Effect of Three Intensities of Clipping on the Density and Production of Meadow Vegetation

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An important part of the forage on cattle ranges of the Bighorn National Forest in north central Wyoming is obtained from the narrow alluvial meadows bordering stream courses. These areas are small in proportion to the total rangeland, but they are potentially productive and serve an integral function in the overall range program. Grazing on these meadows tends to be concentrated, unless isolated by natural or manmade barriers.

Native herbaceous vegetation of these meadows consists primarily of ovalhead sedge (*Carex festivella* Mackenz.), beaked sedge (*C. rostrata* Stokes), Raynold's sedge (*C. raynoldsi* Dewey), dunhead sedge (*C. phaeocephala* Piper), baltic rush (*Juncus balticus* Willd.), and tufted hairgrass (*Deschampsia caespitosa* (L.) Beauv.). An overstory of willows (*Salix* spp. L.) on the wetter sites and shrubby cinquefoil (*Potentilla fruticosa* L.) on the drier sites is often present.

The adverse effect of close and frequent clipping on subsequent yields of herbaceous species has been reported by several authors. Among them are Canfield (1939), Harrison and Hodgson (1939), Sampson and Malmston (1926), Kennedy and Russell (1948), and Sarvis (1923). McCarty and Price (1942) and Stoddart (1946), have found that clipping only once during the early part of the growing season or clipping at the end of the growing season has little effect upon the yield of many herbaceous species.

In 1952, three areas of meadow type were selected to determine the reaction of the meadow vegetation to various intensities of clipping. On Rabbit Creek Annex, vegetation consisted of the sedges, grasses, and forbs native to the area. The other two areas, Elgin Park and Little Sourdough, were dominated by Kentucky bluegrass (*Poa pratensis* L.) and white Dutch clover (*Trifolium repens* L.).

Methods

Two cages approximately eight feet square were located in each meadow[2]. Within each cage, six permanent sub-plots, measuring 1 x 2 feet, were clipped annually from 1952 to 1955, inclusive.

Two sub-plots (referred to hereafter as the one-inch plots) were clipped to a one-inch stubble height every two weeks. Two other subplots (the three-inch plots) were clipped to a three-inch stubble height every two weeks. Clipping began about June 30 and ended about September 15. The remaining two sub-plots (the check plots) were clipped to one-inch stubble height on about September 15.

Density of vegetation was measured in 1952 and 1956. A wire loop three-fourths inch in diameter was used to make 25 observations in a grid fashion on each plot. Only those plants whose bases appeared in the loop observations were used to figure density.

Forage production was expressed as air-dry weight from clipping. No effort was made to segregate species.

Results

Effect Of Clipping On Density

Rabbit Creek Annex. Total density (number of hits with a three-fourths inch loop expressed as percent) of grasses and grasslike plants was reduced on plots clipped at two-week intervals (Table 1). Greatest reduction was on the one-inch plots where the total grass and grass-like density dropped from 55.5 to 18.0. Individual species that decreased between 1952 and 1956 were ovalhead sedge,

[1] *Central headquarters maintained at Fort Collins in cooperation with Colorado State University. Research was conducted in cooperation with the University of Wyoming at Laramie.*

[2] *Rodents or other disturbing factors necessitated abandonment of one cage in Elgin Park in 1953, limiting conclusions to the results from one cage.*

Table 1. Effect of three intensities of clipping on the density of some major species at Rabbit Creek Annex, 1952 to 1956.

Plants	Clipping Treatment: One inch 1952	One inch 1956	Three inch 1952	Three inch 1956	Check 1952	Check 1956
	(Percent)					
GRASS AND GRASSLIKE						
Kentucky bluegrass	0	2.0	0	8.0	4.5	3.0
Tufted hairgrass	13.0	5.0	18.0	16.0	7.5	8.0
Other grasses	7.5	5.0	9.0	5.0	12.5	9.0
Beaked sedge	7.5	0	8.5	2.5	6.5	6.0
Ovalhead sedge	18.5	2.0	9.5	5.0	9.5	11.0
Raynold's sedge	9.0	4.0	11.5	8.0	23.0	19.5
Other grasslike	0	0	0	0	0	0
Total grass and grasslike	55.5	18.0	56.5	44.5	63.5	56.5
FORBS						
White Dutch clover	0	0	1.0	0	1.0	0
Other forbs	1.5	3.0	2.5	4.5	1.5	5.5
Total forbs	1.5	3.0	3.5	4.5	2.5	5.5
MOSS AND LITTER						
	43.0	79.0	40.0	51.0	34.0	38.0
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0

beaked sedge, Raynold's sedge, and tufted hairgrass. Kentucky bluegrass was not present in 1952 but had appeared in small amounts by 1956. The density of moss and litter increased from 43.0 to 79.0. The change in forb density was insignificant.

Reduction in density was less marked on the three-inch plots. Total grass and grasslike density dropped from 56.5 to 44.5. Density of beaked sedge decreased from 8.5 to 2.5 and other species decreased somewhat less. Kentucky bluegrass increased from 0 to 8.0 in the four years. Forbs were of minor importance. Moss and litter increased, but less than a third the increase observed on the one-inch plots.

On the check plots, change in density was slight. Total grass and grasslike density decreased from 63.5 to 56.5. Most of this loss was due to a decrease of Raynold's sedge and other grasses. Total forb density increased from 2.5 to 5.5, but changes in individual species was minor. Moss and litter increased slightly.

Elgin Park. At this site, the densities of many grass and grass-like plants were reduced by clipping to one inch at two-week intervals (Table 2). Redtop (*Agrostis alba* L.) and beaked sedge, which had densities of 8.0 and 7.8, respectively in 1952, disappeared by 1956. Density of dunhead sedge and tufted hairgrass decreased from 20.0 to 5.0 and from 28.0 to 10.0, respectively. Kentucky bluegrass was an exception, for it increased markedly. White Dutch clover, the only forb of importance, dropped from a density of 13.6 to nothing. Moss and litter increased from 4.0 to 50.0.

On the three-inch plots, the grass and grasslike plants were not so seriously affected. Dunhead sedge decreased the greatest amount. Other decreases were relatively minor. Tufted hairgrass and Kentucky bluegrass showed marked increases. The density of white Dutch clover decreased from 12.0 to 3.0. Moss and litter remained constant.

On the check plots, few decreases occurred in the density of individual grass and grasslike species. Kentucky bluegrass more than doubled. Among the forbs, density of white Dutch clover decreased from 20.0 to nothing, and western yarrow (*Achillea lanulosa* Nutt.) increased from nothing to 8.0. Density of moss and litter increased from 10.0 to 14.0.

Little Sourdough. In this area, density of most grass and grasslike plants was reduced on plots clipped at two-week intervals

Table 2. Effect of three intensities of clipping on the density of some major species at Elgin Park, 1952 to 1956.

Plants	Clipping Treatment: One inch 1952	One inch 1956	Three inch 1952	Three inch 1956	Check 1952	Check 1956
	(Percent)					
GRASS AND GRASSLIKE						
Kentucky bluegrass	9.0	23.0	16.0	28.0	10.0	25.0
Redtop	8.0	0	13.0	10.0	11.0	8.0
Tufted hairgrass	28.0	10.0	12.0	23.0	20.0	20.0
Other grasses	5.6	4.0	6.0	4.0	6.0	2.0
Beaked sedge	7.8	0	1.0	0	2.0	0
Dunhead sedge	20.0	5.0	20.0	12.0	19.0	16.0
Other grasslike	1.0	2.0	0	0	0	0
Total grass and grasslike	79.4	44.0	68.0	77.0	68.0	71.0
FORBS						
White Dutch clover	13.6	0	12.0	3.0	20.0	0
Western yarrow	0	0	0	0	0	8.0
Other forbs	3.0	6.0	6.0	8.0	2.0	7.0
Total forbs	16.6	6.0	18.0	11.0	22.0	15.0
MOSS AND LITTER						
	4.0	50.0	12.0	12.0	10.0	14.0
BARE SOIL						
	0	0	2.0	0	0	0
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0

(Table 3). On the one-inch plots, relatively large decreases in density of redtop, tufted hairgrass, and alpine timothy (*Phleum alpinum* L.) were offset by an increase in the density of Kentucky bluegrass. Other grass and grass-like species changed very little. White Dutch clover dropped from an initial density of 47.3 to zero. Density of other forbs changed little. Bare soil and ground surface covered only by moss and litter were not present in 1952. By 1956, they had increased in density to 13.0 and 38.0, respectively[3].

On the three-inch plots, the density of Kentucky bluegrass increased from 23.7 to 41.0. Increases of Raynold's sedge and tufted hairgrass and decreases of dunhead sedge, baltic rush, and alpine timothy were comparatively small. White Dutch clover density dropped from 32.7 to 1.5. Other forb species changed little. Area covered only with moss and litter increased from 0 to 17.0.

On the check plots, density changes of most grass and grass-like species were small. The density of tufted hairgrass and Kentucky bluegrass, however, increased from 5.5 to 12.5 and from 19.3 to 44.3, respectively. Density of white Dutch clover decreased from 36.0 to 4.0. Changes in other forbs were slight. The density of moss and litter increased only from 1.0 to 5.0.

Effect Of Clipping On Herbage Production

Rabbit Creek Annex. Herbage production in this area fluctuated widely from 1952 to 1955 (Figure 1). In general, yields were decreased by all clipping. Changes on one-inch and three-inch plots showed greater reductions than did the check plots. By 1955, the yields on the plots clipped frequently were reduced 69.0 percent, while those on the check plots were reduced only 35.0 percent.

Elgin Park. During 1953, production on all plots far exceeded the production of the previous year. However, production dropped sharply during 1954. In 1955, production decreased further on the one-inch but increased slightly on the three-inch plot and check plots. During this final year, the one-inch plots produced 32.0 percent less herbage than during the first year, but the three-inch and check plots produced 81.2 and 7.2 percent more, respectively.

Little Sourdough. Changes in production on these plots followed about the same pattern as those of Elgin Park. In 1953, the highest production was reached. In 1954, production declined sharply on all plots. During the final year, production on the one-inch plots dropped still further, but production on the three-inch plots and check plots remained essentially the same. At the end of the study, the one-

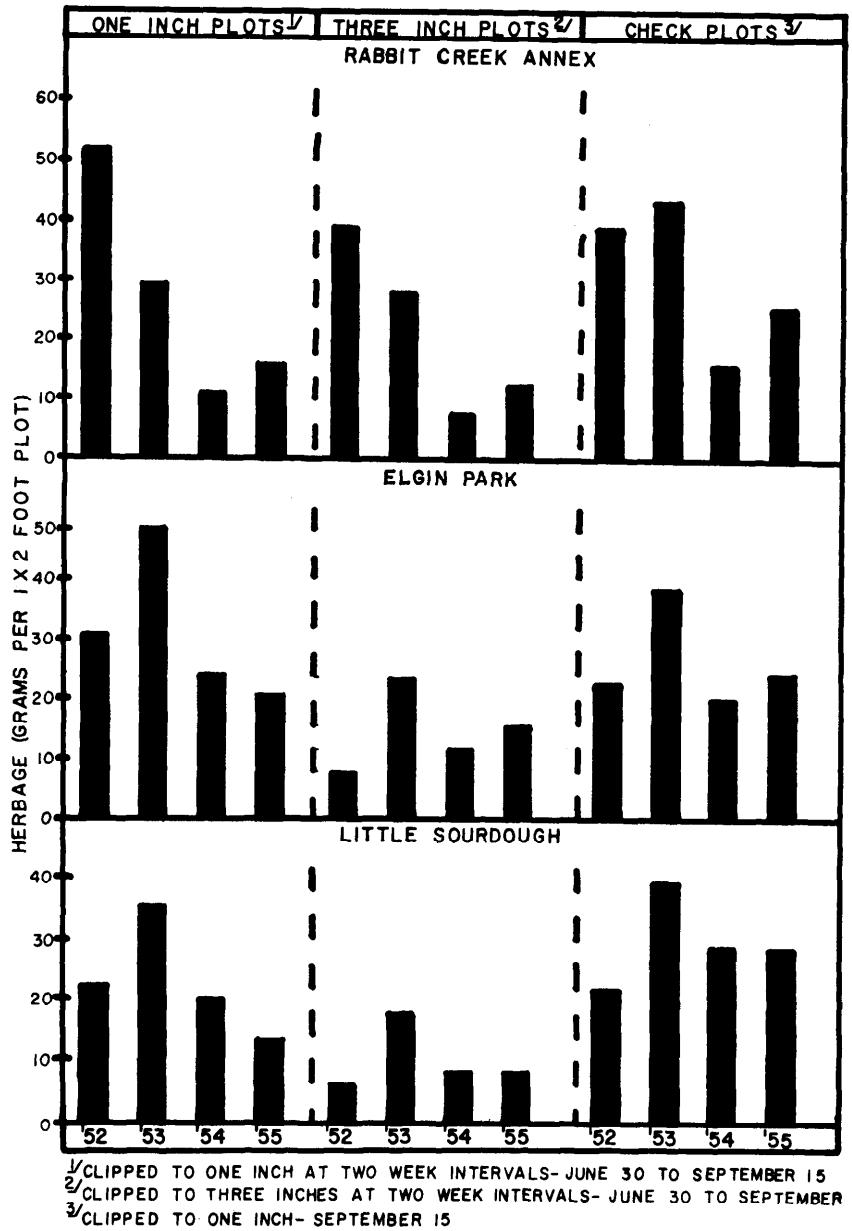

FIGURE 1. Effect of three intensities of clipping on seasonal production of three meadows in the Bighorn National Forest, 1952 through 1955.

[3] *A fresh gopher mound on one of the plots was partially responsible for the high increase in bare soil.*

Table 3. Effect of three intensities of clipping on the density of some major species at Little Sourdough, 1952 to 1956.

Plants	Clipping Treatment					
	One inch		Three inch		Check	
	1952	1956	1952	1956	1952	1956
	(Percent)					
GRASS AND GRASSLIKE						
Kentucky bluegrass	16.3	39.5	23.7	41.0	19.3	44.3
Redtop	8.1	2.0	5.0	5.0	5.0	6.0
Tufted hairgrass	7.5	1.0	12.8	15.5	5.5	12.5
Alpine timothy	5.9	0	5.4	3.0	5.8	5.0
Other grasses	2.9	0	1.3	2.0	7.3	4.0
Dunhead sedge	3.0	1.0	6.2	5.0	3.0	3.5
Raynold's sedge	0	0	.5	2.0	1.0	0
Baltic rush	2.8	1.5	4.2	2.0	9.3	7.9
Other grasslike	0	0	0	0	0	0
Total grass and grasslike	46.5	45.0	59.1	75.5	56.2	83.2
FORBS						
White Dutch clover	47.3	0	32.7	1.5	36.0	4.0
Other forbs	6.2	4.0	8.2	6.0	6.8	7.8
Total forbs	53.5	4.0	40.9	7.5	42.8	11.8
MOSS AND LITTER						
	0	38.0	0	17.0	1.0	5.0
BARE SOIL						
	0	13.0	0	0	0	0
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0

inch plots produced 40.8 percent less than at the beginning and the three-inch and the check plots produced 32.8 and 28.5 percent more, respectively, than in 1952.

Discussion Of Results

Precipitation was light over the general area during 1953, 1954, and 1955. During these years, the meadow at Rabbit Creek Annex, usually wet throughout the growing season, was dry by July 15. Little Sourdough Creek was dry before August, although it usually runs until October.

Under drought conditions, the various sedges and tufted hairgrass, which were the major components of the total density at Rabbit Creek Annex, were unable to maintain density and production under clipping at two-week intervals. Density of these same species was not seriously affected by clipping to one inch at the end of the growing season on approximately September 15. However, clipping at the end of the growing season did reduce production. Thus, factors other than loss of density due to clipping intensity were responsible for a portion of the loss in production.

In 1953, major components in total density at Little Sourdough and Elgin Park were Kentucky bluegrass and white Dutch clover. By 1956, large reductions in density of white Dutch clover had accurred on all plots; the species disappeared from some plots. Conversely, density of Kentucky bluegrass increased on all plots.

On the one-inch plots at Little Sourdough and Elgin Park, production was considerably lower in 1955 than in 1952. Loss in density of white Dutch clover and other species, which was uncompensated, was largely responsible for this loss in production. On the three-inch and check plots, however, as much herbage was produced in 1955 as in 1952. Total production was apparently not affected by density changes in white Dutch clover and Kentucky bluegrass, which were compensating.

Summary

Three intensities of clipping were applied to the vegetation on three meadows in the Bighorn National Forest from 1952 through 1955. Clipping intensities were (1) clipped to one-inch stubble height every two weeks, (2) clipped to three-inch stubble height every two weeks, and (3) clipped to one-inch stubble height at the end of the growing season about September 15. Rainfall during three of the years was subnormal.

The vegetation of one of the meadows consisted of sedges, grasses, and forbs native to the area. The vegetation of the remaining two was dominated by Kentucky bluegrass and white Dutch clover.

Under these conditions, clipping to one inch every two weeks reduced the total density and production of native grasses and sedges. Some species disappeared from all plots. Clipping to three inches at two-week intervals did not seriously affect the density of the native plants but did cause a decrease in production on the meadow dominated by sedges, grasses, and forbs primarily by adversely affecting the sedges. Clipping to one inch at the end of the grazing season had little effect on the density of native species. The change in production was probably due to climatic factors. Kentucky bluegrass increased on all plots where present, but white Dutch clover disappeared from many plots.

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