The Ultimate Doe Hunt: Buck Movement Patterns during the Rut

by Aaron Foley, Randy DeYoung and David Hewitt

In 2005, we began a 5-year project to study the breeding behavior of male white-tailed deer in South Texas. Our main questions were: 1) do bucks have a strategy to locate receptive does during the rut?, 2) do mature bucks, which do most of the breeding, have different movement patterns than young bucks?, and 3) does body condition influence buck movement patterns? Each autumn, we captured 16-30 bucks and fitted the bucks with a collar containing a mini-GPS unit. The GPS collars recorded locations every 15-20 minutes from early November to mid-February, when the collars detached and were recovered for data analysis. During the study period, we monitored 106 bucks aged 1.5 to 8+ years old. We had over 8,000 locations for each individual buck. After months of intensive analysis of buck movement paths, we finally have results!

Most does are bred during a 2 to 4 week period. Because each doe is receptive for only 1-2 days, bucks have a short window of time to locate estrous females. The time constraint suggests that it would be advantageous for bucks to have a strategy to locate receptive does, vs. wandering randomly through the habitat. For instance, bucks may re-visit doe groups to assess estrous status. However, white-tailed deer are not easily observed and conventional radio-telemetry is not suitable for detection of fine-scale movements. Therefore, the breeding strategies used by bucks are unknown.

The GPS data revealed that all bucks increased their activity during rut. Most bucks remained within their pre-rut home range, but had 2 or more focal points for activity. The focal points were 60-140 acres in size, and bucks spent most of their time moving between the focal points during the rut. During peak rut, most bucks re-visited focal points frequently, and over 50% of bucks visited focal points every 20 to 28 hours (Figures 1 and 2). Because does are in estrus for about 24 hours, our data suggest that bucks

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Figure 1. Movement path of a mature buck during peak rut. Note the two focal points where many locations are clustered, movements between them, and the single excursion outside of the buck's home range.

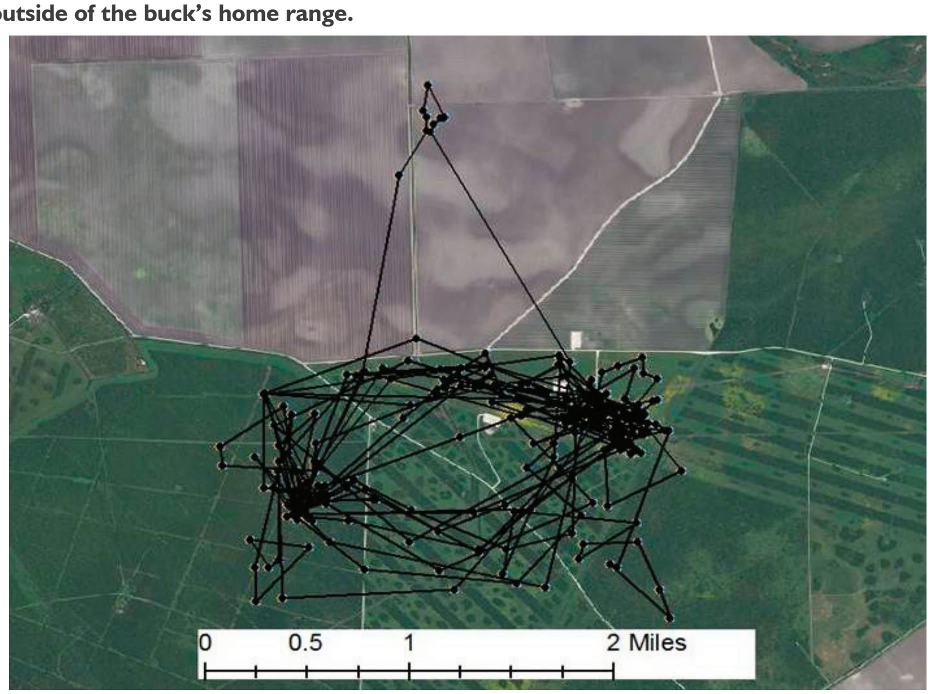
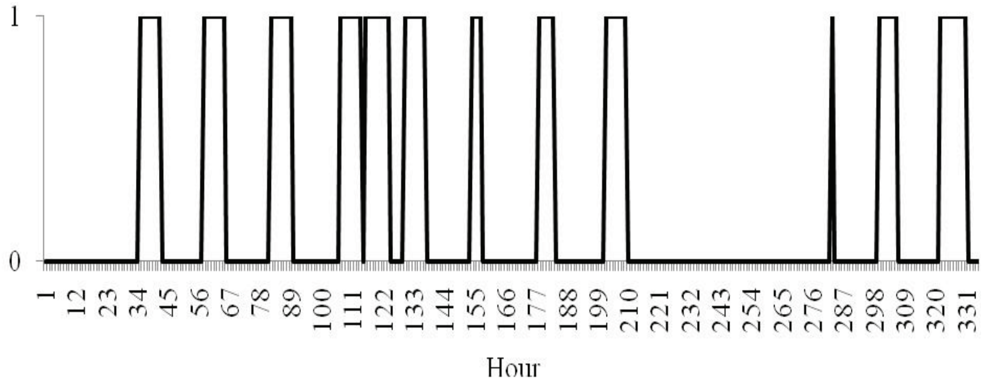


Figure 2. Periodicity of visits to a focal point by mature buck during December; the value of "1" indicates the buck is within the focal point, whereas a value of "0" indicates the buck is outside the focal point. The buck re-visited the focal point at intervals of 23, 24, 25, 9, 15, 24, 24, 23, 81, 17, and 22 hours.



make efficient use of their time by spacing their visits to assess female receptiveness. Interestingly, the focal points of many individual bucks overlapped with other bucks, suggesting many bucks visited the same doe groups during peak rut.

Mature bucks sire most fawns, but 1 and 2 year-old bucks obtain a few breeding opportunities and may collectively sire 30% of fawns. Differences in mating success among young and mature bucks may be due to differences in movement patterns. We analyzed buck movement paths for insights into the search behavior of young and mature bucks. Movement patterns were variable within and among age classes but we detected some trends. During peak rut, yearlings moved 3.5 miles/day whereas 2 year-old males moved 5 miles each day. Mature males had intermediate movement rates at 4.75 miles/day. Yearling bucks not only moved less, but did not re-visit multiple focal points. Two year-olds exhibited movement paths similar to a "Levy flight," a theoretical model of efficient search strategy when resources are widely dispersed and the location is unknown. Mature bucks, however, displayed movement paths that suggested use of spatial memory, as if the bucks knew where to find does, perhaps based on experience or pre-rut reconnaissance.

Yearlings may have exhibited low mating effort because they are subordinate to older bucks and cannot challenge for access to an estrous doe. Because 60% of bucks were aged 3 years or older, 2 year-old bucks may have been forced to search more widely, using movement paths similar to Levy flights, due to social interactions with mature bucks. Alternatively, yearling and 2 year-old bucks may have simply been inexperienced at locating does in estrous. Mature bucks rank higher in the dominance hierarchy, and appear to rely on experience and spatial memory to re-visit focal points.

Lastly, we examined whether body fat reserves influenced movement patterns. One may expect males in poorer body condition to exhibit lower movement rates. Surprisingly, we did not detect any correlations between movement patterns and body fat. There are two ways in which bucks may invest the energy stored in their body fat; they could eat the same amount of food and use body fat to support greater movements. Alternatively, body fat may enable bucks to spend less time foraging and more time searching for, pursuing, and tending females. A simple calculation reveals the cost of increased movements during the rut, based on our data, is much lower than the energy released when a buck loses even a modest 20% of body mass during the rut. This finding suggests that the cost of breeding is mainly reduced time foraging; less time spent foraging means more time is invested in breeding activities.

These data are the first glimpse into breeding strategies used by male white-tailed deer. Yearling bucks, which are physically immature, appeared to be less mobile, perhaps because foraging is more important to them at that age than breeding. Two year-old bucks were more active, and searched more widely relative to mature males, possibly a result of competition for mates. Mature bucks may use fat reserves to spend less time foraging and more time re-visiting areas frequented by does. These different movement patterns may help explain why mature males consistently sire most offspring.

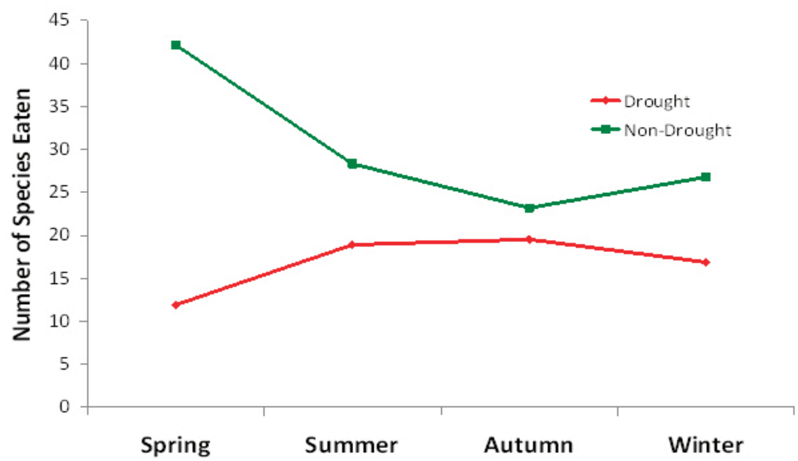
About the Author: Aaron Foley will graduate with his PhD in Wildlife Science from TAMUK in December. He worked collaboratively with M. Hellickson, M. Lockwood, K. Gee, and K. Miller. His study was funded by TPWD, QDMA, and King Ranch.

Surviving and Thriving in South Texas - Deer Diets during Climatic Extremes

by Justin Folks

White-tailed deer are able to adapt to a broad spectrum of environmental conditions, as evidenced by the expanse of their range from central Canada through South America. When asked what are the most difficult conditions a deer must endure, most people would probably refer to the harsh winters of the northern United States and Canada. While heavy snowfalls, low temperatures, and limited food availability during winter certainly make life hard in the North, what about the other extreme?

Figure 1. Average number of plant species eaten by each deer seasonally during wet and dry periods.



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Southern deer experience long, hot summers and unpredictable rainfall. In a semi-arid climate such as South Texas, rainfall is the driving factor behind all ecological processes, and vegetation communities have adopted a "boom and bust" dynamic which compensates for a lack of reliable precipitation. Just as plants have adapted to these rainfall patterns, deer have adapted to changes in forage availability by being able to alter their diets. Data from a recently completed study of deer foraging behavior in South Texas offer a unique perspective into the world of white-tailed deer and their ability to adapt to extreme conditions.

Fellow graduate student Kory Gann and I observed foraging habits of tame does that were permanently released into 200-acre, high-fenced enclosures on the Comanche and Faith Ranches near Carrizo Springs, Texas. We recorded the size and number of bites of each species consumed by each deer. Representative bites of each species were collected, dried, and weighed to determine forage intake. Sampling periods occurred seasonally from summer 2009 through spring 2011.

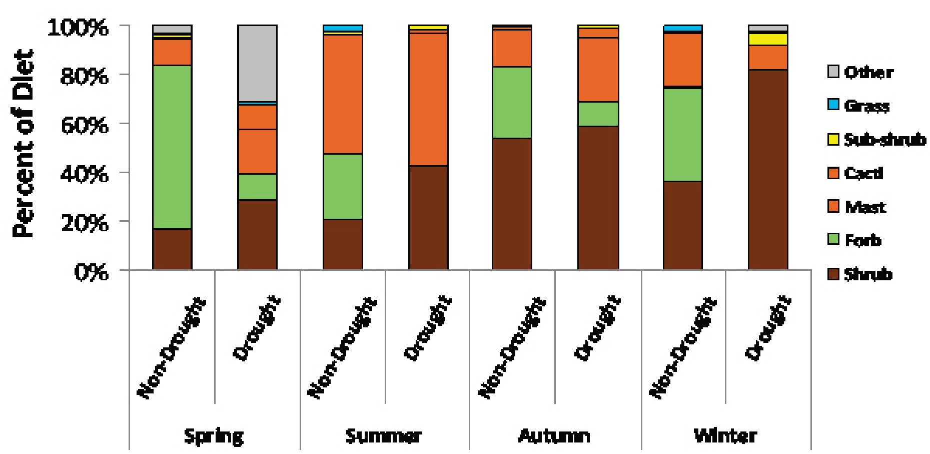
It just so happened that our study included one of the wettest periods recorded in the region, as well as one of the driest. During the 2-year study, each season was represented in both a wet period and a dry period. Thus, we had an unprecedented opportunity to gain insight into how whitetails cope with the dramatic environmental changes experienced regularly in southern Texas.

The first lesson was that deer diets were diverse. Deer ate 137 plant species during our 2-year study, but the average number of species eaten per deer each season varied (Figure 1). Drought obviously had an enormous effect on the number of species consumed because availability of different forage species drastically declined. The greatest number of plant species eaten in any single enclosure came during the exceedingly wet spring of 2010, when all deer combined consumed over 70 species. The lowest total came during the extreme drought in spring 2011, when deer consumed only 11 species. If you haven't read those last two sentences over again in disbelief, that's 70 versus 11 for the same season!

Not only is the number of species consumed influenced by rainfall, but the proportions of forage classes in the diet also change (Figure 2). Deer ate more forbs during wet periods because forbs were available. Deer prefer forbs which are generally more nutritious than shrubs. During drought, when forb availability declined, our deer increased consumption of shrubs. In essence, shrubs act as "maintenance" forage during dry times, but are often not of sufficient quality to support reproduction or high rates of body growth. An interesting point is that consumption of mast (such as prickly pear fruits and mesquite beans that are high in digestible energy) increased during drought. Many plants produce more mast when stressed, which is a boon to deer during stressful periods.

Spring 2011 was particularly difficult and deer responded by increasing intake of many non-traditional forages. Twenty-five percent of their diet was composed of the forage class "Other."

Figure 2. Composition of deer diets seasonally during wet and dry periods.



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These items included litter (dead shrub leaves eaten from the ground), lichens, old prickly pear flowers, and twigs of twisted acacia parasitized by a fungus. Although not included in our food habits data, during drought we also observed deer eating feces, bones (including a deer skull), and rocks.

If deer were picky eaters or if alternative forages were not available, few deer would survive in South Texas. The diverse vegetation communities of the South Texas Plains provide many foraging choices and ensure that something is always available for deer to eat.

Winter conditions in northern portions of the whitetail's range are rough, but they are part of a predictable seasonal pattern. In contrast, deer in a semi-arid environment such as the western Rio Grande Plains of South Texas must endure extreme climatic variation. Conditions may not only vary considerably from season to season, but seasons may be vastly different from one year to the next.

In good years, forage available to deer is as good as anywhere in the country. But during extended drought, reproduction may be difficult and in some years merely surviving is a challenge. Maintaining a diverse plant community is crucial for deer in semi-arid environments because deer prefer and take advantage of diverse diets when rainfall is abundant, and there will be a greater number of drought-tolerant, "maintenance" species of plants that can keep deer alive during drought.

About the Author: Justin Folks is a graduate student working with Dr. David Hewitt, Dr. Tim Fulbright, Dr. Charles DeYoung, Don Draeger, and Kim Echols. His research was supported by the Comanche Ranch, T. Dan Friedkin, the Faith Ranch, and the Stedman West Foundation.

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