Vegetative Composition, Forage Production, and Plant Vigor as Influenced by Date of Mowing¹

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Highlight

Two similar meadows were compared to show how mowing date might affect composition, production, and vigor. Indications are that mowing date does not affect range condition or basal density, but does affect forb composition, forage production and plant vigor.

In northern Osage County Oklahoma it is common for ranchers to mow their native meadows in late fall. Is this a

¹This study is based in part on a dissertation submitted to Oklahoma State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Financial assistance for this project was provided by Phillips Petroleum Company, Bartlesville, Oklahoma. good practice? Will the late removal of top growth reduce the plant's ability to produce forage the following year? Studies have shown that a very critical period in the life of a plant is late fall when the plant is storing food for the next spring's growth.

The purpose of this study was to compare two similar meadows mowed at different times of the year and to show how vegetative composition, forage production, and plant vigor are affected by this mowing date. Climate and soil were shown to be comparable in the two areas, the only main difference being management. The study was conducted during the summers of 1961 and 1962 on the Adams Ranch, a 33,000 acre tract located in the Osage Hills of Oklahoma. This region is bordered on the north by the Flint Hills of Kansas, an area of similar grasslands previously described by Anderson (1953).

Study Areas and Methods

The loamy prairie range site is the most important and is characterized by fertile, deep upland soil (greater than 36 inches) made up of clay loams. Claypan sites also occur throughout the area in patchwork fashion and were described in an earlier publication (Hazell, 1965). Big bluestem (Andropogon gerardi Vitman), little bluestem (A. scoparius Michx.) indiangrass (Sorghastrum nutans (L.) Nash), and switchgrass (Panicum virgatum L.) are the most important grass species.

The general regional climate is one of dry, hot summers with wet springs and falls. The mean annual precipitation is 32.81 inches with about three-fourths during the growing season.

Study area 1, referred to as a native grass meadow, is not grazed by livestock, but instead is mowed annually around July 1 for winter hay (Fig. 1). Study area 2 represents a 15-acre abandoned cemetery on the loamy prairie site (Fig. 2). It affords an excellent comparison with the native meadow in that for many years it has been mowed during the last of August or first of September.

The point intercept method (Levy and Madden, 1933) was used to determine percent basal



Figure 1. General view of native grass meadow on June 1, 1962, usually mowed around July 1. Note fruiting culms of big and little bluestem from preceding year.



Figure 2. General view of annually mowed cemetery on June 1, 1962, usually mowed in late August or early September.

cover and percent species composition. Two hundred sets, 2000 points, were taken along pace transects. The abundance and species of forbs were determined by the square foot method using 100 randomly located square-foot samples.

Forage production was determined by clippings from twenty 11.5 by 24 inch quadrats. Each sample was oven-dried and the weight recorded in grams. Pounds per acre were calculated by multiplying the average weights in grams by the factor 50 (Sims and Dwyer, 1965; Hazell, 1965).

Vigor of the important species was determined by the following measurements: (1) maximum height, (2) average height, (3) leaf length, (4) leaf width, and (5) number of leaves. To obtain leaf length and width of forbs, ten randomly located leaves from ten plants were measured from petiole to tip. On grasses, the third leaf from the base of the culm was measured on ten random plants.

Results

Twelve grass species were recorded in the study areas (Table 1). The four listed previously predominated, with little bluestem being the most important. There was more big bluestem in the meadow than in the cemetery, while indiangrass was more abundant in the cemetery. Since indiangrass is the latest maturing of the "major four," late mowing may be less detrimental to this species than the others.

According to the Soil Conservation Service system of range condition classification, both areas were in excellent range condition. The main four grasses composed an average of 97.5% of the total vegetation in the meadow and 93.8% in the cemetery. It would seem that date of mowing is not correlated with range condition. Species composition was very similar in each

Table 1. Percent composition of grasses on study areas for summers of 1961 and 1962.

Cemetery 64.0	Meadow 64.3	Cemetery
64.0	64.3	
		68.5
9.0	20.0	12.7
20.0	4.6	10.0
2.0	2.3	1.6
1.0	1.5	1.0
1.3	1.0	1.6
	1.5	0.6
	1.4	
	2.3	
1.3		1.1
1.0		0.4
1.0	1.1	2.2
	9.0 20.0 2.0 1.0 1.3 1.3 1.0 1.0	9.0 20.0 20.0 4.6 2.0 2.3 1.0 1.5 1.3 1.0 $$ 1.4 $$ 2.3 1.3 $$ 1.3 $$ 1.0 $$ 1.0 $$ 1.0 $$ 1.0 $$ 1.0 $$ 1.0 1.1

area, and late mowing was not accompanied by a decrease in range condition. Also, no correlation was noted between date of mowing and basal density, as density averaged 10.3% in the meadow and 9.8% in the cemetery.

Although the same forbs occurred in both areas, the composition was strikingly different. The cemetery produced a greater number of forbs, and the dominant species there were relatively insignificant in the meadow (Table 2). It appears that mowing date affects both composition and production of forbs.

Forage production decreased from 1961 to 1962 (Table 3), possibly because rainfall in May 1961 was 5.66 inches and in May 1962 only 1.86 inches.

Forage production in the meadow almost doubled that in the cemetery in both years. Pounds of dry matter per acre per season averaged 3806 for the meadow, but only 2141 for the cemetery. Big and little bluestem Table 2. Average numbers of forbs per acre on the meadow and cemetery for summers of 1961 and 1962.

Species	Meadow	Ceme- tery
Western ragweed Ambrosia psilosto	27,661 ichya	
Slimflower scurfpe Psoralea tenuiflo	a 15,454 ra	
Blue salvia Salvia azurea	9,583	
Daisy fleabane Erigeron strigosu	6,098 s	
Baldwin ironweed Vernonia baldwin	5,663 1ii	
Missouri goldenrod Solidago missour	iensis	55,539
Bigflower coreopsis Coreopsis grandif	lora	39,640
Heath aster Aster ericoides		24,394
Flowering spurge Euphorbia corolla	ıta ——	19,820
Western yarrow Achillea lanulosa		8,712
Others	25,063	92,782
Total	89,522	240,887

were the major forage producers in both areas, but indiangrass was also a significant forage producer in the cemetery. Forage production of forbs was also higher in the cemetery than in the meadow.

Species making up the major portion of the composition did not necessarily produce the most forage. For example, big bluestem generally produced more forage per acre in the meadow than little bluestem even though the percent composition of big bluestem was somewhat less.

The grass species in the meadow produced a significantly greater maximum height, average height, and leaf length than the same species in the cemetery (Table 4). The figures were mostly significant at the .01 level (Steel and Torrie, 1960). These results on grass vigor are in agreement with Johnson (1956), but in contrast with Blaisdell and Pechanec (1949). Differences in leaf width and number of leaves were not statistically significant.

Date of mowing must be an important factor influencing the vigor of the desirable forage species. An earlier mowing date for the cemetery would probably restore the vigor of the grasses. According to Humphrey (1949), grasses in low vigor usually will

Table 3. Forage production (dry weight lb/acre) on the two study areas for summers of 1961 and 1962.

	1961		1962	
Species	Meadow	Cemetery	Meadow	Cemetery
Little				
bluestem	1109	1037	970	769
Big				
bluestem	1780	383	1804	302
Indiangrass	570	639	293	444
Switchgrass	315	31	230	40
Forbs	118	138	113	1 32
Others	15 2	130	158	237
Total [—]	4044	2358	3568	1924

	Max. Ht.		Avg. Ht.		Leaf Length	
Species	June/61	June/62	June/61	June/62	June/61	June/62
Asc	12.5**	17.0**	4.3**	17.2**	4.0**	10.8*
Age	15.3**	30.1**	6.5**	32.0**	9.0**	10.8**
Snu	18.2**	22.2**	13.7**	20.3**	8.4**	17.1**
Pvi	23.0**	40.2**	7.0**	28.8**	10.0**	20.6**
	July/61	July/62	July/61	July/62	July/61	July/62
Asc	27.2**	14.3**	17.8**	12.5**	18.0**	11.5**
Age	29.4**	30.1**	25.1**	32.7**	11.4**	20.5**
Snu	15.5**	16.7**	7.0**	16.1**	2.0	8.6*
Pvi	34.0**	27.6**	23.4**	22.5**	12.1**	14.7**
	Aug./61	Aug./62	Aug./61	Aug./62	Aug./61	Aug./62
Asc	-0.8	14.8**	11.6**	12.0**	9.0**	10.7**
Age	10.0+	19.1**	24.8**	31.9**	12.6**	15.7**
Snu	1.9	14.2**	14.5**	13.3**	16.4**	10.4**
Pvi	35.2**	13.3**	28.6**	27.1**	11.4**	10.4**

Table 4. Average differences in cm for vigor of grasses found on native grass meadow and cometery. Figures represent measurements of cemetery subtracted from native grass meadow.

¹ Asc — Andropogon scoparius, Age — Andropogon gerardi, Snu — Sorghastrum nutans, Pvi — Panicum virgatum.

* Significant at .05 level

****** Significant at .01 level

+ Significant at .1 level

show good to excellent vigor within a period of only one or two years, if the cause is corrected.

Only the five major forbs in each area were measured, and since these were different in the two areas, no comparison of vigor between the same species was made.

Summary and Conclusions

Vegetative composition, forage production, and plant vigor were determined on two similar areas representing the loamy prairie range site during the summer months of 1961 and 1962 in northern Osage County, Oklahoma.

Twelve grass species were recorded in the study areas, with little bluestem predominating. The high percent composition of indiangrass in the cemetery indicates that late mowing may be less deterimental to this species than the others.

Indications are that mowing date did not affect the range condition of the areas. Species composition was very similar, and both areas were in excellent range condition. There was also no correlation noted between date of mowing and basal density. It would appear, though, that mowing date affected both forb composition and production.

Results concerning forage production and vigor of grasses indicate that date of mowing may have some influence on these factors. In both years the native meadow produced twice as much forage as the cemetery, but forage production of forbs was greater on the cemetery. Also, species making up the major portion of the composition did not always produce the most forage.

Leaf height was one of the most consistent indicators of plant vigor. The grasses in the meadow produced a greater maximum height, average height, and leaf length than the same species in the cemetery, and these figures were mostly significant at the .01 level. Leaf width and number of leaves, however, were not correlated with vigor.

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