Oklahoma State

WILDLIFE CHAIRS

Division of Agricultural Sciences and Natural Resources

Department of Natural Resource Ecology and Management

INSIDE THIS ISSUE

Long-term Habitat Use by Northern Bobwhite

By: Samantha Cady, PhD Candidate

A northern bobwhite hen fitted with a GPS transmitter ready for release.

Northern bobwhite have experienced steep population declines in recent decades, which have been largely attributed to habitat loss. Though bobwhite are an intensively studied species, we still have questions about their habitat use patterns. To date, many bobwhite studies have been conducted over relatively short time periods. However, a broader perspective can be gained by examining longer-term data because these datasets can reveal population trends not captured by short term studies. For example, we need multiple years of data in order to confidently conclude that areas of high bobwhite density tend to remain in the same general areas annually and/or seasonally—or whether they move. An understanding of long-term patterns of bobwhite habitat use may inform future management by identifying priority areas that birds are likely to consistently use.

To address these questions, Oklahoma State University, in partnership with the Oklahoma Department of Wildlife Conservation (ODWC), has collected bobwhite movement data over six years from Packsaddle and Beaver River Wildlife Management Areas (WMA)—amounting to approximately 55,000 telemetry locations at each WMA from over 2,000 birds. We are now using this long-term data to determine whether areas of high quail density (e.g., areas that tend to contain a large number of birds) are consistent (1) across seasons—e.g., breeding (April through September) or non-breeding (October through March) and (2) across years.

Early results indicate that bobwhite hotspots are seasonally consistent (that is, within a breeding season or hunting season), but show variation between years. Previous research has found that extreme weather can constrict the space use of bobwhite. In other words, areas considered bobwhite habitat under some weather conditions may no longer be suitable under different conditions. Because Packsaddle WMA experienced high weather variability during the study (e.g., some years experienced drought, while others were unusually wet), variable annual weather conditions are a possible driver of annual differences in bobwhite habitat use. These preliminary results begin to reveal long-term habitat use patterns of bobwhite and provide a more comprehensive understanding of the species. Next steps will include examining bobwhite responses to (1) harvest, (2) habitat management, and (3) food resources. Ultimately, this research project will provide a deeper understanding of bobwhite ecology and will directly inform future management.

Packsaddle WMA provides excellent habitat for bobwhite, but bobwhite use different areas of the WMA between years as conditions change.

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Can Harvest Limit Quail Populations?

By: Dwayne Elmore, Extension Wildlife Specialist

It is often assumed that quail harvest has a minor effect on quail populations, but that is not always true.

Quail hunters often assume that hunting and harvest of quail have negligible effects on quail. In fact, for many years harvest was considered to be completely compensatory to natural mortality. Compensatory means that no matter how many quail are harvested, it would not affect how many quail were in the fall population the following year due to the incredibly high reproductive rate of quail. Obviously this cannot be true when taken to extreme levels. For example, if a quail population has only 2 birds, and you harvest 1 of them, that population is doomed unless rescued by outside birds (immigration).

Perhaps a more realistic question is whether it is likely that quail harvest can be high enough to cause a population reduction (additive harvest) in the following year. That turns out to be a tough question to answer and we need to know some things about the context to properly answer it. While quail do have very high reproduction potential, they have limits. In fact, many heavily hunted areas (public and private) have harvest rates that exceed the quail population's ability to recover the following season, especially during years of poor weather that is not conducive to quail reproduction. So, how do these areas continue to support quail?

Often the answer is due to high levels of immigration from surrounding areas. Up to 25% of quail in a population disperse each year. This dispersal is important for quail to colonize new areas and to ensure good gene flow between populations. So, assuming an area is surrounded by good quail habitat, high harvest may be possible. However, as habitat becomes fragmented, harvest becomes more problematic and the risk of local population loss increases. Areas in eastern Oklahoma, where bobwhite habitat is more uncommon and scattered, are especially at risk of additive harvest. However, even some areas in western Oklahoma that are isolated and surrounded by non-habitat may experience additive harvest.

Additionally, not only does it matter how many quail are harvested from an area, but it matters when. Data from western Oklahoma indicates that only about 20% of the quail alive in November are likely to survive until April. Whereas, nearly 80% of the quail alive in February will likely survive until April. Thus, harvesting quail late in the hunting season, closer to the breeding season, has a much higher likelihood of being additive harvest. Not only is harvest more additive as the season progresses, but birds are typically at the their lowest body condition during this time so the indirect effects of hunting on birds not harvested may be an issue. Flushing and chasing quail is energetically expensive and it increases the risk of quail being captured by predators. Most hunters have probably witnessed an opportunistic Cooper's hawk capture a flushed quail while hunting.

So, what does this mean for a quail hunter? First, hunters should recognize that harvest can, in some situations, be high enough to cause next year's fall population to be lower. In extreme cases, additive harvest may cause local quail populations to disappear. Areas that have small amounts of quail habitat, low quail numbers, and are surrounded by non-habitat are at a much greater risk of overharvest. However, harvesting birds earlier in the season is less of a concern of being additive. None of this implies that we should not hunt quail, but it does suggest that hunters should consider landscape context, quail population size, connectivity to other quail habitat, and timing of harvest and hunting. It also suggests that we need to manage for more and larger areas of quail habitat that are more resilient to hunting pressure, predation, and weather variation.

Large areas of quail habitat can support not only more quail, but also more quail harvest.

Nest Site Selection in Scaled Quail

By: Kiera Kauffman, MS Graduate Student

Extreme egg temperatures can alter the rate of development in quail, resulting in developmental abnormalities or death of the embryos. Although quail can warm or cool the eggs through incubation, that strategy takes a lot of energy when air temperatures are extreme. To incubate eggs more effectively, quail can choose to build their nests in locations that buffer the eggs from fluctuating air temperatures. To evaluate whether nesting scaled quail use temperature to choose nest sites, we attached radio transmitters to scaled quail in southeastern New Mexico. These quail inhabit a semiarid shrubland that experiences extreme temperatures during the summer months when scaled quail are nesting.

We evaluated nest site selection of scaled quail at two scales: the area surrounding the nest and the nest bowl itself. We found that scaled quail chose to nest within areas that were covered with grass and litter and that had taller vegetation than what was generally available on the landscape. Within those grassy areas, scaled quail placed their nest bowls in spots that had even greater cover of grass and litter, and taller vegetation. This suggests that grass and litter are a critical component of scaled quail nesting cover. Furthermore, nest bowls had more shrub cover and greater overhead concealment. This cover may help to hide the nest from predators such as raptors or ravens. However, it may also provide shade for the nest when air temperatures are extreme. During the hottest part of the day, scaled quail nests remained several degrees cooler than locations only a few feet away. Despite clear preferences for nest sites, we did not find any evidence that those preferences affected nest survival during the 2 years of the study.

Scaled quail appear to make nest site selection choices at multiple spatial scales, and these choices result in nest bowls that moderate temperature compared to the surrounding area. When a hen is deciding where to place a nest bowl, her decision may be constrained not only by the availability of appropriate cover, but also by the arrangement of other critical features around the nest. As cover was found to be important to nest site selection, managers should carefully consider how much residual cover they are leaving for quail after grazing and/or brush control. While nest site conditions did not affect nest success during our 2 year study, it may affect survival in some years.

Relatively little is known about the nesting ecology of scaled quail, and our research in New Mexico provides a more holistic understanding of what constitutes nesting cover for scaled quail. This perspective is critical for effective habitat management.

Radio transmitters allowed us to monitor nesting activity of scaled quail. Photo courtesy of Joshua Kuhn.

Influence of Farming Practices on Invertebrates and Waterbirds

By: Ben Singleton, MS Graduate Student

Aquatic invertebrates are a vital source of energy and nutrients for waterfowl and other waterbirds, especially during migration. Because many waterbirds rely on Sequoyah National Wildlife Refuge and the food resources it provides, it is important to assess the influence of current land use practices on aquatic invertebrates in refuge wetlands. Farming has been a large part of land use within the refuge since it was established. Because farming practices can impact wetlands through agrichemical contamination and increased sedimentation, it is possible that the wetland macroinvertebrate community may also be affected by these practices. To determine the potential impacts of farming practices on wetlands, we have initiated a cooperative study with the U.S. Fish and Wildlife Service. This study will evaluate the effects of land management at the refuge on adjacent wetland invertebrate communities and to identify relationships between land management, food availability, and waterbird use of wetland units.

To determine waterbird use and habitat conditions at the refuge, we will conduct surveys twice monthly. To assess the impacts of farming practices on invertebrates, we will sample the water and soil in each wetland throughout the migration season to obtain invertebrate abundance, biomass, and diversity estimates within each wetland. We will use these data to examine the relationship between food availability and waterbird use of the wetlands. This research should assist managers in gaining a better understanding of the habitat and resources being provided by managed wetland units and allow them to be able to make better informed wetland management decisions for migrating and wintering waterbird populations.

Sequoyah National Wildlife Refuge provides important food resources for many migrating waterfowl.

Wildlife Chairs' 2019 Research and Extension Highlights

2019 Research Publications

Cady, SM, TJ O'Connell, SR Loss, NE Jaffe, and CA Davis. 2019. Species-specific and temporal scale-dependent responses of birds to drought. Global Change Biology 25: DOI: 10.1111/gcb.14668.

Carroll, MJ, RD Elmore, CA Davis, and SD Fuhlendorf. 2019. Propagation of shinnery oak as a framework for restoration. Rangeland Ecology and Management 72:632-634.

Duquette, CA, CA Davis, SD Fuhlendorf, and RD Elmore. 2019. Northern bobwhite space use minimally affected by oil and gas development.. Rangeland Ecology and Management 72:484-491.

Duquette, CA, CA Davis, SD Fuhlendorf, and RD Elmore. 2019. Associations between oil and gas wells and arthropod and vegetation communities in the Southern Plains. Rangeland Ecology and Management 72:749-756.

Fuhlendorf, SD, 2019. Saving Graze: Forage or fuel and other paradoxes of conservation. Natural History 127:14-16.

Fynn RWS, DJ Augustine, SD Fuhlendorf. 2019. Managing Browsing and Grazing Ungulates. In: Gordon I, Prins H. (eds) The Ecology of Browsing and Grazing II. Ecological Studies (Analysis and Synthesis), vol 239. Springer, Cham

Gallaway, S, CA Davis, D Dvorett, and B Tramell. 2019. Validation of the Oklahoma Rapid Assessment Method (OKRAM) in depressional wetlands using EPA's three-tiered framework. Wetlands 39: https://doi.org/10.1007/s13157-019-01238-8.

Gallaway, S, CA Davis, D Dvorett, and B Tramell. 2019. Evaluating the effectiveness of floristic quality assessment as a tool for determining the condition of depressional wetlands across ecoregions. Ecological Indicators 102:488-496.

Joshi, O, NC Poudyal, JR Weir, SD Fuhlendorf, TO Ochuodho. 2019. Determinants of perceived risk and liability concerns associate with prescribed burning in the United States. Journal of Environmental Management 230:379-385.

Londe, DW, SD Fuhlendorf, RD Elmore, CA Davis, and J Rutledge. 2019. Female greater prairie-chicken response to energy development and rangeland management. Ecosphere 10:e02982. 10.1002/ecs2.2982.

Londe, DW, SD Fuhlendorf, RD Elmore, and CA Davis. 2019. Landscape heterogeneity influences the response of grassland birds to energy development. Wildlife Biology doi: 10.2981/wlb.00523.

Rakowski, AE, RD Elmore, CA Davis, and SD Fuhlendorf. 2019. Thermal refuge affects space use and movement of a large-bodied galliform. Journal of Thermal Biology 80:37-44.

Starns, HD, SD Fuhlendorf, RD Elmore, D Twidwell, ET Thacker, TJ Hovick, and B Luttbeg. 2019. Recoupling fire and grazing reduces wildland fuel loads on rangelands. Ecosphere 10: e02578. 10.1002/ecs2.2578.

Tanner, EP, JP Orange, CA Davis, RD Elmore, and SD Fuhlendorf. 2019. Behavioral modifications lead to disparate demographic consequences in two sympatric species. Ecology and Evolution DOI: 10.1002/ece3.5472.

Tanner, AM, EP Tanner, M Papes, SD Fuhlendorf, RD Elmore, and CA Davis 2019. Using aerial surveys and citizen science to create species distribution models for an imperiled grouse. Biodiversity and Conservation DOI 10.1007/s10531-019-01921-6.

Twidwell, D, CL Wonkka, H Wang, WE Grant, CR Allen, SD Fuhlendorf, AS Garmestani, DG Angeler, CA Taylor Jr, UP Kreuter, WE Rogers. 2019. Coerced resilience in fire management. Journal of Environmental Management. 240:368-373.

Wonkka,CL, D Twidwell, BW Allred, CH Bielski, VM Donovan, CP Roberts, SD Fuhlendorf. 2019. Rangeland vulnerability to state transition under global climate change. Climatic Change 153:59-78.

2019 Extension Publications

Elmore, R.D., Hickman, K.H., L. Goodman. 2019. The invasive callery pear. Oklahoma Cooperative Extension Service. E-469.

Fogarty, D.T., S.R. Loss, and R.D. Elmore. 2019. Research Summary: The science of scent and implications for northern bobwhite. Oklahoma Cooperative Extension Service P-1057.

Kauffman, K., D. Elmore, and L. Goodman. 2019. Minimizing impacts to wildlife from livestock infrastructure. NREM 9028.

2019 Extension Activity Highlights

16 presentations at professional meetings

14 presentations at landowner events

12 field days and workshops

Created a new app for recording brood observations

2019 Awards and Honors

The Oklahoma Chapter of The Wildlife Society presented the 'Publication Award for Outstanding Peer-reviewed Publication' to *Hovick, TJ, DA McGranahan, RD Elmore, JR. Weir, and SD Fuhlendorf. 2017. Pyric-carnivory: raptor use of prescribed fires. Ecology and Evolution DOI: 10.1002/ece3.3401.*

Oklahoma State University Wildlife Chairs

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Dwayne Elmore holds the Bollenbach Endowed Chair in Wildlife Management with a focus on extension and research. He can be contacted at dwayne.elmore@okstate.edu or 405-744-9636.

Sam Fuhlendorf is a Regents Professor and holds the Groendyke Endowed Chair in Wildlife Conservation. He can be contacted at sam.fuhlendorf@okstate.edu or 405-744-9646.