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Can We Count Deer Using Drones?

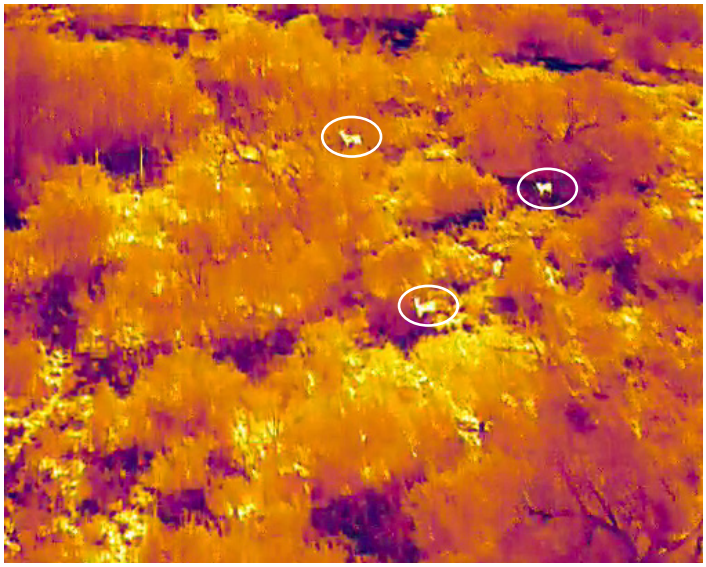
by Aaron Foley, Jesse Exum, and Randy DeYoung

White-tailed deer are often managed for recreational harvest. Deer managers need a way to estimate the number of deer to track population size relative to management goals. Methods for counting deer include spotlight, helicopter, and trail camera surveys. All are useful, but each method has its own strengths and weaknesses. Recently, unmanned aircraft systems, or drones, have become widely available. As the capabilities of drones continue to grow, so does the interest in use of drones for wildlife surveys.

To evaluate a new survey method, one needs to understand what percent of the population is counted, how much counts vary in repeated surveys, and how the counts compare with other survey methods. Jesse Exum took on the challenge of developing drone survey methods and evaluating their effectiveness as part of her graduate research at CKWRI. Jesse flew repeated drone surveys for deer on two South Texas properties (250 acres and 1,000 acres).

One of the first insights was that drone surveys were much better when done with a thermal video camera, which detects animals by the difference between their body heat and the surrounding vegetation. The regular video camera did a poor job of detecting deer in part because deer did not react to the drone. During helicopter surveys, most deer run away and it is easier to see a moving animal than a stationary one.

The next step was to determine what percent of deer present were counted during a drone survey. Wildlife surveys rarely count 100% of animals; deer may be obscured by brush. If we know the percent counted and why some deer are not counted, we can use statistical methods to adjust the count to obtain a more accurate estimate of population size. We found that drone surveys counted 56-64% of deer on both properties. We observed more deer closer to the drone flight path and fewer farther away. This tells us that deer visibility becomes obscured by vegetation farther from the flight line. Fortunately, there are statistical methods to account for the missed deer due to this visibility bias.



Thermal video cameras on drones allowed detection of more animals than regular video cameras.

What Do They Eat?

North American Racers eat a large variety of prey items; however, they do not constrict their prey. They pin down their living prey and swallow it whole. (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/northern-black-racer/northern_black_racer.php)

Dr. Aaron Foley is an Assistant Professor of Research; Ms. Jesse Exum was a graduate student; and Dr. Randy DeYoung is a Research Scientist and Professor at CKWRI. This project benefited from contributions from Dr. Humberto Perotto's CKWRI GIS lab in addition to support from the Dallas Safari Club, Mickey Hellickson, and the Sweden Ranch. ~

The next steps were to generate population estimates after accounting for visibility, then determine consistency in repeated counts on the same site. Repeated population estimates ranged from 2.7–4.0 acres/deer on the 250-acre property and 7.4–10.9 acres/deer on the 1,000-acre property. Additionally, our consistent drone-based population estimates suggest one can get a reliable count from a single survey.

The last step was to determine how the drone estimates compared with other survey methods. On the 1,000-acre property, the helicopter, baited trail camera, and drone surveys all resulted in similar population estimates (8.2–8.9 acres/deer). On the 250-acre property, spotlight counts (4.3 acres/deer) and drone surveys (2.7–4.0 acres/deer) were comparable. The finding that drone counts were similar to other survey methods indicates that drones are a good alternative survey method for deer.

Overall, we found that drones are a promising new tool to the deer manager's toolbox. However, additional work is needed to address some of the weaknesses of the drone surveys. We cannot easily tell whether a deer is a buck, doe, or fawn on the thermal footage; it can also be difficult to separate deer and some species of exotics. We also need to understand how visibility changes in different habitat types. Both properties we surveyed were mainly brush; thus, additional investigation is needed for areas that contain grassland or trees. We are already working on several of these issues in follow-up studies and will continue to provide updates. ~

CKWRI News

The Patton Center

Thanks to a generous gift from Bobby and Sherri Patton, the Patton Center for Deer Research (PCDR) has been established. All deer-related research conducted by the CKWRI will be under the banner of the newly created PCDR, which is committed to conducting research relevant to deer in Texas and northern Mexico. The research projects will increase the understanding of deer ecology, and thereby increase the effectiveness of deer management. We are excited for the new opportunities the PCDR will bring to CKWRI scientists and students!

Sam Beasom Conservation Leader Award

Our director, Dave Hewitt, was awarded the TWA Sam Beasom Conservation Leader Award. This award recognizes a member of the professional conservation community that has made outstanding contributions to the conservation of Texas wildlife and shares the philosophies of TWA. Fun Fact: Sam Beasom was the Director of CKWRI from 1984-1995 and our second Director, Dr. Fred Bryant, made the presentation.

Fred Bryant, Dave Hewitt and Tio Kleberg after the presentation of the Sam Beasom award at the TWA convention in San Antonio.

Jeff Hildebrand Fellowship

This new fellowship, honoring Jeff Hildebrand, will support graduate students and strengthen the research being conducted on the relationship between livestock and wildlife at the CKWRI.

Rebecca Trant Endowment

Becky Trant began her career with CKWRI in 1986, making her the Institute's longest serving full-time staff employee. This endowment in her honor will be used to support CKWRI staff needs.

3MT Awards

Two CKWRI graduate students made a clean sweep of the awards given by the East Foundation at their 3MT (Three Minute Thesis) competition. Rebecca Zerlin won the People's Choice award for her presentation on the Effects of Extreme Weather Events on Butterfly Populations, and Forrest Fay took home both the Best Research Proposal award and the Director's Choice award for the Effects of Prescribed Fire on Nearest Neighbor Relationships in Vegetation. Both students are pursuing their Master's Degrees. Congratulations to Rebecca and Forrest!

It's About Time for Spot Tails!

by Scott E. Henke and E. Drake Rangel

It was a warm morning in Central Texas. Although overcast, the temperature was already 88°F at 7:30 a.m. We 'herpers' (i.e., people who like to study reptiles, called herpetologists) were heading out to locate spot-tailed earless lizards, or STEL's as we began calling them because spot-tailed earless lizard is a mouthful. We left at sunrise in our pick-up truck equipped with eagerness and determination to make our trip a productive one. Our plan was simple enough: road cruise until we found STEL. Road cruising is a very standard method in the reptile world. You basically drive slowly down country roads and wait for reptiles to come to the road's exposed surface to bask in the morning sun. Reptiles, being cold-blooded, regulate their body temperature by behavioral means such as basking in the sun if too cold or finding shady places to hide if too hot. We were confident that we would find STEL because the local residents told us exactly where we could find some. Apparently the locals see STEL often along the sides of cotton and milo fields. As we slowly drove along we saw many reptile species, such as massasaugas, racerunners, fence lizards, even an occasional Texas horned lizard. However, we weren't finding any STEL!

Dr. Scott E. Henke is a Research Scientist and Regents Professor at CKWRI. Mr. E. Drake Rangel is a graduate student in the Range and Wildlife Department and CKWRI at TAMUK. ~

Spot-Tailed Earless Lizards can be very hard to find with their impressive camouflage.

Did You Know?

Yaupon holly (*Ilex vomitoria*) is the only plant native to North America that has caffeine in it. (American Botanical Council, www.herbalgram.org, issue 34)

To conduct this study we received a research grant from the Texas Comptroller's Office to determine the detectability of STEL. You see, STEL are being considered as an addition to the federal list of Threatened and Endangered Species by the United States Fish and Wildlife Service. STEL are cousins in the same family as Texas horned lizards, but STEL do not have the horny spikes on their heads or fringed scales down their sides as Texas horned lizards do. Our job was to collect data to determine the ease of detecting STEL. However, our current problem was that we didn't know if we were not seeing STEL because there were none, or if they were just hiding really well.

As the hours passed, we began to worry because we did not want to fail in our assignment and go home as we came – empty-handed. We had been searching for nearly five hours, the temperature was now in the mid-90's F, yet still no STEL to be found. The clouds gave way to the sun and soon the sky was a clear blue afternoon. The sun began to bake on the road. Even the other species we had already observed were becoming less abundant as the temperatures soared. For most folks in the 'herp' world, this would be the time to close down shop for the afternoon, have a siesta, and come back at sunset when most reptiles would return to the roads to get the day's last rays of sunlight or absorb the heat from the road that had baked in the sun all day. All of a sudden, one of the students yelled out they saw a spotted lizard run alongside the road. We quickly stopped our truck and surrounded the area where the student saw the lizard. There it was, hiding at the base of a sunflower plant, our first STEL. After a successful capture, we loaded back into our truck to continue our quest for more STEL.

It was at this point that our luck began to change, for we began finding one after another. Our trip to Central Texas had become a success and we returned

By The Numbers

12 The average number of eggs in an Attwater's Prairie Chicken (*Tympanuchus cupido attwateri*) nest (https://tpwd.texas.gov/huntwild/wild/species/apc/).

to Kingsville with enough STEL to conduct a series of behavioral experiments using terrariums, heat lamps, UV lights, artificial lights, and food sources on our captured quarry. We determined that STEL bury just under the soil surface and react to the intensity of UV light. STEL have a 'third eye' or parietal eye that is located on top of their head, which they use as a sensor to detect light intensity. As UV light intensifies, they emerge from their underground hiding places and become active. STEL appear to emerge at the time of the greatest UV light intensity, which often is when other reptiles seek hiding cover. We learned to check when the UV index would be at its peak for the day; that would be the best time to detect STEL.

As a biologist wanting to find animals, one needs to know where to look. But for STEL, as we found out, you need to know not only *where* to look for them, but *when* to look for them. To detect STEL, it's all about time, and a lot of sunblock. ~

A Plateau Spot-Tailed Earless Lizard (STEL) surveys its surroundings.

Scan this QR code to listen to our podcast, A Talk on the Wild Side, on Spotify.

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