2020

Game Bird Research Report

BORDERLANDS RESEARCH ◆ INSTITUTE

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.

ENDOWED POSITIONS

Kelly R. Thompson Professorship of Quail Research

John B. Poindexter Endowed Fellowship in Quail Research

We're excited to share BRI's 2020 Game Bird Report with our partners, supporters, and friends. Dr. Luna and his team of graduate students and staff are doing an exceptional job of researching game birds across the Chihuahuan Desert. Each project is designed to ask practical questions and produce meaningful results that will make a difference in game bird management. These research projects could not be conducted without the support of generous donors, including the private funding of endowments.

We are honored to have two named gifts to support our Game Bird Program: the Kelly R. Thompson Professorship in Quail Research (funded by the Texas Parks and Wildlife Foundation) and the John B. Poindexter Endowed Fellowship for Quail Research (funded by friends of John B. Poindexter). Thompson and Poindexter are both long-term supporters of BRI and have each made their mark in the conservation world through their leadership, land stewardship, and philanthropy. We are truly privileged to have their names forever attached to BRI's Game Bird Program.

Louis A. Harveson, Ph.D.
Dan Allen Hughes, Jr., Endowed Director

Designating the Kelly R. Thompson Endowed Professor of Quail Research position in 2018 was a signature moment in the history of the Game Bird Program at BRI/SRSU, providing structure and focus for our efforts. The Game Bird Program at BRI/SRSU currently has five master's students working on projects. Over the last two years we have graduated five students who focused their studies on quail, and our faculty, staff and students in the Game Bird Program have attended eight conferences, given 23 presentations, submitted three book chapters, published four popular articles, and published three articles in peer-reviewed journals, with many more to come.

Over the last two years, we have received considerable private donations to support our work, with our primary benefactors being Park Cities Quail Coalition and the San Antonio Quail Coalition. The Game Bird Program is growing, and we are promoting our efforts through presentations and publishing current and past research. We tailor many of our projects to landowner questions, and as such, our research findings can have immediate implications for obtaining information on quail ecology and determining factors that can help bolster game bird populations in the Chihuahuan Desert.

Ryan S. Luna, Ph.D.
Kelly R. Thompson Professor of Quail Research

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CONTENTS

SCALED QUAIL:

Survival and nesting ecology of scaled quail in the Trans-Pecos

Carlos Gonzalez-Gonzalez

Scaled quail (*Callipepla squamata*) are one of the most ecologically and economically important wildlife species in the Trans-Pecos, as they are the primary upland game bird in the Chihuahuan Desert. However, scaled quail have experienced a decline in their population in recent decades. Leading causes for the decline are thought to be disease, habitat degradation, increase in predators, and weather patterns, but the specific cause is not known.

Despite the importance of scaled quail to the region, few studies have evaluated the species' response to management prescriptions. Supplemental feeding is a common management technique that is thought to benefit scaled quail populations. However, there is a lack of knowledge on the effects of supplemental feeding on scaled quail population dynamics and reproduction response to this management technique.

In 2011, Nine Point Mesa Ranch provided funding to work with Apache Ranch and Lado Ranch to explore the effects of supplemental feeding on survival and nesting success through the use of radio telemetry.

To test this, we supplemented the first site (central Brewster County) with milo year-round; at the second study site (south Culberson County) we did not use supplements; and at the third site (central Culberson County) we supplemented with quail blocks. Collectively across all study sites, we trapped and banded more than 3,000 scaled quail and radioed 164 hens. Scaled quail were followed for two years, starting in May 2012 and ending in September 2013.

When analyzing the data, we grouped across years and compared survival between study sites, because survival rates were not different between years. We found that the study site supplementing with quail blocks had the lowest survival, at 55%, whereas the site supplementing milo had 76% survival and the non-fed ranch had 75% survival.

Compared to other studies, we observed average to higher survival rates than have been reported in the past. In our study, there was no observed increase in survival in the fed sites compared to the non-fed site.

Scaled quail populations are believed to be maintained through high reproductive output in the form of large clutch size. Thus, reproductive failure is likely to have a negative impact on population dynamics of scaled quail. Unfortunately, with a poor understanding of scaled quail reproduction, the capability to evaluate the impacts of environmental factors on population growth is limited. A total of 77 nests were found across the reproductive seasons for 2012 and 2013. We found that scaled quail had high nesting success, at 72%, with an average of 11 eggs per nest, and a 91% hatchability rate. Nesting occurred from May to September with peak nesting in June and July.

Overall, we found that feeding did not seem to have a positive effect on survival or nesting success at these study sites during the time of the study. However, the benefits from supplemental feeding may be more notable in years of severe drought. Additionally, information regarding winter survival and chick survival remains absent in the Trans-Pecos. Supplemental feeding may have a greater effect on maintaining sustainable scaled quail populations by increasing annual recruitment during harsh environmental conditions.

Timing and quantity of rain, combined with range conditions, seemed to have the greatest effect on nesting performance. Vegetation structure and composition may lead to greater sustainability of scaled quail populations. Diversity of vegetation could counteract more population declines by increasing nesting, hatchability, and survival of scaled quail chicks.

QUAIL RESEARCH HIGHLIGHTS

We could not do our work without collaborating with landowners. We depend on land stewards across the Trans-Pecos to help us answer research questions and achieve conservation objectives. We have worked closely with three ranches who have provided funding for countless quail research projects. These partnerships are key to conserving wildlife and natural resources in West Texas.

APACHE

RANCH SPECIFICS

- Located 31 miles NE of Van Horn, Texas
- Precipitation: ~11-15" annually
- Rolling hills dominated by grasses, mixed shrubs, and juniper

GAME BIRD PROJECTS/THESES

- Scaled quail nesting ecology
- Effect of supplemental feed on scaled quail fall-winter diets

LADO

RANCH SPECIFICS

- Located 10 miles S of Van Horn, Texas
- Precipitation: ~12" annually
- Desert scrub with creosote, mesquite, and cacti; riparian washes with high diversity

GAME BIRD PROJECTS/THESES

- Breeding season dynamics and spatial characteristics of scaled and Gambel's quail in desert shrubland
- Comparative ecology of scaled and Gambel's quail

NINE POINT MESA

RANCH SPECIFICS

- Located 65 miles S of Alpine, Texas
- Precipitation: ~11" annually
- Mixed desert scrub; grasses more common in higher elevations

GAME BIRD PROJECTS/THESES

- Survival and nesting ecology of scaled quail
- Scaled quail selection and avoidance of artificial resources and how they influence survival

Diets of scaled quail in the Trans-Pecos

Brenda Gallegos

The diet of scaled quail across the Trans-Pecos is important to their health and survival. Previous studies have looked at the diet contents of bobwhite quail crops; however, scaled quail diets have received much less attention. Although there are a few reports on scaled quail crop contents for Texas, Oklahoma, Arizona, and New Mexico, much of the Trans-Pecos has not been sampled.

The Apache Ranch, Quail Coalition and Quail Forever funded this project to explore what scaled quail are consuming across the Trans-Pecos. We began by collecting 279 scaled quail crop samples from hunter-harvested birds from October to February of 2013 and 2014. Each quail was frozen and later sampled to identify contents and examine seed. Because some of the crop samples came from ranches that provide supplemental feed, we were able to assess differences in forage selection between ranches providing supplemental feed and those that did not.

The most common natural forage item in scaled quail crops from the northern Trans-Pecos was golden crownbeard (*Verbesina encelioides*). Scaled quail also consumed a variety of insects such as grasshoppers, ladybugs, seed bugs, beetles, stink bugs and true bugs. Although a wide variety of insects were found in the quail crops, there appeared to be no particular preference for a specific insect species.

In comparison, we found that on the ranches in the southern portion of the Trans-Pecos that provided supplemental feed, approximately 40-70% of the crop contents were actually from the supplemental feed source. The remainder of the samples were comprised of forage such as: vervain (*Verbena officinalis*), tobosa grass (*Pleuraphis mutica*), ants (*Formicidae*), green vegetation, cactus fruit (*Opuntia* spp.), careless weed (*Amaranthus retroflexus*), spreading fan petals (*Sida abutifolia*), Johnson grass (*Sorghum halepense*), prairie tea (*Croton monanthogynus*), golden crownbeard (*V. encelioides*), western tansy mustard (*Descurainia pinnata*), wild tantan (*Desmanthus virgatus*), and termites (*Isoptera*). Golden crownbeard was also the preferred native plant of the southern ranches, which we identified in approximately 50% of all the crops that were sampled.

Also in the southern portion of the Trans-Pecos, we found that insects, such as ants, did not appear as frequently in the crop samples. However, when they were present, insects typically accounted for more than 80% of the sample. This may be due in part to opportunistic feeding when insects are abundant, as during the winter months insects are not as common.

Ultimately, across the entire Trans-Pecos we found green vegetation appeared in each crop sampled. However, the green vegetation was not as abundant in crop samples obtained from ranches using supplemental feed, compared to ranches that only had natural forage. This is most likely due to quail choosing easily obtainable supplemental feed, rather than seeking green vegetation.

In fact, on the ranches that did not supplement feed, green vegetation accounted for 50-60% of the crop contents. The affinity for consuming this vegetation was likely due to the high water content within these plants. Since these crop samples were obtained from ranches that had limited standing water, quail appeared to be selecting forage that had high water content.

From this study, we determined that scaled quail consume a variety of forage in the Trans-Pecos. To find an elusive covey we recommend focusing on diverse habitats that provide a combination of vegetation types including green vegetation, seed-producing forbs, mast-producing shrubs, and cactus.

MONTEZUMA QUAIL:

Tree canopy cover and vegetation selection of Montezuma quail in the Capitan Mountains of New Mexico

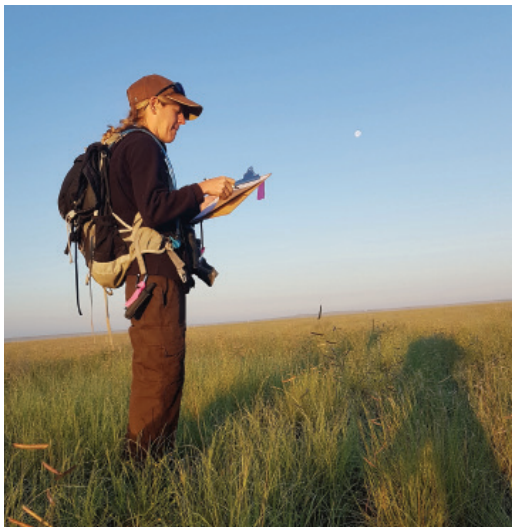
Elizabeth Tidwell, Katie Sauer, Karlee Cork

In the southern United States there are five different quail species: Gambel's quail (*Callipepla gambelii*), northern bobwhite quail (*Colinus virginianus*), Montezuma quail (*Cyrtonyx montezumae*), California quail (*Callipepla californica*), and scaled quail. Of these quail species the Montezuma quail possesses the most elaborate plumage and cryptic behavior. A Montezuma quail's plumage allows them to virtually disappear when they crouch and freeze to avoid detection. However, there is limited knowledge about habitat requirements and population characteristics of Montezuma quail.

We initiated a partnership with the New Mexico Bureau of Land Management and the National Wild Turkey Federation to study tree canopy cover selection, roost site selection, and population characteristics of Montezuma quail in the Capitan Mountains of New Mexico. The study site was on the Fort Stanton Snowy River Cave National Conservation Area, in southeastern Lincoln County, New Mexico. This study site was made up of pinyon-juniper woodlands and ranged in elevation from 5,905 to 7,217 ft.

Between May 2015 and April 2017, we used trained pointing dogs to locate roosting Montezuma quail at night. Once a covey of roosting Montezuma quail were located, researchers used headlamps to disorient the quail and dip nets to capture the birds. The quail were then fitted with either a GPS/VHF or VHF backpack transmitter. This equipment allowed us to monitor the movements and survival of Montezuma quail, providing data points used for analysis. We were able to use data from 27 of the 56 quail captured.

After analyzing the GPS data, we found that Montezuma quail utilized areas with 30 to 69% tree canopy cover. The quail most commonly selected areas to forage where trees were averaging 16.4 ft tall and were spaced approximately 68.2 ft apart. Overall, quail used areas where trees ranged from 4.8-42.3 ft tall and were spaced 5.8-187.0 ft apart.



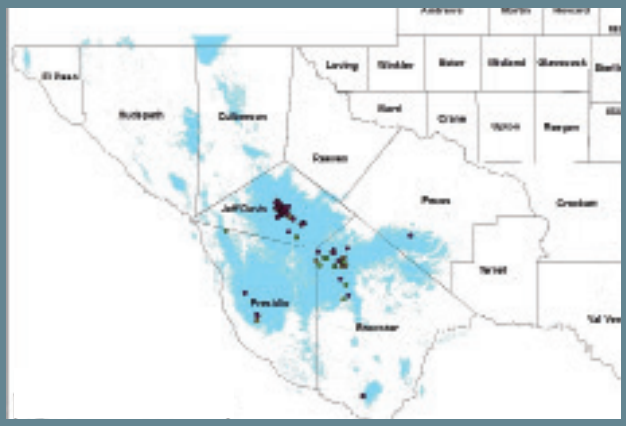
Lastly, we found Montezuma quail to have an overall male-female ratio of 0.9:1 and juvenile-adult ratio of 2.25:1. Quail are unique when compared to most bird species because they have nearly a 1:1 male to female ratio.

Based on these results, we concluded that tree canopy cover should be no less than 30% for suitable Montezuma quail habitat. Similarly, if canopy cover is over 60%, quail will most likely avoid that habitat area.

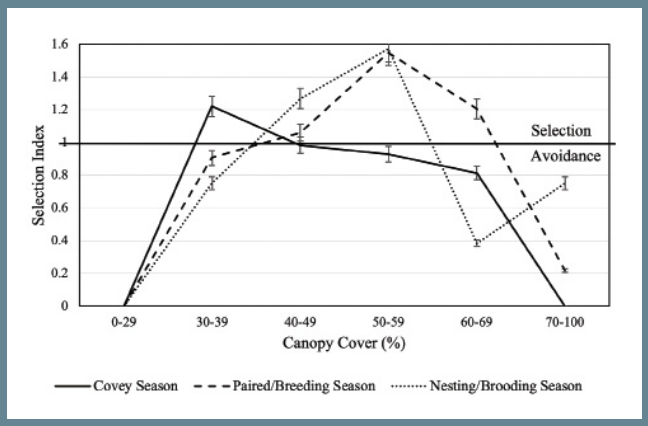
From the telemetry data we collected in New Mexico as well as locations in the Trans-Pecos where Montezuma are known to occur, we modeled predictions for suitable habitat areas in the Trans-Pecos region of Texas. Models incorporated slope, elevation, vegetation cover, aspect, temperature, and precipitation. Our model predictions of Montezuma quail distribution and habitat preferences support much of the existing literature about the species. In general, Montezuma quail are more likely to occur at higher elevations and in semi-desert grasslands dominated by bunch grasses and scattered trees or shrubs. We suggest that Montezuma quail prefer areas of the Trans-Pecos including: the Davis Mountains, Del Norte Mountains, Glass Mountains, Chinati Mountains, and Cuesta del Burro Mountains (see image below).

Overall, it appears that habitat composition (shrub density, grass and bare ground cover, etc.) of desert mountains has the largest impact on the distribution of Montezuma quail. Based on our results, land managers in the Trans-Pecos can enhance quail populations and create more suitable habitat for Montezuma quail by implementing proper brush management.

TEXAS HABITAT SUITABILITY MAP AND TREE CANOPY UTILIZATION IN NEW MEXICO



Potential suitable habitat for Montezuma quail in West Texas using the maximum sensitivity plus specificity threshold. Montezuma quail occurrences were rarefied at 0.62 miles.



Seasonal tree canopy cover utilization by Montezuma quail in the Capitan Mountains of New Mexico, USA, May 2015 to May 2017.

GAMBEL'S QUAIL:

Breeding season habitat use of adult female scaled and Gambel's quail

Richard Temple and Ronald Jankowiak

Scaled quail and Gambel's quail both inhabit the desert landscapes of the Chihuahuan Desert. Although these species' habitat preferences differ slightly, their distributions do overlap. To understand their habitats, we investigated survival and home ranges of adult female scaled and Gambel's quail in the eastern Chihuahuan Desert. During the 2012 and 2013 breeding seasons, we captured 240 Gambel's and 211 scaled quail and equipped them with radio tags.

After analyzing the data, we found that during the 2012 season, scaled quail had a 78% survival rate and Gambel's quail had an 87% survival rate. In the 2013 season, we found both scaled quail and Gambel's quail had a 70% survival rate. Additionally, we found that the average home range for scaled quail in the breeding season was between 54.4 to 330.0 acres and between 163.5 to 669.0 acres for Gambel's quail. The average core use areas for scaled quail was 10.0 to 275.1 acres, and 30.1 to 129.4 acres for Gambel's quail.

During the course of the study, we monitored 17 scaled and 12 Gambel's quail nests and found overlap in the home ranges of females in both species. We also estimated scaled quail had a 72% nest survival rate and Gambel's quail had an 89% nest survival rate. Both species of quail favored sotol plants (*Dasylirion texanum*) for their nest site selection in both years.

Based on these results, we found that excessive drought can suppress nesting activity; however, riparian areas may encourage reproductive activity in both species by providing adequate forage and microclimatic conditions for broods. We suggest that landowners and managers should maintain riparian areas by keeping shrubs in place to provide roosting and loafing habitat. Additionally, by preserving these dense shrub areas, their root systems should stabilize soil and reduce erosion.

Survival, predation, and habitat use of Gambel's quail in the Trans-Pecos

Ronald Jankowiak and Richard Temple

Gambel's quail populations in the Trans-Pecos have been decreasing over the last few decades. Historically, quail populations are primarily affected by habitat changes or habitat loss; however, loss due to predation can also be a contributing factor to overall population declines. For this study, we aimed to understand how predators and habitat use affected quail survival by capturing 134 female Gambel's quail on the Lado Ranch in the spring of 2014 and 2015.

After calculating breeding season survival rates, we identified a 43% survival rate for 2014 and a 62% survival rate for 2015. Of the Gambel's quail mortalities, 18% were attributed to avian predators, 18% to mammalian predators, 47% of the predations could not be attributed to a specific predator, and 17% had an unknown cause of death.

Of the avian induced mortalities, one predator species was positively identified due to the radio transmitter being recovered from a great horned owl's (*Bubo virginianus*) nest. Regarding the mammalian predators, the predatory species could not be credibly identified; however, we found signs attributed to bobcat (*Lynx rufus*), coyote (*Canis latrans*) and grey fox (*Urocyon cinereoargenteus*).

Overall, during the study period we found quail survival rates to be 53%, which is representative of most Gambel's quail survival studies. Although survival rates were relatively high, predation was and continues to be a factor. Traditionally, predator control has been regarded as a primary management tool for quail. However, we suggest habitat management may be a more applicable management strategy for increasing quail populations.

Gambel's quail are often associated with riparian areas and the associations of thick, brushy and thorny vegetation, such as catclaw mimosa or mesquite. We suggest that conservation of these habitats may be essential for implementing sound Gambel's quail management strategies. By managing the habitat, one can also increase concealment cover which should reduce potential predation events.

WATERFOWL:

Shorebird and waterfowl use of moist-soil management units in Sandia Springs

Ryan Anthony

Moist-soil managed wetlands historically created for waterfowl have also created food and habitat opportunities for shorebirds. Shorebirds feed primarily on invertebrates produced in moist-soil wetlands. To maximize shorebird use at the Sandia Springs Wetlands in Balmorhea, Texas, we assessed invertebrate biomass and water quality parameters.

From our examination, we found water depth and temperature were the best predictors of shorebird presence at Sandia Springs Wetlands. To maintain a precise level of water, we recommend the use of screw-type water control gates at the wetlands. These gates control the flow of water rather than the level; by controlling the inflow and outflow rate of water, managers can maintain constant water levels.

In arid wetlands, lack of vegetation cover likely speeds up evaporation, thus requiring higher usages of water. Disking can be a valuable tool for managing vegetation; however, frequent disking can reduce invertebrate diversity, richness, and in some cases biomass. We recommend that disking be conducted immediately after spring drawdowns and only in years that it is absolutely necessary.

At the study site, we found very little biomass of invertebrates within core samples. The combination of low invertebrate biomass and low vegetative foods may be a limiting factor for shorebird usage of Sandia Springs Wetlands. We recommend vegetation in these refugia should be left standing to provide cover and habitat for invertebrates.

Overall, we recommend a water level of at least 4 inches should be maintained in the wetlands year-round to provide maximum submersion of vegetation and maximum water volume to be utilized by invertebrates as habitat. Similarly, a deeper level of water (i.e., 6–12 in.) should be maintained during the winter to make it more conducive for use by waterfowl.

Since shorebirds are present at Sandia Springs Wetlands primarily during late spring and summer, we recommend management for waterfowl should be conducted for migrating waterfowl during the fall and winter. These recommendations could also be applied to similar desert wetlands, as they are an important stopover for many wetland bird species.

TURKEY:

Survival, habitat characteristics, and home range of translocated Rio Grande wild turkeys in southern Brewster County

Trestan Bryant

Rio Grande wild turkeys (*Meleagris gallopavo intermedia*) were once a prolific subspecies of upland game bird occupying several southwestern states, including Texas. In southern Brewster County, populations were lost due to a combination of overharvest and degradation of the riparian habitats they rely on. Previous restocking efforts have been made; however, survival results have varied. We attempted to restock turkeys from healthy populations in the Panhandle region of Texas to southern Brewster County.

We translocated 14 hens and three tom turkeys on a ranch along Terlingua Creek and assessed their habitat selection and movements through the spring and summer seasons.

At the conclusion of the study, we found that the turkeys had a survival of 40%, with the largest change in survival happening around the ninth week of reintroduction. The majority of turkey mortalities were attributed to predation, likely due to fewer roosting trees available and therefore their increased reliance on ground roosting. We also found that the turkeys had an average home range of 72,308 acres, almost three times what is typically reported in literature. The large home range suggests that the turkeys did not settle and found the habitat to be unsuitable.

Additionally, after using a model selection analysis tool, we found that important predictors for selection included distance to the nearest creek, Normalized Difference Vegetation Index, Terrain Ruggedness Index and certain vegetation types. Some vegetation types favored by the turkeys included: Catclaw Shrubland, Mesquite-Creosotebush Shrubland, Creosotebush Scrub, Desert Pavement, Desert Volcanic Rockland, Desert Wash Barren, Desert Wash Grassland, Desert Wash Shrubland, Gray Oak Savanna and Woodland, and Hill and Foothill Grassland.

Based on these observations we suggest that appropriate management strategies include improving available habitat, such as vegetation types typically associated with riparian areas. In order to have site fidelity after release, Rio Grande turkey habitat should include numerous suitable roosting trees, standing water, and large foraging areas that also include ample vegetation to conceal nests. These factors should reduce turkeys' home range size and their tendency to explore.

CURRENT STUDENTS AND ONGOING PROJECTS

ZOE CARROLL

While the Trans-Pecos region of Texas hosts four species of quail, the scaled quail is arguably the most significant quail species in the region ecologically and economically. Despite this, research is limited regarding diet and parasite aspects of its life history. This project seeks to investigate three aspects of scaled quail life history on a Trans-Pecos region-wide scale: determine the primary foods throughout the year, examine diet shifts connected with supplemental feeding, and determine if associations exist between diet and eyeworm (*Oxyspirura petrowi*) and cecal worm (*Aulonocephalus pennula*) infections. The conclusions from this project will be used in order to better understand quail life history and population declines in Texas.

RACHEL BITTNER

Scaled quail, Montezuma quail, and Gambel's quail are three quail species that occur in the Trans-Pecos ecoregion of Texas and the arid Southwest of the United States. Quail populations have been in decline since the 1960s throughout the Southwest due to habitat loss, changing range conditions, and other related causes. Eyeworms and cecal worms, two parasitic nematodes, can be found in these desert quail; however, their prevalence has not been assessed. The objectives of this study are to assess parasite loads of eyeworms and cecal worms in desert quail with regard to age and sex, as well as associations with precipitation gradients across the Trans-Pecos. Additionally, sites that provide supplemental feed will also be assessed to determine if parasite loads increase as quail densities increase around feeding sites.

Zoe is passionate about conservation and management of the wide diversity of bird species in the United States. She graduated from Virginia Tech with her bachelor's degree in Wildlife Science in May 2014. Since then, she has held a variety of jobs and internships focused on wildlife in the eastern United States. She feels fortunate and excited to continue her education by pursuing her master's degree in Range and Wildlife Management at Sul Ross State University under the guidance of Dr. Ryan Luna.

Rachel grew up hiking and camping with her family in state parks throughout Texas, where she developed a love for wildlife and nature. During her undergraduate career at Texas Tech she worked as a student research technician for three Ph.D. students who were respectively studying dwarf seahorses, elk, and axis deer. Rachel also had the opportunity to volunteer on many other projects, including studies on mule deer, lesser prairie chickens, northern bobwhite, and Guadalupe bass. Her undergraduate research focused on using species distribution models to predict suitable habitat for seagrass using the Texas Gulf Coast as a case study.

TREY JOHNSON

Quail populations in Texas have declined over the past few decades primarily due to habitat loss. A myriad of other factors have been investigated as well, but the role that parasites may play in this decline has been a recent topic of concern. To help address this, we collected scaled, Gambel's, and Montezuma quail from across the Trans-Pecos ecoregion of Texas via hunter-harvest under a scientific permit from Texas Parks and Wildlife Department. Quail samples were then necropsied to determine the occurrence of eyeworms and cecal worms. Individual quail organs were submitted to the Texas A&M University Veterinary Medical Diagnostic Lab where histopathological analyses were conducted to gain information on parasite-related tissue damage and to document other pathogenic factors. From this, we identified several parasites that had never before been documented in the quails of the Trans-Pecos ecoregion of Texas.

MARIBEL GLASS

Bosque del Apache National Wildlife Refuge in southern New Mexico was established to provide a critical stopover site for migrating waterfowl. These wetlands recreate the historic habitat that migratory birds need to thrive and provides food and habitat for migratory birds and a diversity of wildlife. However, refuge staff have noticed an increasing density of paspalum, specifically *Paspalum distichum*, or knotgrass, in wetland units. This particular plant has been known to be invasive and displace desirable vegetation if not managed properly. It is still uncertain whether this grass is useful to avifauna and, furthermore, how management prescriptions affect its abundance. This study will determine the production value of paspalum, which management practices facilitate its spread and whether paspalum is a food source for avifauna.

In May of 2017, Trey graduated from Texas A&M University with a Bachelor of Science in Wildlife and Fisheries Sciences. While at Texas A&M, he had the opportunity to work on a research project with northern bobwhites on the Texas coastal prairies. Since then, he has continued to work with upland game bird species in many of the western states. At Sul Ross State University, his interest in upland game birds has grown, particularly with regard to research that helps further the knowledge of upland game bird species and makes strong management implications toward the conservation of those species.

Maribel is proud and honored to continue her passion for wildlife conservation at Sul Ross State University. She graduated from Texas A&M University–Kingsville in 2016 with a Bachelor of Science in Range and Wildlife Management and a minor in Biology. She is now pursuing a Master of Science in Range & Wildlife Management. Her project is titled Assessing the Effects of Management Prescriptions on Knotgrass and its Energetic Production Value for Migratory Birds. Her education in wildlife research will not end at Sul Ross; she hopes to earn a doctorate degree in the future.

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Photos courtesy of Michael Gray (cover, P12 top, P13 top), Bill Broyles (P4, P6 top, P7 both, P10 right, P11), and BRI staff and students.

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.

Apache Ranch
Bureau of Land Management
Dixon Water Foundation
Houston Livestock Show and Rodeo
John B. Poindexter and Friends
Lado Ranch (Wexford Ranches)
Lykes Bros. Inc.
National Wild Turkey Federation
Nine Point Mesa Ranch
Park Cities Quail Coalition
Quail Coalition
Quail Forever
San Antonio Livestock Exposition
San Antonio Quail Coalition
Sandia Springs Wetlands
Texas Parks and Wildlife Foundation
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