

# Forage Production and Utilization in Long-leaf Pine Forests of South Mississippi<sup>1</sup>

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In south Mississippi, cattle grazing in the pine forests has been important to the local economy for more than a century. Even before the heyday of the lumber industry in this section, long-horned cattle of Spanish origin grazed the native grasses in the virgin longleaf pine (*Pinus palustris*) forests. The long growing season, mild winters and ample rainfall all favored year-long grazing of the small cattle herds owned by the early settlers.

After logging removed the virgin forest, and while the second-growth pine stands were becoming established, native grasses became the dominant vegetation on these longleaf lands (Wahlenberg *et al.*, 1939). The sandy texture of the soils and the low yields of cultivated crops discouraged large-scale farming, and 70 to 80 percent of this area is still classed as forest land.

Today, most of the small farm owners depend upon forest grazing either seasonally or yearlong. Increased values in both cattle and timber have emphasized the need for good herd management and full utilization of the forest range.

In response to this need, a study was begun in 1947 with three main objectives: (1) to find out how much grass is produced in pine stands of different densities, (2) to determine how much the quality of the forage varies from one season to the next, and (3) to compare cattle gains in a

4-months' and a 7-months' grazing season.

The study, parts of which ran each year from 1947 to 1953, was conducted cooperatively by the Mississippi Agricultural Experiment Station and the Southern Forest Experiment Station. The Mississippi Agricultural Experiment Station furnished cattle from 1950 to 1952 and was responsible for weighing and herd management. The Southern Forest Experiment Station provided the fenced pastures and made the forage investigations.

## Experimental Pastures

The study was on four pastures on the McNeill Experimental Forest, a tract of second-growth longleaf pine in Pearl River County, Mississippi. Each pasture was 160 acres in size. About 20 percent of the pasture area consists of stream

bottoms; the rest is well-drained upland. Some 55 percent of the upland is well stocked with pole-size longleaf (Fig. 1), and the remainder varies from light to medium stocking. A mixture of slash pine (*Pinus elliottii*) and hardwoods occurs in the stream bottoms. Although the McNeill upland stands have many small openings where grass growth is little affected by tree competition, these pastures have denser pine stocking than the typical longleaf lands in south Mississippi (Smith, 1949).

In addition to the pines, the upland stands included scattered hardwood tree and shrub species.

Bluestem grasses are the most important forage plants on the McNeill range. Little bluestem (*Andropogon scoparius*) and slender bluestem (*A. tener*) are the most abundant, but *A. elliottii*, *A. ternarius* and *A. virginicus* are also common. In addition, the range includes several panicums (*Panicum* spp.), pineywoods dropseed (*Sporobolus junceus*), arrowfeather three-awn (*Aristida purpurascens*), paspalums (*Paspalum* spp.), bearded skeletongrass (*Gymnopogon ambiguus*) and common carpetgrass (*Axonopus affinis*). Carpetgrass occurs mainly in openings and on



FIGURE 1. Short-season steers in well-stocked longleaf stand, 1951. (U. S. Forest Service photo).

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woods roads. A number of wet-land grasses, sedges and rushes provide early spring grazing in the stream bottoms. Switch cane (*Arundinaria tecta*) occurs locally on wet ground. While most of the native grasses make their principal growth in spring and summer, several of the panicums furnish some grazing in winter and very early spring. Native legumes and other weeds (forbs) provide some grazing, mainly in early spring.

Average upland forage on unburned areas consisted of 81 percent grasses and 19 percent weeds.

### Timber Density and Grass Production

In each year from 1947 through 1949, monthly yields of grass were obtained in open, moderate and dense pine stands on burned and unburned sample plots. Maximum yields for the three years averaged 850, 450 and 400 pounds of air-dry grass per acre in open, moderate and dense stands, respectively. Much of the grass that grew under the dense pine stands was covered with needles and was thus unavailable to cattle.

From 1947 to 1953, highest cumulative yields of forage in the open pine stand usually were obtained in August or September, after the flower stalks had developed (Table 1). In general, forage yields declined in October after grasses had reached maturity and the leaves had begun to dry up.

Grass production increased greatly in wet growing seasons. In 1949, when summer rainfall was ample, the maximum in an open, unburned pine stand was about 1,375 pounds (air-dry) of grass per acre. At the other extreme was the 474 pounds produced in the dry year of 1948.

### Nutrient Values of Forage Plants

Analyses of ungrazed native grasses show that nutrient values were highest in the early leaf stages of growth. In early spring, crude protein ranged from 8 to 13 percent in native grasses growing under the different classes of pine stands. About 8 to 9 percent protein is required for beef breeding animals. When ungrazed grasses reached full leaf in early June, protein content dropped to about 6 percent and continued low through the remainder of the growing season (Campbell *et al.*, 1951).

In the grazed pastures, the native forage was evaluated from composite samples representing the cattle diet. In early spring, crude protein was very similar to that on ungrazed range. In summer, however, protein contents of the forage on grazed range were from 6 to 8 percent. Probably because of this higher nutritive value, cattle took the regrowth on previously grazed spots in preference to the more mature grass on ungrazed areas.

The protein content of several native weeds and legumes was

higher than that of the native grasses. Most of these weeds mature in early summer and hence were grazed mainly in the spring.

In the early leaf stage, phosphorus values ranged from about .15 to .20 percent in the native grasses. Phosphorus usually dropped to less than .10 percent in May and continued inadequate for the remainder of the season. To compensate in part for this low phosphorus content, mineral supplement was supplied in all pastures during the study.

The calcium content of native grasses ranged from .22 to .44 percent and was fairly uniform throughout the season. Apparently it was adequate in all stages of growth.

Protein and phosphorus contents of ungrazed grass were only slightly higher on burned than unburned areas. The increased nutrient values due to burning were too small to be considered important. Nutrient contents were about the same for all degrees of timber stocking.

### Cattle Gains

In the three years 1950 to 1952, locally purchased grade steers averaging about 350 pounds were grazed on the forest range for periods of four months and seven months. The steers were placed in pastures in March or early April, provided with salt and minerals, and weighed at 28-day intervals. In 1950, the two short-season pastures were stocked with 24 head and the two long-season pastures with 12 head. In the next two years, stocking was 32 and 16 animals in the short- and long-season pastures, respectively.

In the early part of the season, average gains per head were about one pound per day, but thereafter daily gains were smaller as nutrient content of grasses declined (Smith and Blount, 1952). In the three years, short-season steers gained an average of 82 pounds per

Table 1. Average monthly grass production per acre in unburned, ungrazed open pine stand (air-dry weight)<sup>1</sup>

Month	1947	1948	1949	1950	1952	1953
	Pounds					
April.....	145	...	410	688	280	...
May.....	273	282	423	438	407	330
June.....	585	274	807	541	...	498
July.....	568	340	1,075	786	524	696
August.....	516	413	1,375	910	690	...
September.....	456	474	1,310	848	597	702
October.....	271	400	1,001	692	...	...

<sup>1</sup> Monthly data are cumulative averages for 10 plots. No yields were taken in 1951.

Table 2. Average cattle gains per steer<sup>1</sup>

Year	Short Grazing Season			Long Grazing Season			Average of All Pastures
	Pasture A	Pasture F	Average	Pasture C	Pasture E	Average	
	Pounds						
1950	87	100	92	134	118	126	104
1951	73	75	74	101	152	127	92
1952	87	74	81	103	89	96	86
Average	82	81	82	111	120	115	93

<sup>1</sup> In 1950, pasture A was stocked with 14 head, pasture F with 10 head, and pastures C and E with 6 head each. In 1951 and 1952, pasture A had 18 head, F had 14, and C and E had 8 head each.

head, and long-season steers 115 pounds (Table 2).

Average beef production per year was 7.2 pounds per acre on the short-season pastures and 5.3 pounds on the long-season pastures. The advantage of 1.9 pounds per acre in favor of the short-season pastures is attributable both to the heavier stocking and to the higher nutrient value of forage in spring and early summer.

### Forage Utilization

Near the end of the two grazing periods, estimates were made of grass production and utilization by sampling small plots in all pastures. Periodic observations were also made of plants grazed. On unburned range, grass utilization was relatively light, averaging about 13 percent in the short-season pastures and about 19 percent in the long-season pastures. Cattle prefer to graze on fresh burns, so that utilization was much higher where fire had removed old herbage and pine litter. In the first year after burning, utilization ranged from about 60 to 90 percent of the available grass.

For a short period in early spring, weeds and browse plants—chiefly sweetleaf (*Symplocos tinctoria*), sweetgum (*Liquidambar styraciflua*), flowering dogwood (*Cornus florida*)

and huckleberry (*Vaccinium elliptii*)—made up 10 to 30 percent of the diet; in the remainder of the season grasses made up at least 90 percent of the forage eaten.

On unburned range, cattle grazed mainly the broad-leaved bluestems, feeding on the leafy portions both among the pines and in the openings. Slender bluestem was grazed only lightly unless burned, but burning greatly increased utilization of this species. Dwarf panicums were taken mainly in early spring before they matured.

Although most of the McNeill Experimental Forest is unusually well stocked with pine timber, the tract still produced ample range forage to support cattle grazing.

### Summary

A cooperative study of range forage production was conducted on the McNeill Experimental Forest in south Mississippi from 1947 to 1953. Steers were grazed in four experimental pastures on the area from 1950 to 1952, to compare cattle gains during a 4-months' spring season with a 7-months' spring-summer season.

The most abundant forage species were little bluestem and slender bluestem. Other upland grasses included several panicums, three-awn, dropseed, paspalums and car-

petgrass. In three years, maximum yields of grass were 850, 450 and 400 pounds (air-dry) per acre in open, moderate and dense pine stands, respectively. Heavy pine litter rendered much of the grass in dense pine stands unavailable to cattle. On unburned range, maximum grass production ranged from 1,375 pounds (air-dry) per acre in a summer with ample rainfall to 474 pounds in a dry summer.

Crude protein and phosphorus contents of ungrazed grasses were below cattle requirements except in spring. New growth on closely grazed spots had more nutrients than ungrazed grasses.

In a 3-year period, seasonal gains averaged 82 pounds per steer in the 4-month grazing pastures and 115 pounds in the 7-month pastures. The best gains were made in the early part of the growing season: about 1 pound per day in April and May and about 0.5 pound after May.

On unburned range, utilization of grasses averaged about 13 percent in short-season pastures and 19 percent in long-season pastures. On fresh burns, utilization ranged from about 60 to 90 percent. In general, slender bluestem was grazed only sparingly unless burned.

### LITERATURE CITED

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