

# BROWSE USE BY DEER IN AN EAST TEXAS FOREST<sup>1</sup>

by

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## ABSTRACT

In an east Texas pine-hardwood forest moderately stocked with white-tailed deer, average utilization of 73 recorded species of browse was 18 percent. Fifteen to 20 species furnished most of the browse diet. On the average, laurel greenbrier was grazed most heavily. Although most deciduous species received heaviest use in spring and summer, many of them were also eaten in fall and winter. Heavy browsing during winter was confined primarily to evergreens.

## INTRODUCTION

This paper documents the seasonal utilization of browse by an enclosed population of white-tailed deer (*Odocoileus virginianus*) in east Texas. It supplements other research aimed at learning which browse species are preferred by deer in pine-hardwood forests of the South (Goodrum and Reid 1959, Halls et al. 1970, Harlow and Hooper 1972, Lay 1967). Such information is needed to evaluate habitat quality, to establish guidelines for proper use, and to select and favor plant species most valuable to deer.

In 1964 two adjacent tracts, each comprising approximately 175 acres and with a tree basal area of about 110 square feet per acre, were fenced to enclose deer. In one enclosure all hardwoods larger than 2 inches in diameter (measured 4 1/2 feet above the ground) were removed to eliminate sources of hardwood tree mast. The enclosure was dominated by a sawtimber-size stand of shortleaf and loblolly pines, except that about 35 acres along a creek supported only a few scattered mature pines. These old pines were harvested in 1967, the site prepared for regeneration, and loblolly pine seedlings planted in January and February 1968.

In the other enclosure a thinning in 1965 reduced the stand to 71 square feet of basal area per acre, of which 75 percent was pine and 25 percent hardwoods. The main hardwood species were southern red oak, post oak, mockernut hickory (*Carya tomentosa*), and sweetgum (*Liquidambar styraciflua*). About 35 acres were clearcut in 1970 and planted to loblolly pines the following February.

The upland portions of both enclosures were prescribe-burned in January and February of 1967, and a small portion in each enclosure was burned in February 1971.

Annual yields of available browse varied from 480 to 650 pounds (oven-dry) per acre. Species contributing most were American beautyberry, yellow jessamine, saw greenbrier, blackberry, trumpetcreeper, Alabama supplejack, poison ivy, muscadine grape (*Vitis rotundifolia*), sweetgum, post oak, and southern red oak.

The overwinter stocking rate in each enclosure was approximately 17 acres per deer in 1969 and about 12 acres thereafter. No other big game animals or livestock were present.

Browsing observations were made seasonally for four years, July 1969 to March 1973. Utilization estimates were based on the number and length of twigs removed from current annual growth within 5 feet of the ground. Data were collected from 101 permanent 0.25-acre quadrats located on a grid pattern in each enclosure. The number of twigs browsed was recorded by species on each quadrat during July (spring and summer use), October (fall use), and early March (winter use). Tips of the browsed twigs were marked with paint so that they would not be counted in subsequent observations. Once a twig was browsed, it was seldom browsed again. A total twig

<sup>1</sup>Cooperative study by Texas Parks and Wildlife Department (FAP W-91-R); Fish and Wildlife Service, USDI; School of Forestry, Stephen F. Austin State University; and Southern Forest Experiment Station, USDA Forest Service.

count for each browse species on each quadrat was made in late winter (just prior to spring greenup), and the average length of browsed and unbrowsed twigs was recorded. This system was used because Schuster (1965) showed that twig numbers and length were highly correlated with total yields of browse. The relative use by season was calculated by dividing the number of twigs browsed during a particular season by the number of twigs formed during the year. Yearlong utilization in percent was calculated by the formula:

$$\frac{\text{Length of unbrowsed twigs} - \text{Length of browsed twigs}}{\text{Length of unbrowsed twigs}} \times \frac{\text{Number of browsed twigs}}{\text{Total number of twigs}} \times 100$$

This system of measuring utilization indicates the relative preference of browse species and, for each species, the proportion of twigs eaten seasonally. The supposition is made here that when deer consume twigs they also eat the attached leaves, except for deciduous species in the winter. The data do not show the relative contribution of browse to the deer's total diet because deer eat many other foods not measured in this study.

## RESULTS

For the four years, twig utilization of all browse species combined averaged 18 percent, with a range of 16 to 19 percent. Though the two enclosures differed considerably in timber stand treatments and in number of twigs, the average annual utilization varied little between years and enclosures. Neither the presence of overstory hardwoods in one enclosure nor the increased deer stocking in 1970 had any noticeable effect on the degree of twig utilization.

Seventy-three browse species were recorded on the inventory quadrats. Twig utilization was highest on laurel greenbrier, averaging 41 percent. Four species averaged 30 to 40 percent utilization; 5 species 20 to 29 percent, 28 species 10 to 19 percent, and 35 species less than 10 percent (Table 1).

Table 1. Twig utilization of browse species by white-tailed deer in an east Texas shortleaf-loblolly pine forest, 1969-1972.

Species	Observed twigs <sup>1</sup>		Summer		Proportion of twigs grazed		Winter		Annual utilization	
	No.	Highest relative use in summer	Pct.	Pct.	Fall	Pct.	Pct.	Pct.	Mean	Range
Starjamine ( <i>Trachelospermum difforme</i> )	209	39	34	27	37	3-55				
Red mulberry ( <i>Morus rubra</i> )	84	60	29	11	33	20-67				
Saw greenbrier ( <i>Smilax bona-nox</i> )	1385	47	35	18	31	21-41				
Cat greenbrier ( <i>Smilax glauca</i> )	319	43	29	28	29	17-43				
Trumpetreeper ( <i>Campsis radicans</i> )	313	58	21	21	28	10-62				
Alabama supplejack ( <i>Berchemia scandens</i> )	1545	49	34	17	24	15-31				
Common greenbrier ( <i>Smilax rotundifolia</i> )	812	49	30	21	21	8-33				
Miscellaneous species <sup>2</sup>	2632	47	26	27	16	9-24				
Hawthorn ( <i>Crataegus</i> spp.)	279	43	34	23	15	2-29				
Flameleaf sumac ( <i>Rhus copallina</i> )	103	50	32	18	14	3-22				
Winged elm ( <i>Ulmus alata</i> )	2069	59	21	20	13	7-18				
Post oak, southern red oak ( <i>Quercus stellata</i> , <i>Q. falcata</i> )	426	41	20	39	3	1-7				
Laurel greenbrier ( <i>Smilax laurifolia</i> )	Highest relative use in fall		49	33	41	7-67				
Sassafras ( <i>Sassafras albidum</i> )	160	18	52	31	10	2-26				

Rusty blackhaw ( <i>Viburnum rufidulum</i> )	628	39	42	19	10	2-23
American beautyberry ( <i>Callicarpa americana</i> )	1541	22	42	36	6	1-10
Highest relative use in winter						
Carolina jessamine ( <i>Gelsemium sempervirens</i> )	1792	18	38	44	32	15-50
Blackberry ( <i>Rubus</i> spp.)	379	11	43	46	23	15-28
Japanese honeysuckle, trumpet honeysuckle ( <i>Lonicera japonica</i> , <i>L. sempervirens</i> )	130	5	37	58	19	9-41
Water oak ( <i>Quercus nigra</i> )	312	32	19	49	17	2-36
St. Andrewscross ( <i>Ascyrum hypericoides</i> )	598	20	30	50	13	5-24
Poison ivy ( <i>Rhus radicans</i> )	954	32	21	47	10	6-14
Farkleberry ( <i>Vaccinium arboreum</i> )	1294	34	24	42	8	3-17
Flowering dogwood ( <i>Cornus florida</i> )	783	22	26	52	5	2-9
Miscellaneous species <sup>3</sup>	2813	15	32	53	2	1-5
Shortleaf pine, loblolly pine ( <i>Pinus echinata</i> , <i>P. taeda</i> )	525	23	11	66	2	0-7

<sup>1</sup>Average number of twigs for four years.

<sup>2</sup>Eighteen sparse species utilized moderately.

<sup>3</sup>Twenty-eight sparse species utilized lightly or not at all.

For individual species the degree of utilization ranged widely between years and enclosures. Thus, some plants of the more important species were both lightly and heavily grazed over the 4-year period even though the overall use was fairly stable. Occasional heavy use is not likely to injure plants. In some cases it may stimulate regrowth and help keep foliage within reach of deer.

Twigs from all of the species or groups listed in Table 1 were eaten by deer at all seasons, but use varied markedly between seasons. To some extent, but not always, browsing was associated with plant growth characteristics. Among the 12 species or groups that had highest relative use in the spring and summer, six were deciduous vines. For several of these species almost all growth is completed in spring (Halls and Alcaniz 1972), thus they were eaten when most succulent.

Four species had highest relative use in the fall. Two of these sassafras and American beautyberry, continue to grow through early summer. The other two are semi-evergreen or evergreen and may be eaten in fall because of their green leaves.

Of the ten species or groups most heavily utilized in winter, six were evergreen. Their availability and use are of nutritional significance because the persistent leaves have a higher protein content than the twigs during fall and winter (Blair and Halls 1968), when forage quality deficiencies are critical. The heavy use of evergreens in winter indicates the deer's need for green material during this food-short time. Thus, ranges which lack evergreens may be poor for deer. The degree of utilization for deciduous twigs was high in comparison with that recorded in other studies (Harlow and Hooper 1972, Segelquist et al. 1969, Cushwa et al. 1970).

Most species that averaged 15 percent or more annual utilization were in the first-choice group of palatability as rated by Lay's (1967) method, and species ranging from 5 to 14 percent utilization were in the second-choice group. Red mulberry, trumpet-creeper, hawthorn, water oak, and flameleaf sumac ranked higher than in Lay's ratings, whereas sassafras ranked lower. In comparison to browse rankings shown by Goodrum and Reid (1959) for deer in longleaf pine forests, the present study indicated a higher preference for yellow jessamine, Japanese honeysuckle, and blackberry, and a lower ranking for sassafras. Also, in the present study the relative use was higher for red mulberry, cat greenbrier, water oak, trumpetcreeper, and sassafras, and less for winged elm than that reported for studies previously conducted in the same enclosures (Halls et al. 1970). The exceptions just noted are no more than would be expected considering the variation in time, stocking rates, and vegetation composition.

Fifteen to 20 species furnished the greater portion of browse diet. Nearly all other browse species were browsed to some extent during the year, but rarely were any of them used heavily. Thus, the greatest contribution of the lightly browsed species was in adding variety to the diet, and any heavy use would indicate a seasonal shortage of food. On the other hand, occasional heavy use of the more palatable species is not necessarily an indication of browse scarcity; it may merely represent expectable variation in grazing.

#### LITERATURE CITED

- Blair, R. M., and L. K. Halls. 1968. Growth and forage quality of four southern browse species. Southeast Assoc. Game and Fish Comm. Annu. Conf. Proc. 21: 57-62.
- Cushwa, C. T., R. L. Downing, R. F. Harlow, and D. F. Urbston. 1970. The importance of woody twig ends to deer in the Southeast. USDA For. Serv. Res. Pap. SE-67. 12 p. Southeast. For Exp. Stn., Asheville, N.C.
- Goodrum, P. D., and V. H. Reid. 1959. Deer browsing in the longleaf pine belt. Soc. Amer. For. Proc. 1958:139-143.

- Halls, L. K., J. D. McCarty, and H. V. Wiant. 1970. Relative browsing of 16 species by deer. *J. Range Manage.* 23:146-147.
- , and R. Alcaniz. 1972. Growth patterns of deer-browse plants in southern forests. USDA For. Serv. Res. Pap. SO-75. 14 p. South. For. Exp. Stn., New Orleans, La.
- Harlow, R. F., and R. G. Hooper. 1972. Forages eaten by deer in the Southeast. Southeast. Assoc. Game and Fish Comm. Annu. Conf. Proc. 25:18-46.
- Lay, D. W. 1967. Deer range appraisal in eastern Texas. *J. Wildl. Manage.* 31:426-432.
- Schuster, J. L. 1965. Estimating browse from twig and stem measurements. *J. Range Manage.* 18:220-222.
- Segelquist, C. A., F. D. Ward, and R. G. Leonard. 1969. Habitat-deer relations in two Ozark enclosures. *J. Wildl. Manage.* 33:511-520.

## **RUMEN CONTENTS OF WHITE-TAILED DEER: COMPARING LOCAL WITH REGIONAL SAMPLES**

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### **ABSTRACT**

The rumen contents of 384 white-tailed deer (*Odocoileus virginianus*) collected seasonally from the Savannah River Project in South Carolina were compared with 184 rumen samples collected from six widely scattered areas throughout the Southeastern Coastal Plain. The two sets of rumina differed significantly in the volume of hardened woody twigs and fungi in the spring, dry leaves and fungi in the fall, and succulent twigs in the winter. The decision to collect local samples or rely on regionwide completed studies will depend on the intensity of management and the feasibility of collecting local information. If data on broad plant categories and plant parts such as green leaves, twigs, and fruits are sufficient for management purposes, regionwide studies can be helpful. If the manager needs data on consumption of individual plant species by deer in his area, local sampling is advisable.

### **INTRODUCTION**

A major difficulty in determining food habits of white-tailed deer by rumen analysis is obtaining an adequate number of samples, especially from a local area. Consequently, managers in local areas must frequently rely on regional data such as Harlow and Hooper's (1971). It is essential, however, to determine whether regional findings are applicable to local areas.

In the present study, we compared data collected by Harlow and Hooper (1971) from six locations throughout the Southeastern Coastal Plain with data collected from the U. S. Atomic Energy Commission's Savannah River Plant in South Carolina.

### **SAMPLING AREAS**

Major forest types within the Southeastern Coastal Plain (CP) include the longleaf-slash pine, the loblolly-shortleaf pine, and the oak-gum-cypress types (USDA, Forest Service 1969). Braun (1967) described 13 forest communities contained within these

<sup>1</sup>When this study was conducted Crawford was affiliated with the Southeastern Forest Experiment Station.