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Grazing Capacity of Wiregrass-Pine Ranges of Georgia[1]

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Cattle grazing wiregrass forage in longleaf-slash pine forests of the Georgia coastal plain have long contributed to the economy of the region. It is estimated that these 13.5 million acres of forest lands supply from 20-25 percent of the total feed for the half million or more beef cattle in the area. However, most landowners consider grazing a secondary use of forestland because the major investments are for timber production. Hence, the major aim in grazing longleaf-slash pine forests is to bring in additional income by producing maximum beef per animal.

Maximum beef production may be attained only by a proper balance between livestock numbers and available forage. In the past, cattlemen have depended on observation and experience for determining stocking rates in wiregrass-pine ranges. But many problems have beset attempts to regulate cattle numbers in relation to forage production. Pine tree overstory continually changes through a relatively short timber rotation. These changes cause the production of the range to vary from year to year. In addition, the use of fire has a pronounced effect on timber reproduction and on the availability, palatability and production of certain native forage species. Thus, best management of the forage, so as not to conflict with timber, is extremely complicated and basic standards are necesary to provide guides for optimum stocking rates conducive to greatest economic returns.

Previous grazing studies in the longleaf and slash pine forests of the South (Kirk, *et al.*, 1945; Halls, *et al.*, 1952; Shepherd, *et al.*, 1953; Campbell and Cassady, 1951; and Bond and Campbell, 1951) have provided information helpful to better grazing management but none were specifically designed to measure grazing capacity. Other surveys and studies (Biswell, *et al.*, 1942; and Brasington, 1949) have shown that stocking rates vary considerably and according to local customs. Halls, *et al.*, (1952) reported that winter burning to remove forest "rough" appears essential for maximum cattle production. Shepherd, *et al.*, (1953) showed that grazing capacity during the spring and summer should be based primarily on the acreage of freshly burned range. Controversy still exists as to the use of fire in forest management, but with thorough analysis, planning and preparation, a system of periodic controlled burning can be used with beneficial results. (Bickford and Curry, 1946; Bond and Campbell, 1951; McCulley, 1950; and Wahlenberg, *et al.*, 1939).

Topography of the coastal plain varies from gently rolling to nearly flat. The higher elevations, or uplands, are seldom under water and support an overstory of longleaf (*Pinus palustris)* and slash pine (*Pinus elliottii*) and a shrub understory of gallberry (*Ilex glabra*) and sawpalmetto (*Serenoa repens*). Just a few feet in elevation separates these areas from the lowlands or swamps which are often under water. The latter are characterized by cypresses (*Taxodium* spp.) various hardwoods, and shrubs.

The longleaf-slash pine forests coincide with the wiregrass grazing type, which is a mixture of wiry, fire-tolerant grasses. Dominant among these is pineland threeawn (*Aristida stricta*). Other prominent grasses which may occur to varying degrees are Curtiss dropseed (*Sporobolus curtissii*), several bluestems (*Andropogon* spp.), panicums (*Panicum* spp.), paspalums (*Paspalum* spp.), cutover muhly (*Muhlenbergia expansa*), lopside Indiangrass (*Sorghastrum secundum*) and toothachegrass (*Ctenium aromaticum*). This type contributes the greater portion of forage for cattle grazing in the forest.

The study reported herein was conducted on lands fairly typical of the coastal plain. Its purpose was to determine the grazing capacity and optimum stocking rate for burned wiregrass-pine range as measured by weight performance of steers; also, to evaluate factors such as kinds and amounts of herbage, shrubs, and tree canopy on grazing capacity. Results have direct application to wiregrass-pine ranges which are burned during the winter months previous to grazing

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the following spring and summer. Using grazing capacity of these burned ranges as a standard of comparison, subsequent adjustments for cattle of different age and sex and to unburned range could be made.

Three hundred acres at the Alapaha Experiment Range were divided into six 50-acre grazing units and classified according to topography and vegetation. The ranges were burned during the winter to remove "rough" and promote green growth of grass the following spring. Acreage allowance per steer was based on acreage of burned upland and border. From 2 to 6 steers per unit provided stocking rates of 18, 14, 9, 7, 6, and 4 acres per steer. The same number of steers grazed the same unit each year from March 15 to January 17, except in 1954 when numbers on half the units were reduced by one and all steers were removed in October. Even though the total acreage remained the same each year, the acreage of burned range varied slightly because of the inability to get a complete burn over the entire area.

The effects of burning and grazing upon herbaceous and shrubby vegetation were evaluated through changes in amount of ground cover on twelve grazed plots, each one milacre in size, and the same number of ungrazed plots per range unit. Yield and utilization of grasses were estimated by harvesting herbage at the end of the grazing season from eight grazed and ungrazed plots per unit. Grass yields were related to pine tree overstory and shrub cover by estimating the percent of ground covered by shadow on a series of 0.02-acre plots and harvesting the grass from 3.1-foot-square plots in the center of the tree plot.

FIGURE 1. Fifteen acres of forest range such as this enabled steers to make gains of 160 pounds from March to October.

Factors Affecting Steer Weight Changes

Rate of Stocking

Performance of steers, and presumably other cattle, is dependent upon an ample source of burned wiregrass herbage. Results from this study showed that increases in body weight of steers from March to October were consistently greatest on lightly stocked ranges (Table 1). Steers gained approximately 160 pounds when supplied with 14 or more acres of timbered range, an equivalent of 8.5 acres of open range (Fig. 1). This rate of stocking permitted steers to attain maximum performance as shown by the fact that additional range of 18.1 acres did not increase weight gains.

When ranges were stocked at a moderate rate, 6.4 to 8.5 acres of timbered range (4.4 to 6.9 acres of open range), average steer gains from March to October were 114 pounds. This was approximately 46 pounds per steer less than on lightly stocked ranges. Individual animal performance was very similar within the group on moderately stocked ranges. However, acreage of burned range varied each year and animal weight changes tended to be greatest on the unit that had the greatest acreage of burned range per steer.

Performance was poorest on the heavily stocked range. Steers gained only 76 pounds. This was 38 pounds less than the average of moderately stocked ranges. Each year a certain amount of herbage accumulated before steers were turned on range, and creditable gains were made during the spring

Table 1. Body weight changes of steers and forage utilization under various stocking intensities of wiregrass-pine ranges.[1]

Range unit	Burned wiregrass range		Forage removed by grazing	Initial Weight Mar. 15	Weight changes per steer	
	Actual	Adjusted to open conditions[2]			Mar. 17-Oct. 25	Oct. 26-Jan. 17
	Acres		*Percent*		*Pounds*	
			Lightly Stocked Ranges			
1	18.1	14.5	29	465	155	–49
8	14.2	8.5	32	457	167	–47
			Moderately Stocked Ranges			
3	8.5	6.9	38	481	118	–55
4	6.8	5.3	48	479	117	–42
5	6.4	4.4	46	495	108	–48
			Heavily Stocked Range			
6	4.4	3.0	65	480	76	–60

[1] Average for 1950, 1951, 1953, and 1954. Steers were removed from range in October 26, 1954.

[2] Calculated to represent the number of acres of wiregrass range without trees or shrubs.

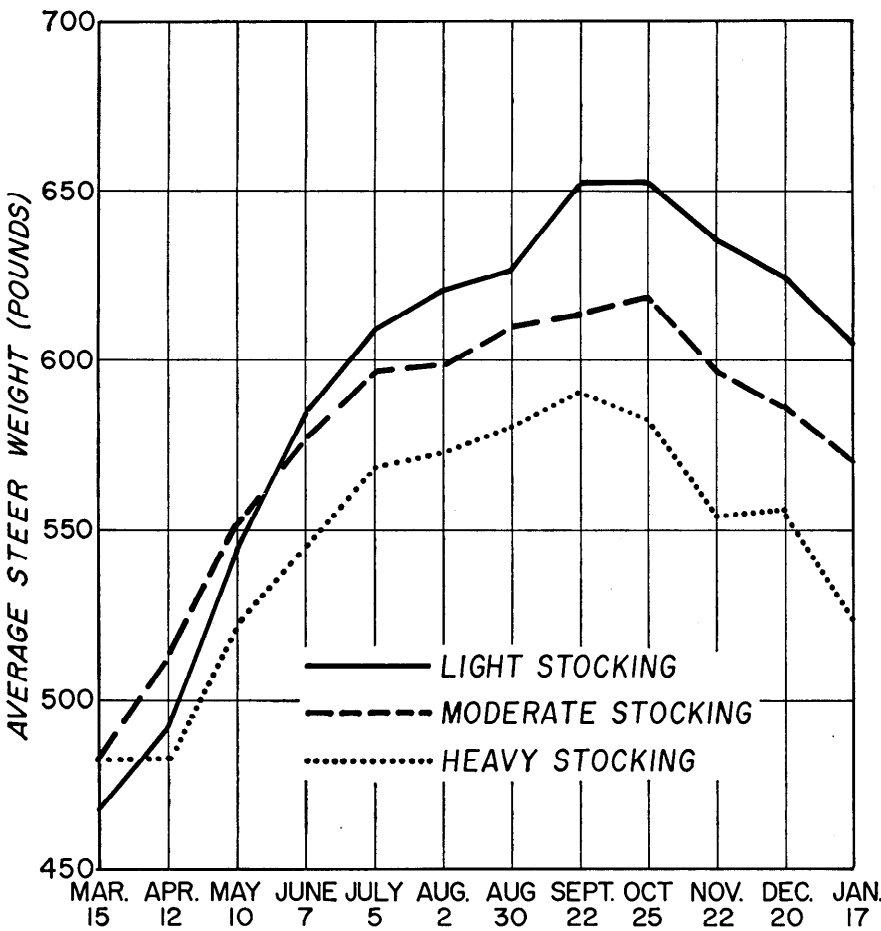

FIGURE 2. Increases in body weight were most rapid during the spring; maximum body weight was reached in October and on lightly stocked ranges (data from 1950, 1951 and 1953).

in all ranges. However, herbage production during late spring and summer was not adequate on the heavily stocked ranges.

Season

Rate of gain was greatest during the spring, regardless of stocking rate (Fig. 2). Approximately 80 percent of total weight changes occurred by July 1. Light gains continued through the summer in proportion to acreage of burned range per steer. The seasonal trend in gains was also influenced to some extent by the relative abundance of main forage species. Pineland threeawn and Curtiss dropseed made rapid growth and were particularly palatable during the spring. Gains tended to be higher in the spring on units where these species predominated. Bluestems and carpetgrass made greatest growth and were more palatable during the summer; therefore, steer gains were better through the summer where these species were most prevalent, provided grazing was not too close.

The advantage of a light to moderate rate of stocking was further emphasized by performance of steers during fall and early winter (Oct. 26-Jan. 17). Although the steers were fed two pounds of cottonseed meal per head daily, all lost weight. But the steers on lightly to moderately stocked ranges, even though in better flesh at the beginning of the fall, lost significantly less weight than those on heavily stocked range. Adequate forage was not the complete solution to the prevention of weight losses during the critical fall period, but it did help to reduce them.

Effect of Rate of Stocking on Degree of Forage Utilization

Forage utilization varied considerably among units but was closely related to the acreage of burned range per steer. Average utilization on upland varied approximately 30 percent on lightly stocked units to a high of 65 percent under the heaviest rate of stocking (Table 1). Utilization was rather consistent from year to year for any particular unit.

Forage utilization on burned lowland areas was generally equal to or greater than on the uplands. Upland species were grazed primarily in the spring, but use of species other than bluestems and carpetgrass slackened off during the summer. On the other hand, forage species on the burned lowlands were grazed consistently from early summer into the fall and winter.

The degree of forage utilization was tied in very closely to animal performance. Maximum weight gains per animal were dependent largely on forage availability to the extent that the steers could obtain sufficient feed when approximately 30 percent of the total season's growth of grass was removed by grazing. When stocking rate was most intense and steers were forced to remove a high percentage of the herbage, the gains per steer were least (Table 1).

Table 2. Continued grazing of burned ranges caused a decrease in ground cover and yield of grass.

	Ground covered by grasses			Grass yield per acre
	1942[1]	1949	1954	1953-1954
	Percent			*Pounds*
Grazed	30.5	28.9	21.7	775
Ungrazed	30.2	33.2	32.6	1075

[1] Data taken from same plots in previously reported study, Halls, *et al.*, 1952.

Effect of Burning and Grazing on Ground Cover and Yield of Grasses

Grazing of these annually burned ranges decreased the ground cover and yield of grasses.

With grazing, average grass cover decreased from 30.5 percent in 1942 to 28.9 percent in 1949 and to 21.7 percent by the end of 1954 (Table 2). Decreases were least under light stocking and greatest under a heavy rate of stocking and forage utilization.

On ungrazed plots, the ground cover of grass changed very little and a fairly stable community of wiregrass species was maintained. Since the native vegetation is a selection of species that has developed through frequent burning over many years, only minor changes would be expected so long as timber stands remained the same and litter was periodically removed.

The decrease in ground cover of grass on grazed portions of range units was accompanied by a decrease in yields. As measured by clippings from caged plots, the average oven-dry grass yield on grazed areas was 300 pounds per acre less than the 1,075 pounds of grass produced on similar plots which had been ungrazed since 1942. Thus, with continued burning and grazing, grazing capacity was reduced 28 percent.

Effect of Tree Overstory and Shrub Cover on Grass Yields and Grazing Capacity

To maintain proper numbers of animals on wiregrass-pine ranges, the relationship between grass, trees and shrubs should be appraised and adjustments made accordingly. The total acreage of timbered range is not always a good criterion for allotting the number of animals to be grazed. Grass yields are greatest where there are no trees or shrubs. But as timber stands and shrubs become more dense they compete critically with the grasses for light, moisture and plant nutrients, and grass yields are decreased.

Table 3. Effect of overgrowth of trees and shrubs on grass production.

Shrub density	Tree overstory				
	None	5%	20%	35%	50%
Percent	*Pounds of grass*				
0	1060	985	757	530	292
5	995	918	691	464	226
10	930	852	625	398	160
15	865	786	557	332	94

Basic relationships established in this study can be used to estimate the productiveness of other wiregrass ranges which vary as to timber stand density and shrub cover. This relationship between grass, trees, and shrubs was best expressed by the calculated regression formula:

$$Y = 1060 - 15X_1 - 13X_2$$

where

Y = estimated grass yield
X_1 = tree overstory in percent
X_2 = shrub cover in percent

For example, where there were no trees or shrubs, grass yields were 1,060 pounds per acre (Table 3). Assuming that with light stocking 35 percent of the forage would be removed by grazing, that grasses contribute 85 percent towards total cattle diet, and that daily dry matter intake for a 50-pound steer is 13 pounds, it would take about 9 acres of wiregrass range to permit a 500-pound steer to make maximum weight gains (Fig. 3).

This acreage would need to be increased as the timber stand and shrub cover became more dense (Fig. 4). For example, calculated per-acre grass yield on Range Unit 8 was 636 pounds. The required amount of timbered range for best animal performance would be 15 acres. This compares very closely to the average of 14.2 acres, which was the actual stocking rate of Unit 8 and from which maximum weight gains were obtained. By the same manner, calculated grass yields on Unit 6 indicated the need for 13 acres of range for best animal performance, but only 4.4 acres were supplied. Therefore, forage utilization was extremely heavy and steer gains were very low.

Light Rate of Stocking is Desirable

Several factors tend to favor a light rate of stocking and forage utilization. Maximum gains generally indicate a higher market grade for cattle. Also, the ability of cattle to make greater gains under light stocking should enable mature cows to calve more consistently. This factor is of special importance in this region of low quality forage where calving per-

FIGURE 3. Approximately 9 acres of open wiregrass-pine range are needed to graze a 500-pound steer from March to January.

FIGURE 4. Limited herbage under dense stands of trees and shrubs necessitates a large acreage of range for maximum gains per animal.

centage is restricted because of the cows' inability to meet the requirements for lactation and breeding simultaneously. Also, less supplemental feeding would be required to keep cattle at an adequate level of nutrition during fall and winter.

Light stocking permits the same number of cattle to graze the range from year to year without causing excessive utilization of forage during the years when a minimum of burned range is available.

Moderate stocking and degree of forage utilization permit more cattle to be run on the forest but at the expense of individual animal performance. During years of limited burned range, adjustments and additional feed may be required to keep cattle in good condition.

There appears to be one justification for heavy utilization of forage. Since wildfire is a critical problem in timber management, removal of maximum herbage may be justified at times to reduce the amount of flammable material. However, this advantage does not compensate for the poor cattle performance under these conditions.

Resume

Where timber is generally regarded as the most valuable product of these forest lands, grazing should be planned not to conflict with timber-growing requirements. The rapidly changing conditions from seedbed preparation to harvest in a timber rotation dictate the exclusion of fire for several years. During this time cattle grazing should be markedly reduced but continued, in order to reduce fire hazard. Later, this same area may be very productive for cattle grazing when and if prescribed burning is used as a tool in timber management. Prescribed burning should be planned primarily for timber rather than grazing needs. The acreage of burned range will, therefore, vary each year but cattle will concentrate on forest range lands which have been burned. Cattle management based on an average of 35-percent utilization of burned wiregrass forage provides greatest returns per animal and presumably greatest return per dollar invested in cattle. Approximately 9 acres of good wiregrass range which yields nearly 1,100 pounds of grass provides ample feed for a 500-pound steer from March to January. Depending on the amount of the tree overstory and shrub cover, the acreage would have to be increased to compensate for decreased yields of grass.

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The 9th Annual California Weed Conference will be held in Fresno, California, January 22 to 24, 1957. Convention headquarters will be at the Hotel Californian, and the meetings will be held in the Civic Auditorium beginning at 1:00 P. M. on Tuesday, January 22.