Mule Deer A Panhandle Paradox

It's generally thought that mule deer cover lots of country. Among the information discovered in Panhandle mule deer research is that deer in the Texas Panhandle travel 2 miles or less to get to cropland feed or water.

A PANHANDLE PARADOX

A groundbreaking study is changing the way we think about mule deer in the Texas Panhandle

Article by MATT WYATT

he Panhandle is a truly unique part of Texas. And it's a truly unique place for mule deer. Across the species' range from Mexico to Canada, few areas holding healthy mule deer populations resemble this piece of the Lone Star State.

"Mule deer are really a western, Rocky Mountain species. But at this eastern extent of their range into the Great Plains, there's really only a handful of areas that they coincide with dense agriculture," said Dr. Levi Heffelfinger, an assistant professor of research for the Caesar Kleberg Wildlife Research Institute (CKWRI) who led the study.

Heffelfinger said there is a great deal known about mule deer, generally speaking, thanks to studies in other parts of the country, including migration studies out of Wyoming and fawning studies in Utah.

"But we really don't know much about the species, how they move, how their populations perform in areas that are densely agricultural," he said.



Levi Heffelfinger, biologist with the Caesar Kleberg Wildlife Research Institute, released a mule deer buck that was captured and tagged in the Texas Panhandle. The research is a three-institution effort to gain more knowledge about mule deer in Texas.



Like much of the Lone Star State, the Texas Panhandle has its own set of environmental factors that wildlife must endure.

Then came a collaboration between three of Texas' most prominent wildlife research institutions—CKWRI at Texas A&M-Kingsville, Borderlands Research Institute (BRI) at Sul Ross State University, and Texas Tech's Department of Natural Resources Management—which cooperated on a comprehensive Panhandle mule deer project, the first of its kind, to take a closer look at one of the least-studied species in the state.

This study sought to answer questions exclusive to this ag-dominated landscape, questions first brought to Texas Parks and Wildlife Department biologists by local farmers.

During certain times of year, some Panhandle farmers would see dozens, sometimes hundreds of mule deer congregated on their cropland. Landowners and biologists alike were curious about how far these deer were traveling to these fields. Where were they coming from? How much time were they spending on these fields? Does this relationship with agriculture affect hunting? Does it impact TPWD's annual population survey?

These questions and others like them sparked the study. Some of the findings defy traditional mule deer wisdom.

THE FINDINGS

From 2015-19, Heffelfinger and his fellow researchers collared and tracked 146 mule deer across four sites with different, distinct landscapes in the Panhandle. Many of the deer provided GPS data for two years.

The first study site in the Western Rolling Plains had 51 deer collared. It covered portions of Hall and Motley counties and consisted of a mixed landscaped with a relatively even balance of agriculture and rangeland.

The second site was situated along the Canadian River Breaks near Stinnett and had much less agriculture than the other sites. The site had 45 collared deer.

The Southwest Panhandle had two sites, one in Lamb County and the other split between Yoakum and Cochran counties. The two sites had 25 collared deer each.

After sifting through the years of movement data from the sites, an intriguing paradox was discovered—although agriculture provides a significant benefit to mule deer, they barely use it.

"Out of those 146, only about half ever used agriculture at any time," Heffelfinger said.

Meanwhile, the other half of mule deer that did use agriculture (usually early-stage winter wheat or alfalfa in the late winter months) utilized it less than 20 percent of the time. Heffelfinger said they're typically foraging for an hour or so then moving into rangeland.

And mule deer are not going far out of their way to access cropland when they do use it.

"If a deer happens to live somewhere where it's more than 2 miles from agriculture, you can almost put your money on it that it will never use agriculture," Heffelfinger said. "They're not doing these long-distance movements... if it's nearby in the area, they'll use it and they'll incorporate it into their foraging. But if it's far away, they're not going to exert that energy to go to that source."

The discovery that mule deer won't travel more than 2 miles to agriculture defies the stereotype of the species, often perceived as big movers. Think Rocky Mountains and massive migrations. In the Texas Panhandle, it's just not the case.

The study also established a threshold for the density of agriculture a mule deer will seemingly tolerate. Researchers saw that once landscapes reached 20 percent agriculture, mule deer began using it less. Once landscapes became 40 percent agriculture or more, deer stop using it altogether.

"It becomes too much of a good thing," Heffelfinger said. "It's beneficial to them in some ways during certain times of the year, but if too much of their home range is just wide-open agriculture, it replaces other important aspects of their life, like hiding cover from predators or thermal cover from the hot summers or water sources."

Deer that did use agriculture gained significant benefits. Does that used agriculture were more likely to successfully produce offspring. Deer that used agriculture had better body condition and more rump fat.



Mule deer in the Texas Panhandle are crop-oriented feeders, especially winter wheat. Or are they? Although agriculture provides a significant benefit to mule deer, they barely use it, research found.

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Mule deer in the Texas Panhandle use agricultural crops such as winter wheat to their advantage. But deer that exist on native vegetation didn't suffer, according to research on mule deer in the top of Texas.

Some exceedingly so.

The heaviest buck recorded on the project was 317 pounds. Researchers used an ultrasound to determine he had 2.5 inches of rump fat.

"We even had to get an extra leather strap to bolt onto the collar just to fit it around his neck. He was absolutely giant," Heffelfinger said, adding the massive buck tried to charge the helicopter during his capture.

The 317-pounder is on the extreme end of the spectrum when it comes to mule deer size in the Panhandle. Heffelfinger's explanation? Possibly laziness.

"There's some of them that really seem to—and I can't prove this—but I think they just get a little lazy. They just camp out in alfalfa fields instead of foraging for native food sources," Heffelfinger said.

"There's some of those bucks that can really get to some astounding size, and you really just don't see that in the wild populations like up in the Northwest, where they have to go through harsh winters and dry summers, whereas some of these deer in the Panhandle have that consistent food source that they can get lazy and camp out in."

The access to agriculture is an advantage for Panhandle mule deer, but the deer not using ag aren't suffering. It's a mosaic of habitat needed for mule deer to thrive: shrublands, grasslands, agriculture, etc.

"If deer didn't use agriculture, they really didn't have poor body condition or poor body size or poor antler size or poor fawn recruitment. It wasn't like the avoidance of agriculture was detrimental to the individual or the population... It's not like croplands are limiting the population like they need it in order to expand. I think it's providing this buffer, this little extra boost for those that do," Heffelfinger said.

"I think part of that nutritional buffer is helping to slowly grow the overall Texas Panhandle mule deer population. It's not exploding, but it's a very slow growth."

The most recent estimate has 71,000 mule deer living in the Panhandle.

MANAGEMENT GAME-CHANGER

This research is a game-changer for the wildlife managers and landowners serving as stewards of this Texas resource.

"We perceived that deer were really, really using ag. Like lots of ag, all the time. And that wasn't the case," TPWD Mule Deer and Pronghorn Program Leader Shawn Gray said.

"Don't get me wrong, there still can be 100 mule deer on a wheat field. That happens. But it's not like every mule deer on the landscape is on that field at the same time."

The study results give TPWD personnel added confidence in their population survey methods and in providing hunting opportunity.

"We were extra conservative in issuing doe permits because we were thinking more of the extreme end of mule deer ranges, like they're probably going 50 miles to ag if they have to, and that was not the case," Gray said.

Deer movement was the study's main focus, but because of the project's breadth and level of expertise involved, many byproducts emerged from the massive volume of data.

For the first time, average home ranges were established for Panhandle mule deer. The average home range for does is about 2,600 acres and the average for bucks is about 9,000 acres. The study site with the largest average home range was the Yoakum-Cochran site, approximately 3,500 acres for does and 11,300 for bucks.

The growth of antler size in bucks peaked between 5.5 and 6.5 years old. The greatest leap in growth was between 1.5 and 2.5 years old. Data collected in the captures was used by TPWD to construct experimental antler restrictions to improve buck age structure and the quality of hunting in the Panhandle. The restrictions prevent mule deer harvest with an outside spread of less than 20 inches, protecting younger deer and shifting hunters' attention to more mature bucks. Those restrictions have recently expanded to a total of 28 counties in the Panhandle and Terrell County in the Trans-Pecos.

"One of the best things that came out of the project was that we took pictures of the bucks each year that we captured them and so we would have three years of photos of those bucks. It was a great tool to show how they progressed in their antler development," said Dana Wright, a TPWD natural resource specialist who assisted with the project.

"Most of our mule deer bucks start out as spikes. So, to see some of these turn into nice 10-point bucks, it was very eyeopening to hunters and landowners alike on some of the changes that the bucks went through. I still get pictures from some of the landowners of some of the tagged bucks. So, I'm still keeping up with them, they're still out there."

Heffelfinger was also able to ascertain peak rut dates by examining significant dips in deer movement in the summer. He used these dips as the peak fawning period as deer stop moving the day after giving birth. By subtracting the mule deer gestation period (203 days), Heffelfinger was able to determine peak rut dates.

In the Western Rolling Plains, the peak fawning date is July 22 and peak rut is December 30. In the Canadian River Breaks, peak fawning is June 25 and peak rut is December 3, nearly a full month before the Western Rolling Plains. In the Southwest Panhandle, peak fawning is July 13 and peak rut is December 21.

CHRONIC WASTING DISEASE

The findings from this study can help wildlife officials with disease management.

Chronic wasting disease is a threat facing North America's cervid populations. Although many of the cases in Texas are from whitetails connected to deer breeding facilities, the disease has been detected in wild deer. More than 60 of the state's approximately 400 cases are from free-ranging mule deer.



While mule deer bucks are what whet a hunter's appetite, it's the does that keep a deer population healthy. Questions from Panhandle farmers were the genesis of a first-of-its-kind study with three universities cooperating—Caesar Kleberg Wildlife Research Institute at Texas A&M-Kingsville, Texas Tech University, and the Borderlands Research Institute at Sul Ross State University.



Fawn survival is crucial to maintaining a robust deer population. One of the spin-offs from the Panhandle mule deer study is to track young deer to determine how they move and whether or not they expand their range.

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The Texas Panhandle is among the most intensely agricultural regions in the country. How does that affect mule deer populations and hunting? The results of a three-institution study discovered some counter-intuitive data.

CWD is a fatal neurological disease that is spread through infectious misfolded proteins called prions. It is like scrapie in sheep, "mad cow disease" in bovine and other transmissible spongiform encephalopathies. According to the Centers for Disease Control and Prevention, symptoms include weight loss, stumbling, lack of coordination, listlessness, drooling, lack of fear of people. There is currently no cure.

CWD has been found in free-ranging deer herds in at least 29 states and is thought to be impossible to eradicate once it becomes established on a landscape.

The disease can spread through bodily fluids like blood, urine or saliva when healthy deer come into contact with CWD-infected deer, and can also spread through contamination of soil, plants and water. Many of the ways it is transmitted are associated with deer movement. Because of this, a better understanding of how and why deer move is a valuable tool for wildlife managers working to arrest the disease's spread.

The Panhandle study has already been used in the state's efforts to manage CWD. An 8.5-year-old mule deer buck that was showing symptoms of CWD was found to be positive in the Lubbock area last year.

In response, TPWD set up containment and surveillance zones in the area where the infected deer was found. Hunters in the state's CWD zones are required to take their harvest to check stations for testing within 48 hours.

"We actually used some of this information when we delineated our most recent CWD zone in the Lubbock area. That's why those zones are pretty small in comparison to the Dalhart zone, because it's extensively ag production around that area," Gray said. The study's finding that mule deer don't use landscapes with more than 40 percent agriculture resulted in TPWD constructing a more consolidated, biologically based CWD zone in Lubbock County.

This disease management application is another unintended byproduct to emerge from the depth of the Panhandle study.

"We didn't go into this thinking about chronic wasting disease. But as we were getting movement data and started to see where animals were congregating, it's like 'oh wow, this is going to be really important for figuring out size of surveillance zones, planning sampling schemes and trying to project where CWD could be going next," CKWRI Executive Director Dr. David Hewitt said.

WHAT'S NEXT

CWD risk in relation to deer movement will be further examined as part of another five-year study on elk, mule deer and whitetails in the Panhandle. The new study will feature the same universities that produced the mule deer project, plus Texas A&M-College Station.

The Panhandle study led by Heffelfinger is a launchpad for future projects like the upcoming CWD study, baseline research that provides a benchmark for the many questions that surround this species in Texas.

"Since we started this project, we just got more questions that we want answered," Wright said.

Among them is fawn dispersal, a topic that Heffelfinger is delving deeper into in the wake of some of his findings about mule deer movement. A pilot study was spawned from Heffelfinger's curiosity of one buck fawn that was GPS collared at the Yoakum-Cochran site near the end of the Panhandle project.

This young buck wandered 43 miles northwest into New Mexico.

"One day he took off," Heffelfinger said. Then he went "missing" when his collar failed. Until a farmer sent a photo of the collared buck in one of his fields to New Mexico Department of Game and Fish, which relayed it to Heffelfinger.

A year and a half later, Heffelfinger received another photo. This time of a buck a young hunter harvested as his first



High fences, for the most part, are not a prominent feature on Texas Panhandle ranches.

deer. It was the same buck, this time 2.5 years old and 30 miles east back in Texas.

Fascinated by these long expeditions, Heffelfinger has collared 30 fawns in the Canadian River Breaks to further explore these movements.

The study is still in a preliminary phase, but Heffelfinger and his colleagues have found that a significant portion of mule deer less than a year old are making these long journeys. It isn't just the males roaming to establish a new home range, which is common in many other juvenile mammals. Heffelfinger collared two does that made 80-mile roundtrips.

"Lo and behold, about 20 percent of our sampled population are doing these extraordinary excursions," Heffelfinger said.

Heffelfinger wants to take a closer look at this phenomenon in the coming years. The implications for mule deer management and understanding abound.

And it is just a small piece of what has sprouted from this groundbreaking study on mule deer in the Texas Panhandle.

THE COLLABORATION

Knowledge will continue to be built from the Panhandle study for years to come, thanks to the pooled resources of CKWRI, BRI, Texas Tech, TPWD, Boone & Crockett Club and the Mule Deer Foundation. The academic cooperation of three universities on a project of this magnitude is particularly intriguing. Not to mention rare. It could also be the trend going forward.

"I think you'll see that across the natural resource and wildlife conservation fields, is that you really can't do things in a silo anymore. You can't do things solo. I think everybody is learning that collaboration is really key to any good conservation work, especially when you're talking about landscape-level projects," said Dr. Louis Harveson, founder and director of BRI.

The expertise and resources that can be leveraged in these big projects is unparalleled when multiple universities and organizations assemble for the benefit of the resource.

"As we get away from one-off, master's student-type research and start trying to tackle these problems in a bigger, more comprehensive way, these research coalitions and big collaborative projects are going to have real value," Hewitt said.

The real-world application of these types of studies benefit not only wildlife managers, landowners, and hunters, but all Texans who care about wildlife, regardless of which species is studied next.

"This new collaborative model really is the future of landscape-scale research in the state of Texas and probably the country. I think it serves as a great model for the rest of the country," Harveson said.



Texas Deer Management Permit

Genetics, Environment, and Opportunity

Article by JOSEPH HEDIGER, COLE ANDERSON, RANDY DEYOUNG, and MICHAEL CHERRY Photos by RANDY DEYOUNG



Is this buck just old or is he genetically inferior? Or maybe his antler growth was affected by something else? Drought, maybe? Environmental factors play a major role in genetic expression.

The quest for healthier, heavier, and larger antlered deer dates back at least to medieval times when large antlers were exchanged as gifts between royal families as a token of affection emblematic of the quality of a royal's land.

The deer during this period were much larger than contemporary deer in Europe. Franz Vogt, a German chemist, recognized this discrepancy and during the early part of the 20th century sought to produce mature male deer with body and antler sizes that surpassed the record trophies preserved in the German Mortizburg collection.

His approach was novel but straight forward: provide exceptional nutrition that meets metabolic requirements in a relatively low-risk environment. His results were astounding.

His deer surpassed the antler size and body mass of almost every deer harvested in Europe for the past several centuries, although his deer did not beat the record deer in the German Mortizburg collection. Vogt's research was cut short due to World War II, thus preventing his third-generation deer from reaching maximum potential.

In Texas, a management method that has the potential to produce a "Vogt effect" is a Deer Management Permit (DMP). This permit allows managers of high-fenced properties to contain wild

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white-tailed deer within a defined enclosure on their property for the purpose of natural breeding.

The motivation behind the DMP program is rooted in managers seeking more control over which deer reproduce and which sire's fawns survive on their property. This desire to manipulate which bucks reproduce within a population increased after scientific study and empirical field data revealed that dominant bucks do not monopolize breeding opportunities in the wild as people once widely believed.

Fawn-rearing success increases with experience and age; therefore, selecting a mature female would be prudent. Body size and antler characteristics are the major determinants for selecting a particular mature male. Coincidently, these attributes are highly heritable.

Although selection was the primary motivation behind the development of DMP, that alone would not be sufficient to reproduce the "Vogt effect." Remember, Vogt designed his experiment to provide his deer a relatively risk-free environment through abundant nutrition and the absence of external stressors such as predators and natural fluctuations in food supply.

The relative importance of genetics and environment to the success of DMP programs is unknown and addressing this open and important question could lead to considerable improvements in deer management beyond DMP programs. Generations of Vogt's deer were born, raised, and reproduced in this highly favorable environment. This resulted in a "silver spoon effect," a common effect among species when individuals born into favorable conditions have an inherent advantage over those born into less favorable conditions.

The mechanism behind the "silver spoon effect" is found at the genetic code level. Chromosomes containing all of an animal's genetic material and sequencing reside with a cell. In response to environmental triggers, a cascade of events occurs within the cell, facilitating adaptations to the chromosomes.

The result is a change in phenotypic expression without changing the genetic sequence, a process termed "epigenetics." In ungulates, conditions experienced during the year of birth and those of their grandmothers, two generations prior, influence adult body size.

The generational effect witnessed with epigenetics can also be described as transgenerational plasticity (TGP). TGP occurs when the environment encountered by one generation alters the phenotypes of subsequent generations. It is an adaptive advantage of an organism to prepare future offspring for the environment they will be exposed to throughout their life.

Unlike Vogt's experiment, DMP-raised individuals are released from their enclosure into an environment very different from the one where they received their fetal programming. This novel environment requires them to search for food, compete with rivals, and avoid predators to survive.

A similar scenario is seen with species reintroductions. For instance, animals that are born in captivity and released into the wild are often less likely to survive than their wild counterparts. This mismatch in fetal programming and environment can result in maladapted offspring. For example, in humans, grandchildren



of individuals exposed to famine in-utero were more likely to be obese, thus predisposing them to additional comorbidities.

By understanding the ecological drivers within a Deer Management Permit enclosure, managers have the potential to drastically improve antler phenotypes of white-tailed deer. Such results were demonstrated by Franz Vogt. However, the longterm implications for such a management strategy are unknown.

Based on species reintroduction studies, it is possible that DMP-raised deer may have more desirable antlers but are less likely to survive long-term. Clearly, research in this area is needed to appropriately guide management decisions pertaining to DMP.

Across much of Texas, fawns born during the summer of 2022 experienced poor conditions during gestation and lactation caused by extreme drought. While some of these deer will undoubtedly be exceptional specimens when harvested as mature bucks, it may be a smaller proportion when compared to cohorts born in better years.

A practical extension, albeit not well grounded in research, would be to heavily harvest this cohort, thus removing the "rusty spoon" from the population. However, drought, and poor conditions more broadly often also result in numeric effects where fewer fawns survive, which could result in the remaining fawns having greater per capita resource availability.

This could occur if a doe lost one fawn from a set of twins, releasing the survivor from competition for nursing opportunities. Thus, the "rusty spoon" effect could be counteracted by the numeric effect of the drought. Researchers still have much to unravel regarding interactions between epigenetics, cohort effects, and density-dependence, but these lines of inquiry may someday not only replicate the "Vogt effect" but also reveal the mechanisms driving the process.

For additional information about the laws and regulations of Deer Management Permits, contact Texas Parks and Wildlife or visit texreg.sos.state.tx.us.