CONCLUSIONS

The major influence on the soil as a contributor to the energy balance of an earth-sheltered structure was its mass. Data indicated that increasing soil depth decreased temperature fluctuation. However, the influence of each additional inch of soil must be weighed against its impact on the structural components of the building. No reason to advocate soil depths greater than 18 in. could be substantiated by this research.

Secondly, the use of plant materials on earth covered roofs and walls should be promoted primarily for aesthetic reasons, as their effect at an 18 in. depth was not significant. Similarly, the use of water to irrigate plants, especially water that has been heated or cooled, did not significantly benefit the structure's energy balance. Since elimination of irrigation lessens the challenges to the building's waterproofing barriers, planting should be designed to minimize irrigation demands while maintaining aesthetic quality. We believe that native and naturalized plants which are able to thrive without supplementary irrigation would be the best choice for vegetative cover on earth structures.

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Effects of Repeated Shredding on a Guajillo (*Acacia belandieri*) Community

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ABSTRACT

Shredding is often used to manage brush in South Texas. The objective of this study was to determine the effects of repeated shredding on density and canopy cover of browse plants used by white-tailed deer (*Odocoileus virginianus*) and on brush species diversity in a guajillo (*Acacia berlandieri*) community. About 2000 acres in Zavala County were shredded at 3-year intervals from 1969-1978 with a drag-type shredder. In 1985, brush density and canopy cover were determined in 5 unshredded and adjacent shredded areas. Shredding had little effect on density and canopy cover of high, medium, and low value browse plants. Density of exceptionally palatable plants was lower on shredded than on unshredded areas. Brush species diversity was also lower on shredded range.

INTRODUCTION

Shredding is widely used for brush management on the South Texas Plains (Hamilton et al., 1981). The treatment removes top growth but rarely kills brush (Welch et al., 1985). Although top growth is replaced within 2-3 years (Welch et al., 1985), a short-term increase in forage production often occurs following shredding (Scifres, 1980). Other advantages of shredding include improved management efficiency by increasing visibility of livestock and improved grazing distribution (Scifres, 1980). Hamilton et al. (1981) suggested shredding at 3-5 year intervals to suppress stands of mixed brush in South Texas.

Top removal increases palatibility of brush for cattle and white-tailed deer (**Odocoileus virginianus**) (Box and Powell, 1965; Powell and Box, 1966). Powell and Box (1966) attributed increased palatibility to greater browse availability and nutritional quality. Everitt (1983) found that regrowth of shredded brush had higher crude protein and phosphorus levels than current growth from nonshredded plants.

Guajillo (**Acacia berlandieri**) is a desirable livestock and wildlife browse species that dominates shallow ridges in the Rio Grande Plain of Texas (Davis and Spicer, 1965). The USDA Soil Conservation Service recommends shredding for management of guajillo because of its value for browse (Scifres, 1980). The objective of this study was to determine the effects of shredding at 3-year intervals for 9 years on white-tailed deer browse and brush species diversity of a Guajillo community.

MATERIALS AND METHODS

The study was conducted on the A.L. Cardwell Ranch in Zavala County in the South Texas Plains. The study area is a Gravelly Ridge range site with gravelly loam over caliche

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or gravelly clay soils (USDA-SCS, unpublished information). The ranch is grazed by cattle at 18-20 acres/animal unit yearlong (A.L. Cardwell, pers. commun.).

About 2000 acres of brush were shredded at 3-year intervals from 1969-1978 with a drag-type shredder (A.L. Cardwell, pers. commun.). Initially, a machine with a heavy 9-foot single blade was used. Later, a "Terrain King" with a 15-foot "bat-wing" blade was used. To provide regrowth for deer, the shredder was adjusted to a cutting height of 10-12 inches. Shredding was done primarily in the spring. Small tracts of untreated brush were left to provide cover for wildlife.

Five untreated sites ranging from about 1-8 acres in size were used for study. Maximum distance between sites was about 2 miles. At each site, 2 164-foot transects were randomly placed in the untreated area and in an equal-sized portion of the adjacent shredded area. Three 5 × 16-foot plots were placed at 49-foot intervals along each transect. Woody plants and cacti rooted in each plot were recorded by species. Canopy cover of brush was determined by the line intercept method (Canfield, 1941) using 4 66-foot transects in each treatment at each site. Data were collected in the summer of 1985.

Shannon's index was used to determine brush diversity (Pielou, 1977). Absolute brush density was used in the calculation of Shannon's index and evenness. Values for evenness should accompany values for diversity because diversity depends on both the abundance of each species and species richness.

Brush species were categorized into exceptional, high, medium, and low value browse for white-tailed deer (Nelle, 1984). Paired t-tests (n=5 sites) (Snedecor and Cochran, 1967) were used at the 0.05 level to determine if differences in canopy cover and density between treatments were significant for each category. Diversity and evenness were also compared between treatments using paired t-tests.

RESULTS AND DISCUSSION

Canopy cover of exceptional, high, and low value browse was similar on shredded and unshredded areas (Table 1).

Table 1. Mean canopy cover (%) and density (plants/acre) of 4 categories of white-tailed deer browse plants on rangeland shredded at 3-year intervals from 1969-1978 and on unshredded range, Zavala County, Texas 1985.

Brush parameter	Value for white-tailed deer[1]			
and treatment	Exceptional	High	Medium	Low
Canopy Cover (%)				
Unshredded	3	29	36	5
Shredded	<1[ns]	33[ns]	31*	<1[ns]
Density (plants/acre)				
Unshredded	647	1,205	5,360	647
Shredded	126**	1,817[ns]	5,552[ns]	162[ns]

[1]Exceptional plants were Texas kidneywood (**Eysenhardtia texana**) and elbowbush (**Forestiera angustifolia**); high value plants were guajillo (**Acacia berlandieri**), spiny hackberry (**Celtis pallida**), pricklypear (**Opuntia lindheimeri**), and guayacan (**Porlieria angustifolia**); medium value plants were blackbrush (**Acacia rigidula**), Mexican persimmon (**Diospyros texana**), purple sage (**Leucophyllum frutescens**), honey mesquite (**Prosopis glandulosa**), shrubby blue sage (**Salvia ballotaeflora**), and desert yaupon (**Schaefferia cuneifolia**). The only low value plant was whitebrush (**Aloysia lyciodes**). Classification of species based on Nelle (1984).
*,** Values significantly different between treatments at the 0.05 or 0.01 levels, respectively.

Shredded areas supported 14% lower canopy cover of medium value browse than unshredded range. Density of exceptional plants was lower on shredded than on unshredded areas. For other browse categories, density weas similar between treatments.

Fulbright and Beasom (1985) found that medium value browse species such as honey mesquite (**Prosopis glandulosa**) were more abundant on sites that had been root plowed 30 years earlier than on unplowed sites. High value browse plants were present in lower abundance on root-plowed than on unplowed sites. Although shredding may reduce the density of exceptional browse plants, it may be a more desirable brush management treatment than root plowing for landowners who want to maintain high value deer browse. Exceptional browse plants are highly palatable but usually compose a smaller portion of deer diets than high value plants because they do not make up a significant part of the brush community, even on range that has not been subjected to brush management (Nelle, 1984).

Brush species diversity was significantly ($P<0.01$) higher for unshredded (0.66) than for shredded areas (0.49). Values for evenness were also significantly ($P<0.01$) higher on unshredded range (0.76) than on shredded range (0.64). Species richness was also lower on shredded areas. Thirteen brush species were encountered on untreated areas compared to 11 on shredded range.

Results of this study were consistent with previous studies on the effects of mechanical brush management on brush diversity. Fulbright and Beasom (1985) found that at 30 years post-treatment, fewer brush species were present on root plowed than on untreated range.

Plant species diversity is important for quality white-tailed deer habitat (Varner et al., 1977; Scifres, 1980). However, no clear relationships between level of diversity and quality of deer habitat have been established. Thus, further studies are needed to determine if the reduction in brush diversity resulting from repeated shredding would be detrimental to white-tailed deer.

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