

TECHNICAL NOTES

The Claypan Range Site in Northern Osage County Oklahoma¹

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The Osage Hills of Oklahoma constitute an area which is world renowned for its bluestem-fattened cattle. According to Anderson (1953), "the Flint Hills of Kansas are joined on their southern end by the Osage range lands of Oklahoma, a region of similar grasslands." This hilly region with gently rolling topography constitutes one of the last large segments of true prairie in the United States.

The loamy prairie range site is the most important and is characterized by a fertile, deep upland soil (greater than 36 inches) made up of clay loams. These soils are nearly black, highly granular, and permit

good root penetration, but moisture penetration is slow. The slow permeability as well as the rolling topography with many steep winding ravines, makes cultivation difficult. Therefore, native grass is the most practical vegetation. Four important grass species, big bluestem (*Andropogon gerardi* Vitman), little bluestem (*A. scoparius* Michx.), indian-grass (*Sorghastrum nutans* (L.)

Nash), and switchgrass (*Panicum virgatum* L.) dominate the region and are found growing on the loamy prairie site.

Many acres of claypan soils of the Parsons silt loam type are scattered in patchwork fashion over the region and were of concern in this study (Figure 1). These soils, which have 5 to 16 inches of medium acid and rather floury silt loam over a com-

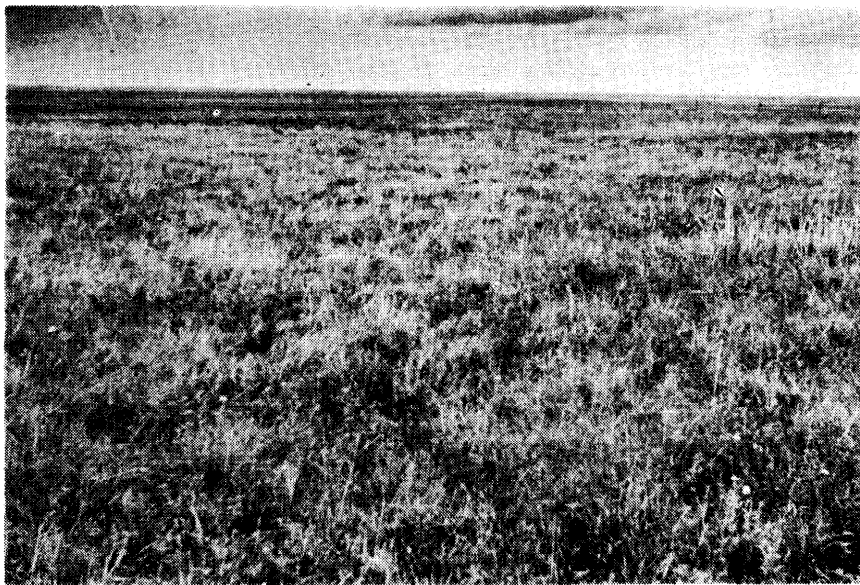


FIGURE 1. Many acres of claypan soils are scattered throughout the region and were of concern in this study.

¹This study is based in part on a dissertation submitted to Oklahoma State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Financial assistance for this project was provided by Phillips Petroleum Company, Bartlesville, Oklahoma.

pact clay layer, have developed from mottled olive, yellow, and dark brown clayey shales (Gray & Gallo-way, 1959). They exhibit very slow permeability, seasonal wetness, and low fertility. According to Weaver and Crist (1922) claypans appear in some localities to be due largely to the calcareous nature of the soil, and in others to the concentration and cementing effect of colloidal clay aided in part by the carbonates. The soil is poorly adapted for deeply rooted tall grasses. Thus, the vegetation is made up primarily of the short-rooted grasses buffalograss (*Buchloe dactyloides* (Nutt.) Engelm.) and blue grama (*Bouteloua gracilis* (H.B.K.) Lag. and Steud.). Western ragweed (*Ambrosia psilostachya* DC.), dotted gayfeather (*Liatris punctata* Hook.), and heath aster (*Aster ericoides* L.) are the principal forbs. During drought, root penetration on these claypan soils is greatly restricted and forage production is greatly reduced.

The study was conducted during the summers of 1961 and 1962 on the Adams Ranch, a 33,000 acre tract in the northern part of Osage County. The general climate is one of dry, hot summers with wet springs and falls. Rains of several days are common, and long-continued droughts are infrequent. The mean annual precipitation is 32.81 inches with about three-fourths during the growing season.

The primary objective of this study was to determine forage production, vegetation composition, and vigor of plants growing on the claypan site. It is hoped that this report may provide some further knowledge for establishing a management plan for both cattle and range.

Methods

The rate of growth of the dominant species, relative composition and forage production of both grasses and forbs, basal cover, and plant vigor were determined in an area representing the claypan range site.

The point intercept method of vegetation analysis (Levy and Madden, 1933) was used to determine the basal density and percent composition of the vegetation. Two hundred sets, 2,000 points, were taken along pace transects. The total number of forbs was counted and aver-

aged for the plot on 100 randomly located square-foot samples and the number of species in each plot was counted.

To determine forage production, twenty movable exclosures were placed at random in the area from May 26 to August 25 of each year. Near the close of the growing season, a plot 11.5 by 24 inches was hand clipped at ground level in each exclosure. The herbage was separated into four categories: buffalograss, blue grama, other grasses, and forbs. The clipped samples were then weighed, oven dried (100-105° C. for 24 hours), and reweighed. The average dry weight in grams was multiplied by 50 to determine pounds of forage produced per acre. This is a mathematical means of determining pounds per acre devised by E. H. McIlvain and collaborators at the Southern Great Plains Field Station, Woodward, Oklahoma.

Vigor of the important species was determined by the following measurements: (1) maximum height, (2) average height, (3) leaf length, (4) leaf width, and (5) number of leaves per plant. To obtain the measurements of leaf length and leaf width of forbs, ten randomly located leaves from ten plants were measured from petiole to tip. On grasses, the third leaf from the base of the culm was measured on ten random plants.

Results

Eleven grass species were recorded in sampling the claypan site (Table 1). Blue grama and buffalograss predominated, comprising 49.7 and 30.5 percent respectively of the vegetation. Switchgrass was the only tall grass, but it was very sparse and was not sampled either year with the point quadrat. According to the Soil Conservation Service system of range condition classification, the claypan was in excellent range condition, since the most abundant grasses represented the highest unit of vegetation this site is capable of producing. Buffalograss, blue grama, tall dropseed (*Sporobolus asper* (Michx.) Kunth), and sideoats grama (*Bouteloua curtipendula* (Michx.) Torr.) made up 80.3 percent of the total composition, and each of these four grasses is allowable in determining range condition. Because of the abundance of the low-growing, sod-forming short

Table 1. Composition of grasses on Claypan range site for the summers of 1961 and 1962.

| Species | Percent composition | |
|------------------|---------------------|------|
| | 1961 | 1962 |
| Blue grama | 40.4 | 59.0 |
| Buffalograss | 37.5 | 23.5 |
| Windmillgrass | 12.0 | 8.8 |
| Tumblegrass | 4.8 | 1.4 |
| Tall dropseed | 2.7 | 2.3 |
| Silver bluestem | 2.0 | 1.4 |
| Sand dropseed | 0.6 | 1.4 |
| Carices | 0.0 | 0.9 |
| Sideoats grama | 0.0 | 0.5 |
| Purple lovegrass | 0.0 | 0.5 |
| Hairy grama | 0.0 | 0.5 |

grasses, the basal density was very high (15.3 percent).

A host of forbs headed by western ragweed was present on the claypan site (Table 2), and they were either uneaten by stock or grazed only sparingly. The number of forbs more than doubled between 1961 and 1962, due mostly to the 70 percent increase of western ragweed and the 49 percent increase of dotted gayfeather. The increase of total forbs per acre was 62 percent from 1961 to 1962, western yarrow (*Achillea lanulosa* Nutt.) being the only forb that did not increase.

A decrease in forage production was noted from 1961 to 1962 (Table 3), possibly due to the fact that rainfall in May 1961 was 5.66 inches, and in May 1962 only 1.86 inches.

Blue grama and buffalograss, the most abundant grasses on the claypan site, produced the major portion of the forage. Total forage production was 2152 pounds per acre in 1961, and 1824 pounds per acre in 1962. Of this total production, blue grama averaged 674 pounds for the two years, or 33.9 percent of the total. Buffalograss produced an average of 135 pounds of dry forage per acre, or 6.6 percent of the total.

Other grasses, including windmillgrass (*Chloris verticillata* Nutt.), tumblegrass (*Schedonnardus paniculatus* (Nutt.) Trel.), purple lovegrass (*Eragrostis spectabilis* (Pursh) Steud.), silver bluestem (*Andropogon saccharoides* Swartz), and tall dropseed produced an average of 491 pounds of dry forage per acre. The numerous forbs produced an average of 687 pounds per acre for the two years, or 34.8 percent of the total forage production.