rainfall with a summer maximum, high wind velocities, moderately high summer temperatures, and moderate to low relative humidities. Winters may have frequent short periods of near zero temperature, but total snowfall is small and winters are open. An important feature of winter is the rapid change in temperature with the passage of cold fronts; variations of 50° from one day to another are not unusual. Precipitation effectiveness is low because of the high evapotranspiration stress and the convectional type rainfall. The soil seldom is wetted below 3 feet during years of normal rainfall.

Under pristine conditions, the area was covered by grassland communities of simple floristic composition. Evidence suggests the possibility of a coniferous forest during pluvial intervals which, in the past, have alternated with periods of aridity. Local conditions caused by soil texture and topographic control of precipitation effectiveness result in several variations of the climax vegetation. Roots penetrate to a shallower depth on the Pullman soil but to a greater depth on the sandier soils of the Amarillo series, reaching a maximum on the dune sands of the Tivoli series.

Although the aerial portions of the climax grass species seldom exceed 1½ feet in height, the roots are extensive and extract moisture from large volumes of soil. The extensive ramification of the root system tends to dry the soil to permanent wilting percentage rapidly after a rain and to improve the structure and permeability of the soil. Moreover, this thorough permeation by grass roots contributes to the deeper distribution of organic matter of the soil without actual movement of the organic matter after mineralization. Since water is lacking, the intensity of soil forming processes is reduced because of the low precipitation which falls during the time of year when climax vegetation is removing moisture at a maximum rate.

LITERATURE CITED


1957b. Studies of Cenozoic geology along eastern margin of Texas High Plains, Armstrong to Howard Counties. Rpt. of Investigations No. 32, Bur. of Econ. Geol., Univ. of Texas.

Range Condition Improves with Rest

F. DeWITT ABBOTT
Kansas State Soil Conservationist, Salina, Kansas.

One of the most basic of the principles used in management of natural range is that rest will restore the natural vegetation. Often it is the most economical way to improve range cover. Good examples of this are innumerable and may be found throughout the Great Plains region.

Areas of true prairie in a depleted condition within the Great Plains are generally more responsive to resting than mixed prairie and other more arid grassland associations. It is possible on true prairie in eastern Kansas to improve range from fair to good condition by resting for two consecutive full growing seasons.

The photographs shown in Figures 1 and 2 are graphic evidence of this fact. The two photographs were taken one year apart at the same location. This true prairie rangeland is located 5 miles east and 1 mile north of Soldier, Kansas, in Jackson County, about 40 miles north of Topeka, Kansas. The area lies in the 30-34 inch precipitation zone. Monthly averages are highest for May, June, and September. Hard frosts affecting native vegetation are uncommon from late April to mid October.

The soil is a Shelby clay loam.
Figure 1. A tract of native vegetation near Soldier, Kansas on October 30, 1957 after one year of rest.

Table 1. Estimated relative annual production of air-dry herbage by species, grouped according to response to overgrazing, during first and second years of rest from grazing.

<table>
<thead>
<tr>
<th>Species groups by response to overgrazing</th>
<th>Air-dry Production of Herbage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One-Yr. Rest</td>
</tr>
<tr>
<td>Invading annual grasses</td>
<td></td>
</tr>
<tr>
<td>Invading annual forbs</td>
<td>35</td>
</tr>
<tr>
<td>Increasing mid grasses</td>
<td>30</td>
</tr>
<tr>
<td>Decreasing tall grasses</td>
<td>20</td>
</tr>
<tr>
<td>Other (response unclassified)</td>
<td>10</td>
</tr>
</tbody>
</table>

It has a friable clay loam surface layer 10 to 12 inches thick. The subsoil is a heavy clay loam. This is underlain at a depth of 40 to 60 inches by glacial till of clay loam texture. At this location, the slope varies from 5 to 6 percent.

Figure 1 is a view of the tract after the first year of rest. The photo was taken and the vegetation was in fair condition on October 30, 1957. It is easy to deduce what had happened during that growing season. Annual grass and forb invaders were first to respond, giving the area a “weedy” aspect. If livestock had been present, the abundant Horseweed fleabane (Erigeron canadensis) and many other invaders already present, would have been kept grazed down. On ranges in low condition, they become very prominent during the first year of protection from grazing. However, underneath this weedy cover, there were remnants of the original true prairie vegetation. A few seed heads of big and little bluestem (Andropogon furcatus and A. scoparius) Indiangrass (Sorghastrum sp.) and Switchgrass (Panicum virgatum) appeared after the first year of rest. But far more important than these few seed stalks was the extension of roots, rhizomes, and tillers at or below the surface on these perennials. Rhizome extension is readily checked on rested ranges by carefully lifting them with a spade in autumn following deferment. Rhizomes frequently extend two to four inches all around scattered tall grasses after the first season of deferment on depleted ranges. These produce above ground shoots the following season.

Those not familiar with the processes of secondary succession may jump to the conclusion that benefical results are not obtained by a one year deferment. In fact, it may appear that the season's rest has resulted in weeds “taking the place”. Where there is a lack of understanding, this would be a natural reaction. Consequently, it is important that technicians providing council and guidance to ranchers desiring to improve deteriorated range point out that a great increase in prominence of weeds is very likely to occur as a result.

Figure 2. The same tract of native vegetation shown in Figure 1 on September 10, 1958.
of a one year rest. Firstly because they or their seeds are often abundant on ranges in low condition, and secondly, because until the year of rest, most are closely grazed and inconspicuous.

Figure 2 is a view of the same tract after two consecutive growing season rests. It was taken September 10, 1958. Range condition improved remarkably but the dramatic change was during the second year of rest. This range was in good condition by the end of the 1958 growing season. Weeds were crowded out and the taller growing grasses characteristic of true prairie in eastern Kansas were restored.

This is an example of aiding secondary plant succession by resting. It shows how rapidly native grasses responded to good management and how range condition may be inexpensively raised from low to high. It shows that where the original grasses were still well distributed, though weak from close grazing, range condition could be inexpensively raised from low to high in two years.

Daily Versus Every-Third-Day Versus Weekly Feeding of Cottonseed Cake To Beef Steers On Winter Range

E. H. McILVAIN AND M. C. SHOOP


Stockmen who feed protein range supplements to beef cattle in winter have diverse opinions about the relative merits of daily and every-other-day feeding. This is because little experimental work has been done on length of feeding interval. And yet, high wintering costs and low winter gains seriously affect economic production of range livestock.

Development of a management system to lower wintering costs in the Southern Great Plains also promises to benefit range forage production. Stockmen could afford to graze their ranges less heavily during the physiologically critical summer months if production efficiency could be increased during winter.

The present study was conducted to determine winter, and subsequent summer, gain responses of beef steers to various intervals of protein supplement feeding on winter range. Smith et al., (1956) reported lower winter gains from every-other-day than from daily feeding, when cattle were fed equal protein supplements. Other investigators, Melton (1960), Melton et al., (1960), and Rowden et al., (1960) found little or no difference in gains of range cattle fed winter protein supplements daily, thrice weekly, twice weekly, or weekly.

Procedure

Intervals for feeding protein supplements to weaner calves on winter range were compared for a 4-year period beginning November 1956 on the Southern Plains Experimental Range in northwestern Oklahoma. Annual precipitation on the experimental range is 23 inches; annual variation is from 10 to 43 inches. The range in absolute temperatures has been -27°F and 113°F. Predominant soil type of the rolling dunes is Pratt loamy sand. The vegetation consists of sand sagebrush with an understory of mixed sod-forming and bunch grasses. Crude protein in the 10 most abundant grasses averages 3.7 percent in winter.

A randomized block experimental design with one replication in 1956-57, two in 1957-58, and four in each of the last two years was used. Treatments studied for 4 years were daily feeding versus every-third-day feeding. A third treatment, weekly feeding, was added during the last 2 years (Table 1).

A uniform group of commercial steer calves was obtained each October from the same herd of grade Hereford cows. All calves were weighed individually for 2 consecutive days at beginning and end of each grazing season and on single days at end of each month. Calves were allotted to treatments at random within weight classes on the basis of average individual weight, and then a few non-random adjustments were made to minimize feeder-conformation grade and fleshing-condition score differences between lots.

Average initial weight of the steers varied yearly from 470 to 502 pounds. The average winter grazing season started November 3 and ended April 26. The summer season ended October 4. Stocking rates varied yearly from 7.1 to 8.9 acres per steer. Steer lots were rotated among pastures at 2-week intervals throughout the year to minimize pasture variables.

Salt was fed free choice and no roughages were given during the 4-year trial except during one 16-inch snow storm. The range supplement was 41 percent pro-