

Effects of Fencing and Plowing on Plant Succession in a Revegetating Field¹

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The abandoned field under investigation consists of a five-acre plot in the Grassland Investigation Project near Norman, Oklahoma. It was farmed for a period of 20 to 25 years prior to 1941. In 1941 it was retired from cultivation and planted to Korean lespedeza. The plot was grazed until 1949 at which time it was fenced, and a half-acre portion was plowed to a depth of seven inches. The period of field study extended from 1950 through 1954.

The plant populations of both plots were determined by means of twenty-five quadrats of 0.1 square meter each in the spring of 1950 and in the early autumn of 1950, 1951, 1952 and 1954. In each quadrat the living areal (foliage) cover was estimated to the nearest whole percent of the total quadrat area. From these data the relative frequency, and the relative cover were calculated. The relative values were obtained by dividing the frequency or cover of a given species by the sum of the frequencies or cover data of all species encountered in the samples. Since

the relative frequency and the relative cover were similar for each species only the relative cover per species (percent of total cover) is reported.

Revegetating, Abandoned Field

The vegetation of the unplowed, abandoned field (control) was analyzed in 1949 by Kelting (1951). He reported that two annual species, three-awn grass and Korean lespedeza (planted) and one perennial species, Scribner's panic grass, were the major dominants and furnished most of the cover during the main part of the growing season. This was true also in 1950 (Table 1). During the course of the current investigation, however, three-awn grass and Korean lespedeza declined in importance and the latter disappeared completely (Table 1). By 1954, western ragweed, many-flowered aster, and fall witchgrass along with Scribner's panic grass, had become the dominant species (Table 1).

Replowed, Abandoned Field

In the spring of 1950 the plant population of the replowed, abandoned land was composed largely of western ragweed, Korean lespedeza, false dandelion and buffalo-bur. The last two species composed

nearly half of the total foliage cover in the spring of 1950 (Table 1). However, false dandelion was not encountered in subsequent sampling and buffalo-bur, much reduced in quantity, was sampled again only in the autumn of 1950.

In the autumn of 1950 the plant population was composed primarily of western ragweed, three-awn grasses, Korean lespedeza, and fall witchgrass (Table 1). As in the case of the unplowed plot, the three-awn grasses decreased in importance and Korean lespedeza disappeared completely during the period from 1950 to 1954 (Table 1). Although western ragweed was dominant during much of the sampling period it was reduced to a minor species during the very severe drought year of 1954.

By the time of the 1954 sampling period the only important species, on the basis of relative cover, were many-flowered aster and fall witchgrass (Table 1). The increase in many-flowered aster was unexpected although its rise during the drouth period of 1954 might have been anticipated on the basis of Weaver's reports (1954). In view of the fact that fall witchgrass decreased in relative cover from 1952 to 1954, it seems probable that this species is aided by protection from grazing.

On the basis of behavior the species in the replowed, abandoned field have been divided into five groups. In group I the species exhibited a high relative cover only in the spring of the first growing season and disappeared before the second growing season (Table 1). In group II the species had a relatively high cover during the first

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Table 1. Relative areal (foliage) coverage of important species in a revegetating, abandoned field (Control, C) and a portion of the abandoned field replowed in December, 1949 (Replowed, R).

Group	Species		1950		1951	1952	1954
			Spring	Fall	Fall	Fall	Fall
I	<i>Pyrrohappus grandiflorus</i> (False dandelion)	R	†10.6	—	—	—	—
	<i>Solanum rostratum</i> (Buffalo-bur)	R	36.2	6.0	—	—	—
	<i>Ambrosia psilostachya</i> (Western ragweed)	C	4.9	0.8	0.9	12.6	15.0
II		R	21.3	12.1	9.3	17.2	1.1
	<i>*Aristida spp.</i>	C	7.8	50.1	19.0	18.1	5.3
	(Three-awn grasses)	R	6.4	23.2	44.5	9.1	2.5
	<i>Lespedeza stipulacea</i> (Korean lespedeza)	C	7.2	16.4	17.3	6.5	—
		R	8.5	25.5	3.3	0.5	—
III	<i>Panicum scribnerianum</i> (Scribner's panic grass)	C	22.2	13.4	17.1	25.1	27.9
		R	4.2	t	t	4.7	4.7
	<i>Chloris verticillata</i> (Windmill grass)	C	11.1	4.6	1.6	4.7	2.0
		R	t	1.0	7.0	7.3	4.9
	<i>Aster ericoides</i> (Many-flowered aster)	C	1.3	0.5	1.1	1.4	14.6
IV		R	4.2	5.7	1.2	13.3	49.7
	<i>Leptoloma cognatum</i> (Fall witchgrass)	C	t	7.7	22.0	9.1	22.7
		R	t	10.8	22.9	37.6	23.4
V	<i>Andropogon saccharoides</i> (Silver beardgrass)	C	t	—	0.4	1.2	0.4
		R	—	—	2.6	1.8	1.9
	<i>Andropogon scoparius</i> (Little bluestem)	C	—	0.1	1.6	—	2.4
		R	—	—	—	—	0.5

* *A. basiramea* and *A. oligantha*, chiefly the latter.

† Sum of relative cover data for all species does not equal 100 percent since the above list is only partial.

year but decreased in importance throughout the period of observation. In group III the species exhibited moderate cover the first year after replowing but increased only moderately during the five-year period (Table 1). In group IV the species exhibited a low relative cover during the first year but attained dominant status by the end of the fifth year (Table 1). In group V the species possessed a very low relative cover during the first year and increased only slightly throughout the sampling period (silver beardgrass and little

bluestem). Of the last group, little bluestem is destined to become a dominant species in the next ten to twenty years.

Comparison of Plots

The number of species in the unplowed abandoned field (control) was higher in 1950 and 1951 than that of the plowed plot although the numbers in both plots were similar in 1952 and 1954 (Table 2). The decrease in number of species in the control was due undoubtedly to the lack of grazing and the increased competition re-

sulting therefrom. It will be observed that there was little difference between the plots in the percent areal cover except in the spring of 1950 (Table 2). This contrasts markedly with the results when the native prairie was plowed. In the plowed prairie "The amount of living areal cover produced during the second season after plowing was approximately two and one-half times as great in each of the plowed plots as in the control" (Rice and Penfound, 1954).

Summary

This paper presents a comparison of the plant populations in a revegetating, abandoned field (control) and a replowed portion of the abandoned field over a five-year period (1950 through 1954).

At the beginning of the period (1950) the abandoned field (control) was dominated by three-awn grass, Korean lespedeza, and Scribner's panic grass, but by 1954, the dominants were Scribner's panic grass, western ragweed, many-flowered aster, and fall witchgrass.

In the first spring after plowing (1950), the replowed abandoned field was dominated by western ragweed, Korean lespedeza, false dandelion, and buffalo-bur, but by the end of the observation period (1954) the only important plants in the replowed plot were many-flowered aster and fall witchgrass.

The number of species was greater in the revegetating field (control), but the percent areal (foliage) cover was similar in both plots throughout the observation period (1950 through 1954).

LITERATURE CITED

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Table 2. Number of species and areal cover in a revegetating field (control) and a portion of the revegetating field replowed in December, 1949.

	1950		1951	1952	1954
	Spring	Fall	Fall	Fall	Fall
Number of species per sample (25 quadrats)					
Control	47	28	34	28	22
Replowed	17	23	18	22	21
Percent areal (foliage) cover per quadrat					
Control	30.6	74.4	80.8	43.0	24.7
Replowed	4.7	61.2	68.9	38.3	24.7