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Geron Gowdy shown taking measurements within a restored native grassland. © Alec Ritzell

WILDLIFE RESPONSE TO NATIVE GRASSLAND RESTORATION

by Geron Gowdy, Fidel Hernández, Timothy Fulbright, and Michael Hehman

Non-native, invasive plants have become established in many areas across the globe. Some of these species were accidental introductions, whereas others were introduced to enhance agricultural production or brought in for aesthetic reasons in urban areas. Unfortunately, many of these introduced species have expanded beyond their original introduction or planting sites, establishing across thousands of acres of native rangeland and displacing native species in the process.

One such species is buffelgrass. Buffelgrass is native to Africa and has been seeded in many countries including Australia, Mexico, and the United States within southwestern rangelands. Beginning in the 1940s, buffelgrass was seeded in Texas to provide forage for cattle. This grass is extremely adept at surviving and even thriving in drought. During wet times, it can grow and reproduce profusely through copious seed production. These characteristics are desirable from the perspectives of ease of establishment, provision of cattle forage, and ability to spread on semiarid rangelands. However, from the perspective of biodiversity, this can be harmful.

Buffelgrass can create large monocultures (an area comprised primarily of one dominating plant species), and the resulting loss in plant diversity, in turn, decreases wildlife diversity. Some generalist wildlife species may be able to persist in buffelgrass-dominated areas; however, habitat specialists can suffer and be extirpated.

Restoring buffelgrass-dominated rangelands to native grasslands is difficult. However, if successful, native grass restoration may provide a means of restoring wildlife diversity given that greater plant diversity generally promotes greater wildlife diversity. In collaboration with other Caesar Kleberg Wildlife

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This Issue

By The Numbers

17–22 range of weights in pounds of an adult nutria (The Mammals of Texas, W.B. Davis and D.J. Schmidly, TPWD)

8–17 typical range of the number of eggs laid in the clutch of the red-eared slider (A field guide to Texas Reptiles and Amphibians, R.D. Bartlett and P.P. Bartlett, Gulf Publishing Co.)

Research Institute colleagues (Dr. Eric Grahmann, Mr. Forrest Smith, and Dr. David Wester) and graduate students (Brandon Palmer, Ellart Vreugdenhil, and Javier Huerta), we initiated a study in 2013 to evaluate whether a buffelgrass-dominated site could be converted back to a native grassland and, if so, whether wildlife diversity would increase as a result.

Our study was conducted on the Hixon Ranch in La Salle County, Texas. We selected 2 sites: a restoration site (buffelgrass-dominated area subject to native grassland restoration) and a control site (buffelgrass-dominated area). The restoration site and control site were chosen because of similar management histories and vegetation characteristics.

Restoration was a multi-year (2014–2016) process and involved (1) an initial prescribed fire to remove herbaceous cover, (2) multiple discings to control buffelgrass seedlings that emerged following rains, and (3) multiple applications of a herbicide (glyphosate) to further exhaust buffelgrass seedbanks. The restoration site was disced and/or sprayed with herbicide on 5 separate occasions. Finally, a diverse mix of locally adapted native grasses and forbs was planted in autumn of 2016 and desirable native shrubs were transplanted in the spring of 2017.

To monitor the wildlife response to restoration, we conducted surveys for birds, small mammals, and butterflies before restoration and 2 years after. What did we find? Was the restoration "successful," and did wildlife diversity increase?

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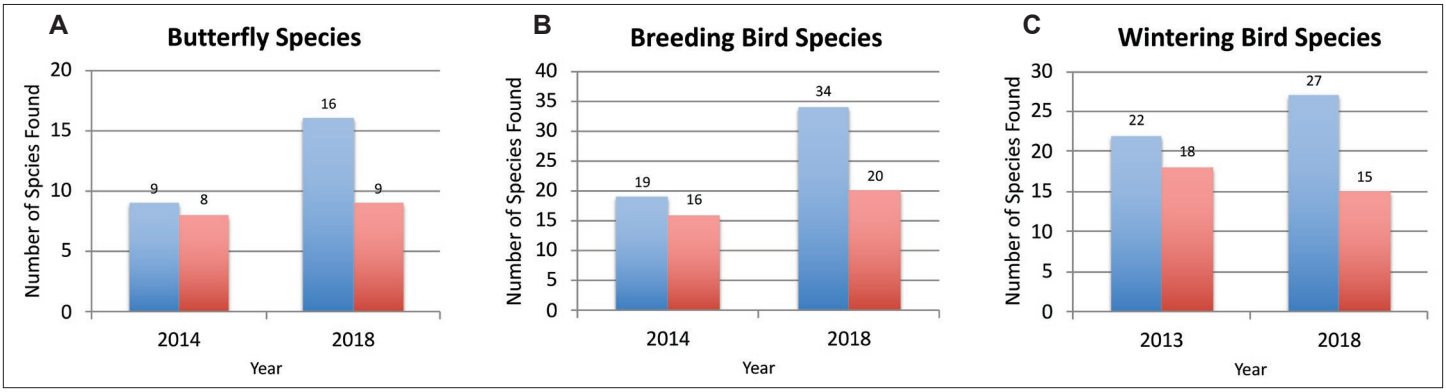
Butterfly diversity increased on the site restored from buffelgrass to native plants.

Deeming the restoration "successful" or not will require several years of monitoring. However, preliminary findings indicate substantial changes to the flora and fauna on the restoration site.

Cover of native plants has progressively increased on the restoration site from about 5% pre-restoration (2013) to greater than 30–80% post-restoration (2018). Importantly, we have observed a concomitant increase in wildlife diversity over this period. For example, butterfly species on the restoration site increased from 9 species (2014) to 16 species (2018). In comparison, butterfly diversity has remained relatively constant at about 8 to 9 species on the control site (Figure A). Similarly, bird diversity has increased from 19 species (2014) to 34 species (2018) for breeding birds (Figure B) and increased from 22 species (2013) to 27 species (2018) for wintering birds on the restoration site (Figure C), whereas it has remained relatively constant at about 15 to 20 species on the control site (Figures B and C). Thus, it seems that wildlife diversity is progressively increasing as native plants become established.

The preliminary findings of this study suggest that (1) native grassland restoration of buffelgrass-dominated areas is possible on a relatively large scale (approximately 300 acres) and (2) wildlife positively respond to the increased native plant diversity. There just might be a ray of hope for restoring buffelgrass-dominated rangelands, although the effort, resources, and patience that are necessary for success may be considerable. ~



Comparison of relative abundance for butterflies (A), breeding birds (B), and wintering birds (C) before (2013–2014) and after restoration (2018) of a buffelgrass-dominated rangeland to a native grassland in La Salle County, Texas (= Restoration Site, = Control Site).

CKWRI NEWS

Renowned Ecologist Visits

In April, students and faculty at the Caesar Kleberg Wildlife Research Institute (CKWRI) were treated to a visit from **Dr. Valerius Geist**, a distinguished ecologist and deer researcher, who is professor emeritus at the University of Calgary. Dr. Geist gave 3 seminars on topics ranging from the North American Model of Wildlife Conservation to European Deer Research to Human Evolution. His background and life experiences give him unique insights into wildlife management and research.

Dr. Valerius Geist (left) was a guest speaker at the CKWRI, thanks to the generosity and foresight of Mr. René Barrientos (right).

Dr. Geist was born in the Ukraine before WWII and grew up in Germany and Austria. He came to North America for his graduate work, earning a Ph.D. at the University of British Columbia on mountain sheep. He then worked with Nobel Laureate Konrad Lorenz in Germany before settling at the University of Calgary where he taught and conducted research for 30 years.

Dr. Geist's European upbringing allowed him to understand the exceptional conservation model used in North America to recover wildlife populations from decimation during the late 1800s and early 1900s. He was one of the first people to describe the North American Model of Wildlife Conservation, and he is a passionate advocate of this approach to conservation.

Dr. Geist presented findings of deer research in Europe during the 1930s that suggested consistent, multi-generational high-quality nutrition can increase antler size. This research was largely unknown in North America until Dr. Geist published a paper on the topic in 1986. The ideas it contained have influenced deer research and management in the United States for 3 decades.

The opportunity to interact with Dr. Geist was provided by **René Barrientos**, a long-time supporter of the CKWRI. René is passionate about supporting education of wildlife students and understands the value of having CKWRI students learn from one of the world's top wildlife scientists. Everyone at the CKWRI appreciates Mr. Barrientos and his thoughtful support in providing this unique opportunity to our students and faculty. ~

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UNDERSTANDING THE ROLE OF INSECTS IN PARASITE TRANSMISSION

by Nicole Traub, Tessa Green, and Alan Fedynich

The northern bobwhite is one of the most extensively studied avian species in Texas. Bobwhites are primarily granivorous; nevertheless, insects compose more than 80% of the diet of newly hatched chicks during their first 2 weeks of life and are an important protein source for hens. Although beneficial in terms of diet, insects can serve as intermediate hosts for helminth parasites.

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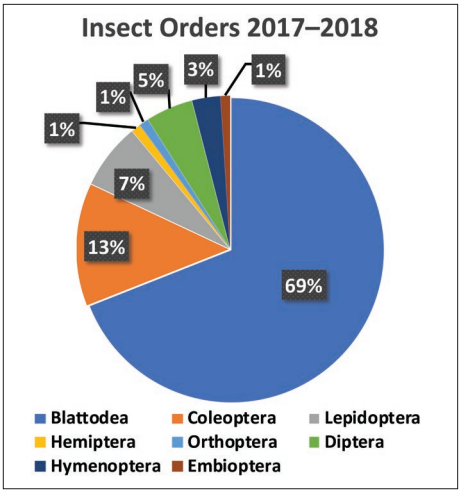
In South Texas, helminth parasites that infect northern bobwhites have been extensively surveyed over the past 7 years by researchers at the Caesar Kleberg Wildlife Research Institute through funding by the South Texas Chapter of the Quail Coalition. Over 10 species have been identified including the ever abundant cecal worm (*Aulonocephalus pennula*), the potentially pathogenic eyeworm (*Oxyspirura petrowi*), and a newly discovered zoonotic tapeworm in the genus *Mesocestoides*.

We know insects serve as intermediate hosts for helminth parasites that infect bobwhites in South Texas. However, it is unclear which insect species are involved. To learn more, we have been sampling insects on several South Texas ranches during the summers of 2018 and 2019 to determine species present and their relative abundance. We have also examined the crops of 136 hunter-donated bobwhites from the 2016–2017 hunting season and 106 from the 2017–2018 hunting season to see if insects are being consumed



Percentage of insects by taxonomic order that were found in bobwhite crop examinations from the 2017–2018 hunting season.

Did You Know?

The most effective predators on mottled ducks are alligators and raccoons. (The Mottled Duck, C.D. Stutzenbaker, TPWD)

The blind snakes that occur in Texas can be mistaken for an earthworm because of their small size and coloration.

during the winter months and, if so, which species are being eaten.

The most abundant insects by taxonomic order in the 2018 summer field collections were Orthoptera (grasshoppers, crickets, and locusts), Hemiptera (true bugs: aphids, leafhoppers, cicadas, and shield bugs), and Lepidoptera (butterflies and moths). Insects were found in 19 bobwhite crops (14%) from the 2016–2017 hunting season and 22 crops (21%) from the 2017−2018 hunting season. Six taxonomic orders were present in 2016–2017 and 8 orders in 2017–2018. Beetles (Order Coleoptera) were the most abundant (57%) in 2016–2017 while in 2017–2018, cockroaches and termites (Order Blattodea) were the most abundant (69%).

We are identifying insects to species and dissecting them to see whether they have parasite larva, which would demonstrate their role as intermediate hosts. Because parasite larva cannot be readily identified to species using morphological features, DNA techniques will be used.

© Larry Gilbert

Nicole Traub (left) and Tessa Green (right) are collecting insects in South Texas.

Our pilot study is providing new insight into insect availability during the summer, the kinds of insects eaten by bobwhites during winter, and what parasite larvae occur within what insects. From this information, we will be able to determine if the same insect species are available as a food source year-round and what insects are infected with larval parasites during the summer and winter periods.

Obtaining information about insects infected with larval parasites that ultimately infect bobwhites is crucial if we hope to fill in the knowledge gaps regarding the host-helminth parasite system occurring in South Texas. Ultimately, such information will aid in our understanding of the impact parasites have on bobwhites within the region. ~

What Do They Eat?

Striped scorpions are insectivores "...consuming mostly spiders, centipedes, crickets, flies, beetles, and other small insects." (https://animaldiversity.org/accounts/Centruroides_vittatus/#geographic_range)

The Cooper's hawk prefers to feed on birds and small mammals, but will also take reptiles. (Handbook of Birds of the World, Vol. 2, del Hoyo et al., Lynx Edicions)

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