BRUSH MANAGEMENT ON THE CROSS TIMBERS EXPERIMENTAL RANGE: II. HERBACEOUS PLANT RESPONSES

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Story in Brief

This study on the Cross Timbers Experimental Range was initiated in 1983 to compare rangeland responses to five brush treatments. The treatments consisted of two herbicides, tebuthiuron and triclopyr applied in 1983, with and without spring burning in 1985 and 1986, and no brush control. Stocker cattle were grazed season-long (late April to late September) in 1985 and 1986 in each 80 acre treatment pasture. Following both herbicide treatments, grass and forb standing crops increased dramatically on previously wooded shallow savannah range sites. But, by 1986 more grass was produced on shallow savannah range sites treated with tebuthiuron than with triclopyr. Understory herbaceous plants of low, medium and high forage value increased in frequency in response to both herbicides. Forb standing crop and frequency of low value forbs such as horseweed appear to have peaked in 1985 and declined in 1986. Forage released from brush competition on the oakbrush range type has not been fully utilized under season-long grazing by stocker steers because of greater steer preference for the grassland range type. The burns in 1985 and 1986 were generally of insufficient intensity to provide substantial follow-up brush control on savannah sites. Thus, through 1986, the fourth year after herbicide application, there were no herbage production advantages to the prescribed burns.

Key Words: Brush Control, Range Improvement, Herbicides, Prescribed Burning, Plant Control

Introduction

Large increases in herbaceous species and forage production follow control of the overstory hardwoods in the Cross Timbers and similar regional oak-hickory ranges. In the Cross Timbers of central Oklahoma, production of desirable grasses increased to as much as 4000 lb/ac two to three years after spraying for brush control (Elwell et al. 1974). Forage production increased from less than 100 lb/ac to over 1500 lb/ac in three years with a single application of 2,4,5-T in the Quachita Highlands of eastern Oklahoma (Stritzke et al., 1975). Tebuthiuron, a soil applied herbicide, will provide similar forage production increases (Scifres et al., 1981). However, follow-up brush treatments are necessary since brush resprouting and brush release will eventually cause forage production to decline to pretreatment levels or below. Integrating prescribed fire into a brush management program may offer a low-cost alternative to follow-up herbicide applications for prolonging the effective life of the initial herbicide treatment.

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Combinations of herbicides and prescribed burning for brush control in the Cross Timbers have not been inadequately tested. Also, no herbaceous plant response data is available for the Cross Timbers for brush treatments applied in the presence of cattle grazing. Thus, the objective of this research was to determine herbaceous plant responses to tebuthiuron and triclopyr with and without spring burning as a brush control maintenance treatment. This paper presents results from the first four years of this long-term study.

Materials and Methods

This study was conducted on the 1760 acre Cross Timbers Experimental Range (CTER), located in the western edge of the Cross Timbers southwest of Stillwater in Payne County, Oklahoma.

Twenty pastures, each 80 acres in size, were assigned to one of five brush treatments. The treatments consisted of two herbicides with and without repeated spring burning and an untreated control. The herbicides, tebuthiuron and triclopyr, were applied at 2.0 lb/ac on March 18 and June 21-22, 1983, respectively. The first maintenance burns were conducted in late March to early April of 1985 and 1986. All twenty pastures were seasonally grazed by stocker cattle from late April to late September beginning in 1985 as described in McCollum et al. (1986).

Production of herbaceous vegetation was sampled on three of the most common range sites in late July and early August (approximate peak standing crop). Standing crop of current year's growth was clipped to ground level and separated into grass and forb categories before being dried and weighed. Frequency of occurrence (i.e., rooted frequency) of understory species was sampled on the same range sites at the end of the growing season. Frequency quadrats were 50 X 50 cm for all species except for little bluestem, which was sampled in a 25 X 25 cm quadrat frame nested within the 50 X 50 cm frame. Sampling was conducted along previously established transects on three range sites: shallow prairie, moderately wooded (40 to 60% tree cover) shallow savannah, and sandy savannah (Ewing et al., 1984). Selected data from the shallow prairie and shallow savannah range sites are presented to illustrate the early post-treatment differences that occurred on these range sites.

Forage utilization was estimated in November 1986 to determine grazing distribution within grassland and oakbrush range types. A method adapted from Anderson and Currier (1973) was used to estimate forage use along transect lines crossing each pasture. Use was rated on a scale of 1 to 5 where 1 was none to light use, 3 was moderately heavy use, and 5 was severe use.

Results and Discussion

Grass production on shallow prairie range sites was increased in 1983 with the triclopyr treatment but not with the tebuthiuron treatment (Table 1). By 1984, grass production on the triclopyr treated pastures was double that of the control pastures. Shallow prairie range sites on the CTER were dominated by grasses and were relatively free of brush competition before treatment (Ewing et al., 1984), so the substantial increase in grass production resulting from the triclopyr treatment must not be attributed to reduced forb (i.e., weed) competition. This data suggests that when significant proportions of brush-free tallgrass sites

Table 1. Standing crop (lb/ac) of current year's growth on shallow prairie range sites.

	1983			1984		
Treatment	Grasses	Forbs	Total	Grasses	Forbs	Total
Tebuthiuron	1590	10	1600	1720	180	1900
Triclopyr	2080	100	2180	2490	40	2530
Control	1600	210	1810	1200	190	1390

occur interspersed within brush sites, triclopyr may provide a short-term advantage to tebuthiuron.

Both herbicides resulted in dramatic increases in grass and forb production by 1984 on shallow savannah range sites (Table 2). Grass standing crop increased steadily from 1984 to 1986 but increased less in triclopyr than in tebuthiuron treatments. Competition by herbicide resistant understory brush species may be responsible for the lower increase in grass production in the triclopyr treatments. Forb standing crop, which increased greatly after application of both herbicides, peaked in 1985. Early successional, low and medium value annual forbs had high frequencies by 1985, but had declined in frequency in 1986 (Table 3). In contrast, medium and high value perennial grasses generally increased in frequency from 1985, especially in the tebuthiuron treatment.

No consistent or large differences in standing crop or species frequencies have resulted from the follow-up burn treatments. The prescribed burns in both 1985 and 1986 were of low to moderate intensity within the shallow savannah range sites because of insufficient dry fine fuel and the presence of cool season herbaceous species. Thus, greater effectiveness of the spring burns may be expected in the future as production of warm season grasses such as little bluestem and big bluestem increase and provide more suitable fuel.

Grazing has not been uniform in any of the brush treatments (Table 4). Hence, stocking rates could not be increased as much as forage availability would allow without resulting in overuse of the grasslands. Eighty percent or more of the grassland type was fully utilized (moderately light to moderately used) in all treatments. Forage use in the oakbrush type was mostly light to moderately light. Thus, more than 75% of the oakbrush type was underutilized in all brush treatments. An earlier grazing date and higher stocking density might increase the use of forages in the oakbrush type. The oakbrush type should eventually become more attractive to stocker cattle when warm season grasses begin to produce more forage and as the dead tress begin to fall.

Table 2. Standing Crop (lb/ac) of current year's growth on shallow savannah range sites.

Treatment	1984			1985			1986		
	Grasses	Forbs	Total	Grasses	Forbs	Total	Grasses	Forbs	Total
Tebuthiuron	990	170	1160	2050	1810	3860	3330	560	3890
Tebuthiuron + fire	1150	180	1330	1910	2740	4650	2820	1940	4760
Triclopyr	540	1050	1590	1490	2570	4060	1910	1010	2920
Triclopyr + fire	980	480	1460	1230	1910	3140	1860	1350	3210
Control	150	90	240	80	40	120	40	40	80

Table 3. Frequency (percent) of selected understory species on shallow savannah range sites.

Species	Forage value rating[a]	Tebuthiuron		Tebuthiuron + fire		Triclopyr		Triclopyr + fire		Control	
		1985	1986	1985	1986	1985	1986	1985	1986	1985	1985
		(Percent)									
Grasses and grasslikes											
Warm season											
Little bluestem[b]	M-H	14	13	10	10	2	3	6	6	3	2
Big bluestem	H	5	9	7	8	0	1	2	2	1	0
Rock muhly	L-M	20	18	11	16	4	9	8	3	4	5
Purpletop	M	36	21	34	17	6	3	10	10	4	0
Cool season											
Rosette panic grass	M	54	78	70	83	50	65	55	68	12	5
Virginia wildrye	H	10	10	5	13	16	9	20	10	1	1
Sedge	M-H	28	21	36	30	26	39	22	26	10	9
Forbs											
Marestail	L	36	5	56	6	28	1	29	15	0	0
Lettuce	H	20	3	10	3	7	3	6	4	0	0
Pokeweed	L	5	6	8	10	24	20	16	11	0	0

[a] H = high, M = medium, L = low.

[b] Scientific names are: little bluestem (Schizachyrium scoparium), big bluestem (Andropogon gerardii), rock muhly (Muhlenbergia sobolifera), purpletop (Tridens flavus), rosette panic grass (Panicum oligosanthes), Virginia wildrye (Elymus virginicus), sedge (Carex spp.), marestail (Conyza canadensis), lettuce (Lactuca spp.), pokeweed (Phytolacca americana).

Table 4. Proportion of grassland and oakbrush range types in forage use categories[a] at the end of the 1986 grazing season.

Treatment	Grassland				Oakbrush			
	Light (0-15%)	Mod. light (16-40%)	Moderate (41-60%)	Heavy (61-80%)	Light (0-15%)	Mod. light (16-40%)	Moderate (41-60%)	Heavy (61-80%)
Tebuthiuron	9	57	30	5	3	72	25	0
Tebuthiuron + fire	0	44	47	8	28	67	5	0
Triclopyr	0	40	43	17	27	70	3	0
Triclopyr + fire	0	44	54	2	26	60	14	0
Control	5	39	53	3	74	26	0	0

[a]Use categories, in percent use of an area around a grid point, are based on visual estimation of key species degree of use and a narrative description of the level of use of available forage in an area. The severe use category (81-100% use) is not shown since no areas received a severe use rating.

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