Cattle Grazing Impacts on Small Cleared Areas in Dense American Elm Woodlands

JAMES F. GEORGE AND JEFF POWELL

Abstract

Removal of overstory canopy of American elm (*Ulmus americana*) greatly increased the utilization of understory herbaceous vegetation by cattle. Cattle browsing killed all the elm sprouts.

American elm (*Ulmus americana*) is an important component of stream-course and flood plain woodlands of central Oklahoma and is invading contiguous uplands (Rice and Penfound 1959). This increase in overstory cover not only decreases production of forage species, but also decreases palatability of those plants present (Welton and Morris 1928; Halls and Epps 1969).

In a study in northern Oklahoma, Dwyer (1961) found that cattle browsed American elm, often maintaining individual trees in a shrub-like state. Dalrymple et al. (1965) reported that Winged elm (*U. alata*), a similar species, was heavily browsed by cattle in Oklahoma.

The objectives of this study were to determine the effects of top removal and fertilization of an American elm woodland on utilization of understory herbaceous vegetation and woody sprouts by cattle.

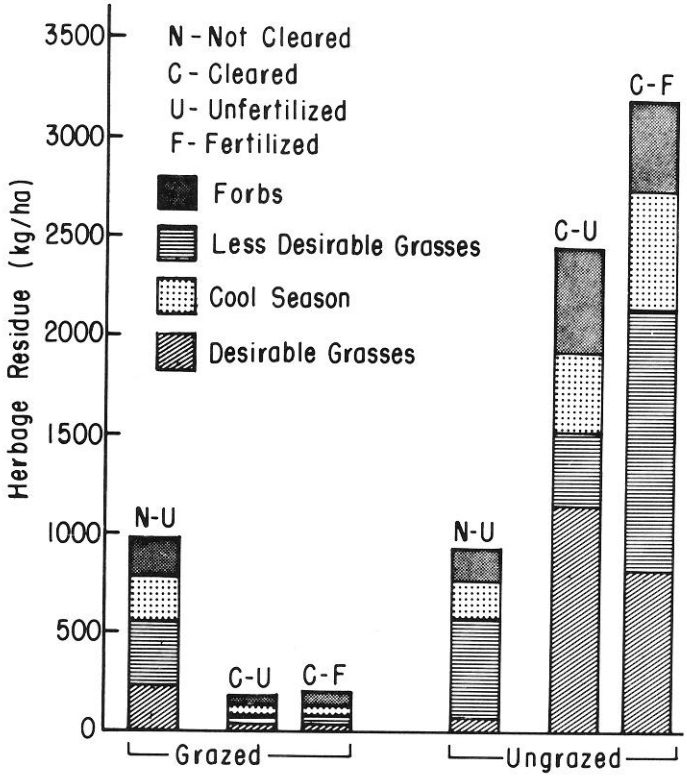

Fig. 1. *Herbage residue (kg/ha oven-dry) remaining at end of 1973 growing season.*

Authors are research assistant and associate professor, Department of Agronomy, Oklahoma State University, Stillwater. James George is, at present, range scientist, El Paso Natural Gas Company, El Paso, Texas.

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Study Area

The study area is located in Payne County, Oklahoma, about 18 km west of Stillwater. The study site is a transition zone between an upland tallgrass prairie and a flood plain woodland. The site was cultivated prior to the mid-1930's and has since been invaded by American elm.

The annual precipitation averages 820±250 mm. The average precipitation distribution during the 210-day growing season is 21% during April and May, 28% during the June-August period, and 17% during September and October.

The overstory vegetation consisted of a dense stand of uniform-sized trees, 97% of which were American elm. The stand contained about 2,500 trees per hectare, with an average basal diameter of 10.0±2.2 cm. The herbaceous species were grouped into four species classes. Dominant desirable grasses (preferred by cattle) included *Schizachyrium scoparium, Tridens flavus,* and *Panicum scribnerianum*. Less desirable grasses were predominately *Andropogon virginicus, Bothriochloa saccharoides, Leptoloma cognatum, Setaria* spp. and *Sporobolus asper*. Cool-season grasses and grass-like plants included *Bromus japonicus, Carex* spp., and *Elymus virginicus*. Dominant forbs were *Ambrosia psilostachya, Veronia baldwinii,* and *Desmodium sessilifolium*.

Methods

The study was conducted in a grazed paddock of 9.7 ha and an adjacent, ungrazed area. The grazed area was moderately stocked with

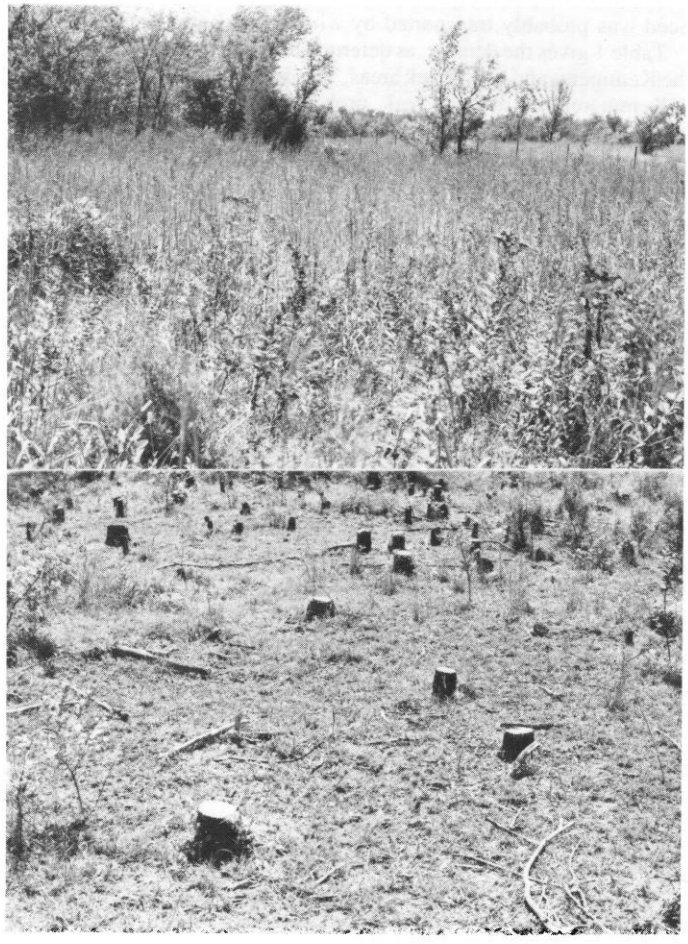

Fig. 2. *View of (A) ungrazed and (B) grazed plots.*

Fig. 3. *American elm sprouts in (A) ungrazed and (B) grazed areas.*

6 steers, averaging 250 kg initially, from May to October. About 20% of the grazed area was wooded, whereas most of the ungrazed area was wooded and maintained as a wildlife area.

The randomized block experimental design in the grazed area consisted of four replications of two fertilizer treatments (0 and 74 kg/ha each of nitrogen and phosphorus) on 5 × 7 m plots cleared of trees in May 1973. Trees were cut at a height of 5 to 10 cm with chain saws. The adjacent ungrazed area consisted of three replications of the same treatments on plots of 15 × 30 m. Smaller plots were used in the grazed area to provide an adequate number of plots similar in elm density and herbaceous species composition to those in the ungrazed area.

One plot per replication was randomly selected to be left uncleared and unfertilized as a control in both the grazed and ungrazed areas. There were no uncleared, fertilized plots. Herbage production, grazing residue and sprout length data were collected at the end of the 1973 growing season. The height of the tallest sprout per stump was determined at the end of the growing season in 1974 and 1975.

Statistical analyses of differences in herbage production within the ungrazed areas, grazing residue within the grazed area and sprout length averages within each area were by analyses of variance. Statistical analyses of differences in herbage standing biomass, whether grazed or ungrazed, and sprout length averages between the grazed and ungrazed areas were by the unpaired t−test method (Steele and Torrie 1960). The level of significance of differences discussed was 5% or greater.

Results and Discussion

Total herbage production on the uncleared and unfertilized, grazed area (1,000 kg/hectare) was no less than that on the uncleared and unfertilized ungrazed area (Fig. 1). However, the amount of grazing residue on grazed cleared areas at the end of the 1973 growing season was less than 20% of that on grazed uncleared areas. There was no difference in grazing residue due to fertilizer treatments although fertilization increased herbage production on cleared ungrazed areas.

Herbage data from the ungrazed area show that overstorage removal greatly increased herbage production (Fig. 1). Herbage production increased by about 1,500 kg/hectare on cleared, unfertilized areas and about 2,200 kg/hectare on cleared, fertilized areas.

Apparently cattle concentrated grazing on the cleared areas and neglected uncleared areas with overstory canopy present. Utilization of plants of all herbaceous species classes was very heavy and generally exceeded 90%. All species found on the small grazed areas were at least partially grazed (Fig. 2).

Most (88%) of the stumps in each cleared area produced sprouts soon after being cut in May. Sprouts on both fertilized and unfertilized cleared areas were heavily browsed by cattle (Fig. 3). The average sprout length at the end of the 1973 growing season in the ungrazed area was 22 cm for unfertilized areas and 27 cm for fertilized areas. However, average sprout length at the end of the 1973 growing season in the grazed area was 5.5 cm and 4.8 cm for unfertilized and fertilized areas, respectively. Similar grazing during the growing season in 1974 and 1975 resulted in the death of all sprouts on all cleared and grazed areas by the end of the 1975 growing season. The average height of the tallest sprouts in the ungrazed area in October 1975 was about 50 cm. There was no apparent decline in vigor of sprouts in the ungrazed area between 1973 and 1975.

Our results agree with those of Reynolds (1962) and McEwen and Dietz (1965), who found that cattle prefer forage from open areas over forage beneath the canopy of trees. The removal of overstory tree cover not only increased production of herbaceous vegetation, but also increased utilization of available forage and browse. Very little browsing of elm twig tips by deer (George and Powell 1977) or by cattle was detected on uncut trees in the control areas.

Small cleared areas could be used in a management program of mechanical-biological control of American elm. If continued production of sprouts is desired, larger cleared areas would reduce the likelihood of the sprouting stumps being killed by continued heavy browsing by animals concentrating on small areas. The optimum combination of cleared area and grazing pressure will need to be determined to maximize herbage production and optimize sprout regrowth under grazing.

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