Seasonal Food Habits of White-tailed Deer in the South Texas Plains

LEROY A. ARNOLD, JR. AND D. LYNN DRAWE

Abstract

From October 1972, through September 1974, rumen analyses were used to determine food habits of white-tailed deer on the H.B. Zachry Randado Ranch in south Texas. Sixty-nine plant taxa were identified in the diet. Year-round preferences for various forage classes were 21.1% cactus, 32.7% browse, 26.6% forbs, 8.3% grasses, and 11.3% unknown. Cactus was heavily selected from June through September, and was consumed less but still heavily during October through January. Highest forb consumption occurred during March, April, and May. Browse usually was an important part of the diet, and grass consumption on untreated range was constantly low. A direct relationship was found between frequency with which a plant species was eaten and variability in the amount of that species consumed. Perennial plant species were more important as forage than annual species. Application of 2, 4-D herbicide caused grass consumption to increase 30 times over nonsprayed areas.

The increasing economic potential of white-tailed deer on private lands in Texas indicates a need for more detailed information about deer habitat requirements. Especially needed is information on the amounts of forage deer require and kinds they prefer, the seasonality of their feeding habits, and the effects on deer foods following control of rangeland vegetation. Identifying desirable deer forage could be of primary importance in land-use planning that is compatible with production of quality deer.

Everitt (1972) indicated that the feeding habits of whitetails vary widely from herd to herd and often change with season of the year. Differences in ecological types, plant associations, land use, and density of deer populations account for many variations reported between herds (Korschgen 1962). This has been verified in local studies by Halloran (1943), Davis (1951), McMahan (1964), Chamrad and Box (1968), Kelly (1970), and Everitt (1972). Seasonal variations in diet have been linked to changes in abundance, phenology, and nutrient quality of range plants during the year (Short 1971).

The tendency of deer diets to be highly localized puts a greater demand on landowners to establish individual management programs. This demand also is increased by the fact that in Texas access to game ranges is controlled by landowners. Controlled access, for all practical purposes, has put game animals in custody of the landowner instead of the state (Teer and Forrest 1968). This situation theoretically should allow the greatest income from deer to be gained by ranches with good deer management.

This paper reports results of a study of seasonal food habits of white-tailed deer on the H.B. Zachry Randado Ranch in the western portion of the South Texas Plains. This study was conducted in an effort to expand on spring feeding habits examined by Everitt (1972). Objectives of this study were: (1) to determine and compare seasonal food preferences of white-tailed deer on the ranch, (2) to establish a relative importance rating of foods eaten by deer on the ranch, and (3) to make recommendations for improved management of the deer herd based on food habits on this ranch and the surrounding area.

Study Area

The H.B. Zachry Randado Ranch consists of 3,045 ha in Jim Hogg and Zapata Counties in the South Texas Plains vegetational region (Gould 1975). It consists of rolling brushland intersected by gravel hills and gulleys. Eight soil types and six range sites lie within the ranch. The major portion of the ranch is a sandy loam site made up of fine sandy loam and loam soil types (Higginbotham 1975). Most sites on the ranch have been placed in fair range condition (Higginbotham 1975).

Both mechanical and chemical vegetation control have been practiced on the ranch. Approximately 810 ha were sprayed with 2,4,5-T during the spring of 1969 and 1970 primarily to control honey mesquite (*Prosopis glandulosa*). A large portion of this same area was sprayed with 2,4-D in April to control goldenweed (*Isocoma coronopifolia*). Also, areas of the ranch have been rootplowed or bulldozed and terraced in strips and patterns. The mosaic pattern of the several range sites and different control measures make vegetation of the ranch very diverse.

During the study approximately 200 head of cows and calves were managed on a one-herd, three-pasture, prescription grazing system. Deer had free access to the entire ranch, but movement off the ranch is limited by a 2.44-m "deer-proof" fence. The population of mature white-tailed deer on the ranch fluctuates around 400 animals annually. There is approximately a 1 to 1 buck:doe ratio as determined by helicopter census annually.

Methods

Food habits were determined by rumen analysis of 73 deer collected from October 1972 through September 1974. One to nine deer were collected monthly. Of these deer, 11 were bucks and 61 were does.

After a deer was killed, the entire rumen contents were removed. A 0.95-liter randomly selected sample of solid matter was mixed with 10% formalin solution and placed in a plastic container. Strained samples, randomly selected from throughout the contents remaining on a #20 sieve, were analyzed by the point-frame method described by Chamrad and Box (1964) and Chamrad (1966).

Individual plant parts were identified to species and ordered into five classes: (1) cactus, (2) browse, (3) forbs, (4) grasses, and (5)

Authors were graduate research assistant and associate professor, College of Agriculture, Texas A&I University, Kingsville 78363, when the research was conducted.

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Arnold is currently ranch manager, L&L Company, Box 152, D'Hanis, Texas 78850; Drawe is assistant director, Welder Wildlife Foundation, Sinton, Texas 78387.

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unknown material. Though cacti usually are reported as part of the browse class, it became apparent in this study, as well as the previous food habits study by Everitt (1972), that cacti are a highly important part of the diet on this ranch. Thus the Cactaceae have been considered separately.

Each species found in the diet was ranked by its preference value: percent frequency of occurrence multiplied by percent volume in the diet over 2 years (Chamrad and Box 1968).

Part of the ranch was sprayed with 2,4-D in April 1974, to control goldenweed. Rumen contents of four deer killed in the sprayed area were compared to rumen contents of eight deer killed on nonsprayed areas to determine if the application of 2,4-D had changed deer diet.

Data were transformed according to Ostle (1966) to correct for inherent bias in the raw data recorded as percentages. One-way analysis of variance was used to determine if statistical differences existed among months and selected groupings of sequential months for each plant class. By using all possible sequential monthly groupings, (i.e., 2 months, 3 months, etc.), it was possible to determine statistically which plant class was preferred and how long that class was preferred over another. Scheffe's multiple contrast test for lack of fit was used to analyze the relationship between frequency of specific plants occurring in the diet and the variance with which they occurred (Steel and Torrie 1960).

Results and Discussion

Overall Food Preferences

Based on rumen analysis of 63 white-tailed deer collected outside the sprayed area, year-round preferences for various forage classes were 21.2% cactus, 32.7% browse, 26.6% forbs, 8.3% grasses, and 11.3% unknown material. The diet consisted of 69 identifiable plant taxa. There were 2 cacti, 32 browse, 34 forb, and 1 grass species identified in the year-round diet.

Pricklypear cactus (*Opuntia lindheimeri*) had the highest percent volume and frequency of any single species found in the diet (Table 1). It comprised 20.9% volume of the diet and had a frequency of 70.1%. It was the only species of cactus other than tasajillo (*Opuntia leptocaulis*) eaten by these deer. After deleting deer that did not consume cactus, deer that consumed pricklypear had an average of 29.8% volume in their diet.

The second most heavily preferred species, a forb, was perennial lazy daisy (*Aphanostephus riddellii*), which had an average volume of 6.5% and a frequency of 43.3%. Other species found to be heavily preferred, having a frequency of over 20%, were annual lazy daisy (*A. kidderi*), la coma (*Bumelia celastrina*), granjeno (*Celtis pallida*), prostrate euphorbia (*Euphorbia prostrata*), desert lantana (*Lantana macropoda* var. *albiflora*), and honey mesquite (Table 1).

Deer on the ranch can best be described as browsing animals when cactus is added to this class. Cactus and browse species combined made up approximately 53.8% volume of the diet on a year-round basis.

Cactus Consumption

There were significant seasonal fluctuations in the consumption of cactus based on statistical analyses (Table 2). The most significant change in cactus consumption of the monthly groupings tested was the 4-month grouping beginning in February. Cactus was heavily selected during June through September, making up 32.9% volume of the diet. It was selected less but still heavily during October through January, making up 26.7% volume of the diet. Minimal consumption of cactus occurred during February, March, April, and May, when it made up only 5.0% volume of the diet.

Cactus, because of its low nutritive value, was classically assumed a source of water for deer. No pattern between rainfall and cactus consumption was found in this study, but there was an indication that it is eaten heavily during periods of high temperature.

Cactus consumption could not be linked directly to the availability of other plants. Many plants for which deer showed high preference during spring remained available into the summer when cactus consumption increased. Mesquite beans were preferred when available, from June through September, but even then cactus was selected highly.

Table 1. Ranking of the top 40 species found in deer diets on the H.B. Zachry Randado Ranch, 1972 to 1974, based on preference value Percent Frequency × Percent Volume).

Taxon	% Frequency	% Volume	Preference value[1]
Opuntis lindheimeri	70.1	20.9	1,463.8
Aphanostephus riddellii	43.3	6.5	279.6
Prosopus glandulosa	26.9	5.8	156.9
Aphanostephus kidderi	25.4	6.1	154.8
Bumelia celastrina	22.4	3.4	75.7
Celtis pallida	23.9	3.0	71.6
Commelina erecta	17.9	2.5	52.5
Acacia greggii	14.9	3.5	45.1
Lantana macropoda var. *albiflora*	20.9	2.1	43.0
Zanthoxylum fagara	16.4	2.2	36.8
Porlieria angustifolia	28.4	1.2	32.9
Castela texana	17.9	1.6	27.9
Leucophyllum frutescens	17.9	1.2	21.7
Euphorbia prostrata	20.9	1.0	21.3
Colubrina texensis	14.9	1.3	19.1
Schaefferia cuneifolia	14.9	1.1	16.1
Xanthisma texanum	10.4	1.3	14.0
Physalis viscosa	11.9	0.9	11.1
Ambrosia psilostachya	11.9	0.9	10.7
Pithecellobium flexicaule	7.5	1.3	9.5
Trixis radialis	8.9	1.1	9.4
Diospyros texana	9.0	1.0	9.0
Prosopis reptans var. *cinerascens*	10.4	0.8	7.8
Menodora heterophylla	4.5	1.5	6.9
Cynanchum barbigerum	11.9	0.5	6.2
Ziziphus obtusifolia	10.4	0.5	5.3
Parthenium confertum	8.9	0.5	5.0
Phoradendron sp.	5.9	0.5	3.1
Acacia rigidula	7.5	0.4	2.8
Solanum triquetrum	5.9	0.4	2.7
Cocculus diversifolius	5.9	0.4	2.6
Psilostrophe gnaphlodes	4.5	0.5	2.1
Krameria ramosissima	9.0	0.2	2.0
Ephedra antisyphilitica	6.0	0.2	1.4
Eysenhardtia texana	6.0	0.2	1.3
Ratibida columnaris	3.0	0.4	1.3
Opuntia leptocaulis	6.0	0.2	1.3
Acleisanthes obtusa	4.5	0.3	1.1
Gaura brachycarpa	1.5	0.7	1.0
Zexmenia hispida	4.5	0.2	0.8

[1] Values may not calculate exactly because of rounding-off.

Forbs, Browse and Grass Consumption

The pattern of forb consumption did not follow exactly the pattern found for cactus. There was an indication that the highest amounts of forbs are consumed when cactus is low in the diet (Table 2). Statistical analyses indicated the monthly grouping which best demonstrates the forb consumption pattern would be the 3-month grouping beginning in March. Highest forb consumption occurred during March, April, and May, whereas the lowest was during September through February.

Amounts of browse and grass in the diet remained relatively stable all year with no significant shifts in the amount consumed

Table 2. Percent of the deer diet in each forage class in the Zachry Randado Ranch study, 1972 to 1974.

Months	No. deer	X% Cactus[1]	X% Browse[1]	X% Forbs[1]	X% Grass[1]
January	6	28.33^{c}	33.50	24.50^{b}	2.16
February	6	3.83^{ab}	35.50	35.66^{b}	16.33
March	6	13.50^{ab}	19.00	47.16^{d}	6.16
April	4	0.50^{a}	9.50	73.75^{e}	2.50
May	6	2.50^{a}	48.16	33.16^{bc}	4.50
June	5	40.60^{cd}	26.00	16.60^{b}	1.80
July	9	46.88^{d}	37.22	8.88^{ab}	1.66
August	4	21.75^{bc}	53.75	4.25^{a}	14.25
September	5	22.00^{b}	29.20	45.00^{c}	8.00
October	3	14.00^{ab}	52.33	5.33^{a}	13.00
November	5	26.80^{bc}	27.80	31.40^{bc}	0.40
December	4	33.75^{c}	24.75	19.50^{b}	8.00
F-Ratio		4.06**	1.51	3.54**	.90

[1] Means within forage classes followed by a different letter are significantly different ($P<.05$) by Scheffe's multiple contrast test.
** Highly significant difference ($P<.01$).

(Table 2). Browse was normally a major part of the diet, but grasses remained constantly low. While browse species were likely to be an important part of the habitat for cover, they also made up a large part of the diet.

Effects of 2,4-D Application on Feeding Habits

Deer food habits were greatly altered for 2 or 3 months after an area was treated with 2,4-D. This was caused largely by the lack of browse and forbs following spraying. Grasses, which had been relatively unimportant throughout the study, were selected an average of 30 times more on the sprayed area than on nonsprayed areas (Table 3). Though there was an apparent decrease in cactus, browse, and forbs in the diet, the decrease was not statistically significant (Table 3).

This change in diet certainly could have a detrimental effect over a long period. Though no detrimental effects were observed on the physical or reproductive condition of deer 3 months after 2,4-D application, a continuous diet of grasses would place the deer under nutritional stress.

Field observations indicated deer density declined on the sprayed area. Whether the deer moved out of the area and then returned could not be determined. Feeding habits of deer collected in the treated area indicated they did not range off the area, since their diet was largely grasses. If they did range far enough to sample unsprayed areas, they probably would not frequent the treated area until conditions improved.

Diet Complexity

Numerous studies testify that plant species composition in deer diets is highly variable. This study indicates that the variability with which individual plant species are consumed by deer may be predictable based on the frequency at which they are consumed. There apparently is a direct relationship between variability in the volume of a species consumed and its frequency of consumption, i.e., the most frequently eaten plants may be taken in great amounts by one deer and in only small amounts by another deer (Fig. 1). Regression analysis yielded a highly significant ($P<.01$) *F*-ratio, but the coefficient of correlation was low ($r=0.27$). A test for lack of fit showed a nonsignificant *F*-ratio, which would not lead to rejection of the theory that a correlation exists despite the poor correlation coefficient.

Table 3. Differences in deer diet by forage class on sprayed (4 deer) and nonsprayed (8 deer) areas on the Zachary Randado Ranch, 1974.

	Sprayed		Non-Sprayed		
	Mean%	Standard Deviation	Mean%	Standard Deviation	*F*-ratio
Cactus	14.00	15.64	42.50	25.04	4.32
Browse	29.25	17.86	36.50	18.46	0.42
Forbs	5.00	3.56	11.38	12.68	0.79
Grasses	44.00	17.40	1.38	2.00	69.64**

** Highly significant difference ($P<.01$).

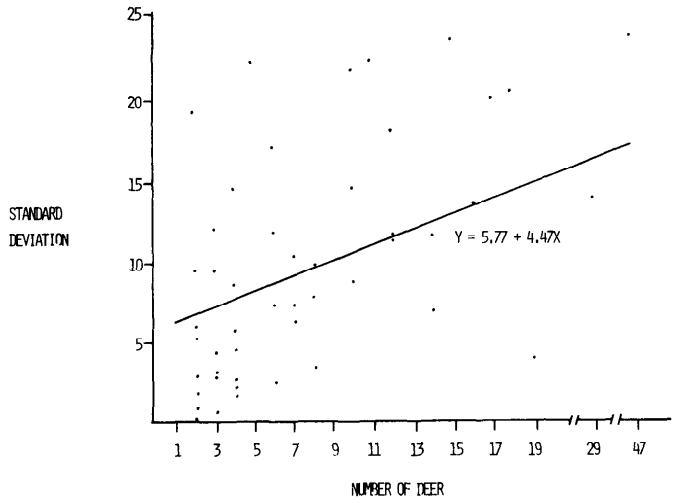

Fig. 1. *Transformed standard deviations of % volume of each species in the diet vs. number of deer consuming the species. Each dot represents one species.*

These deer select a wide range of plants, specifically varying the volume consumed for individual plant species. The volume of a preferred species eaten (those showing high frequency of occurrence in the diet) varied considerably among individuals, thereby not exerting a constant level of grazing pressure upon desirable plant species even when they are continuously available. The low cattle stocking rate coupled with the complex vegetation of the ranch provides the deer herd with a wide variety of plant species. This deer herd's independence from a rigid diet allows it to better cope with environmental changes. Thus during droughts, hard winters, and defoliation of food plants from herbicide applications, these animals are capable of altering their diet to the prevailing conditions.

Management Recommendations:

Brush control in areas of similar habitat should be designed with consideration for at least the first 10 species in the value rating (Table 1) and perhaps even the first 20. Since these include mainly perennial browse species, selective management should be relatively easy.

Burning should be conducted in a manner that would not adversely affect pricklypear production. Mottes and large trees of la coma, granjeno, catclaw (*Acacia greggii*), and lime pricklyash (*Zanthoxylum fagara*) should be left during mechanical brush control operations.

Careful consideration should be given to the use of herbicides, especially for control of honey mesquite. Since mesquite mast rated third in preference value, and yet is available only seasonally, there appears a need for it in the diet. If 2,4,5-T is used for mesquite control, it should be sprayed in

strips instead of large blocks, thus allowing deer access to this plant. The effect of 2,4-D upon high-preference value plant species is an obvious drawback to its use. Spot spraying by helicopter or ground application would be the best means of controlling "weedy" species while minimizing disturbance of noninfested areas.

If a major objective of a ranch is production of quality white-tailed deer, it would be good management to plant some of the better forb species in brush control areas. Annual lazy daisy, perennial lazy daisy, and day-flower (*Commelina erecta*) would be desirable. If seeds could not be obtained commercially, then perhaps some harvesting process could be designed. Another practice familiar to ranchers and technicians alike would be to disturb the soil by disking strips through preferred habitat, thus creating weedy areas for the growth of preferred species like annual lazy daisy.

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