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SOUTH TEXAS RANGELANDS

Factors Affecting Deer Diets And Nutrition

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In the past, South Texas ranchers focused on growing grass to enhance cattle production. However, increasing prices of wildlife hunting leases have encouraged a change in management priorities. Because of the current economic importance of wildlife, especially white-tailed deer, ranchers should recognize the impact that brush management, grass seeding and other improvement practices for livestock have on their deer herd. Knowledge of deer diets and nutrition can benefit ranchers who are interested in deer management and want to coordinate vegetation management practices with changes in the nutritional value of the habitat. From a nutritional perspective, there are three important considerations for the manager interested in maintaining a healthy, productive deer herd.

1. Nutritional requirements of deer relative to sex, age and physiological state
2. Nutritional value of the habitat relative to the availability and quality of forage
3. Competition among deer and other animals for the available forage

Nutritional Requirements

A manager should consider deer nutrition on a seasonal basis. Changes in the nutritional requirements of deer that occur with gestaton, lactation, breeding and antler growth should be coordinated with seasonal changes in nutrient availability from forage plants. Nutritional requirements of deer are generally separated into five categories: protein, energy, minerals, vitamins and water. Research on deer nutrition has primarily focused on protein, energy and minerals (phosphorus and calcium). These requirements are most often the ones that limit growth, reproduction and antler development.

Protein

Protein is very important for body growth in deer, especially for fawns and yearlings. Inadequate protein intake in a given year will also reduce antler development. In fact, a period of inadequate nutrition (low protein) for buck fawns may adversely influence antler development for several succeeding years. A deer must obtain at least a 6 to 7 percent crude protein diet to maintain rumen function, but a protein diet in the 13 to 16 percent range is required for successful growth, antler development and reproduction.

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Energy

Energy requirements of deer are not well-known, particularly how energy demand may be affected by weather conditions and the physiological state of deer. Energy deficiencies can result in cessation of growth, weight loss, reproductive failure and impaired rumen function. Most research in Texas done on deer forage quality has primarily focused on protein and mineral levels of food plants, not on energy content. However, several recent studies have included a qualitative measurement called dry matter digestibility (DMD), a measure closely related to digestible energy. Although DMD will slightly overestimate the energy content of some plants, especially those with high lignin or ash content, DMD is a good indicator of digestible energy for most plants. A summary of available research data indicates that adult deer require forages with a DMD of 50 to 55 percent, which increases to approximately 65 percent for lactating does. As forage plants mature and their quality (including energy) declines in July and August, does experience the stress of lactation and bucks require greater nutrient levels for antler production. Therefore, energy may be limiting during late summer, particularly during drought years.

Minerals

Most research on mineral requirements of deer has involved growing fawns. Little information is available on requirements of adult deer, particularly for maximum antler growth in bucks. A phosphorus intake level of approximately 0.35 percent is necessary to provide maximum weight gain, bone growth and antler development in yearling bucks. With the exception of a few plants in early spring, few forage species contain this level of phosphorus. Therefore, phosphorus may be a limiting nutrient in South Texas for maximum antler growth. Diets containing 0.40 percent calcium and 0.28 - 0.30 percent phosphorus are required for acceptable growth and development in deer. Sodium, potassium, chlorine, zinc, iron, magnesium and other minerals are important, but most are needed in very small amounts and are usually supplied in common forage plants.

Vitamins

Very little research has been conducted on vitamin requirements of deer. Vitamins A, D and E are among the more important vitamins for proper growth and development in deer. Vitamin A is undoubtedly important for antler growth as hardening (ossification) occurs. Deer can convert carotene in green leaves into vitamin A, which then becomes available for a variety of functions. During most of the year, carotene intake should be more than adequate, but slight vitamin-A deficiencies may occur during harsh, dry winters. Vitamin D is probably important in promoting calcium absorption and the mineralization of bone as it is in other species. Vitamin-D requirements are probably met by exposure to sunlight (ultraviolet light) and by the consumption of ultraviolet irradiated plant tissues. Vitamin E is important for preventing muscle tissue damage in deer that are subjected to severe physical exertion.

Water

Water requirements for deer vary with climate, type of food, physiological state and amount of activity. The amount of free water consumed is inversely proportional to the concentration of water in food. Although it has not been experimentally established, deer can probably survive without free water if green forage is abundant. Forage plants often contain significant amounts of water (45 to 65 percent in browse and 70 to 90 percent in forbs). Pricklypear is especially important as a source of water (90 percent) for deer in South Texas. Free water may be more important in South Texas than more temperate regions, especially during the hot, dry summers when temperatures commonly rise above 100° F. Water availability can be critical during drought situations when forbs and other succulent vegetation are scarce. Ranchers may improve deer performance by locating a water source every 1000 acres or less during droughts or dry seasons.

Nutritional Value of Deer Habitat

The two habitat variables that affect deer diets and nutrition are plant availability (quantity and accessibility) and quality (nutrient content and digestibility). Plants will vary in abundance, stage of growth and nutritional characteristics on a seasonal basis. Deer will attempt to maintain a quality diet and meet nutritional needs by adjusting diet components as the forage plants change in quality. If one or both of the above habitat variables are limiting, it will have a detrimental effect on deer nutrition.

Forage Availability

Four basic categories of plants are available to deer for consumption: woody plants (browse), forbs (weeds), cacti and grasses. The proportion of each plant category or any particular species in the deer diet will vary among years, seasons, regions and individual deer. Availability of preferred plants is a key factor contributing

to this variation. When a plant is green and growing, it is likely that a deer will eat it (at least in small portions). However, if a particular plant category (e.g. forbs) is largely unavailable within the home range of a deer, then its diet will reflect higher than "normal" percentages of browse, cacti and possibly grasses. Similarly, if a particular plant species is not present in the deer habitat, this species obviously would not be listed as a preferred deer food. Availability is a key variable and should be considered when comparing the results of diet studies.

On most South Texas ranches, availability of browse is generally not a problem. The exception is where brush has been eliminated and pastures have been seeded to grass. Mixed brush communities provide deer with sufficient amounts of moderate to high quality browse.

Forbs, on the other hand, are often scarce. High quality perennial forbs are uncommon because of past misuse of the rangeland. Annual forbs are highly dependent on soil moisture and are usually present only for brief periods in the spring and fall. Mild winters with adequate moisture can result in flushes of cool-season forbs.

Although forbs are considered to be the most nutritious and preferred food category for deer, brush and cacti may be more important in South Texas since they are consistently available and consumed by deer throughout the year. Grasses are the least important food category to deer, although use will increase slightly during spring and fall if grasses are available. Young, cool-season grasses such as wintergrass, ryegrass and rescuegrass can be important sources of protein during the winter.

Forage accessibility is another important habitat component for the deer manager to consider. Brush characteristics such as height, density and growth form can limit browse accessibility. Brush mottes (thickets) can be extremely dense and impenetrable for grazing and browsing animals. In such situations, most browsing is restricted to the perimeter of the motte. The few weeds and grasses that survive under the brush thickets often cannot be utilized. Brush management practices such as rootplowing, roller chopping, discing, dozing and prescribed burning can increase forage accessibility by creating openings or thinning dense brush thickets. Top removal practices (shredding, roller chopping, fire) can increase browse availability and nutritional quality by reducing the structure of tall, single-stemmed plants and promoting new growth of many brush species.

Leaves of shrubs can also become inaccessible because of overgrazing. This is a common problem with live oak in the Edwards Plateau and can occur with granjeno or guajillo in South Texas. When a range is overstocked and herbaceous (non-woody) forage becomes scarce, deer and other ruminants will depend heavily on browse. If animal numbers are not reduced, excessive browsing will occur and a "browse line" will develop four to five feet off the ground. Any leaves that sprout below this browse line will quickly be consumed. There may still be a great amount of browse remaining under these conditions, but if it is higher than five feet, it is inaccessible to deer.

Another accessibility problem can occur on large expanses of open or cleared range. There may be abundant forbs and small regrowth brush in a large cleared area, but few deer will venture more than 200 to 250 yards from the security of the perimeter cover. Although the forage is physically accessible, it may be behaviorally inaccessible to deer. The manager must be aware of what a deer perceives as available forage.

A third component of food availability is plant diversity. Diversity of food plants allows deer to select a quality diet from the available species as they fluctuate seasonally in nutritional quality. Diversity is particularly valuable if the species have different growing seasons. A variety of plants with different growing seasons will increase the probability for year-round availability of quality forages. Deer can shift diet components in response to changing nutrient levels associated with the seasonal growth of each plant species. A diversity of plant species can also be important when mast crops such as mesquite beans, persimmons and acorns mature in a staggered manner, thereby increasing the availability over time of these important energy sources.

Forage Quality

The quality of deer food plants can sometimes be improved through vegetation manipulation, (such as brush management). However, the manager has much less control over forage quality than quantity. Forage quality is associated with the growth stage of the plant, the plant species and environmental factors such as soil type and precipitation (soil moisture).

No single plant species maintains the year-round nutrient levels required by deer for successful growth and reproduction. However, some plant species are higher in nutrients than most other species in the same plant category. An example of a high quality browse species is spiny hackberry (granjeno) which main-

tains adequate levels of crude protein, energy and phosphorus year-round. Some browse species may maintain adequate year-round levels of a particular nutrient (such as crude protein), but may be seasonally deficient in energy or certain minerals required by deer. Pricklypear is high in dry matter digestibility (energy) but is relatively low in crude protein and phosphorus. This emphasizes the importance of maintaining a diversity of forage species for deer nutrition. The variation in nutrient content among several South Texas browse species, as well as seasonal fluctuations in nutrients, are shown in Table 1.

Forbs are generally higher in nutrient content than browse species. On an annual basis, forbs tend to be 35 to 40 percent higher in energy content than browse species, similar in crude protein and 45 to 50 percent higher in phosphorus. Examples of higher quality forbs are bundle flower, ground cherry and lazy daisy.

Grasses are generally used by deer only when young tender

Table 1. Typical Nutrient Contents[1] for Selected South Texas Browse Species.

	Spring			Summer			Fall			Winter			Preference Rating[6]
	CP[2]	P[3]	DMD[4]	CP	P	DMD	CP	P	DMD	CP	P	DMD	
Blackbrush	20	.23	34	15	.14	29	16	.18	37	14	.14	26	Medium
Bluewood (Brazil)	21	.21	60	17	.17	48	18	.16	55	16	.13	50	Medium to High
Bumelia (Coma)	20	.19	51	16	.17	47	15	.16	48	15	.13	40	Medium to High
Catclaw acacia	24	.31	61	18	.14	50	19	.15	53	17	.14	47	Medium to High
Cenizo	16	.17	57	13	.13	50	15	.16	55	12	.15	50	Medium
Guajillo	27	.25	48	20	.17	40	21	.16	47	17	.14	43	Medium to High
Guayacan	21	.17	58	17	.13	57	18	.14	58	16	.10	55	Medium to High
Kidneywood	26	.25	62	22	.21	57	23	.26	50	20	.24	54	Medium to High
Lime pricklyash (Colima)	21	.26	67	16	.19	58	17	.21	65	15	.18	62	Medium to High
Live oak (leaves)	13	.18	57	10	.09	49	11	.10	51	9	.08	48	Medium
(acorns)							6	.24	68				High
Lotebush	24	.21	51	19	.20	48	20	.18	44	15	.14	39	Medium
Mesquite (beans)				13	.21	62							High
Prickly pear (pads)	12	.13	75	7	.10	69	9	.11	71	5	.08	68	High
(fruit)				6	.13		8	.18	63				High
Spiny hackberry (Granjeno)	28	.26	72	22	.20	67	23	.19	69	19	.15	67	Medium to High
Texas colubrina (Hogplum)	24	.29	59	19	.20	50	22	.21	54	17	.18	50	Medium
Texas persimmon	18	.20	58	14	.13	51	12	.14	58	10	.11	41	Low to Medium
(fruit)				6	.10								Medium to High
Twisted acacia (Huisachillo)	22	.24	39	18	.20	37	20	.19	33	16	.16	28	Medium
(beans)				10	.15								Medium
Whitebrush	23	.26	58	19	.20	51	22	.21	55				Medium
Shelled corn[5]							9	.27	75				

[1] Nutrient content levels vary considerably depending on precipitation, soil type and growth stage. However, the relative nutritive values can be useful in planning brush management strategies.

[2] Crude protein

[3] Phosphorus

[4] Dry matter digestibility (energy)

[5] For comparison with browse nutrient content.

[6] Browse preferences of deer vary among seasons, soil types and ecological regions. Ratings were determined from occurrences of browse species in deer diets relative to their availability in the habitat.

shoots are green and growing. Grasses contain their greatest nutrient levels and are more digestible during this stage of growth. The preferred, native grass species average 10 to 15 percent crude protein, 0.17 to 0.27 percent phosphorus, and 45 to 55 percent dry matter digestibility (energy).

Competition for Forage

Interspecific competition occurs when different species such as deer and domestic livestock compete for resources that are in short supply. Competition does not occur simply because two species are consuming the same types of food plants. It is possible for sheep, goats, cattle and deer to occupy the same range without competition if the animals are present in low numbers and there is a diversity and abundance of forage plants. Even when grazing animals are present in moderate numbers, competition is usually minimal. Competition becomes severe only when livestock numbers exceed the forage supply or deer numbers exceed the carrying capacity of the habitat. Several years of overstocking results in decreased plant vigor, forage production and livestock production potential. Range overutilization has a direct impact on deer habitat and the nutritional quality of deer diets.

Certain kinds of livestock are preferable to others when competition with deer for forage is a concern. Under similar stocking rates, competition for forage between deer and cattle is less than competition between deer and sheep or goats. Because goat and deer diets are similar, they have a greater diet overlap than deer and other domestic species. However, competition will be minimal if deer and goat numbers are relatively low and forage is abundant. Sheep tend to eat mostly forbs and grass and thus will often compete with deer for forbs, especially when they are scarce. Cattle compete the least with deer since they eat primarily grass, although they will consume some forbs and browse. On an overgrazed range, cattle will compete with deer for remaining forbs and browse. During a drought, when herbaceous plants have deteriorated or have been consumed, cattle will shift their diet to browse and may compete with deer.

Exotic species are significant competitors with white-tailed deer in some areas of South Texas and in the Edwards Plateau. Some large species (for example, nilgai and eland) have diets similar to cattle, but most of the smaller deer species (for example, axis, sika and fallow) have diets similar to whitetails. They prefer forbs and succulent browse tips, but unlike whitetails, they have the physiological capacity to effectively utilize grasses to obtain nutrients. Exotic deer do very well on Texas rangelands and can increase herd size rapidly. They compete directly with white-tailed deer, and because of their superior digestive capabilities, they can out-compete native deer in overpopulated habitats.

Intraspecific competition (competition among individuals of the same species) is common among deer herds in many areas of Texas where the carrying capacity has been exceeded. This competition among deer can become significant in areas where predators have been eliminated, especially if there is little hunting pressure. Another factor that can contribute to overpopulation is a hunting policy of harvesting only bucks. The usual result is a high doe to buck sex ratio, low harvest rate compared to fawn survival, overpopulation and declining body condition.

Increasing Forage for Deer

Some ranchers feel uncomfortable about increasing their deer harvest and choose to artificially increase the carrying capacity of their ranch. One way is by providing supplemental feed. Feeding a deer herd is extremely expensive, and generally the costs of maintaining the additional deer far outweigh the financial returns. In addition, the extra nutrition provided by feeding will magnify the problem, resulting in increased reproduction. Fawning rates will increase and herd size will expand until it is once again above carrying capacity. Therefore, if the manager is not willing to increase harvest to compensate for herd growth, the strategy of supplemental feeding will not reduce forage competition. With a few possible exceptions, supplemental feeding is not financially profitable.

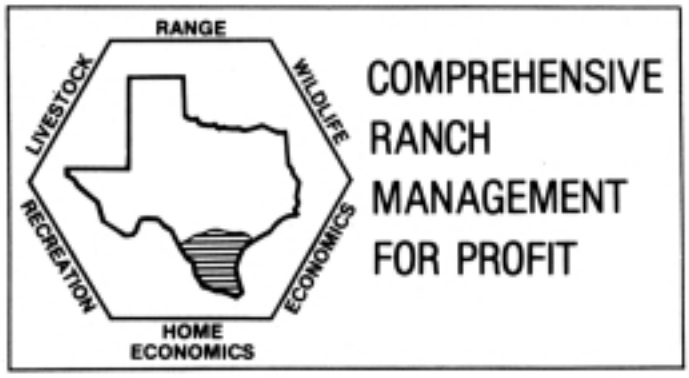
Another method to increase a habitat's carrying capacity is the establishment of food plots. Food plots are sometimes irrigated to provide nutrient-rich green forage to deer diets that are seasonally deficient in quality or quantity of food plants. This method can be used to maintain higher deer numbers, but overpopulation can also occur if herd growth is not checked through harvest. Food plots have been successful in many areas of Texas in improving individual deer performance when used with a proper deer harvest program to keep deer numbers balanced with forage.

A third method for minimizing intraspecific competition is managing deer numbers through hunting so that the population is always below carrying capacity. This requires careful monitoring of deer numbers, deer body condition and seasonal habitat conditions. This

management strategy is successful if forage availability and quality are adequate within the habitat of the deer herd. Improved deer herd nutrition should not be expected if livestock numbers are increased to take advantage of the additional high quality forage.

Conclusion

Managers can influence the quality of deer forage by manipulating vegetation and encouraging plant diversity. The greatest influence on deer nutrition can be achieved by managing forage quantity. This is done through correct stocking rates, proper harvest of deer to keep numbers and forage in balance, and discriminate brush and weed management. In addition, the manager should be aware of the nutritional value of deer food plants so that informed brush, weed and grazing management decisions can be made.



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