Production and Persistence of Common Carpetgrass in Relation to Site and Harvest Frequency[1]

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Highlight

On a range in central Louisiana, maximum production of carpetgrass and total herbage was obtained by harvesting once or twice per season. Carpetgrass and forbs increased in percent botanical composition with frequent harvests, while bluestems and other grasses increased with infrequent harvests. Site did not significantly affect herbage production.

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This paper reports responses of carpetgrass (*Axonopus affinis*), a potentially important source of forage on Gulf Coast forest ranges, to major environmental influences. Persistence and production at several harvesting frequencies were observed on two sites where carpetgrass stands were well established.

Common carpetgrass is low growing and occurs most frequently on relatively heavy, imperfectly drained soils, where it spreads rapidly by stolons to form dense sod. It also becomes dominant on moderately sandy, well-drained soils that have been compacted. Being only moderately tolerant of shade, carpetgrass is found mainly along roads and trails, near feedlots and corrals, on firelines, and in other forest openings that receive heavy use.

Since cattle generally graze forest openings more heavily than adjacent wooded range, carpetgrass often becomes an important component of the herbaceous cover on forest ranges. Use further inten-

sifies after carpetgrass establishment because cattle prefer this species to most associated range grasses (Halls et al., 1956). Consequently, grass stubble in openings is usually kept extremely short, even when overall range use is moderate. This condition creates an impression that carpetgrass yield is meager; however, Wahlenberg (1946) stated that carpetgrass produces 3 to 20 times more beef per acre than associated native range grasses.

Newell and Keim (1947) studied effects of harvesting frequency on five important native grasses of the Great Plains. The group included four bunchgrasses and buffalograss (*Buchloe dactyloides*). Only buffalograss yielded more herbage on plots frequently clipped than on those cut once per season. This species, like carpetgrass, is stoloniferous and commonly grows where heavy grazing has reduced bunchgrasses. Lang and Barnes (1942) found that midgrasses decreased in yield under frequent clipping, but shortgrasses clipped frequently produced more than those harvested only at the end of the season. Thus, it appeared that frequent removal of herbage might stimulate growth of the relatively short, stoloniferous carpetgrass. In any event, some knowledge of the proper harvest frequency for maximum range productivity was needed.

Procedure

This study was restricted to two sites on the Palustris Experimental Forest in central Louisiana where longleaf pines had been clearcut more than 20 years before. For at least 10 years the areas had been heavily grazed. One site was flatwoods and the other sandy ridge. The sandy ridge soil, Ruston fine sandy loam, is coarser and considerably more permeable than Beauregard silt loam, the flatwoods soil.

On each site, the density and composition of the herbaceous cover were reasonably uniform. Carpetgrass dominated lesser amounts of slender bluestem (*Andropogon tener*), pinehill bluestem (*A. divergens*), panicums (*Panicum* spp.), bahiagrass (*Paspalum notatum*), and other intermingled *Paspalum* species. Principal forbs were common lespedeza (*Lespedeza striata*), low hop clover (*Trifolium procumbens*), poor-Joe (*Diodia teres*), rabbit-tobacco (*Gnaphalium obtusifolium*), and ragweed (*Ambrosia artemisifolia*).

Three areas on each site were fenced to exclude cattle. A 15.5- × 9.3-foot rectangle centered in each exclosure was divided into 15 contiguous 3.1- × 3.1-foot plots by spring-loaded wires as described by Duvall (1968). Five clipping treatments, replicated three times, were randomly assigned to each set of 15 plots.

Treatments consisted of clipping herbage to ½-inch stubbles every 2 weeks, 4 weeks, and 8 weeks, and twice and once per growing season. Cutting at 2-, 4-, and 8-week intervals required, respectively, 13, 7, and 4 harvests annually with the initial harvest each year near mid-May. On plots cut twice per season, harvesting was done in late July and late October. The final harvest on all plots was made in late October. Treatments were repeated for 3 consecutive years, 1967 through 1969.

Table 1. Average annual production (lb./acre) of herbage classes by harvest frequency and site.

Site and forage class	Harvest frequency				
	2 weeks	4 weeks	8 weeks	Twice/ season	Once/ season
Sandy Site					
Carpetgrass	1141	1517	1798	1912	1825
Bluestems	65	90	153	348	518
Other grasses	69	128	90	282	253
Forbs	206	185	220	321	237
Total	1481	1920	2261	2863	2833
Flatwoods Site					
Carpetgrass	1262	1654	1857	2340	2062
Bluestems	13	9	68	268	398
Other grasses	234	162	293	583	1132
Forbs	147	133	72	66	91
Total	1656	1958	2290	3257	3683

Herbage was separated into four classes: (1) carpetgrass, (2) bluestems, (3) other grasses (including grasslike plants), and (4) forbs. These were ovendried at 75C and weighed. Total herbage production was computed annually after the final October harvest.

The experimental design was a split-split-plot factorial, and data were subjected to analysis of variance. Means were compared by Duncan's new multiple range test to find significant differences at the 0.05 level (Steel and Torrie, 1960).

Results and Discussion

Site Production

The flatwoods site appeared slightly more productive than the sandy site, but the difference was not statistically significant (Table 1). The greatest difference in total production between sites, 850 pounds per acre, occurred with one annual harvest. Production on both sites decreased with increased frequency of harvest.

An interaction between site and harvesting frequency significantly influenced production of other grasses and total herbage. Production was greatest on flatwoods sites when harvests were once or twice per season, but productivity was similar on both sites with harvests at 2- to 8-week intervals. Carpetgrass, bluestems, and forbs responded similarly on both sites to harvest frequency.

Herbage Production

Average annual production of carpetgrass ranged from about 1,200 lb./acre when harvested every 2 weeks to over 2,100 lb. when harvested twice per season (Table 2). Variation in bluestem production within cutting frequencies was so great that treatment effects were nonsignificant; however, there was a trend toward increased bluestem production as cutting frequency decreased. Production of other grasses increased when harvest frequency

Table 2. Production (lb./acre) of herbage classes by harvest frequency and year.

Species and year	Harvest frequency					
	2 weeks	4 weeks	8 weeks	Twice/ season	Once/ season	Average
Carpetgrass						
1967	1422	1608	1884	2198	2273	1876 b[1]
1968	1452	2223	2581	3099	2745	2420 a
1969	730	925	1017	1083	814	914 c
Average	1201 c[2]	1585 bc	1827 ab	2127 a	1944 ab	1736
Bluestems						
1967	89	91	109	147	199	127 a
1968	22	37	124	349	531	213 a
1969	6	21	98	427	643	239 a
Average	39 a	50 a	110 a	308 a	458 a	193
Other Grasses						
1967	137	116	147	171	268	168 b
1968	197	219	269	583	796	413 a
1969	122	101	158	545	1013	388 a
Average	152 c	145 c	191 bc	433 ab	692 a	323
Forbs						
1967	145	151	110	209	133	150 a
1968	221	182	182	313	119	203 a
1969	164	144	146	59	239	150 a
Average	178 a	159 a	146 a	194 a	164 a	168
Total						
1967	1793	1966	2250	2725	2873	2321 b
1968	1892	2661	3156	4344	4191	3249 a
1969	1022	1191	1419	2114	2709	1691 c
Average	1569 d	1939 c	2275 b	3061 a	3258 a	2420

[1] Yearly average values followed by a common letter are not significantly different at the 0.05 level.
[2] Treatment average values followed by a common letter are not significantly different at the 0.05 level.

was reduced; one harvest per season produced 4 times as much herbage as harvests at 2-week intervals. Forb production remained relatively uniform at all cutting frequencies. Total herbage production more than doubled by reducing frequency of harvest from 2 weeks to once per season. An earlier study in central Louisiana reported similar findings (Cassady, 1953).

Maximum and minimum herbage production occurred in 1968 and 1969, respectively. Yearly fluctuations apparently reflected precipitation patterns. Rainfall distribution was variable in 1967 but relatively uniform during the 1968 growing season; an extended drought occurred during the 1969 season. In 1969, growth of the shallow-rooted carpetgrass was severely limited, while that of other herbage classes appeared to be only slightly impaired. Bluestems and other grasses were apparently more drought resistant than carpetgrass, especially when harvested infrequently. Forb production appeared to be unaffected by drought at any cutting frequency. Aggressive, deep-rooted bahiagrass, the major other grass, grew very well during 1969 despite low rainfall.

Changes in production of individual grasses during the 3-year study were strongly affected by clipping interval. Production of herbage in all classes except forbs was lowest in 1969 at 2- and 4-week harvesting intervals. At intervals of once or twice per season, however, production of bluestems and other grasses increased 3- to 4-fold from 1967 to 1969. In 1967 production of bluestems and other grasses was twice as great for harvests once per season as for harvests every 2 weeks. In 1969, during drought, production was about 10 times greater for these two herbage classes when harvested only once per season. Maximum carpetgrass production was obtained when harvested twice

Table 3. Proportion (%) of total herbage produced, by herbage class, harvest frequency, and year.

Species and year	Harvest frequency					Average
	2 weeks	4 weeks	8 weeks	Twice/ season	Once/ season	
Carpetgrass						
1967	79.3	81.8	83.7	80.7	79.2	80.9 a[1]
1968	76.7	83.5	81.8	71.4	65.5	75.8 b
1969	71.4	77.7	71.7	51.2	30.1	60.4 c
Average	75.8 ab[2]	81.0 a	79.1 ab	67.8 bc	58.3 c	
Bluestems						
1967	5.0	4.6	4.9	5.4	6.9	5.3 b
1968	1.2	1.4	3.9	8.0	12.7	5.4 ab
1969	0.6	1.7	6.9	20.2	23.7	10.6 a
Average	2.3 b	2.6 b	5.2 ab	11.2 a	14.4 a	
Other grasses						
1967	7.6	5.9	6.5	6.3	9.3	7.1 c
1968	10.4	8.2	8.5	13.4	19.0	11.9 b
1969	11.9	8.5	11.1	25.8	37.4	18.9 a
Average	10.0 b	7.5 b	8.7 b	15.2 ab	21.9 a	
Forbs						
1967	8.1	7.7	4.9	7.6	4.6	6.6 b
1968	11.7	6.9	5.8	7.2	2.8	6.9 b
1969	16.1	12.1	10.3	2.8	8.8	10.0 a
Average	12.0 a	8.9 ab	7.0 bc	5.9 c	5.4 c	

[1] Yearly average values followed by a common letter are not significantly different at the 0.05 level.
[2] Treatment average values followed by a common letter are not significantly different at the 0.05 level.

per season; more and less frequent harvests both diminished carpetgrass production after the initial year of study. Forb production was not affected by harvest frequency or year.

Botanical Composition

During the initial year of study, carpetgrass produced about 81% of the total herbage regardless of harvest frequency (Table 3). The proportion of carpetgrass was maintained for 3 years by harvesting at 2-, 4-, and 8-week intervals but diminished significantly with less frequent harvesting. Earlier studies (Wahlenberg et al., 1939; Duvall and Linnartz, 1967) showed that heavy grazing encourages the spread of carpetgrass, while the proportion of carpetgrass diminishes rapidly with little or no use. In the present study the reduction in proportion of carpetgrass after harvests once per season was due mainly to the large increase in production of the other herbage classes rather than a reduction in carpetgrass production. Carpetgrass production in 1969 was about equal on most and least frequently harvested plots.

The proportion of total herbage produced by bluestems ranged from about 5 to 7% in 1967 but increased during successive years where harvests were infrequent. On plots clipped once per season, bluestems produced nearly one-fourth of the total herbage in 1969. However, frequent harvests reduced the proportion of bluestems. Similar responses to grazing and clipping were noted by Wahlenberg et al. (1939) and Cassady (1953), respectively.

The proportion of other grasses increased each year regardless of harvest frequency, but the proportion increased less with frequent harvests than with infrequent harvests. Other grasses were the largest component of total herbage in 1969 on plots clipped once per season.

The proportion of herbage contributed by forbs was variable but generally increased with each successive year of study and with increased frequency of harvest. These responses can be attributed to changes in production of associated herbage classes because forb production remained relatively uniform regardless of year or harvest frequency.

Conclusions

Study results indicate that maximum herbage production cannot be achieved if the range is grazed

to maintain a high proportion of carpetgrass. Moderate use of established carpetgrass stands will provide a variety of species for animal selectivity and maximum sustained yield. Heavy grazing is required to maintain pure stands of carpetgrass, which are often desirable as a firebreak on forested southern range.

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