



2021

Conservation Biology Research Report



CONSERVING THE LAST FRONTIER

OUR MISSION:

Conserving the natural resources of the Chihuahuan Desert Borderlands through research, education, and outreach.

Since 2007, the Borderlands Research Institute has encouraged effective land stewardship of the ruggedly beautiful terrain of the Chihuahuan Desert. By providing land managers with the most current scientific information, the Borderlands Research Institute is helping to conserve one of the most biologically diverse regions of the world.

Housed at Sul Ross State University, the Borderlands Research Institute builds on a long-lasting partnership with private landowners, the university's Range and Wildlife Program and cooperating state, federal, and non-governmental organizations. Faculty scientists and the graduate students they mentor are conducting groundbreaking research on every aspect of the desert landscape and the wildlife it supports.

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Patricia Moody Harveson, Ph.D.
*Davidson Endowed Chair and
Carnivore Specialist*

Dana L. Karelus, Ph.D.
*Research Scientist and Spatial
Ecology Specialist*

Mieke Titulaer, Ph.D.
*Research Scientist and Bird
Conservation Specialist*

ENDOWMENTS



James A. "Buddy"
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of Conservation Biology



The Chihuahuan Desert provides infinite opportunities to not only investigate the mysteries of nature, but to also conserve that diversity through partnership with landowners and natural resource professionals of the region. Regardless of the species, one of the commonalities of the Conservation Biology program is the scale at which the projects occur. Many of our projects occur across vast landscapes of the Chihuahuan Desert. We are

honored by the hundreds of landowners that grant us access to their properties, and we are inspired by their commitment to stewarding the natural resources they've been entrusted with.

Undoubtedly, conservation is a group effort; we are indebted to our partners, donors, and landowners that help research, fund, and host our research projects. We are especially appreciative of the James A. "Buddy" Davidson Charitable Foundation that recently endowed our Chair in Conservation Biology. The James A. "Buddy" Davidson Endowed Chair serves as program leader, spokesperson, and chief strategist for the Conservation Biology Program at BRI.

Louis A. Harveson, Ph.D.

Dan Allen Hughes, Jr., Endowed Director



The Borderlands Research Institute's Conservation Biology Program is focused on monitoring and conserving the region's rich biodiversity. The diverse Chihuahuan Desert landscape of the Big Bend is anchored by the Rio Grande and ranges from flat and undulating grasslands to the forested mountaintops of our sky islands. This diverse landscape is home to an equally diverse array of fauna and flora including many rare and endemic species.

I'm proud to partner with our team of scientists, including Dr. Mieke Titulaer, Dr. Dana Karelus, and many graduate and undergraduate research assistants who conduct research focused on a wide range of species and explore issues from grassland bird wintering ecology to large carnivore movements and recolonization.

Through our research, we identify conservation needs for the habitats and wildlife of the Big Bend. We take a landscape level approach to much of our work, focusing on ecosystem function and the impacts of humans on these complex systems.

Patricia Moody Harveson, Ph.D.

Davidson Endowed Chair of Conservation Biology



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MOUNTAIN LION:

Carrion, scavengers, and ecosystem services provided by mountain lions in the Davis Mountains, Texas

Michael Stangl, Patricia Moody Harveson, and Louis A. Harveson



Mountain lions introduce carrion to other ecosystem species. Photo courtesy of Ben Masters.

Animal carcasses, also called carrion, are a unique resource that is widely available across the landscape and has the potential to link virtually all biotic components of an ecosystem through direct and indirect means. Though typically overlooked in traditional food web networks, carrion provides an essential source of nutrients and energy to an entire suite of species. Carrion utilization is a fundamental ecological process observed by nearly all terrestrial predators, which could all be considered opportunistic scavengers. A vast network of interactions, spanning species and trophic levels, reverberates out from these carrion deposits, scattered across the landscape.

In a healthy, intact ecosystem, carrion is introduced into the food web via natural deaths (varying in scale from mass die-offs to individuals succumbing to adverse conditions) or as the unconsumed remnants of carcasses from predation events. Considering the latter, it follows that apex predators may serve a deeper and more complex ecological function than simply regulating prey populations. Other species that occupy lower trophic ranks than apex predators, or are regarded as competitors, are incidentally provided a resource that would otherwise be unobtainable. Additionally, during adverse conditions (e.g., leaner winter seasons), many species may depend upon a regular supply of carrion to sustain themselves.

Predators, however, are not the only species that are capable of regularly facilitating the introduction of carrion into the ecosystem. Roadkill events, the refuse of sport hunting, or the destruction of an individual or species for management purposes are only a few of the ways humans may incidentally supply carrion to scavengers. Little is known, though, about how human-introduced carrion is accepted into the ecosystem, and whether scavengers' utilization or behavior at such carrion sites differs from the naturally introduced carcasses.



Scavengers, like bobcats, search for mountain lion kill sites. Photo courtesy of BRI staff.

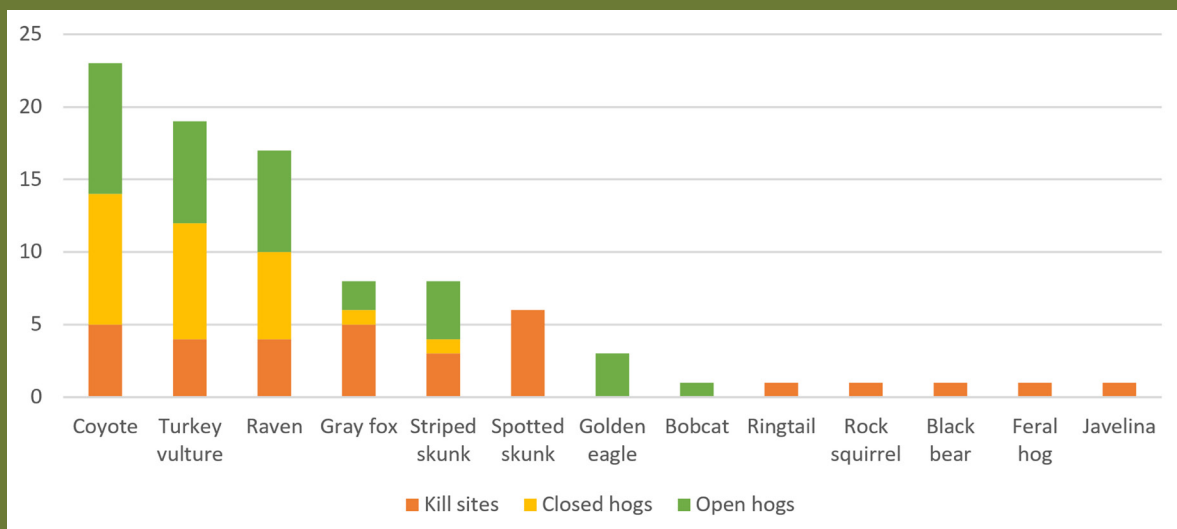
In the Davis Mountains, Texas, we investigated scavenger use of two of the major sources of carrion in the region. Our objectives were to examine the carcass refuse from mountain lion (*Puma concolor*) predation events and the invasive feral hog (*Sus scrofa*) carcasses culled for land management purposes.

We investigated nine mountain lion kill sites and deployed motion-triggered cameras at the sites in an effort to film all visiting and feeding scavenger species. We also set cameras at 20 feral hog carcass sites, with the same initiative. We further subdivided the hog carcasses into two groups: “open” (where entrails were exposed using a long incision) and “closed” carcasses. We reviewed and analyzed the videos filmed by these cameras for presence or absence of a species and feeding and visiting times of species.

Collectively, scavengers fed for 45,277 minutes (~755 hours) across all carcass types. We recorded 13 species scavenging at mountain lion kill sites, with the spotted skunk (*Spilogale putorius*) being the most prevalent species, occurring at six of the nine sites investigated. We found that “open” hogs hosted a greater variety of scavenging species, with eight species documented, whereas “closed” hogs elicited five species. Coyotes (*Canis latrans*) were the most prevalent species observed at both “open” and “closed” hog carcasses. Rarer species of scavengers, documented at either kill sites or hog sites, included black bear (*Ursus americanus*), bobcat (*Lynx rufus*), golden eagle (*Aquila chrysaetos*), and ringtail (*Bassariscus astutus*). Overall, we found a higher diversity of scavenger species at mountain lion kill sites than at hog carcasses.

The inclusion of carrion and scavengers within our ecological investigations allows us to widen our inquisitive lens. With this research, we hope to capture a more holistic and comprehensive understanding of the interactive ecosystem, highlighting the importance of apex predators such as mountain lions in ecosystem functionality through the facilitation of carrion to scavengers.

SCAVENGER SPECIES



Occurrences of scavenger species feeding at mountain lion kill sites and at “open” and “closed” feral hog carcasses in the Davis Mountains, Texas.

Movement and space-use by mountain lions in West Texas

Dana L. Karelus, Patricia Moody Harveson, and Louis A. Harveson

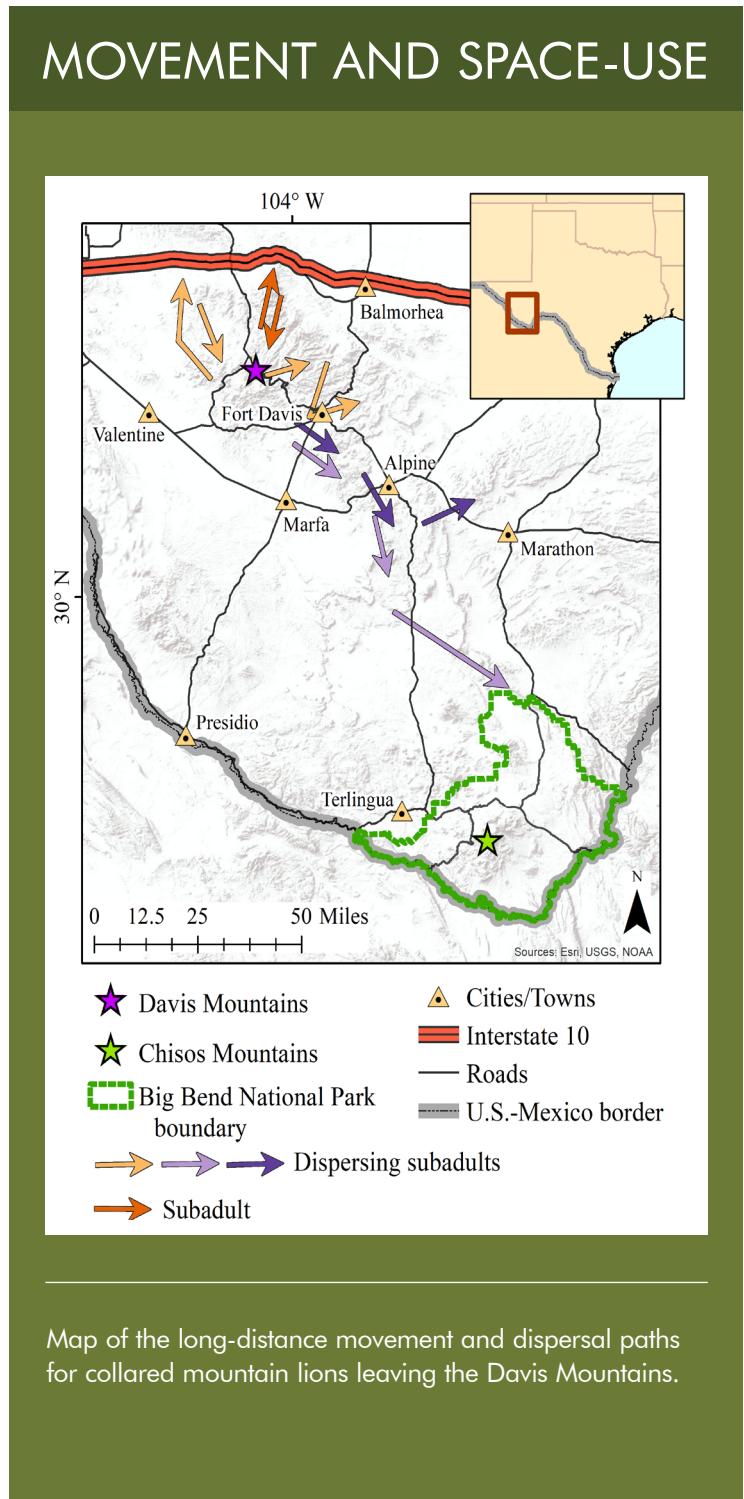
Information regarding the movements and space-use of large carnivores is essential for species' management and conservation planning. For large carnivores, such as mountain lions in West Texas, this type of information could be especially important for mitigating human-wildlife conflicts.

To understand this relationship, we captured and tracked the movements of 24 mountain lions (15 females, nine males) in Big Bend National Park and the Davis Mountains, Texas, between 2011 and 2017. We estimated movement metrics and home range sizes for adult mountain lions using continuous-time movement models.

As expected, females and males exhibited different movement and space-use patterns. We found that females moved at slower rates and had smaller home ranges than males. On average, females traveled approximately 7 miles per day and had 109-square-mile home ranges, whereas males moved over 12 miles per day and had 416-square-mile home ranges. However, females and males both crossed their home range in about a week, indicating that males covered more space by moving faster than females.

Based on these results, we know that mountain lions in the region can travel a long distance in a relatively short amount of time. Three young lions dispersed from their natal range in the Davis Mountains, with one traveling more than 90 miles in less than a month before being trapped and killed just north of Big Bend National Park. Adults also cover large spaces in short times and their ranges are large enough that they include multiple private ranches which they move through quickly, not staying long before moving on.

Resident mountain lions in this region also remain in the same home ranges throughout the seasons, suggesting that the mountain ranges provide adequate habitat with a rich and abundant prey base. Together, the information from our study provides us with a clearer understanding of how these mountain lions are using the landscape of West Texas.



BLACK BEAR:

Occupancy of black bears in the Davis Mountains: Documenting the natural recolonization of an iconic Texas species

Jamie Cooper, Dana L. Karelus, Patricia Moody Harveson, and Louis A. Harveson



Recolonizing black bears in the Davis Mountains are faced with increased mortality risks due to human impacts (e.g., vehicle collisions, traps).
Photo courtesy of Katy Baldock.



Graduate student Jamie Cooper sets up trail cameras to survey for black bears. Photo courtesy of BRI staff.

American black bears are one of two remaining large carnivores in Texas. Once widely distributed throughout Texas, this species was extirpated by the 1950s due to intense hunting pressure, federal predator control programs, and habitat loss and degradation. Due to state protection from exploitation, black bears have since been recolonizing the Big Bend region in West Texas from Mexico.

Previous research has documented growth and dispersal of a resident population in Big Bend National Park, yet there is limited documentation of other regional populations. Our objective was to provide evidence of the recolonization and occupancy of black bears in the Davis Mountains.

As part of our carnivore monitoring activities, we have conducted camera surveys in the Davis Mountains over the past decade, documenting the changes in black bear presence. Our surveys covered a 132-square-mile grid of privately-owned lands including The Nature Conservancy's Davis Mountains Preserve.

When our camera survey began, we had no photos of black bears in the Davis Mountains. Then, in 2016, we captured our first photo of a black bear in the Davis Mountains and have seen a steady increase in the number of photos each year. Sightings data from Texas Parks and Wildlife for Jeff Davis County reveal a similar trend, with black bear reports increasing every year since 2016.

We estimated the occupancy of black bears using data from 12-week surveys in 2018 and 2019. We analyzed photos, identifying black bears in 85 photos from Summer 2018 and 87 photos from Spring 2019.

Combining presence-absence data from these photos with environmental covariates, we modeled occupancy rates of black bears. As expected, tree canopy cover was an important predictor of occupancy, showing the highest occupancy of black bears in areas with the greatest percentage of cover. Our study serves as a record of initial occupancy and will help biologists monitor future changes in this naturally recolonizing population of black bears in the Davis Mountains.

KIT FOX:

Kit fox occupancy and co-occurrence with coyotes in Trans-Pecos, Texas

Matthew Hewitt, Dana L. Karelus, Patricia Moody Harveson, Louis A. Harveson, and Russell Martin (Texas Parks and Wildlife Department)



Kit fox are a desert-adapted species found in the Trans-Pecos. Photo courtesy of Carolyn Nored Miller.



Graduate student Matthew Hewitt sets up a kit fox survey station with scent lures and a wooden stake for height reference. Photo courtesy of BRI staff.

were to survey areas of suitable kit fox habitat using remote trail cameras to detect kit fox and coyotes, estimate kit fox detection and occupancy rates to create a predictive occupancy map for the Trans-Pecos, and determine species co-occurrence patterns between kit fox and coyotes.

We surveyed for kit fox using motion-triggered trail cameras in areas most likely to be occupied (grasslands with less than 5% slope) on private and public lands across the nine Trans-Pecos counties. Between March 2018 and March 2020, we conducted 732 baited camera surveys that averaged 14 days each, totaling over 10,000 trap days and 84,586 photos of 49 species. We collected 313 independent kit fox photos at 99 (13.5%) of our camera sites and 1,430 independent photos of coyotes at 471 (64.3%) of our camera sites.

Kit fox (*Vulpes macrotis*) and the closely related swift fox (*Vulpes velox*) are among the smallest members of the American canids. Adults of both species weigh approximately five pounds and are noticeably smaller than the more common gray fox (*Urocyon cinereoargenteus*), which averages eight pounds. While similar in appearance, kit and swift fox are geographically distinct.

Swift fox occupy the shortgrass and mixed-grass prairies of the Great Plains, including the Texas Panhandle. Researchers have studied swift fox in the Texas Panhandle, documenting population declines largely attributed to loss and fragmentation of habitat and competition with predators.

Kit fox occupy the arid regions of northern Mexico and the western United States (from southwestern Oregon through California and eastward through Nevada, Utah, Arizona, New Mexico and western Texas). However, very little is known about the distribution of kit fox in Texas.

In the arid Trans-Pecos region of Texas, coyotes coexist with kit fox throughout most of the kit foxes' range. Coyotes can compete for resources and sometimes kill kit foxes. Little is known about these species interactions in Texas, but the possibility for competitive exclusion of kit fox by coyotes warrants an investigation into their coexistence.

We partnered with Texas Parks and Wildlife Department to examine this relationship and map their distribution in West Texas. Our objectives

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Coyotes occur in a wide range of habitats and were detected at 64% of our camera sites in the Trans-Pecos. Photo courtesy of BRI staff.

To analyze the data, we used occupancy modeling to test for the effect of survey length on detection and for the effects of slope, elevation, shrub height, and bare ground on kit fox occupancy. Overall detection was highest at the beginning of the 14-day survey period and decreased over time.

Overall occupancy for surveys was influenced by all four environmental variables, with the highest occupancy in areas with gentler slopes, lower elevations, shorter shrubs, and a greater percentage of bare ground. We used the model to make a predictive map of occupancy across the Trans-Pecos region and evaluated the map with kit fox sightings from other sources.

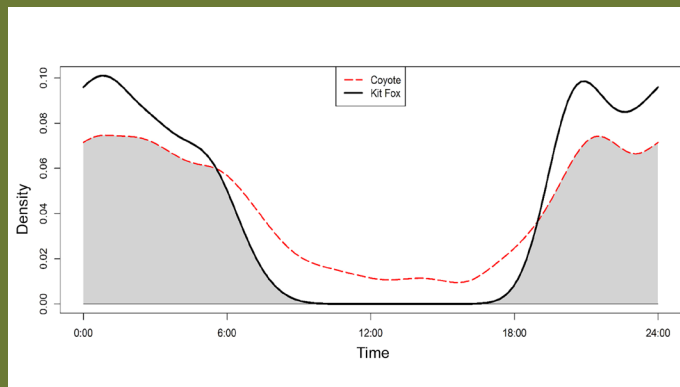
We then used a conditional two-species occupancy model to investigate the effects of coyotes (the dominant predator) on kit fox (the subordinate predator) detection and occupancy. Our model showed that kit fox and coyotes likely exist on the landscape independently of one another (species interaction factor [SIF] = 1.03), meaning that coyote presence or absence did not affect the detection or occurrence of kit fox in our surveys.

We also investigated the daily hourly activity patterns of the two canids and found that they overlapped substantially, suggesting that species co-occurrence is not facilitated by temporal partitioning. Our results suggest that kit fox and coyotes occupy similar habitats and are active at similar times of the day, yet are still able to coexist in West Texas.

We then used a conditional two-species occupancy

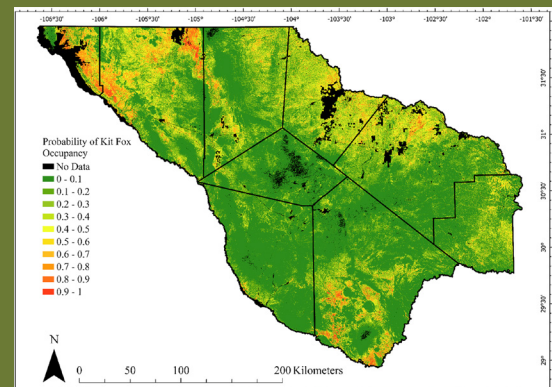
ACTIVITY AND OCCUPANCY

Daily activity patterns for kit fox and coyotes



Daily activity patterns of kit fox and coyotes based on camera trap photos of each species. Species' temporal overlap is represented by the gray-shaded area. Kit fox were strictly nocturnal, whereas coyotes displayed some activity during daytime hours.

Kit fox predicted occupancy in the Trans-Pecos



The predicted occupancy map can be used by biologists to better understand where and in what habitats kit fox are most likely to occur in the Trans-Pecos region of Texas.

WINTERING GRASSLAND BIRDS:

Winter survival of Baird's and grasshopper sparrows in the Marfa grasslands of Texas

Denis Perez-Ordoñez, Mieke Titulaer, Louis A. Harveson, and Russell Martin (Texas Parks and Wildlife Department)



BRI staff, students, and volunteers slowly walk and wave sticks to encourage birds to fly into the net. Photo courtesy of Paul Slocumb.

Grassland birds are experiencing one of the fastest population declines in North America due to long-term habitat loss and degradation across their annual cycle. Researchers have estimated that since 1970, 53% of grassland bird populations have been lost. These declines are even stronger for some species wintering in the Chihuahuan Desert. For example, since 1966, Baird's sparrow (*Centronyx bairdii*) and grasshopper sparrow (*Ammodramus savannarum*) have declined by approximately 75%.

To better understand what is driving these population declines, we partnered with Texas Parks and Wildlife Department, Bird Conservancy of the Rockies, and the Dixon Water Foundation, to study grassland bird overwinter survival at the Dixon Water Foundation's Mimms Ranch in Marfa, Texas.

For three winter seasons, between 2016 and 2019, we monitored Baird's and grasshopper sparrows using VHF radio telemetry. We captured birds using a mist net placed in dense patches of grass. With the help of volunteers from Texas and Chihuahua, Mexico, we drove birds into the mist net by forming a semi-circle and slowly walking toward the net. Once birds were caught in the net, we placed radio transmitters on the birds and released them back into the grassland.

Over the three seasons, we placed transmitters on 217 individual birds (123 Baird's and 93 grasshopper sparrows). Between December and March, graduate students and trained technicians traveled to the Mimms Ranch to track and observe the birds daily. During observations we noted whether a bird was dead or alive, its condition, and if dead, tried



Grasshopper sparrow is one of the species found in the Trans-Pecos grasslands. Photo courtesy of BRI staff.



Volunteers have the opportunity to release captured birds. Photo courtesy of Dana Karelus.

to identify the cause of mortality. We also conducted vegetation surveys at 20 bird locations per individual bird and across a grid of random points. At the vegetation points, we measured the microclimate near the ground with iButton® temperature loggers.

Over the three years of the study, winter survival probability ranged from 47% to 100%, and on average, was lower for grasshopper than Baird's sparrow (three-year mean = 65.92% and 85.54%, respectively).

We identified the main cause of mortality was predation by loggerhead shrike and other diurnal raptors. Additionally, based on our models, minimum ambient temperature was also a main determinant of mortality. Many factors could interplay to make birds more susceptible to predation, particularly when temperatures are low. Their need for energy intake increases, and birds may have to venture further from protective cover to find sufficient seeds, which may be buried under snow or frost.

When temperatures are too low, birds may simply not be able to consume enough seeds to meet their energy requirements. Low temperatures also require birds to adopt thermoregulatory positions, allowing them to maintain core internal temperatures, which make them more susceptible to predation. Furthermore, birds may generally be more visible to predators when the ground is covered by snow.

Despite low temperatures, our results also show that minimum microclimate temperatures were warmer in tall grass patches, compared to short grass patches. The difference was small (1°F lower in short grass, on average), but significant. We also found that when ambient temperatures were low, the survival probability was higher for birds in tall grass patches compared to birds in short grass patches.

These results combined suggest that tall grass cover can provide microclimate refuges for grassland birds when conditions are harsh. By adopting management strategies that ensure sufficient grass cover, we can potentially reduce the negative effects of cold temperatures, and in turn, increase the survival rate of wintering grassland birds.

This is the first study of many to estimate winter survival of grassland birds in the Marfa grasslands. Our results contribute to a regional collaborative effort to increase our understanding of wintering grassland bird ecology in order to inform science-based management strategies to restore grassland habitat that can support thriving bird populations.

Habitat selection by wintering grassland birds in the Marfa grasslands of Texas

Fabiola Baeza-Tarin, Mieke Titulaer, Louis A. Harveson, and Russell Martin (Texas Parks and Wildlife Department)



Mieke Titulaer retrieves a bird from the net. Photo courtesy of Luis Pallares.



Graduate student Fabiola Baeza-Tarin holds a brightly colored frisbee that is thrown to direct birds into the net. Photo courtesy of Paul Slocumb.

Desert grasslands are among the most threatened ecosystems globally, with only 20% of their historical range remaining today. This affects all species that depend on the grassland ecosystem for their survival. As key indicators of grassland health and integrity, grassland birds are ecologically significant and merit further study.

Together with partners from Texas Parks and Wildlife Department, Bird Conservancy of the Rockies, and the Dixon Water Foundation, we studied two grassland-obligate bird species, Baird's sparrow and grasshopper sparrow, to better understand their ecological requirements during the winter.

Using mist nets, we captured birds in the winter seasons between 2016 and 2019. We placed radio transmitters on their backs and tracked them daily. We documented vegetation composition throughout the study area to evaluate bird-habitat relationships, relative to habitat conditions. We also investigated seed availability in the soil seed bank within two grazing systems (i.e., rotational and continuous), in relation to bird habitat selection.

We found that both Baird's and grasshopper sparrows favor areas with higher grass and more grass cover. Baird's sparrow, in particular, avoided areas with tall shrubs and tumbleweeds. Our soil seed bank analysis indicated that birds selected areas with higher seed biomass in the

rotationally grazed pasture, but not in the continuously grazed site. In agreement with other studies, these findings emphasize the need to manage for sufficient grass cover and height, and suggest that shrub removal could be an important restoration technique for grasslands.

Although more research is needed regarding the role of livestock grazing as a management strategy, we suggest that by establishing sufficient grass cover and restoring degraded grasslands, both livestock and grassland birds can benefit. The close collaboration with private landowners is key to preserving desert grasslands and its wildlife.

LANDSCAPE ECOLOGY:

Identifying conservation priority areas using mountain lion habitat suitability and connectivity models

Dana L. Karelus, Patricia Moody Harveson, and Louis A. Harveson

The Respect Big Bend initiative is a coalition of scientists, landowners, community members, and industry leaders focused on conserving the unique resources and iconic communities of the Big Bend region of Texas through responsible energy development. Wildlife species in the region have economic, iconic, and conservation value, and the Respect Big Bend coalition identified wildlife conservation as a core value.

Large mammals can have expansive ranges encompassing the habitat requirements of many species, which makes them excellent surrogates for identifying high priority areas for conservation. In particular, mountain lions serve as an umbrella species, representing the habitat needs of many species such as black bears, desert bighorn sheep (*Ovis canadensis*), and many others.

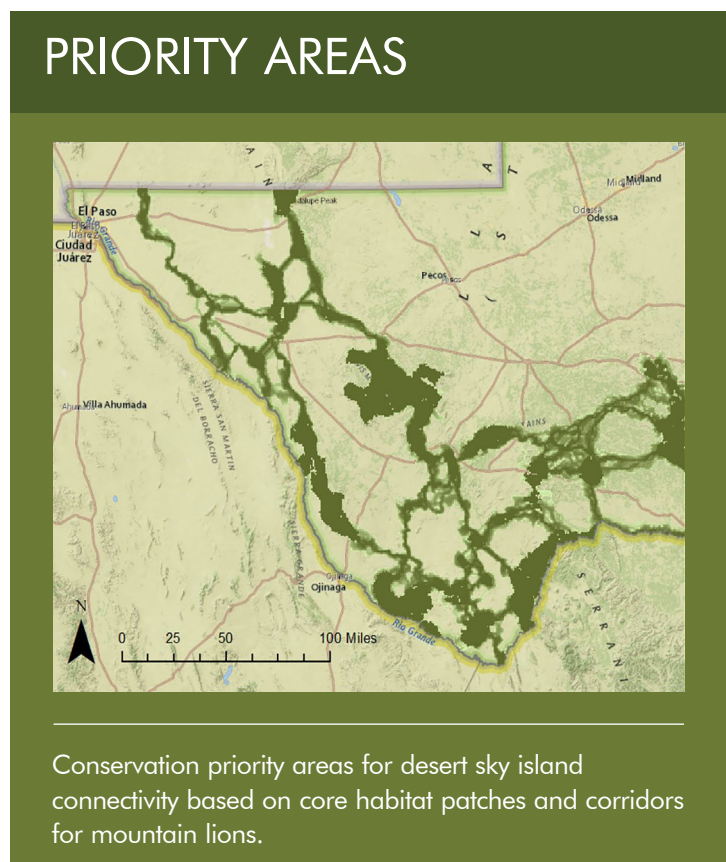
Across the Trans-Pecos, mountain lions use a broad range of habitats, including forested higher elevation mountain ranges. Also known as desert sky islands, these areas are the upper elevation of mountains surrounded by large expanses of lowlands. To help identify priority areas for conservation, we mapped the connectivity corridors that mountain lions use to move from one sky island to another.

Using GPS location data from 21 adult mountain lions from the Davis Mountains and Big Bend National Park that we radio-collared and tracked between 2011 and 2017, we modeled habitat suitability and connectivity for mountain lions and all species that inhabit and move between sky islands in West Texas.

We used resource selection functions to estimate habitat suitability from our mountain lion location data. Two environmental covariates were used in our model: 1) landform, which was classified into seven categories (i.e., valleys, hilltop in valley/local ridge in plains, headwaters, ridges and peaks, plains/gentle slopes, local valley in plains, and steep slopes) and 2) heat load index, which was classified into three categories based on aspect and slope (i.e., cool, neutral, and warm).

We used circuit theory and least-cost path analysis to identify corridors connecting core habitat patches, or areas of most suitable habitat, for mountain lions in West Texas. From the habitat suitability model, we predicted areas where mountain lions were most and least likely to travel and mapped the connecting corridors between adjacent core patches.

These habitat patches and corridors indicate the priority conservation areas to maintain connectivity between our desert sky islands in West Texas, and are necessary for all species that use these high elevation habitats. These results help guide the Respect Big Bend effort in managing energy development and wildlife habitat.



CURRENT STUDENTS AND ONGOING PROJECTS

BARBARA SUGARMAN



Barbara is from San Diego, California and obtained a BS in Forestry at Northern Arizona University. After receiving her degree, she lived in Colorado and Utah for several years. Barbara has been interested in nature and wildlife since early childhood. As her education

progressed, she fell in love with wildlife management, specifically conservation. Her particular area of interest is in small mammals and mesocarnivores. She has previously worked with Utah prairie dogs, Gunnison's prairie dogs, black-footed ferrets, and American pika.

EMILY CARD



Emily grew up in southeastern Michigan, where she cultivated a love for the natural world while exploring the woods behind her house and the beaches of the Great Lakes with her sisters. She attended Michigan State University as an undergraduate student and

graduated with a degree in Zoology. After graduation, she worked as a wildlife technician on a variety of conservation-related projects focusing on reptiles, prairie dogs, and grassland and marsh birds.

Translocation of black-tailed prairie dogs in the Trans-Pecos ecoregion

In the last 200 years, prairie dog populations have declined dramatically due to poisoning, shooting, sylvatic plague, and habitat loss. As a result, wildlife biologists are researching how to restore this keystone species back into the ecosystem. Prairie dog translocation is a natural extension of this research, moving prairie dogs from large, healthy colonies, to areas where wildlife managers and landowners want to establish prairie dogs. Barbara is working to fill the void of knowledge on how to successfully establish a prairie dog colony in West Texas. The goal of Barbara's project is to study and implement the translocation of prairie dogs and establish a prairie dog colony that persists on the landscape. This project will assist wildlife managers with future prairie dog translocations and aid in the restoration of prairie dogs to the Trans-Pecos ecoregion.

Effects of woody plant removal on grassland bird habitat characteristics

Approximately 90% of migratory grassland bird species that breed on North America's Great Plains spend the winter in the Chihuahuan Desert. However, the encroachment of woody plants into grasslands changes suitable habitats for birds, contributing to the decline of many grassland bird species. To evaluate how grassland birds respond to habitat restoration efforts, Emily will be conducting grassland bird and vegetation surveys on Trans-Pecos ranches that contain plots treated with herbicide to remove woody plants and untreated plots. She aims to evaluate grassland bird-habitat relationships in treated and untreated plots and assess how treatment for woody plant removal influences the structures of vegetation and bird communities. She will also utilize citizen scientists to monitor birds on private properties in the Trans-Pecos region. This project will inform researches and landowners about woody plant removal and the bird species that occupy their properties throughout the year.

ALEX CHÁVEZ TREVIÑO



Alejandro (Alex) graduated from Universidad Autónoma de Nuevo León with a Biotechnology and Genomics degree in 2016. His passion for science compelled him to become a field technician for two years in Mexico, the U.S. and Canada, collecting data for bird ecology

research projects. During this time, he chased many species of birds and learned to love them; these experiences inspired him to draw pictures of birds and nature. Motivated to go back into science and research his own project, Alex began his graduate degree at the Borderlands Research Institute at Sul Ross State University. He describes graduate work as hard but fulfilling, and he hopes his work will contribute to the conservation of grassland birds.

CAITLIN CAMP



Caitlin learned to love the outdoors and wildlife by going on family trips to national parks across the country and exploring creeks near her home in Austin. During her undergraduate studies at Texas A&M University, she expanded her passion for the

environment while assisting with honeybees and coral reef systems research projects. Upon graduating in 2016 with a degree in Environmental Studies, Caitlin interned at a wildlife rescue center and worked at various environmental jobs. After briefly working in the construction industry, she was motivated to enroll in graduate school at Borderlands Research Institute at Sul Ross State University to study wildlife. Caitlin's educational goals are to learn how she can protect wildlife and their habitats.

Grassland bird community structure and density in managed sites

In North America, habitat changes such as shrub encroachment are some of the causes for the decline in grassland-obligate bird species. To control invasive shrub species, Alex treated two ranches in the Trans-Pecos with herbicide to selectively remove shrubs and enhance the grasslands. Alex compared the bird communities in these treated areas with control areas by performing transects. In 2019 and 2020, Alex performed over 600 transects and detected more than 16,000 birds. Additionally, Alex designed a strategy to estimate abundance of grassland birds in the winter using systematic mist netting. With the help of many volunteers from the U.S. and Mexico, BRI researchers captured birds using mist nets and kept record of all birds detected while sweeping the area. This project is helping to inform landowners about invasive shrub species and grassland-obligate bird species' habitat.

Species distribution and co-occurrence of carnivores in Big Bend National Park

Big Bend National Park is home to a number of carnivore species, including black bear, mountain lion, badger, bobcat, coyote, gray fox, kit fox, raccoon, ringtail, long-tailed weasel, hog-nosed skunk, hooded skunk, spotted skunk, and striped skunk. Understanding the distribution of these species is important for park biologists to monitor impacts of human activity and potential human-wildlife conflict. Camera traps are a noninvasive and relatively inexpensive way of surveying and monitoring mammals over large areas and over long time periods. In this study, Caitlin will use motion-triggered cameras to monitor the distribution and overlap of carnivores, as well as other mammals. This data will be useful for the long-term monitoring of wildlife biodiversity and species distributions in the park.

CONSERVING THE LAST FRONTIER



Cover photos courtesy of Ben Masters (P1, P16) and Dana Jones (P2).

BRI staff editors include Julie Rumbelow, Stacey S. Dewald, Lydia Saldaña, and special thanks to Sonia Yeck.

The Borderlands Research Institute at Sul Ross State University depends on private donations to fund much of our work. We are immensely grateful to our many partners who make our work possible.

Big Bend National Park
Bird Conservancy of the Rockies
Cynthia and George Mitchell Foundation
Dixon Water Foundation
Fort Worth Audubon Society
Horizon Foundation
Houston Livestock Show and Rodeo

James A. "Buddy" Davidson Charitable Foundation
Meadows Foundation
National Fish and Wildlife Foundation
Permian Basin Area Foundation
Potts and Sibley Foundation
Rob and Bessie Welder Wildlife Foundation
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