

Yields and Consumption in a Southern Illinois Bluegrass-Broomsedge Pasture

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AN EVER increasing need for better understanding and use of all types of vegetation used as forage by grazing animals is evidenced by the increase in the national population and decreasing carrying capacity of many rangelands. Figures obtained from agricultural statistics and decennial census reports show that in 1900 there was 0.66 of a beef animal per capita. In 1920 there was 0.41 of a beef animal per capita, and as recently as 1947 the per capita figure had dropped to 0.37. From these figures it is clear that better use of all grassland areas is needed or we shall eat less beef.

The purpose of this study is to investigate the yield and consumption in a bluegrass-broomsedge pasture in southern Illinois. This type of pasture is common in many parts of southern Illinois and land predominately in broomsedge is common over the entire southeast United States. Management for better utilization of broomsedge on hilly lands where threat of erosion is too great for improvement is also sought. Chemical composition and cattle gains on broomsedge have been reported before, but detailed measurements of yields and consumption of broomsedge are not so well known.

THE PASTURE: CONDITIONS AND USE

The 80-acre pasture used in this study is located five miles south of Carbondale, Illinois. The topography is that of rolling upland. Hills of 20 to 40 feet are separated by ravines. The ravines are wet at times and a few of them are

continuously wet as there are at least two springs which produce a seepage of water. One pond is located in the southeast corner of the pasture and the entire southern end of the pasture is coursed by a stream from the overflow of the pond and the springs. The occurrence of water in the south part of the pasture has resulted in heavier use in that part.

Grazing began in this pasture several years ago when it was converted from a golf course. In the beginning the pasture was largely of Kentucky bluegrass (*Poa pratensis*)¹. With the reduction of bluegrass by heavy use and mid-summer drought, broomsedge (*Andropogon virginicus*) entered and became established in considerable amount. In recent years the pasture has been mowed twice a year in an effort to control the weeds and the broomsedge. The broomsedge has not diminished noticeably under this treatment. Two years ago lespedeza was scattered over the pasture and a stand was achieved locally. The present rate of stocking is 26 head for a period of about 7 months. Three of the animals were horses.

SAMPLING THE VEGETATION

The vegetation of the entire pasture was sampled by means of well distributed square-foot plots. A transect through the pasture was made in such a way that the sampling area included all types of topography. Sampling for percentage composition was by stratified random

¹ Nomenclature followed is that of Gray's Manual of Botany, 8th Ed.

method, along the transect line at an interval of 20 paces. Fifty samples were taken in June and 50 in July. The July samplings were taken between those obtained earlier. The apparatus and method was that employed by Voigt and Weaver (1951).

Basal area was estimated as the percent

5 percent. This was occasioned by certain minor forbs or sedges which were considered to be ecologically of small importance.

Kentucky bluegrass existed as a type in only small and scattered areas although it made up 36 percent of the vegetation (Table 1). The largest part of the pasture

TABLE 1

Grasses, grasslike plants, and forbs occurring in 100 one square-foot samples in a bluegrass-broomsedge pasture. The percent composition of each species and total basal area of the vegetation is given

SPECIES OF PLANTS	COMPOSITION	BASAL AREA
	Percent	Percent
Grasses and grasslike plants		
Red top (<i>Agrostis alba</i>)	0.1	
Wiregrass (<i>Aristida oligantha</i>)	3.2	
Broomsedge (<i>Andropogon virginicus</i>)	28.1	
Lovegrass (<i>Eragrostis pectinacea</i>)	3.1	
Six-week's fescue (<i>Vulpia octoflora</i>)	1.0	
Rush (<i>Juncus</i> spp.)	3.8	
Kentucky bluegrass (<i>Poa pratensis</i>)	36.4	
Panic grass (<i>Panicum</i> spp.)	0.8	
Beadgrass (<i>Paspalum circulare</i>)	1.2	
Total	77.7	
Forbs		
Ragweed (<i>Ambrosia bidentata</i>)	2.5	
Daisy (<i>Chrysanthemum leucanthemum</i>)	1.4	
Buttonweed (<i>Diodia teres</i>)	6.4	
Lespedeza	9.5	
Yellow oxalis (<i>Oxalis stricta</i>)	0.1	
Bracted plantain (<i>Plantago aristata</i>)	1.1	
Sorrel (<i>Rumex hastatulus</i>)	0.6	
Sheep sorrel (<i>Rumex acetosella</i>)	0.7	
Total	22.3	
Grand total	100.0	25.6

of ground covered by vegetation at 1.5 inches height. It was found to be 25.6 percent. In estimating percentage composition the total vegetation, regardless of amount was considered as 100 percent. The percent of each species was based upon the part of the total basal area that each furnished. A percentage composition thus based upon basal area was not recorded if it furnished less than

was a mixture of bluegrass and broomsedge. Other areas where broomsedge or bluegrass gave way to other types were the hilltops or upper slopes where wiregrass or low weedy herbs replaced them. Broomsedge made up 28 percent of the vegetation and nearly always had at least a small amount of Kentucky bluegrass with it. One forb of particular importance in the pasture was lespedeza

TABLE 2

Average total amount of new forage clipped from 5 exclosures in a bluegrass-broomsedge pasture, and their controls each month, May through September, 1952. All weights of forage are in grams, air-dry

	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Exclosure.....	164.4	220.5	241.7	132.9	228.7
Control.....	104.6	154.2	121.0	103.5	131.3
Amount consumed.....	59.8	66.3	120.7	29.4	97.4
Exclosure.....	164.4	220.5	241.7	132.9	228.7
Control of preceding month.....	00.0	104.6	154.2	121.0	103.5
Amount of yield.....	164.4	115.9	87.5	11.9	125.2

which made up 10 percent of the composition.

SAMPLING FOR YIELD AND CONSUMPTION

Many methods for determining consumption of forage by range animals are available and have been well described by Heady (1949). The cage or portable exclosure method was used in this study because it combines both yield and consumption and gives a month to month picture of pasture trends. Monthly yields and consumption may even be obtained by species or other component by selective clipping. The cage method has been used with much success by others (Joint committee, 1943; Klingman et al, 1943; and Darland and Weaver, 1945).

The exclosures used in this study were similar to those devised by Darland and Weaver (1945), being constructed of wood instead of steel fence posts and using barbed wire spaced 6 inches apart instead of using woven wire. These exclosures proved simple to make and were less expensive. Five exclosures were spaced in the south side of the pasture in the bluegrass-broomsedge type. The exclosures covered a 29 square foot area and were spaced about 100 to 125 yards apart.

By subtracting dry weight of the vege-

tation clipped from the five control areas from that clipped from five exclosed areas, the average monthly consumption could be ascertained (Table 2). Yield of the first month was calculated to be the weight of air-dry forage under the exclosure after a months protection from grazing. Selective clipping of bluegrass, broomsedge, and forbs was employed. Each of these components was bagged separately for each control and exclosed area. Thus, monthly and total seasonal yields and consumption were available by component.

ECOLOGY OF DOMINANTS

In good vigorous condition bluegrass is successful because of its early and rapid growth. It is the first grass to appear green in spring and develops flower stalks late in April or early May. Its life cycle is mostly complete before the warm season broomsedge begins to compete for light, water, or nutrients. The bluegrass becomes dry and mostly dormant until fall (September) when added precipitation and shorter days are favorable for its renewed growth. Bluegrass grows well through October and into November furnishing good forage.

Broomsedge is a bunchgrass. It forms bunches which average 8 to 10 inches in

diameter where pure and older stands occur. The interspace in such a stand is 12 to 15 inches. The grass is a vigorous competitor on soils with low fertility, and may be a subere dominant for many years. Its height at maturity is 34 to 40 inches and often as great as 4 feet. The bunches average 80 flower stalks in an old stand and individual stalks may have 12 to 13 internodes. There may be as many as 50 racemes per stalk and each raceme has 8 to 12 spikelets. In the broomsedge type on an abandoned field it may compose 60 or more percent of the community, and yield as much as 2 tons per acre of air-dry forage at the end of the growing season (Fig. 1). The mulch of this type is heavy at about a ton per acre and hinders growth as well as delaying it in the spring. The basal area of this type is about 14 percent.



FIGURE 1. A meter quadrat showing the yield and mulch from a nearly pure stand of broomsedge. The yield was over 2 tons per acre, and the mulch about 1 ton per acre. This area was not within the study pasture.

MONTHLY AND SEASONAL YIELDS AND CONSUMPTION

In this pasture the bulk of the forage was furnished in the first month by Kentucky bluegrass, and during the next month by bluegrass and herbs, chiefly lespedeza. Later, as well as during the second month, broomsedge became im-

portant in the yield and because of the unavailability of anything else the utilization of broomsedge was good during June, July and September (Fig. 2).

Broomsedge, being a warm season grass, yielded high during the mid- and late seasons. Severe drought hit during July and August and both yield and consumption were low during these months. Broomsedge leaves were rolled and stiff though the grass was not dead. Broomsedge alone made up 54 percent of the total yield of 0.84 ton per acre and 0.48 percent of the forage consumed was broomsedge.

Very little forage was furnished by bluegrass during June and even then the consumption exceeded the current yield (Fig. 2). The consumption of bluegrass also exceeded the current yield during the months of July and August. This indicated that during these months or all of the grazing season that much of the forage was kept closely grazed. Only the broomsedge because it was lower on the preferred order of species was making any growth, and the bunches stood out well defined in the matrix of closely grazed bluegrass.

Overgrazing of bluegrass has resulted in some bare ground, thin spots of vegetation, and areas dominated by wiregrass. Under this treatment of overgrazing the broomsedge itself will probably spread as many seed stalks are allowed to form. The present rate of stocking is about 1 animal unit per 3 acres for a period of about seven months. About 68 percent of all forage produced was consumed, thus leaving about a third of the vegetation on the ground for protection against erosion. The remaining unconsumed forage was practically all broomsedge.

While weights on the cattle were not available, it is a safe assumption that they lost weight or did not gain during August.

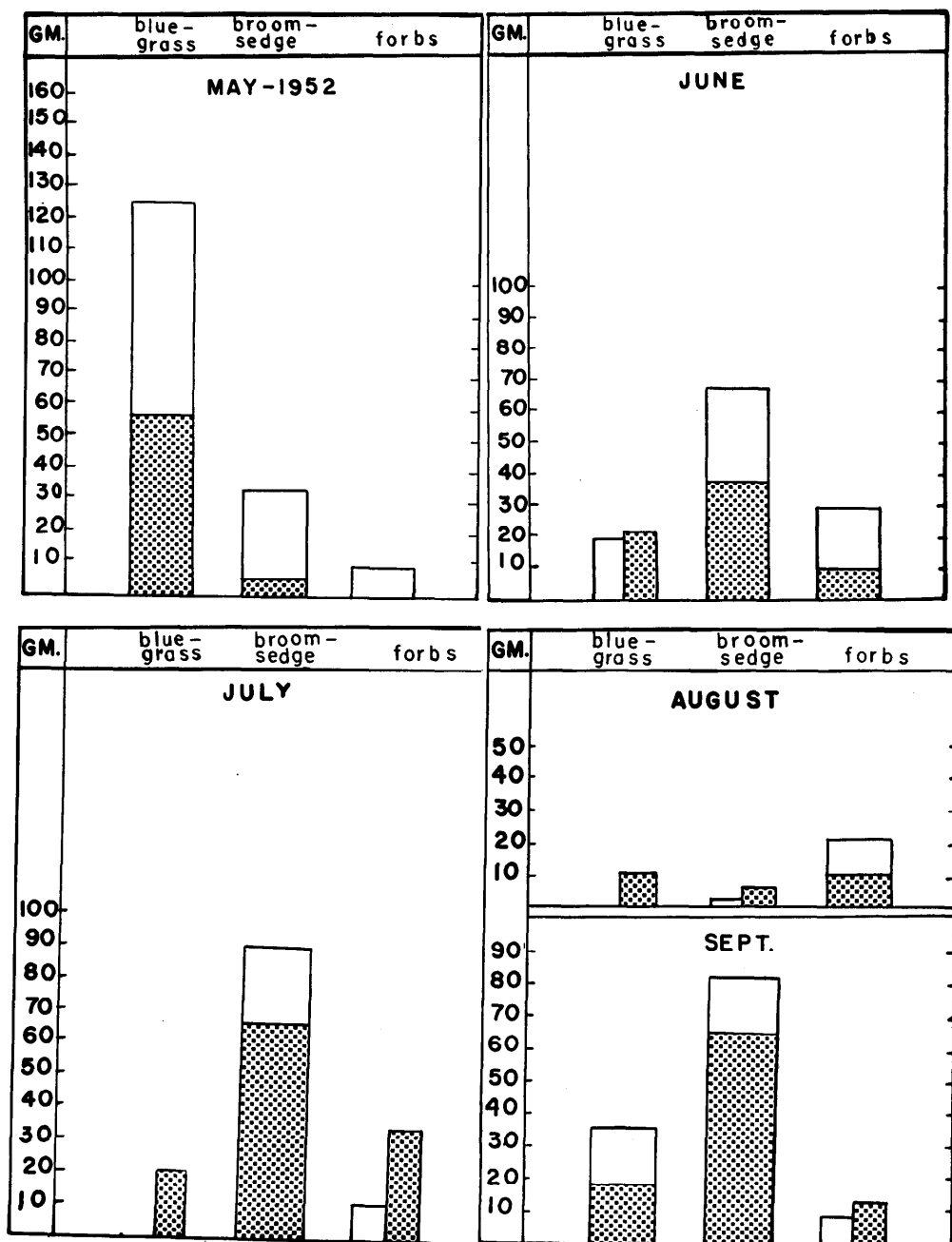


FIGURE 2. Bar graphs showing yields in grams of bluegrass, broomsedge, and forbs by the month. The consumption for each month is the checkered area. Where current consumption exceeded current yield the bar is divided lengthwise. The bluegrass component contains minor grasses which were in such small amounts as to be considered of little ecological importance.

Campbell and Biswell (1945) report a loss of weight by cattle on broomsedge range of the southeast Atlantic Coastal Plain during the month of August.

DISCUSSION

Selective grazing by cattle is affected by both botanical and chemical composition of the herbage, especially where forage is plentiful, and differs from the average of that present in the pasture as a whole (Weaver and Tomanek, 1951). Selection of certain species in preference to others is a matter of palatability and abundance together with ease with which each may be grazed (Cory, 1930). Others have attributed selection of a species to a sense of smell (Johnstone-Wallace and Kennedy, 1944). Plice (1952) has found convincing evidence that the sugar content is most important and that selection is not merely by intuition. Broomsedge sprayed with blackstrap molasses and water was eaten avidly by cattle whereas ordinarily in the mature state it is ignored. In a test of preference among eight reseeded grasses Springfield and Reynolds (1951) found a direct relationship of the moisture of fresh herbage to the species most often selected and grazed most in quantity. Orchard grass was the highest in utilization of the eight tested. They report that a preferred species apparently had ability to maintain succulence for a longer period. Low moisture content of broomsedge when leaves rolled due to drought was no doubt a factor in its low utilization during August.

Mowing the pasture twice during the grazing season accomplished the destruction of many annual weeds, and reduced the coarse growth in the bunches of broomsedge (Fig. 3). This definitely improved the utilization of broomsedge. The mowing dates were mid-June and early September. It is very probable that an earlier time for the last mowing would be even better as flower stalks are

beginning to form by late August. Spread of broomsedge could be somewhat controlled by an earlier date for the last mowing. If the inflorescence is in the boot stage and is cut, the plant still produces an abundant crop of seed upon drying. The last mowing should precede the boot stage by a week or two.



FIGURE 3. A detailed view of broomsedge after the first mowing in late June. The broomsedge is about 6 inches in height. The mulch is heavy.

In a broomsedge pasture where the slopes are so great as to preclude rejuvenation of the pasture, then the broomsedge should be mowed at least twice during the season and the areas fenced so as to keep the animals within the broomsedge type during the months of May, June, and July, when its utilization has been observed to be best. Better pasture may be rested during these periods. Grasses with higher nutritive values should replace broomsedge if topographic conditions and cost are not prohibitive factors.

The pasture in which this study was done must be classified as fair condition or slightly lower due to composition, yields, and the large amount of invading grasses and forbs. Most of the herbs are annuals. Bluegrass has suffered a loss of its former percentage of the composition to broomsedge. Yields are comparable with those of a pasture of fair grade. The 0.84 ton per acre yield and 0.57 ton consumption

compares almost exactly with 0.83 ton per acre yield and 0.56 ton per acre reported by Weaver and Tomanek (1951) for a fair pasture in eastern Nebraska.

SUMMARY

A hilly 80-acre pasture 5 miles south of Carbondale, Illinois which was composed largely of bluegrass and broomsedge was studied for yields of forage and its consumption by 26 head of livestock. The grazing season was about seven months. The bluegrass-broomsedge pasture is a common type on hilly land in southern Illinois. The best use and management of this type was studied using 5 moveable cage exclosures, each of which was 29 sq. feet in area.

Composition was studied by means of 100 one-square foot quadrats which were randomly distributed along a transect line through the pasture. Bluegrass made up 36 percent of the vegetation. Broomsedge, the other widely distributed grass, made up 28 percent of the vegetation.

Broomsedge was mowed twice during the grazing season. The first mowing was mid-June and the second was in early September. Mowing prevented accumulation of debris of previous years and seemed to foster utilization of the broomsedge, especially during dry weather after the decline of bluegrass. Bluegrass was found to be consumed best during the first month of grazing and in May. After this period it went into summer dormancy.

Consumption of broomsedge was highest during the months of June, July, and September. Consumption of all types was low during August. Yields were also lowest during August.

Total production in the pasture was 0.84 ton per acre of which 68 percent was consumed (0.57 ton per acre). Broomsedge made up 54 percent of the total yield and 48 percent of the total amount of forage consumed. The pasture

is judged to be in the fair-poor range condition class.

About 3 months of satisfactory grazing of broomsedge types can be expected in southern Illinois. Where possible, broomsedge pastures should be improved, and if this is impossible they should be mowed and used in a rotation with some kind of cool season improved pasture.

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