Herbage Production in Four Range Plant Communities in South Texas[1]

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The Coastal Prairie region of Texas is one of the world's most famous cattle producing regions and its history is rich with reports of unlimited numbers of animals grazing on a veritable sea of grass. Although this area has contributed greatly to beef production in North America from the days of the early Spanish explorers to the present, few studies have been made concerning forage production on these ranges.

The present paper is part of a detailed evaluation of the properties of four range plant communities designed to furnish basic data for the management of South Texas ranges. Production estimates were made on (1) a mesquite-buffalograss community, (2) a chaparral-bristlegrass community, (3) a bunchgrass-annual forb community, and (4) a pricklypear-short grass community.

Preliminary work was carried out during the summer of 1956 on the vegetation inventory and range condition classification. Detailed studies of forage production were made from July 1957 through September 1958.

Study Area

The study area was located on the Rob and Bessie Welder Wildlife Refuge, San Patricio County, Texas approximately nine miles northeast of Sinton on U. S. Highway 77. It is in somewhat of a transition between the Coastal Prairie and the Rio Grande Plain vegetational regions of Gould (1957). This intermediate location between two biological regions is reflected in the biota which includes species of both areas.

The climate is characterized by relatively warm temperatures at

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all seasons. The average rainfall for the general area approaches 30 inches, but during 1958 41.75 inches of rainfall were received.

All the desired plant communities were within the 3968 Refuge acres and all communities were subjected to a constant rate of grazing. Hereford steers were grazed at the rate of one animal unit to 13.5 acres. About one adult white-tailed deer was also present for each seven acres giving a stocking rate of one animal unit for each 10.25 acres for deer and cattle combined. The general area was in fair range condition.

The mesquite and chaparral communities occurred on Victoria clay soil, the bunchgrass community on Nueces fine sand, and the pricklypear community on Orelia clay loam. The clay and clay loam areas are usually classified as a "hardland site" (Soil Conservation Service, 1956) while the fine sand is considered a "sandyland site." Detailed soil and plant analyses have indicated that the clay loam of the pricklypear community differs significantly from the other "hardland" areas and should be considered a separate site.

Methods

Plant communities were selected on the basis of earlier vegetational analyses. Twenty sampling stations were located at random within each community. Two 50-foot line intercepts similar to those of Canfield (1942) were established at each sampling location for determining basal density of herbaceous plants. Forb density and canopy cover of woody plants were determined from a 10-foot by 6-inch belt transect and a circle 20-feet in diameter at each sampling station.

Exclosures sufficiently large to permit clipping of plots 9.6 square feet in area were located at 10 sampling stations in each community. Paired plots, one outside and one inside the movable exclosures, were clipped the first week in April, July, October, and January and plant production determined by the "Australian method" of McIntyre (1954). Each grass species was kept separate and reported on an air dry basis. All forb species were clipped together and their relative production estimated by species at the time of each clipping.

Grass names used are from Gould and Box (1959) and other plant names are those used by Rowell (1957).

Results

The most abundant grasses, as measured by basal density, on the mesquite-buffalograss community were buffalograss *(Buchloe dactyloides)* 29.2 percent, three-awn species *(Aristida* spp.) 17.4 percent, filly panic *(Panicum filipes)* 14.2 percent, plains bristlegrass *(Setaria leucopila)* 12.8 percent, and curlymesquite *(Hilaria belangeri)* 10.8 percent. The most abundant forbs were oneseed croton *(Croton monanthogymus)*, horsemint *(Monarda punctata)*, and prairie coneflower *(Ratibida columnaris)*. Percentage composition of the woody canopy cover on the mesquite community was mesquite *(Prosopis juliflora* var. *glandulosa)* 95.5 percent, blackbrush *(Acacia amentacea)* 1.9 percent, and huisache *(Acacia farnesiana)* 2.6 percent and several other shrubs in amounts less than one percent. A total of 18.5 percent of the area was covered with woody canopy.

Grasses found in the chaparral-bristlegrass community were plains bristlegrass 29.8 percent, buffalograss 24.8 percent, curlymesquite 20.8 percent, three-awn grasses 8.8 percent, and filly panic 6.6 percent. The same forbs occurred on the chaparral area as on the mesquite type. Percentage of woody canopy on the chaparral type included blackbrush 34.8 percent, agarito *(Berberis trifoliata)* 11.9 percent, granjeno *(Celtis pallida)* 11.3 percent, mesquite 10.9 percent, huisache 3.7 percent, prickly ash *(Zanthoxylum fagara)* 2.7 percent, lote *(Condalia obtusifolia)* 1.5 percent, and others in amounts less than one percent. A total of 20.4 percent of the chaparral type was covered in woody canopy.

The major grasses of the bunchgrass-annual forb community were seacoast bluestem *(Andropogon scoparius* var. *littoralis)* 29.2 percent, knotroot panic *(Panicum firmulum)* 21.0 percent, sand burs *(Cenchrus* spp.) 14.4 percent, fringeleaf paspalum *(Paspalum ciliatifolium)* 6.4 percent, and balsam scale *(Elyonorous tripsacoides)* 4.0 percent. The most common forbs were skunk daisy *(Verbesina enceloides)*, wooly croton *(Croton capitatus)*, rough nama *(Nama hispisum)*, heartsepal wild buckwheat *(Eriogonum multiflorum)*, and bull nettle *(Cnidosculus texanus)*. Woody species and pricklypear did not occur on the area.

Grasses found in most abundance on the pricklypear-shortgrass community were windmillgrass *(Chloris verticillata)* 22.5 percent, curlymesquite 20.7 percent, sand burs 8.8 percent, plains bristlegrass 18.8 percent, and buffalograss 8.3 percent. Forb density was generally low, but local stands of broomweed *(Gutierrezia texana)* occurred throughout the area. Percentage composition of woody cover was mesquite 80.2 percent, granjeno 4.0 percent, prickly ash 3.4 percent, blackbrush 3.0 percent, huisache and agarito 2.6 percent each and lote 2.1 percent. Woody canopy covered 18.8 percent of the area and 20.6 percent was covered with pricklypear *(Opuntia lindheimeri)* giving a total brush-pricklypear cover of 39.4 percent.

Most of the grasses were of warm-temperature or tropical origin and of the Panicoid and Eragrostoid-Chloroid lines (Box

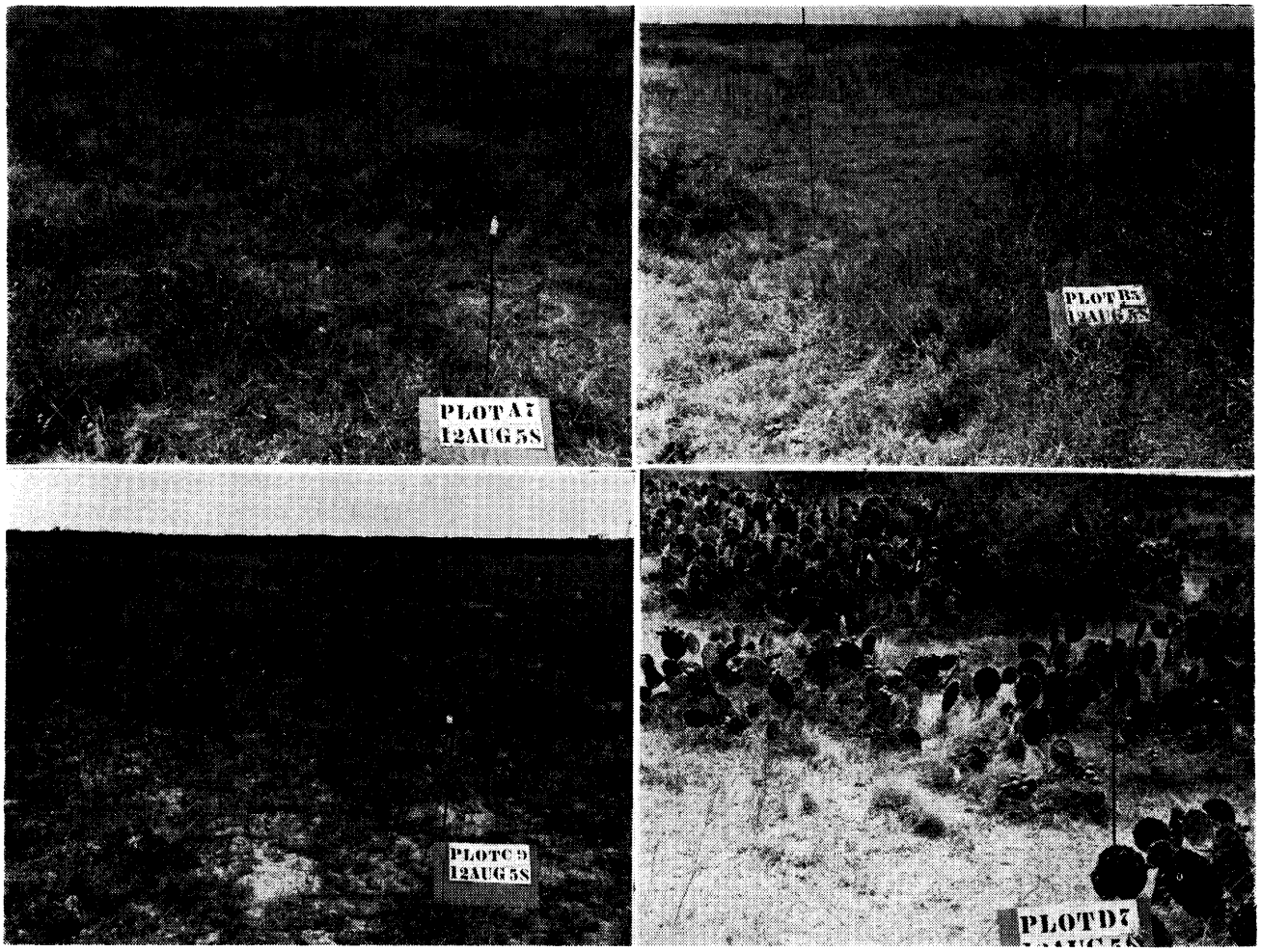

FIGURE 1. Typical mesquite-buffalograss (Plot A7), chaparral-bristlegrass (Plot B5), bunchgrass-annual forb (Plot C9), and prickly-pear-short grass communities.

and Gould, 1958). These grasses grew throughout the year whenever moisture was available. Consequently, grass production did not follow as rigid a seasonal pattern as it does in many areas, and it appeared to be more closely associated with available moisture than with seasonal patterns. A picture of plant production is presented in Figure 2.

Two peaks of grass production occurred during the year. The greatest production was in the spring during the March-June period and was followed by a noticeable drop in plant growth during the summer. A secondary peak occurred in the fall (Figure 2).

Buffalograss, filly panic, and three-awn grasses produced the bulk of the forage in the mesquite-buffalograss community. During the January-March period production declined by species in order of their importance, from buffalograss, plains bristlegrass, Texas wintergrass *(Stipa leucotricha),* curlymesquite, to filly panic. During the April-June period three-awn grasses, buffalograss, curlymesquite, white tridens *(Tridens albescence),* and filly panic, respectively, produced the most forage. In summer filly panic was the most productive followed by buffalograss, plains bristlegrass, white tridens, and silver bluestem *(Andropogon saccharoides* var. *longipaniculata)* respectively. From October to December plant production was not measurable for many of the more abundant species, but curlymesquite, three-awn grasses, white tridens, windmillgrass, and Texas cupgrass *(Erichloa serecia),* although present in minor percentages, produced small amounts.

Plains bristlegrass, buffalograss, and curlymesquite made up the bulk of the forage on the chaparral area. During the January-March period the highest producing grasses were plains bristlegrass, buffalograss, curlymesquite, filly panic, and the three-awns. This pattern remained almost unchanged throughout the study with the exception of the July-September period when plains bristlegrass did not produce a measurable amount of forage and filly panic

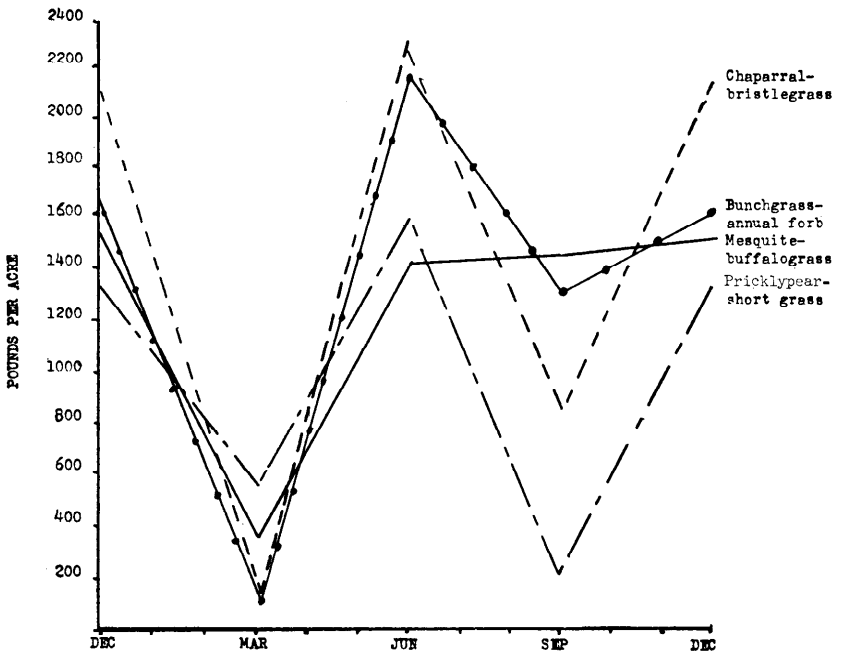

FIGURE 2. Seasonal grass production in four range plant communities.

became one of the more important species. Also, during the October-December period Texas wintergrass produced a substantial amount of forage although it was present only in minor amounts.

Seacoast bluestem was the most productive grass on the bunchgrass-annual forb community. However, less desirable grasses such as knotroot panic, sand burs, and fringeleaf paspalum contributed substantially to total yield. These three grasses comprised 42 percent of the total grass production during the spring period. They continued to produce large amounts of herbage during the early summer, but did not produce substantial amounts after July. Seacoast bluestem and balsam scale were the major contributors to fall forage production.

Windmillgrass, curlymesquite, and buffalograss comprised the major portion of the production on the pricklypear-shortgrass community. Only during the spring period did plains bristlegrass contribute substantially to forage yield.

The mesquite-buffalograss community did not show the severe drop in grass production during the summer months. This community had a high percentage of filly panic in its vegetation which continued to grow during the July-September period. Filly panic made up 67.5 percent of the total grass production during this period.

Forb production followed a definite seasonal pattern in all communities (Figure 3). Peak growth for the clay and clay loam soils occurred during the March-June period. In the mesquite and chaparral communities oneseed croton, horsemint, and prairie coneflower were the forbs contributing most to the total dry matter produced.

Broomweed was the only forb that made substantial production on the pricklypear type. Although it occurred only in local stands, it excluded other plants in those areas and produced a large amount of dry matter.

On the sandy soils, the early spring forbs that contributed most to the total dry weight were Arkansas dozedaisy *(Aphanostephus skirrhobasis)*, bluebonnet *(Lupinus subcarnosus)*, and tall verbena *(Verbena halei)*. Later in the season skunk daisy and wooly croton made up the bulk of the forb production.

Discussion

Early explorers described the vicinity of the study area as a vast prairie covered with "stirrup high" grasses with trees only on the watercourses (de Solix, 1767). By the 1790's huge herds of semi-wild cattle roamed the region (Obereste, 1942) and vast herds continued to use the area throughout the 1800's (McCampbell, 1952).

The past history of heavy stocking is apparent in the vege-

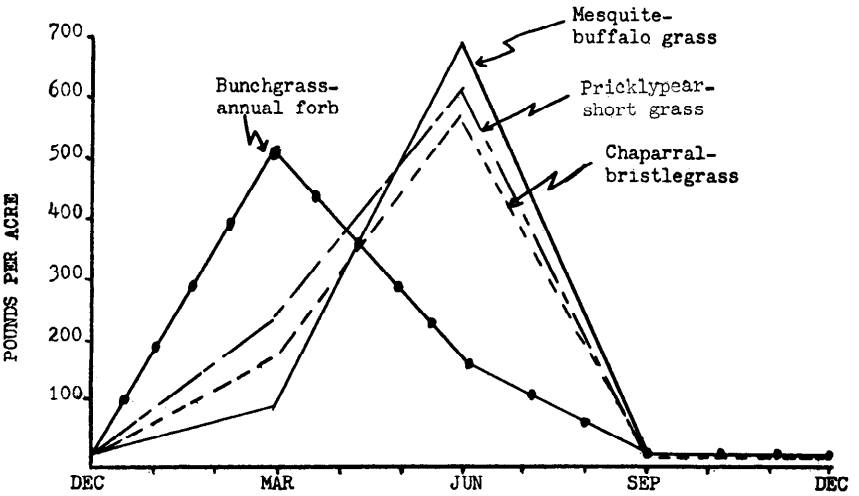

FIGURE 3. Seasonal forb production in four range plant communities.

tation today; shortgrasses and brush are common throughout the region. Although the study area was in somewhat better range condition than most of the rangeland, it was fairly typical of large areas in the general region.

Rainfall for the study period was almost 12 inches above average and much of the production was comprised of annual plants and plants of only seasonal value. Therefore, production measured during the present study may be somewhat higher than normal.

Data presented show that there were two periods of low forage production during the year. In the late winter, January to March, little herbage was produced. Under heavy stocking a period of forage deficiency could be expected during this time. Likewise, during the July-September period forage became dry and little additional plant material was produced.

Many ranchers of the area follow a practice of supplemental feeding during the winter months. Although the chemical composition of the plants was not studied, more green herbage was available during the winter period than during the summer months. Therefore, if livestock are to be fed, a protein supplement for the summer months might be justified where rapid gains are desired. However, in most instances, proper stocking should provide adequate forage at all times.

Different management practices for each of the four communities may be justified. Although total herbage production was not greatly different for the four communities, the species composition and phenology of the plants were quite different. A detailed analysis of the plant and soil properties of the plant communities showed that these vegetational types were distinct ecological entities. Therefore, where practical, each community should be fenced and managed separately.

Summary

Herbage production was measured on a mesquite-buffalograss community, a chaparral-bristlegrass community, a bunchgrass-annual forb community, and a pricklypear-short grass community in San Patricio County, Texas by use of the Australian difference method. Total yearly production was very similar for the mesquite, chaparral, and bunchgrass communities but was somewhat lower in the pricklypear community. Two peaks in production occurred during the year, one March through June, the other September through December. Highest forb production occurred during the spring period in all communities, but it was approximately two months earlier in the bunchgrass community than in the others studied.

LITERATURE CITED

BOX, THADIS W. AND F. W. GOULD. 1958. Analysis of the grass vegetation of Texas. Southwestern Naturalist 3: 124-130.

CANFIELD, R. H. 1942. Application of the line intercept method in sampling range vegetation. Jour. Forestry 39: 388-394.

GOULD, F. W. 1957. Texas grasses—a preliminary checklist. Tex. Agr. Expt. Sta. Misc. Pub. 240. 33 pp.

——— AND THADIS W. BOX. 1959. Grasses of the Texas Coastal Bend. Contribution 34, Series C, Welder Wildlife Foundation, Sinton, Texas. 85 pp. Mimeo.

MCCAMPBELL, COLEMAN. 1952. Texas seaport, the story of Corpus Christi and the Coastal Bend area. Exposition Press, New York. 303 pp.

MCINTYRE, G. A. 1954. The measurement of pasture yield under grazing. Comm. Sci. and Industr. Research Organ., Australia, Bul. 201: 71-83.

OBERESTE, W. H. 1942. History of Refugio Mission. Refugio Timely Remarks, Refugio, Texas. 397 pp.

ROWELL, CHESTER. 1957. A provisional check list of the flora of the Rob and Bessie Welder Wildlife Foundation Refuge, San Patricio County, Texas. Unnumbered publication, Welder Wildlife Foundation, Sinton, Texas. 15 pp. Mimeo.

SOIL CONSERVATION SERVICE. 1956. Soil capability map of the Rob and Bessie Welder Wildlife Refuge. Sinton, Texas. Soil Conservation Service. U. S. Department of Agriculture.

DE SOLIS, CASPER JOSE. Diary of a visit inspection made to Texas missions. Translated by Margaret Kress. Southwestern Hist. Quarterly 35: 28-76.

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