recommended in this meadow.

The Current Status of White-nose Syndrome in Texas and Plans to Assess Potential Movement Through Mexican Karst Systems

LILIANNA K. WOLF, *Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX, 77840, USA*

ABSTRACT White-nose syndrome (WNS) is a chronic and fatal fungal disease which has decimated cave bat populations throughout North America since it was first documented in New York state in 2006. Since the

disease's introduction, it has spread at an alarming rate northward, southward, and westward across the United States and Canada. Although WNS has not yet manifested itself in Texas, our team has documented the recent presence of the fungus that causes the disease, *Pseudogymnoascus destructans* (Pd), in the Panhandle and Edwards Plateau regions of the state. The recent documentation of Pd on a Mexican free-tailed bat roosting in a hibernaculum in south Texas is especially concerning. This species migrates as far south as Argentina and Chile, and has a range in the US that spreads from South Carolina to California (although the major migratory routes are between Texas and Mexico). Pd is known to be spread by bats from cave to cave. Seemingly, the fungus could spread southward through karst regions into Mexico and Central and South America as an innocuous fungus, until it reaches a climate cold enough to allow for the development of WNS. This is a review of the current state of WNS research in Texas, and an introduction to the proposed work for my master's thesis work, which will examine the potential for Pd to travel southward through karst regions in northeastern Mexico.

Road Density, Corridors, and Wildlife – Vehicle Collisions in South Texas

KELLEY A. WOOD, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

ABSTRACT Wildlife-vehicle collisions can cost Americans large sums of money and injure or kill wildlife and humans. As urbanization increases, collisions will also increase due to encroachment on wildlife habitat. This study was conducted to identify relationships between wildlife-vehicle collisions, road density, and natural corridors. For our study, we predicted that more wildlife-vehicle collisions would occur near the corridor areas (waterways and railroad right-of-way) and in less dense roadways with higher speed limits. We geocoded roadkill carcass records (January 2015 to June of 2018) from the Animal Control Division in Kleberg County to include in a GIS. We downloaded the TxDOT road database from TNRIS and included it in our GIS. We created a buffer by road and corridor type to assess roadkill frequency by species and time of year. For the 3.5 year study period, there were 1,968 roadkill records. Domestic species made up 66% of carcasses, and wildlife species made up the remaining 34%. The largest number of collisions occurred with domestic cats at 802 records and domestic dogs at 472 records. The largest number for wildlife species was 407 for Virginia opossums. The majority of the collisions occurred in urban areas with high road density. Areas designated as corridors and less dense roads did not have a high amount of collisions as we had predicted. But, understanding urban roadkill trends could assist Animal Control departments in identifying neighborhoods that could benefit from spay and neuter pet programs and education programs on fencing and leash laws to reduce roadkill.

Hybridization of Deer in the United States: Tracking the Maternal Lineage

EMILY A. WRIGHT, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

EMMA K. ROBERTS, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

ROBERT D. BRADLEY, *Department of Biological Sciences, Texas Tech University. Natural Science Research Laboratory, Museum of TTU, Lubbock, TX, 79409, USA*

ABSTRACT White-tailed deer (*Odocoileus virginianus*) and mule deer (*O. hemionus*) are known to hybridize across a large portion of the United States and Canada. *Odocoileus* hybrid zones previously have been documented throughout much of West Texas (Trans-Pecos Region and Texas Panhandle, specifically along the edges of the Llano Estacado). The most recent study revealed that hybridization may be bidirectional and identified 2 unexpected mitochondrial lineages of mule deer. One clade of mitochondrial sequences obtained from morphologically identified mule deer were more similar to sequences obtained from morphologically identified white-tailed deer than to the other mule deer clade. To further investigate the significance of mule deer maternal lineages, we are examining the following 3 objectives: 1) investigate sources of mule deer by examining a robust cytochrome-b (Cytb) dataset that includes samples from a broader, geographic region, 2) examine paternal contribution to the hybridization process by genotyping Y-linked zinc finger (Zfy) gene in select individuals, and 3) examine informative genetic variation in a reproductive, nuclear gene (zonadhesin, Zan) potentially involved in a post-mating isolation barrier in mammals. Collectively, the aforementioned molecular markers will be utilized to ascertain the molecular history of the aberrant mule deer clade and determine hybridization, genetic lineages, and geographical relationships among mule and white-tailed deer. To date, a Cytb dataset of 93 samples (47 white-tailed, 46 mule deer) was analyzed to generate a Bayesian phylogeny and delineated 3 clades of deer (two mule deer, one white-tailed deer). Zfy and Zan will be utilized to genotype both deer species.

Using Genomics to Characterize Population Structure, Connectivity, Genetic Variation, and Health of Desert Bighorn Sheep in Texas

EMILY A. WRIGHT, *Department of Biological Sciences, Texas Tech University, Lubbock, TX, 79409, USA*

FROYLAN HERNANDEZ, *Texas Parks and Wildlife Department, Alpine, TX, 79830, USA*

CALEB D. PHILLIPS, *Department of Biological Sciences, Texas Tech University. Natural Science Research Laboratory, Museum of TTU, Lubbock, TX, 79409, USA*

ROBERT D. BRADLEY, *Department of Biological Sciences, Texas Tech University. Natural Science Research Laboratory, Museum of TTU, Lubbock, TX, 79409, USA*

WARREN C. CONWAY, *Department of Natural Resources Management, Texas Tech University, Lubbock, TX, 79409, USA*

ABSTRACT Desert bighorn sheep (*Ovis canadensis nelsoni*) were extirpated from the Trans-Pecos Region of Texas by the 1960s due to overharvesting, competition with, and diseases from domestic sheep and exotic livestock. Restoration and translocation efforts by Texas Parks and Wildlife Department have reestablished populations to where bighorn sheep numbers have increased from ~14 in 1959 to >1,500 across 11 mountain ranges. Several conservation concerns surround these restocking efforts. First, to understand the origins, and potential disease risks relative to the source stock origins of translocated bighorn sheep, source stocks must be examined. Second, bighorn sheep are susceptible to several epizootic diseases, such as pneumonia, thus potentially impeding augmentation and translocation success. Although diseases usually target individuals with compromised immune systems, this may not be the case with *Mycoplasma ovipneumoniae*, given its ability to impact all age and sex classes, particularly within small, isolated sheep populations. Third, these populations may have undergone inbreeding and genetic drift. Genetic profiles will be generated using mitochondrial DNA (mtDNA) and RADSeq to understand current Texas bighorn sheep population structure and diversity. Specifically, MtDNA markers track the success of maternal lineages to measure spatiotemporal genotype movement, whereas RADSeq methods will generate SNPs (single nucleotide polymorphisms) to identify variation between

individuals and populations, and SNPs can be mapped to genomic loci to identify specific genetic traits. This research will provide baseline information relevant for management and conservation purposes to assess inbreeding and "genetic health", optimize future translocation efforts, and develop parameters for tracking genotype fitness.

Assessing Changes in Wildlife Road Mortality Hot Spots After the Construction of Wildlife Mitigation Structures on a South Texas Highway

THOMAS J. YAMASHITA, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

TRINITY D. LIVINGSTON, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

KEVIN RYER, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

JOHN YOUNG JR., *Environmental Affairs Division, Texas Department of Transportation, Austin, TX, 78701, USA*

RICHARD J. KLINE, *University of Texas Rio Grande Valley, Brownsville, TX, 78520, USA*

ABSTRACT Roads are a leading cause of mortality for many species of wildlife, including endangered species such as the ocelot (*Leopardus pardalis*) in south Texas. To prevent ocelot mortalities and maintain habitat connectivity, the Texas Department of Transportation (TxDOT) installed 11.9 kilometers of fencing and upgraded or built 5 wildlife crossing structures (WCS) on State Highway 100 (SH 100) in Cameron County. Construction occurred between September 2016 and May 2018. The objective of this study was to see how wildlife road mortality (WRM) hotspots have changed with the construction of fencing. Road mortality surveys have been conducted since September 2015 along a 15 kilometer stretch of SH 100 encompassing the full fenced area plus equal distances beyond the fence ends. Using Emerging Hot Spot Analysis, we assessed how WRM hotspots changed from the pre-construction period through post-construction. Preliminary results indicate that while total WRMs have decreased after the construction of fencing, a new hot spot is forming near the eastern fence end while a sporadic hot spot near the western fence end also exists. This analysis will provide valuable insights into how the construction of exclusionary fencing affects the spatial pattern and species composition of WRMs.

Variation in Demographic Trade-Offs for Yellow Mud Turtle Populations in Texas

JONATHAN A. ZENOR, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

RICHARD T. KAZMAIER, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

MARK J. LANGE, *Texas Parks and Wildlife Department, Columbus, TX, 78934, USA*

TREVOR J. MCVAY, *Department of Life, Earth, and Environmental Sciences, West Texas A&M University, Canyon, TX, 79016, USA*

ABSTRACT Turtles are of high conservation concern, but remain among the least studied vertebrates. Research examining variation in patterns of survival and reproduction across the group is particularly scarce, yet such demographic data are essential for proper management of any species. Yellow mud turtles (*Kinosternon flavescens*) are common, easily sampled, and found throughout most of the western half of Texas, making them excellent models to explore possible trade-offs in survival and reproduction. We began sampling yellow mud turtles in 2007, and have made 3,843 captures of 2,255 individuals across 11 sites. We assessed age of individuals using plastral annuli and calculated site-specific survival via age-structured regression. Average clutch size was determined using x-rays from 728 captures of adult females. Annual survival range 62.2–87.6% across 9 populations, and average clutch size ranged 3.3–5.0 across 5 sites. We failed to detect a relationship between clutch size and annual survival ($P = 0.462$), but our data suggest that within-site differences in habitat may be more influential in driving variation in survival and reproduction than across site difference. These trends also suggest that these turtles are using more of a bet-hedging strategy. For such a wide-ranging species, management focused on within-site habitat may serve as a more successful strategy than one that focuses across larger spatial scales. While this species is currently abundant in Texas, it is considered threatened in 3 states. As such, a more thorough understanding of the factors driving its survival will better equip us for its proper management.

Nilgai Antelope Behavior and Movement: Implications for Cattle Fever Tick Eradication

LISA D. ZOROMSKI, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOHN A. GOOLSBY, *USDA Agricultural Research Service, Cattle Fever Tick Research Laboratory, Edinburg, TX, 78541, USA*

AARON M. FOLEY, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S., *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Nilgai antelope (*Boselaphus tragocamelus*) were first introduced to Texas rangelands during the 1920s–1940s. Native to India, Nepal, and Pakistan, nilgai have expanded into much of coastal south Texas and northern Mexico. Nilgai provide a significant economic benefit to ranching operations via hunting revenue. However, nilgai have the ability to spread cattle fever ticks (CFT; *Rhipicephalus annulatus* and *R. microplus*). Cattle fever ticks can transmit bovine babesiosis to cattle, a serious economic threat to the U.S. cattle industry. Incursions of CFT into south Texas from Mexico required the establishment of temporary and permanent quarantine zones. This burdens infested ranches with expensive and time-consuming eradication requirements. Wildlife can hinder eradication efforts on livestock because white-tailed deer (*Odocoileus virginianus*) and nilgai are alternative hosts for CFT. Control methods, such as treated baits, are available for deer. Nilgai do not

respond to bait, which is a major challenge for controlling the spread of CFT. The USDA-ARS has developed remotely activated sprayers as a treatment measure for nilgai. However, the sprayers must be positioned in locations that nilgai use frequently. Research is lacking on nilgai behavior, but nilgai regularly re-visit fence crossings and latrines, where repeated defecations occur at a localized site. We are assessing frequency, time, sex, and age of nilgai that use latrines and fence crossings via camera traps on 3 south Texas ranches. We are also identifying the number and distribution of latrines. Knowledge of nilgai movement and behavior will help identify areas to place sprayers to help with the eradication of CFT in the U.S.

Genetic Structure and Diversity of Nilgai Antelope in Texas

LISA D. ZOROMSKI, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

RANDY W. DEYOUNG, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

MASAHIRO OHNISHI, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

JOHN A. GOOLSBY, *USDA Agricultural Research Service, Cattle Fever Tick Research Laboratory, Edinburg, TX, 78541, USA*

AARON M. FOLEY, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

J. ALFONSO ORTEGA-S., *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

DAVID G. HEWITT, *Caesar Kleberg Wildlife Research Institute, Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville, Kingsville, TX, 78363, USA*

TYLER A. CAMPBELL, *East Foundation, San Antonio, TX, 78216, USA*

ABSTRACT Nilgai antelope (*Boselaphus tragocamelus*) were released onto private ranches in Texas during the 1920s–1940s. Nilgai now occur throughout much of coastal south Texas and northern Mexico, with an estimate of over 30,000 nilgai in Texas. Although nilgai were introduced over 80 years ago, little is known about nilgai ecology in either Texas or their native range in India, Nepal, and Pakistan. The goal of this study was to identify genetic markers that will amplify in nilgai to enable fine-scale analyses of population structure and identification of individuals. We screened 20 microsatellite DNA loci developed for livestock and cervids, and found 7 loci that amplify and have enough variation to identify individuals. The mean number of alleles per locus was 6.14, expected heterozygosity = 0.706, polymorphic information content = 0.666, identity non-exclusion probability = 2.6*10-7, and sibling identity non-exclusion probability = 2.6*10-3. We are currently genotyping nilgai tissue samples collected from Kleberg, Kenedy, Cameron, and Willacy counties in Texas, geographically representing the U.S. nilgai range We will analyze population structure to infer movements and connectivity, and also determine if founder effect has affected genetic diversity. Finally, we are evaluating the markers for use on fecal DNA in a mark-recapture study of latrine ecology, where nilgai practice repeated defecation at localized sites. The results of this study, the first population genetics analysis of nilgai, will serve as a reference for future genetic studies and provide information for nilgai population management in south Texas.

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