

Is Deferment Always Needed After Chemical Control of Sagebrush?¹

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Highlight

The effects of 0, 1, 2, and 3 years of grazing deferment after sagebrush control were compared on subalpine ranges of the Big Horn Mountains in Wyoming.

On units open to grazing, utilization of Idaho fescue was generally below the level which sustains yield under season-long grazing. Under such conditions, the desirable forage grasses quickly increased in vigor and revegetated the area after sagebrush was killed. Continued moderate utilization did not retard the revegetation process or influence the subsequent reinvasion of sagebrush.

Chemical control of sagebrush (*Artemisia* spp.) is probably the most popular range improvement practice in Wyoming. Wyoming ranchers began spraying sagebrush as early as 1950. The practice became quite popular and 106,000 acres were sprayed in 1964 alone. The total acreage now exceeds 1/2 million (Kearl, 1965).

Many land management agencies encourage or require one or more years of grazing deferment—the objective being to perpetuate maximum forage production (Pechanec et al., 1965). Deferment, however, may place a temporary hardship on the ranching operation. Herds must be reduced or additional range must be acquired to replace the temporary loss of available forage.

This paper compares the effects of 0, 1, 2, and 3 years of deferment on forage production and reinvasion of sagebrush.

Study Areas and Procedures

To replicate the treatments in time and space, four experiments were set up in cattle allotments of the Bighorn National Forest. The Soldier Creek and Antelope Butte areas were sprayed in 1960. The remaining areas, Buck Creek and Grouse Creek, were sprayed in 1961.

Each experiment consisted of two randomized complete blocks, with subsampling of the experimental units for utilization, production, and sagebrush density. The no-deferment units were never fenced. Deferments of 1, 2, and 3 years were obtained through fencing and removal of fences at appropriate times.

Production of major vegetational components was measured on each of the 15 subsample units (1 × 4 ft) by the weight-estimate method (Pechanec and Pickford, 1937a). The sample mean was adjusted by double sampling techniques (Wilm, Costello, and Klipple, 1944). These measurements were made the year before spraying and annually for six years after control.

Utilization was determined by the ocular estimate by plot method (Pechanec and Pickford, 1937b). Estimates were made the year of spraying and annually thereafter.

To assess the reinvasion of sagebrush, seedlings and older sagebrush plants were counted on each subsample unit the year after spraying and annually thereafter.

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²Forest Service, U. S. Department of Agriculture, with headquarters at Fort Collins, in cooperation with Colorado State University. Research reported here was conducted at Laramie, in cooperation with University of Wyoming.

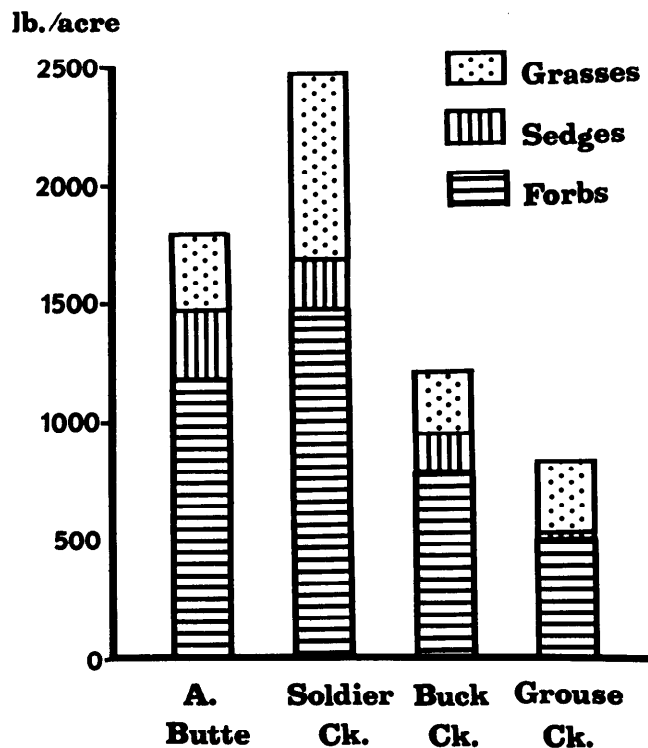


FIG. 1. Production of herbage in the year before sagebrush control. Sagebrush was sprayed in 1960 at Antelope Butte and Soldier Creek, and in 1961 at Buck Creek and Grouse Creek.

Effectiveness of the control program was determined from pre- and post-treatment measurements of sagebrush density and crown cover. Cover was determined from ten 100-ft line intercepts (Canfield, 1942) at each of the four experimental areas. These intercepts were not located within the experimental units, but were scattered throughout the immediate area. Density was determined by superimposing over each line intercept a 10×100 ft belt transect and counting the number of plants.

Data were subjected to analysis of variance and conclusions were based upon significance at the 0.05 level of probability.

The herb flora at Antelope Butte, Soldier Creek, and Buck Creek was typical of the Idaho fescue (*Festuca idahoensis* Elmer) community (Hurd, 1961; Beetle, 1956) which occurs in subalpine parks throughout the Big Horn Mountains. The Grouse Creek experiment, elevation about 6,500 ft, was at the lower limits of the zone, and such species as bluebunch wheatgrass (*Agropyron spicatum* (Pursh) Scribn. and Smith) were common.

The sagebrush community, prior to spraying, supported a relatively dense understory of perennial grasses and forbs. Total herb production ranged from about 800 lb/acre at Grouse Creek to 2,500 lb/acre at Soldier Creek (Fig. 1). Forbs dominated the herbaceous vegetation at each location. Production of perennial grasses ranged from about 250 lb/acre at Buck Creek to nearly 800 lb/acre at Soldier Creek.

Crown cover of big sagebrush (*Artemisia tridentata* Nutt.) ranged from 14% at Buck Creek to 24% at Soldier Creek (Fig. 2). Stem density ranged from 14 per 100 ft² at Buck Creek to 18 per 100 ft² at Grouse Creek.

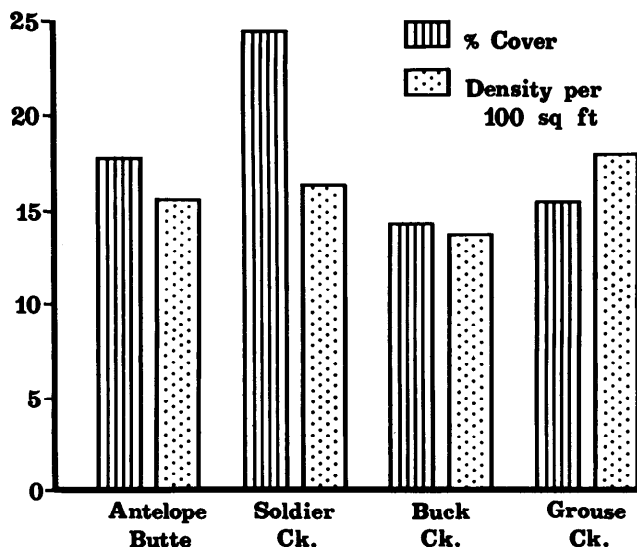


FIG. 2. Crown cover and stem density of big sagebrush in the year before sagebrush control. Sagebrush was sprayed in 1960 at Antelope Butte and Soldier Creek, and in 1961 at Buck Creek and Grouse Creek.

Results

Excellent control of big sagebrush was obtained with the aerial applications of 2,4-D. Crown cover and density were reduced by about 98% on each of the four experimental areas.

Utilization of Idaho fescue, the key management species, was higher in the pretreatment year than in the years following sagebrush control (Fig. 3). The decrease in utilization was probably a result of an increase in grass production without a commensurate increase in stocking rate. In the post-treatment years, utilization was generally less than 43%—the level which sustains yield under season-long use (Beetle et al., 1961).

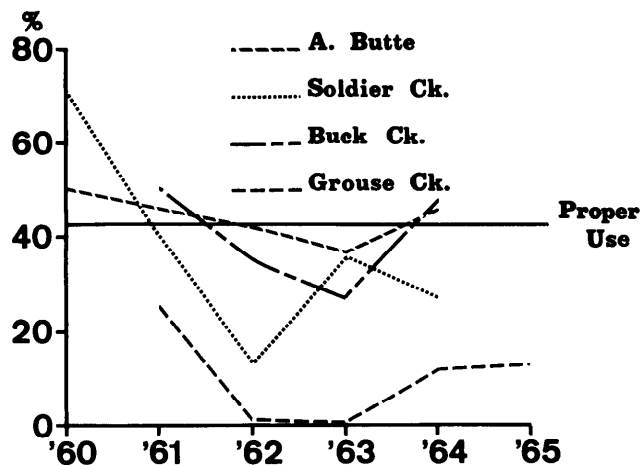


FIG. 3. Utilization of Idaho fescue on areas open to grazing at each of the four experimental areas. Sagebrush was sprayed in 1960 at Antelope Butte and Soldier Creek, and in 1961 at Buck Creek and Grouse Creek.

Table 1. Average (1959–1965) herbage production (lb/acre) in the Antelope Butte Experiment as affected by length of deferment.

Species	Years of Deferment				
	0	1	2	3	LSD ¹
Total grasses	583	460	458	376	NS
Idaho fescue	331	237	165	163	31
Columbia needlegrass	57	37	79	50	NS
Raynold's sedge	82	141	198	132	NS
Total forbs	451	437	505	513	NS
Lupine	119	107	123	89	NS

¹ Least significant difference among treatment means at the 0.05 level of probability.

Herbage production—At Buck Creek and Grouse Creek, length of deferment had no effect upon production of all grasses, Idaho fescue, Columbia needlegrass (*Stipa columbiana* Macoun.) Raynold's sedge (*Carex raynoldsii* Dewey), all forbs, and lupine (*Lupinus sericeus* Pursh).

In the Antelope Butte experiment, production of all grasses, Columbia needlegrass, Raynold's sedge, all forbs, and lupine was not affected by length of deferment (Table 1). Yield of Idaho fescue, averaged over all years, was greatest under no deferment and least under two and three years of deferment. These differences among treatments, however, were as large in 1959, the year before spraying, as in the post-treatment years. Therefore, they probably reflect only chance variation among experimental units and not treatment effects.

At Soldier Creek, total production of grasses was not increased by deferment for one or two years (Table 2). Three years of deferment generally had the same effect as no deferment, but in 1963 the yield was 547 lb/acre more in non-deferred areas.

Average annual yield of Columbia needlegrass at Soldier Creek was not affected by length of deferment. But in 1962, production under no deferment

Table 2. Average (1959–1965) herbage production (lb/acre) in the Soldier Creek Experiment as affected by length of deferment.

Species	Years of Deferment				
	0	1	2	3	LSD ¹
Total grasses	793	653	836	558	223
Idaho fescue	319	273	346	196	NS
Columbia needlegrass	130	64	69	46	NS
Raynold's sedge	60	8	25	44	NS
Total forbs	474	543	429	430	NS
Lupine	85	146	137	120	NS

¹ Least significant difference among treatment means at the 0.05 level of probability.

Table 3. Density (per 100 ft.²) of big sagebrush seedlings and older plants as affected by length of deferment after sagebrush control. Data averaged over five years.

Experiment	Years of Deferment				
	0	1	2	3	LSD ¹
Antelope Butte	7.0	5.4	0.7	2.1	2.0
Soldier Creek	4.0	13.4	8.0	9.8	NS
Buck Creek	3.4	31.3	2.1	2.4	NS
Grouse Creek	35.5	10.2	6.7	19.8	NS

¹ Least significant difference among treatment means at the 0.05 level of probability.

was about 193 lb/acre more than under the other three treatments.

Production of Idaho fescue, Raynold's sedge, all forbs, and lupine was not affected by length of deferment.

Sagebrush reinvasion—In the post-treatment years, density of sagebrush varied greatly in all experiments, but the high mortality rate of seedlings consistently reduced the density to a low level.

In the Buck Creek, Grouse Creek, and Soldier Creek experiments, length of deferment had no effect upon the density of sagebrush (Table 3). At Antelope Butte, density was reduced by deferment of two or three years. High mortality rates reduced the number of seedlings to a uniformly low level, however, and there was no year-to-year increase in sagebrush density regardless of the length of deferment.

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