that potassium is very abundant in the forage species tested. As in previous studies, calcium was found to be adequate and crude protein and phosphorus very deficient.

Four major native forage species were collected at the early, full, and mature green leaf stages of development. Pinehill bluestem (Andropogon divergens) is the most abundant grass in the gently rolling hills of central Louisiana. Slender bluestem (Andropogon tener) is more common in the relatively open flatwoods of southwest Louisiana. Narrowleaf panicum (Panicum angustifolium) was selected as representative of a large group of upland panicums found throughout the piney woods area. Swamp sunflower (Helianthus angustifolius) is the preferred forb on most longleaf pine ranges. These species were collected from two distinct soil types common in Louisiana, Beau-regard very fine sandy loam and Ruston fine sandy loam.

The Feeds and Fertilizer Laboratory of the Louisiana Agricultural Experiment Station tested all samples for cobalt, iron, copper, manganese, zinc, molybdenum, magnesium, sulphur, potassium, calcium, phosphorus, and crude protein. Crude protein, phosphorus, and calcium were analyzed by standard procedures of the A.O.A.C. (1950), other minerals by the methods of Parks et al. (1943).

All species, at all growth stages and from both soil types, contained adequate amounts of all the minor minerals. There is no advantage, therefore, to using expensive minor-mineral supplements for beef cattle grazing on longleaf-pine bluestem ranges. Several of the minor minerals, especially cobalt, copper, and manganese, were present in rather large amounts. Since excessive quantities can be harmful to animals, indiscriminate use of trace-mineral supplements should be avoided.

Potassium also proved ample. As in previous studies, calcium was adequate. Phosphorus was deficient at all seasons and crude protein held up only in samples taken in spring and early summer—findings that corroborated those of Campbell and Cassady (1951), Campbell et al. (1954), and Fraps and Fudge. (1940).

The need for phosphorus and protein supplements and the ability of the native forage to supply adequate minor elements is being demonstrated in practical herd tests in central Louisiana. In these tests typical open-range cattle are put under a program of simple, yearlong range and herd management. Cottonseed cake is fed from early fall until late spring. Bonemeal and salt are kept before the animals yearlong. No minor mineral supplements are used.

The ranges are fenced and stocking is moderate. Calves are dropped from early December through March and weaned in August.

Under this management, cow weights have risen from 700 to 900 pounds in three years. Calf crops average over 80 percent, and calves weigh more than 425 pounds. In effect, beef production has been more than doubled.

These practical herd tests, together with the laboratory analyses, strongly suggest that minor mineral elements are not a limiting factor in beef production on longleaf pinc-bluestem ranges. Native forage must be supplemented with crude protein and phosphorus, however, to maintain high calf production from range herds.

**LITERATURE CITED**


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**THE EFFECT OF NITROGENOUS FERTILIZERS ON CATTLE DISTRIBUTION ON MOUNTAIN RANGE**

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One of the most important problems facing range managers in the western states is non-uniform distribution of livestock. The problem increases in importance on ranges with high uplands with interspersed valleys and stream bottoms. Cattle have a natural tendency to congregate in the valleys and stream bottoms. As a result of this tendency, lowlands are frequently heavily grazed while adjacent slopes and hilltops remain lightly utilized.

Common range practices used to encourage cattle to utilize forage in rough areas include (1) development of salting, watering and supplemental feedgrounds within lightly used areas, (2) drift fences, and (3) range riders. Although one or a combination of several of these practices has been helpful in obtaining uniform grazing, much remains to be desired.

Studies conducted in 1955 on the Bighorn National Forest in-
dicated that the application of 67.5 pounds of nitrogen in the form of urea was effective in obtaining grazing on areas ordinarily used very lightly. The production of grass was not significantly increased.

**Procedure and Results**

On June 20, 1956, a strip of rangeland 350 feet wide and one mile long was fertilized with urea at a rate of 67.5 pounds of nitrogen per acre. The material used was applied by airplane to an area which received only 15 percent utilization in 1955. Utilization checks, based upon leaf height of Idaho fescue made in September of 1956 showed 73 percent use on the area actually fertilized and 55 percent use of the adjoining non-fertilized area.

On June 28, 1957, 30 acres of rangeland were fertilized with an aerial application of 200 pounds per acre of ammonium nitrate (33 percent N). Utilization checks, based on leaf height of Idaho fescue, were completed in September on the 1956 and 1957 fertilized areas and on an unfertilized check area. Each area was sampled four times, measuring

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<td>18.52**</td>
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**Indicates significance at .01 level.**

**BOOK REVIEWS**

Edited by Lowell K. Halls, Forest Service, U. S. Department of Agriculture, New Orleans, Louisiana


This book was written primarily for agricultural students, farmers and farm leaders. Of the 16 chapters, one on Managing Grassland Soils and one on Classifying and Judging Land may be of particular interest to Southern Section members.


A title such as "Conservation Farming in the South" would have more accurately conveyed the contents and type of this book. Land use capability is fully covered, but the more technical and perhaps more basic phases of soil science are generally only lightly or incompletely developed.

Proper logic is not always used. For example, Vanderford states, "The number of acres of land used for pasture has increased considerably (in the South) during the last decade." But the only proof, if intended for this purpose, is a table showing the 1954 acreages of land in crops and in pastures in each of the southern states and in all combined. The conclusion drawn is that there is more land in pasture than in crops in the South, which is quite different than showing any increase or extent of increase in pasture acreage. Actually, only a casual study of the figures presented on this subject suggest that even the conclusion stated should have reservations. It is true that there is more total acreage in pastures than in crops in the South, but over half of the total pasture acreage is in one state, Texas, and in 11 out of the 15 southern states listed, more land is in crops than in pastures.

This book has other weaknesses. Several statements fail to convey the thought that one feels the author wanted to put across. Oftentimes, in the development of a statement, the emphasis is charged to a different subject or phase than one started with, which is disconcerting to say the least, and inconclusive at best. Another brief example can be cited: "Since pastures produce the cheapest