Brush Management Influences Preference Values of South Texas Woody Species for Deer and Cattle[1]

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Highlight

All mechanical brush control practices except root plowing increased preference values and forage ratings of South Texas brush species for deer and cattle the first year following treatment. Preference values for shrubs declined with length of time following treatment. Increased preference values were associated with increased availability, the amount of new regrowth, and crude protein content of the shrubs.

The woody vegetation of South Texas is not normally considered of significant value as forage for livestock. Major emphasis in the area is on brush removal or brush control. Prior to 1958, over 9,600,000 acres of South Texas brush were treated (Carter 1958). Today, the U.S. Soil Conservation Service estimates that an additional 54,000,000 acres are in need of some form of control (U.S.D.A. 1964).

Recently, biologists have claimed that brush control is harmful to deer populations (Lehmann, 1960) and may influence the diets of deer (Davis et al., 1962; Davis and Spicer, 1963). Others maintain brush can be managed for increased forage value for both deer and cattle (Box and Powell, 1965).

South Texas brushlands are composed of ten or more brush species, each responding differently to brush control practices. Brush cover equal to that of the original stand usually occurs in 3 to 15 years following brush control, although species composition and rate of increase may be altered by the type of control (Box, 1964). Deer and cattle preference values for brush species are increased by most mechanical brush control practices, and forage values are generally increased by all mechanical treatments except those involving plowing (Box and Powell, 1965).

The extent to which woody species are used for browse has been attributed to percent crude protein and moisture content by Dalrymple et al. (1965) and to the amount of new regrowth available (Box and Powell, 1965). Dietz (1965) reported no significant difference in chemical content of annual regrowth of 5 Colorado browse species clipped at different intensities. This paper reports the influence of annual mowing on preference values of brush species in South Texas.

Methods

During the summer of 1963, five commonly used mechanical brush control treatments (Table 1) were applied to 3 replications of adjacent 20-acre plots on the Welder Wildlife Refuge. Treatments were described by Box and Powell (1965). The vegetation, on Victoria clay, was chaparral-bristlegrass and mesquite-buffalograss similar to that described by Box (1961). Approximately 500 steers and 1300 deer feed on the 7800 acres within the Refuge. Both deer and cattle are stocked at moderate rates on good condition range.

Frequency of use and percent utilization by deer and cattle were determined on 20 randomly-located plants of each brush species during June of 1964 and 1965. Utilization by deer was not distinguished from utilization by cattle. The amount of canopy cover of brush species was determined by 15 randomly-located 100-ft line intercepts per plot in June of each year.

The preference value for each species was calculated by multiplying percent utilization by frequency of use (Dwyer, 1961). The forage rating for all brush species was determined by multiplying the preference value of the species by its percent ground cover in an area. The forage rating for all brush in an area was determined by totaling the respective forage ratings for all brush species sampled in that area.

A 100-foot wide strip was mowed across the brush control plots in early April, 1965. Animals were, thereby, given a choice of plants the first season after mowing and plants three seasons after brush control treatment. A rotary mower pulled behind a farm tractor cut the plants about 3 inches above the ground.

Material was hand plucked during the spring of 1965 from current growth of six of the most abundant woody species. Composite samples were made from plants of each species on treated and on untreated plots. Samples were oven dried to determine moisture content as an index to succulence. Dried material was ground in a Wiley mill and analyzed for crude protein by the Kjeldahl method (AOAC, 1950).

Results and Discussion

Preference values and forage ratings were significantly ($P<.05$) less on all 1963 treatments during 1965 than in 1964 (Table 1). The decrease in preference values can be attributed

Table 1. Preference values and forage ratings for deer and cattle for all woody plants on brush control areas treated in 1963.

Treatment	Pref. value 1964	Pref. value 1965	Forage rating 1964	Forage rating 1965
Check	1330	2029	25	78
Mower	12775	2795	196	94
Roller chop	12670	2265	160	60
K-G Blade	9660	2335	108	65
Root plow	4000	1650	6	13
Root plow and rake	8820	2095	13	14

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to 2 major factors. First, the research area received more rain in the spring of 1965 than in the spring of 1964, making more grasses and forbs available to the animals. Secondly, brush species contained more old-growth woody material than they had the previous year.

Animals showed no marked preference for plants on any one individual treatment in 1965. In 1964, they preferred plants that had their tops removed by mowing or roller chopping. Plants sheared with a K-G blade also had high preference values. However, in 1965, plants treated in 1963 had regained their typical woody growth form and were not especially preferred over plants receiving no treatment.

Forage ratings for treated areas also declined from 1964 to 1965. Although treated brush plants were larger in 1965, lower utilization and frequency of use contributed to less total value as range plants than in 1964 (Table 1). Current growth of South Texas woody plants becomes less available to all animals with increasing age, size and "thorniness." Therefore, even though volume of woody plant material increased, its value for forage decreased.

The decrease in preference value of woody plants with age of regrowth is shown in Table 2. Plants mowed a second time in 1965 had significantly greater preference values than those mowed in 1963 only. Those cut in 1963 were preferred over untreated plants. Both preference values and forage ratings are greatest the first year following top removal. Preference values decline rapidly the second and third year. Any increase in palatability and availability due to mechanical treatments is normally lost after several years.

Species change differentially in preference value following

Table 2. Preference values in 1965 for 11 shrubs following 3 mowing treatments.

Species	Unmowed	Date of mowing 1963	1965
Acacia farnesiana	1710	1995	2400
Acacia tortuosa	5	5	5
Acacia rigidula	5	5	5
Berberis trifoliolata	5	180	320
Celtis pallida	5	315	2295
Condalia obtusifolia	245	125	1105
Condalia obovata	5	5	400
Diospyros texana	20	45	20
Lycium berlandieri	5	5	5
Prosopis glandulosa	45	20	180
Zanthoxylum fagara	45	20	450

treatment. Huisache (*Acacia farnesiana (L.) Willd.*) was the only plant that maintained a high preference value throughout the study. Only twig tips were eaten, and this fast-growing species supplied new growth continuously even in areas where brush control was not practiced.

Some species, such as blackbrush acacia (*Acacia rigidula* Benth.), twisted acacia (*Acacia tortuosa (L.) Willd.*), Mexican persimmon (*Diospyros texana* Scheele), and lycium (*Lycium berlandieri* Dunal) were relatively unpalatable in all stages. Brush control treatment did not materially increase their preference values.

Thorny heavily-armed plants such as agarito (*Berberis trifoliolata* Moric.), granjeno (*Celtis pallida* Torr.), lotebush (*Condalia obtusifolia* (Hook.) Weber.), bluewood condalia or brazil (*Condalia obovata* Hook.), and pricklyash (*Zanthoxylum fagara* (L.) Sarg.) were improved considerably in preference value the first year, but their selection by animals declined sharply as thorns and stems hardened.

Several reasons contributed to the increased preference values of plants on freshly mowed areas. First, mowing removed thorn-armed, woody tops. Tender shoots were completely available to animals, and animals moved through the area with ease.

Current growth made up a greater percentage of the plant material in resprouts than in untreated plants. On check plots, animals would take only tips of the outermost branches, while on treated areas, they would eat more shoots and more of any one shoot. There was no significant difference in moisture content of the current growth of plants.

Crude protein content of the current growth of plants was higher on treated areas than on untreated areas. Crude protein content increased in all treated plants except mesquite, although the increase was not statistically significant at the .05 level. Individual species would probably show a significant increase with an increased sample size. However, the increase in protein content of an individual species was not necessarily associated with its increased preference value. Honey mesquite (*Prosopis glandulosa* Torr.) did not increase in protein with treatment, yet its preference value was increased 80-fold. Mexican persimmon and lycium did not increase in preference values although the protein content of

Table 3. Crude protein percentages of six shrubs from mowed and unmowed areas.

Species	Unmowed	Mowed
Acacia farnesiana	18.37	20.35
Condalia obovata	16.81	18.91
Condalia obtusifolia	15.03	21.26
Diospyros texana	11.97	14.81
Lycium berlanderi	12.87	15.83
Prosopis glandulosa	16.13	16.16

both increased. All other species improved in preference values as crude protein content increased.

Animals tended to select brush plants from treated areas in preference to those of untreated areas the first year following control. However, the amount of utilization on most brush species decreased rapidly after the first year. If brush species are to be used to a greater extent as forage in South Texas, a system of periodic pruning or top removal appears necessary. Both mowing with a rotary mower and roller chopping tended to increase preference values of normally unpalatable brush plants.

Summary

Five commonly-used mechanical brush-control practices were applied to adjacent 20-acre plots in 3 replications on Victoria clay in South Texas during 1963. Preference values and forage ratings for deer and cattle were calculated for the brush regrowth of each treatment during 1964 and 1965. Both preference values for brush plants and forage ratings for all treated plots increased the year following treatment, but declined the second year.

In 1965, plants mowed in that year had higher preference values than those mowed in 1963. Those mowed in 1963 were preferable to untreated plants. Crude protein content was higher in plants on treated areas than on the untreated check plot.

Increased utilization of brush was attributed to increased availability of forage, increased percentage of new regrowth, and increased protein content of plants on treated areas.

LITERATURE CITED

ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS. 1950. Official methods of analysis. 7th Ed. Washington, D.C.

BOX, T. W. 1961. Relationship between plants and soils on four range plant communities in South Texas. Ecology 42:794-810.

BOX, T. W. 1964. Changes in wildlife habitat composition following brush control practices in South Texas. Trans. N. Amer. Wild and Nat. Resource Conf. 29:432-438.

BOX, T. W., AND JEFF POWELL. 1965. Brush management techniques for improved forage values in South Texas. Trans. N. Amer. Wild. and Nat. Resource Conf. 30:285-296.

CARTER, M. G. 1958. Reclaiming Texas brushland ranges. J. Range Manage. 11:1-5.

DALRYMPLE, R. L., D. D. DWYER, AND J. E. WEBSTER. 1965. Cattle utilization and chemical content of winged elm browse. J. Range Manage. 18:126-128.

DAVIS, R. B., R. SPICER, V. KLETT, AND C. RAMSEY. 1962. Diet of the white-tailed deer on selected areas of controlled and uncontrolled brush in the Rio Grande Plain. Job Completion Report No. 10, Federal Aid Project W-84-R-3, Texas Game and Fish Commission, Austin. 44 p.

DAVIS, R. B., AND R. SPICER. 1963. Distribution and behavior of white-tailed deer using adjacent areas of controlled and uncontrolled brush. Job Completion Report No. 11, Federal Aid Project W-84-R-4, Texas Game and Fish Commission, Austin. 20 p.

DIETZ, D. R. 1965. Deer nutrition research in range management. Trans. N. Amer. Wild. and Nat. Resources Conf. 30:274-285.

DWYER, D. D. 1961. Activities and grazing preferences of cows with calves in northern Osage County, Oklahoma. Okla. Agr. Exp. Sta. Bull. B-588. 61 p.

LEHMANN, V. W. 1960. Problems of maintaining game on ranges subjected to brush control. Proc. 5th World Forest. Cong. Vol. 3:1807-1809.

U.S.D.A. 1964. Grassland restoration: The Texas brush problem. Unnumbered Bull. USDA Soil Cons. Serv., Temple, Texas. 33 p.