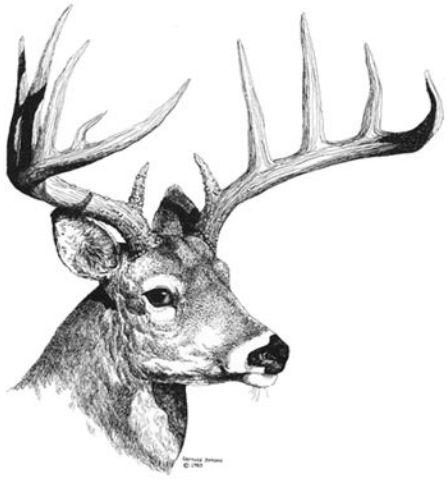

INSIDE DEER RESEARCH

A newsletter for supporters of the deer research program at the Caesar Kleberg Wildlife Research Institute Texas A&M University-Kingsville

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Genetic Insights into Buck Breeding Success

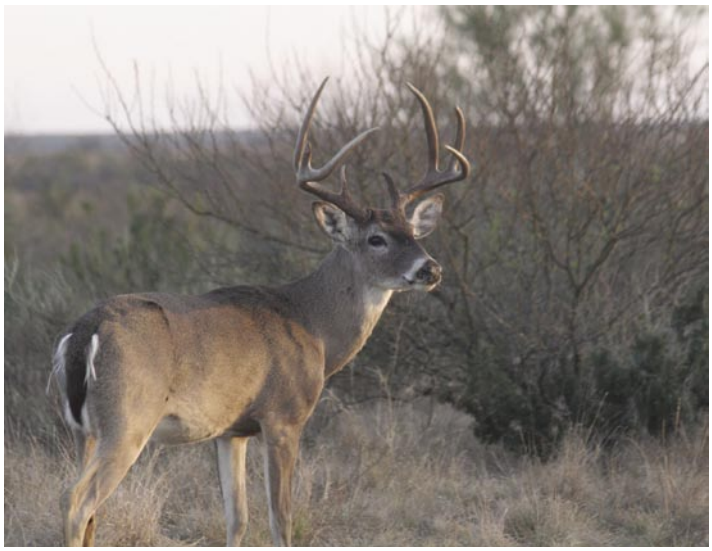
By Randy DeYoung

Which bucks are breeding and how many fawns are they siring? These are 2 questions that managers and biologists alike have pondered for decades. Why? Because the answers to these questions have important ramifications for harvest management. On one hand, if breeding is predictable, done by a small number of easily identified individuals, then certain management strategies, such as selective harvest, may be highly feasible for improving antler quality in managed populations. For instance, a manager might protect large-antlered bucks and cull bucks with poor antler quality and quickly (within 10–20 years) produce bigger deer. On the other hand, if one harvested all large-antlered bucks, then the population might be "high-graded," resulting in decreased antler quality.

For many years, no one knew exactly which bucks were breeding. As many hunters know, it can be very difficult to locate some mature bucks, much less observe them continuously throughout the breeding season. However, large-antlered, mature bucks were often seen in the company of does during the rut and it was assumed that these bucks were the most successful breeders. The first detailed scientific studies of behavior in wild deer, painstakingly conducted at Texas' Welder Wildlife Refuge and Michigan's George Reserve during the late 1970s, also found that mature, large-antlered bucks were often seen courting does, lending support to the previous assumptions. In the early 1980s, the first studies of breeding success in a species of deer, the red deer (a close relative of elk), indicated that nearly all breeding was done by mature stags with the largest antlers. Therefore, it seemed a fairly safe assumption that this was also the case with white-tails: mature, large-antlered bucks were doing most of the breeding. This statement was often repeated and eventually became one of the central dogmas of white-tail behavior.

In the 1990s the dogma began to become brittle around the edges. Several researchers, notably from the University of Georgia, began to question the validity of many accepted descriptions of deer behavior. At the same time, several advances in genetic technology were making it easier to use genetic techniques in wildlife populations. For the first time, biologists could explicitly document breeding success. Surprisingly, the genetic data did not always support expectations. In fact, visual observations were often a poor predictor of an individual's breeding success because not all individuals and copulations can be observed. Although these studies caused some to question the conventional wisdom about breeding success in white-tailed deer, there was no hard evidence to overturn long-held beliefs.

In the late 1990s, I joined a team of researchers from Mississippi State University, Texas A&M University, and the Samuel Roberts Noble Foundation. Our main goal was to investigate buck breeding success using genetic techniques, research which formed a major part of my Ph.D. research at Mississippi State. The study involved several different deer populations in 3 states and >4 years of data on buck breeding success (including 11 years on one area) through the cooperation of numerous organizations, including the Welder Wildlife Foundation and King Ranch. The first of its kind in white-tails, the study revealed some surprising and unexpected aspects of buck breeding behavior. Overall, mature bucks (≥3 years old) sire the majority of fawns



© Timothy Fulbright

Bucks with the largest antlers are not necessarily the most successful breeders.

(70%) in populations with reasonable age structure and sex ratios. However, more individual bucks were breeding than anyone thought, including some young bucks (<3 years old). The breeding success of individual bucks was limited, with the most successful buck siring only 6 fawns within a single year. Further, the bucks with the largest antlers were not necessarily the most successful breeders. Some large-antlered bucks sired fawns, some apparently did not. We saw no clear trends in antler or body size that might help managers identify successful bucks.

Why such unexpected results? The answer involves a combination of time, opportunity, and competition. White-tail does live in small groups that are dispersed unevenly in brushy habitat. During the rut, bucks must roam widely to locate individual estrous does and may spend 24 hours or more with a receptive doe, a behavior called "tending." Most does are bred within a 2-week period, during which any one buck can only be in one place at a time. While one buck is tending a doe, other bucks, regardless of their age or antler size, are searching for receptive does. So, a buck doesn't have to be the most dominant in the population to breed, he just needs to be the most dominant buck to find a receptive doe. During peak rut when many bucks are tending does, he may be the only buck to find that particular doe.

How do these findings relate to management? Well, the jury is still out on the long-term effectiveness of some management tools and the behavioral responses of bucks. Hopefully, these questions will be addressed in the future by an ongoing long-term research project conducted by Texas Parks and Wildlife, King Ranch, and the CKWRI. For now, it appears that in some cases, selective harvest strategies aimed at improving population antler size may not be very efficient–harvest may need to be extremely intense to have a noticeable effect within a reasonable amount of time, say 10–20 years. Each manager has a unique set of goals and is restrained by a different set of limitations in terms of resources, habitat, and rainfall. Those unwilling or unable to practice selective harvest at a high level of intensity may be better served by investing in the 2 time-tested pieces of the puzzle: age and nutrition. On the flip side, the wide distribution of breeding probably means that white-tails are more resilient in terms of tolerating harvest pressure without becoming "high-graded," precisely because antler traits are not tied as closely with breeding success.

The more we research deer, the more complicated we find them to be. Yet, each time we are frustrated by the white-tail's lack of cooperation with our wants and desires, we uncover another piece of the puzzle as well as more stimulating questions. In the next edition of *Inside Deer Research*, I will discuss patterns of long-term breeding success.

BUCK MOVEMENTS: Dominant Floaters and Other Theories

By Charles A. DeYoung, Mickey W. Hellickson, and Tyler A. Campbell

Hunter or manager: How far does a buck travel? Deer biologist: It depends! This common exchange about buck movements is not satisfying to the hunter or manager looking for a simple answer. However, buck movement may depend on the animal's age, social status, population density, habitat quality, and the time of year. Additionally, white-tailed deer tend to be individuals, sometimes varying greatly from buck to buck, even within the same age class.

Ben Brown studied buck behavior on the Welder Wildlife Refuge near Sinton, Texas in the early 1970s. He grouped bucks into 4 general categories based on their association with other deer and general amount of movement. Brown's categories were the following:

Naive males – generally male fawns and yearlings that frequently associated with female groups.

Subdominant floaters – young bucks with large home ranges that tended to roam about and join other deer groups on a temporary basis. These bucks are usually socially subordinate to older bucks.

Core animals – mature bucks that range on a regular basis with one or more similar bucks during the summer and pre-rut. These bucks commonly have small home ranges.

Dominant floaters – Large mature bucks that roam widely and are socially dominant over nearly all deer they encounter.

Mickey Hellickson radio-tracked 96 bucks of various ages on the Faith Ranch near Carrizo Springs during 1993–1995. Tyler Campbell analyzed Mickey's data to see if Faith Ranch bucks followed the patterns proposed by Ben Brown. Home ranges of Faith Ranch bucks of different ages did not differ statistically. Young (2 years old), medium (3–4 years), mature (5–6 years), and old (7 or more years) aged bucks had average annual range sizes of 2,277, 1,232, 1,316, and 1,054 acres, respectively. Great variability within each buck class may have obscured some of Brown's categories. For example, Brown observed a very large 3-year old buck to act like a core animal. Thus, there may be "crossover" between social status and age in regard to the buck categories. This would cause the data to be more variable and possibly obscure real differences.

Among animals that were 3 or more years old at capture, there were indications that Faith Ranch bucks with larger body size had larger annual home ranges. However, antler size in these bucks was not correlated with range size. One of the Faith Ranch bucks showed signs of being a dominant floater. A large 5-year old buck had an annual range that was 5,372 acres larger than the average for mature bucks!

The theory that there are a few dominate floaters in deer populations with well developed age structures has interesting implications for hunters. It seems like every year there is a case were a really huge buck turns up in an unexpected location. Sometimes these deer show up on small, low-fenced properties, having never been seen before the day they were harvested. Could these be dominate floaters that have huge home ranges according to Brown's prediction? If so, it means there is always hope for a big buck on a low-fenced property!

Fawns and Food: Fuel for South Texas Deer Management

by David G. Hewitt

There are many possible goals for the management of a deer herd. In South Texas, the most common goal is to produce large antlered bucks. There is much discussion about the role of age, nutrition, and genetics in producing these bucks. There is often little discussion about the role of fawn production in growing large bucks.

Why is fawn production important? There are many reasons. Obviously, in any hunted population, new animals are needed so that the harvest can be sustained. The more intense the harvest, the higher the fawn production necessary. Even in trophy management, fawn production is critical, because trophy management is, in part, a numbers game. The likelihood of producing a trophy buck increases with the number of bucks in the herd, all other things being equal. Not only is the number of bucks in general important, but so is the number of mature bucks. Fawn production is especially important to producing mature bucks, because for every 5 buck fawns born, only 1 is likely to reach its 7th birthday.

Managers seeking to produce trophy bucks often implement a culling program to remove bucks with undesirable antler characteristics. If fawn production is high, the culling program can be much more intense. High fawn production also enables a manager to reduce the number of does in the deer herd because each doe is highly productive. Resources made available by carrying fewer does can be used to support more bucks at a higher plane of nutrition.

So fawn production matters. What factors influence fawn production? Nutrition and predation are 2 important environmental factors that influence fawn production. Nutrition's role in fawn production will be the focus of this article. Predation will be covered in a later article.

Nutrition is important in fawn production because supporting a fawn is the most nutritionally demanding activity of a deer's life cycle. Most research has focused on protein and energy demands of reproduction. This does not mean that minerals and vitamins are unimportant, only that we do not know as much about them.

The importance of nutrition begins before the doe is bred. Does consuming low amounts of energy are less likely to breed and are more likely to have single fawns than does consuming high amounts of energy. Protein does not seem to matter as much at this point in the reproductive cycle. Recent research at the CKWRI suggests that the does' body condition is not as important as the amount of energy consumed. Does eating a poor quality diet and in poor condition will cycle shortly after being switched to a good diet, even if their body condition is still poor. Furthermore, the number of fawns they produce is the same as does whose body condition was good throughout the breeding season.

Fawn and yearling does are especially sensitive to nutritional conditions during the fall. If doe fawns are in real good shape and have a high energy intake, they are capable of breeding. Yearling does are less sensitive to nutritional conditions than fawns, but will not breed if their energy intake is low. The number of fawns a yearling doe will carry is even more sensitive to nutritional conditions. If conditions are average, she is more likely to have a single fawn. If conditions are excellent, she may have twins.

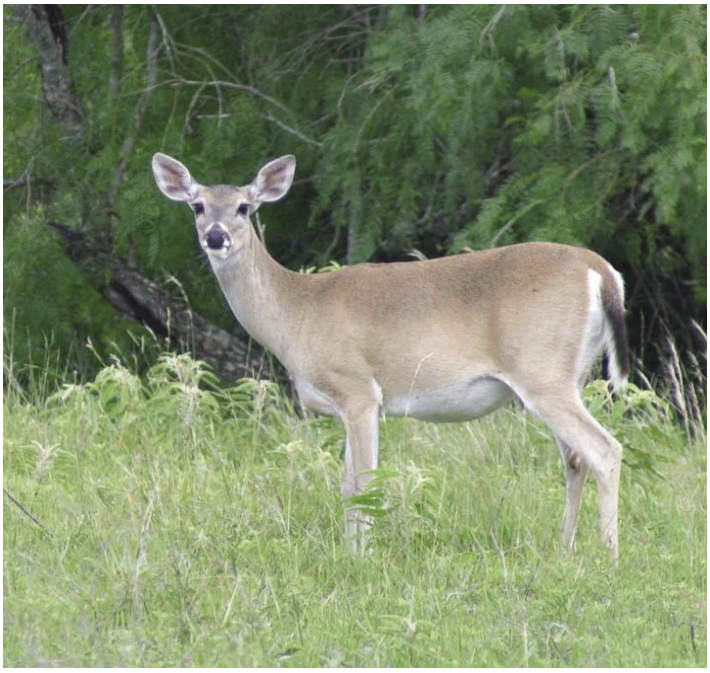
Because white-tailed deer evolved in northern environments and are adapted to poor quality diets during the winter, nutrition's role does not seem to be as important during early gestation. However, from late April until the fawns are born, adequate intake of both protein and energy are essential to producing a healthy fawn. Protein is especially important because two thirds of fetal growth occurs during the last third of pregnancy. Pregnant females eating poor quality diets during spring will give birth to small fawns, which are unlikely to survive.

Although late gestation is nutritionally expensive, the cost of producing fawns increases dramatically for 4–6 weeks after the fawns are born. Lactation requires large amounts of nutrients, which is paradoxical because diet quality in South Texas can be poor during summer, especially during drought. If conditions are poor, the doe may not be able to produce enough milk for her fawns to grow. This will make them susceptible to predation and disease. A doe with twins may not be able to produce enough milk to support both fawns. Losing 1 fawn will improve the chances that the remaining fawn will survive.

A potentially critical, but unstudied, period in the life of a fawn occurs in late summer when the doe initiates the weaning process by reducing milk production. The fawn is fully capable of eating solid food, but because of its small size and high requirements for body growth, it requires a high quality diet. If such forage is not available, the fawn may grow slowly and even become weak and sickly.

Producing healthy fawns is especially important because there is evidence in other deer species that nutrition during the first year of life can affect the growth and size of that deer later in life. A nutritional environment that supports production of large, healthy fawns is likely to result in large, healthy adult deer. Thus, biologists should strive to manage range resources to provide the doe and her growing fawns with the very best nutrition possible. It will be an investment with high payoffs as those deer mature.

Fawns are the fuel behind the management of any harvested deer herd. Food is the fuel supporting the production of fawns. The intensive management on many ranches has resulted in high fawn production and deer populations that would grow quickly if not intensively harvested. Although harvesting the annual surplus can be a lot of work, that surplus opens up management options that would not be available otherwise. High fawn:doe ratios are also an indication that the nutritional environment is good and this should be welcome information because it suggests that nutritional resources are also sufficient for bucks to approach their genetic potential for antler size.



High quality food is necessary in late spring and summer for does to produce large, healthy fawns.

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