

How Closely May Black Grama and Tobosa Grass Be Safely Grazed Year After Year?

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LIVESTOCK production in the semi-desert grasslands of Western Texas, Southern New Mexico, and southeastern Arizona was introduced by the early Spanish settlers. These pioneer people were quick to realize the adaptability of the country to grazing cattle, and thus laid the cornerstone of one of the most colorful and successful enterprises of the Southwest, one which has survived to this day as a major industry.

Livestock raising has since maintained its position in the economic field of the southwest chiefly because it is an enterprise well suited to natural conditions. Here cattle raising is favored by a temperate climate with mild winters and a diverse vegetation comprised chiefly of grasses, in which there is included both summer and winter palatable plants. A further advantage is that the natural balance between grasses having different seasonal palatabilities is such as to permit yearlong grazing on inexpensive, naturally produced, native forage.

Although the soil is exceedingly fertile the average annual rainfall of less than 10 inches precludes its use in the production of cultivated crops. In addition to being the highest commercial use which the semidesert grasslands are adapted, properly regulated grazing in general need not interfere with other uses of the land or with the beneficial protective functions of the vegetation.

*Maintained at Tucson, Arizona, by the Forest Service, U. S. Department of Agriculture, in cooperation with the University of Arizona, and covering the states of Arizona, New Mexico and the west half of Texas.

However, if the stockmen are to enjoy the benefits of these ranges in perpetuity the intensity of grazing use applied on them must be one which will allow the principal forage plants to maintain themselves naturally upon the land. Not only must the good forage plants be preserved but the yield of forage therefrom must be sustained. These conditions can only take place on properly stocked and otherwise properly managed ranges. The chief hazards of the cattle industry, namely, heavy death loss in time of drouth and low percentage in calf crops, are obviously intensified by overstocking. Therefore, the solutions to the fundamental problems in range management of the semidesert grasslands begin with the proper care of the range itself and the maintenance of a plentiful supply of forage at all times.

Results of Early Studies

In response to a demand for study of the problems of range management with which the cattle industry was faced, the Jornada Experimental Range was established by Executive Order in 1912. On this area, located on the Jornada plain in Southern New Mexico, 21 years of experimentation have resulted in definite contributions of facts, which if followed, will aid in the perpetuation of a profitable livestock industry on the semidesert grassland type of range.

Early in these experiments it became apparent that two grasses provided the greater part of the forage. Nature had distributed these grasses according to their seasonal palatability in a singular-

ly equitable manner. Tobosa grass (*Hilaria mutica*) of the clay soils in the periodically flooded swales provided excellent summer forage, but this grass becomes practically worthless after growth has ceased for the season. On the other hand, black grama (*Bouteloua eripoda*), the dominant grass of the well-drained sandy soils, provides yearlong palatable forage and is greatly preferred by cattle in the winter and dry spring months.

It was also found that by applying proper seasons of use to these two grasses and the selection of a reasonably good grade of stock, the average death loss could be decreased to less than two per cent and at the same time the average calf crop per cent, weight and quality of product could be materially increased.

Further Problem To Be Solved

The further problem to be solved was, how close could these two main forage grasses be grazed and yet an adequate supply of usable forage be maintained at all times. The answer should obviously be in terms of standards of utilization which the practical stockman could employ in determining proper utilization of his own range.

Experiments with these objectives were begun in 1925. They involved the cropping by hand of black grama and tobosa grass, the method of closest approach in effect to the actual grazing or cropping of grass by livestock. During the past 11 years the plants growing on experimental plots of equal area have been regularly clipped at prescribed heights and intervals of harvestings.

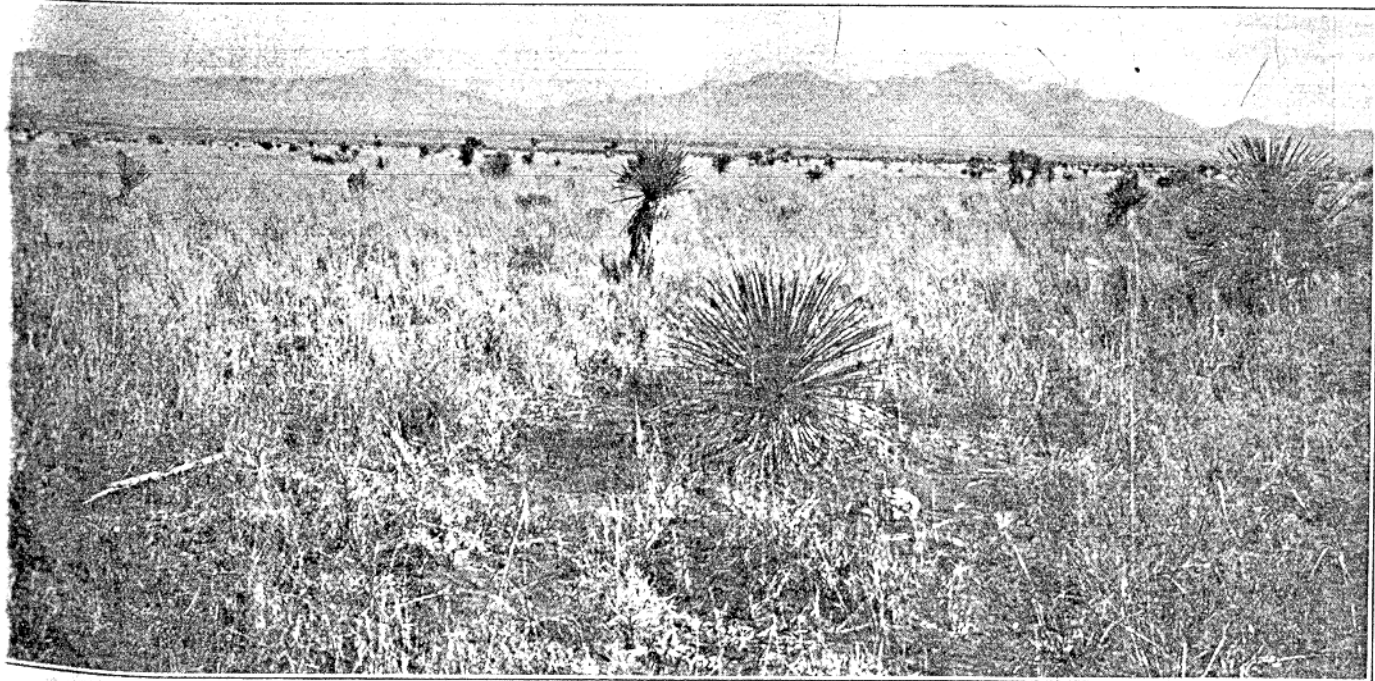


Figure 1.—Conservatively Grazed Black Grama Pasture. Black grama is one of the few native grasses which retains its forage value during winter and during prolonged drouth. This photograph was taken April 18, 1934, in Jornada Pasture No. 10 at a point 1 mile distant from permanent water.

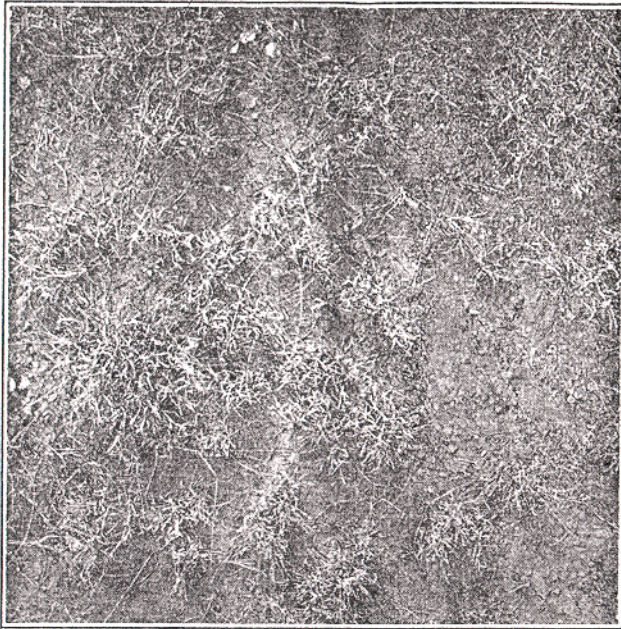
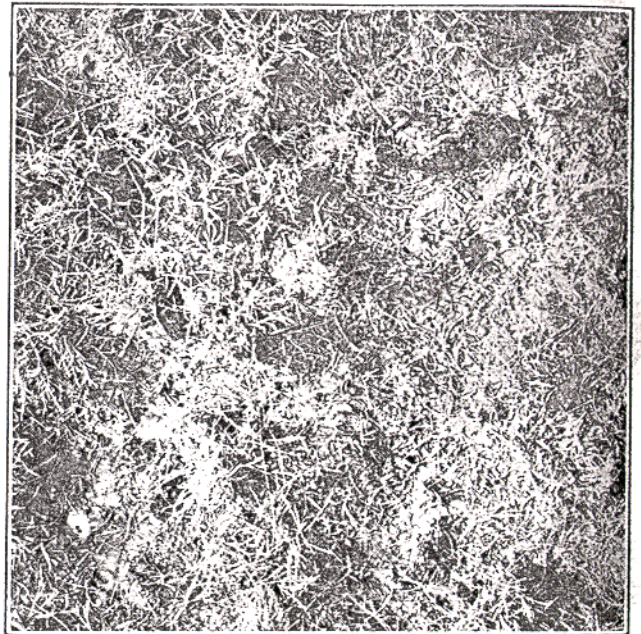


Figure 2.—Black Grama Before and After Clipping. (Above) Plot before clipping in 1925. (Below) Same plot in 1935. Eleven years of cropping at six-week intervals during the period of growth and a final harvesting at the close of the growing season at a height of two inches, has produced a condition similar to that which results from severe overgrazing. (Top, 2A; bottom, 2B.)



Figure 3.—Tobosa Grass Plot Before and After Clipping. (Above) Plot before clipping in 1925. (Below) Same plot in 1935 after 11 years of cropping at a height of four inches at 2-week intervals throughout the growing season. The vegetation has increased on this area 123 per cent, or more than double that of 1925. (Top, 3A; bottom, 3b.)



The forage yield of each plot was determined by weight when the clip had reached an air dry condition, and the effect of clipping on the density of plant cover was measured once each year by mapping each individual tuft and computing the plot area occupied by each.

Results on Black Grama

Black grama plots were cropped at heights of one and two inches and at intervals of two, four and six weeks during the growing season. Another pair of black grama plots were clipped at these heights once each year at the end of the period of growth.

The persistent cropping of all the stems at either one or two inches, regardless of the clipping frequency, resulted in killing practically all the black grama plants.

Long before the tenth year of the ex-

periment the forage yield had decreased below that of either unclipped or conservatively grazed plants. This reduction amounted to about one-half the normal in the third or fourth year; in the tenth and eleventh years the forage yield was practically nothing.

A peculiarity of the black grama soil makes this range type highly susceptible to site deterioration. Black grama land has a top layer of loose sand. This sand is absolutely essential to the reproduction and general well-being of the plant. When all stems are cropped at either one or two inches, this sand mulch is carried away by wind and water. If the black grama forage cover is to be maintained, great care in preserving this sandy layer is necessary. Cropping of all stems of black grama plants resulted in the destruction of the established plants, pre-

vented reproduction of new plants, and practically destroyed the site all within a period of 10 years (fig. 2, A and B). Results obtained by clipping are almost identical with the conditions produced on observed overgrazed black grama areas. Adequate protection to the site is essential. For example: Consecutively grazed black grama pastures, where a degree of utilization which left 25 to 35 per cent of the old grass stems intact at the beginning of the new growing season, was practiced, carried their quota of stock through the 1934 drouth with no loss from starvation and but little damage to the range (fig. 1).

Results on Tobosa Grass

Tobosa grass after it had been subjected to 11 years of cropping of all stems at heights of two and four inches respect

ively, and at intervals of one, two, and four weeks and once annually at the end of the growing season, gave the following results: Plots clipped at a height of two inches at intervals of one week and two weeks lost heavily in tuft areas by the end of the tenth year of persistent harvesting. Plots clipped at this height at intervals of four weeks and at the end of the growing season maintained their tuft area above that of the beginning but the plants showed a distinct loss of vitality. Plots clipped at four inches increased their plant cover with the greatest increase falling on the plot clipped at weekly intervals. (See fig. 3, A and B.)

The rate of forage production of tobosa grass plots was reduced somewhat by the frequent clipping, but it is believed that this loss in volume was more than com-

pensated by the increase in quality of the product.

Under the two-inch height of clipping the tobosa grass site also incurred slight deterioration, but the four-inch stubble provided ample protection for the site on the plots clipped at that height.

Summary of Results

The results of this experiment which have a distinct bearing on the proper methods of management of black grama and tobosa grass ranges may be summarized as follows:

Black Grama

1. Forage yield of black grama was cut in half within a period of three years of persistent cropping of all of the stems at a height of two inches. Pastures subjected to winter-spring use in which an evenly distributed 25 to 35 percent of the black grama stems had been consistently ungrazed at the beginning of the new growing season carried their full quota of cattle through the 1934 drouth without any death loss from starvation and with but little damage to the grass itself.

2. A 25 per cent unused reserve of black grama stems produced an adequate supply of new plants. Close grazing of black grama reduced vegetative propagation in proportion to the number of stems grazed. When all stems were taken, no new plants were produced.

3. Two or three years of cropping all black grama stems at a height of two inches or less destroyed the site. The wind swept away the sand mulch which is so essential to the black grama plant. New plants did not grow after the sandy layer was removed because the young roots could not penetrate the hard soil, but a reserve which provided forage for periods of drouth also afforded adequate protection for the site.

Tobosa Grass

4. Forage yield of tobosa grass was reduced somewhat by frequent cropping at four inches. However, the four-inch stubble provided adequate protection for the site, and the betterment in the quality of the frequently cropped forage has apparently more than compensated the decrease in quantity.

5. Cropping of all the stems of tobosa grass as often as once each week during the growing season increased the production of new plants. The underground stems (rhizomes) which produce new plants are beyond reach of cattle and the opening up of the site to sunlight by the removal of old growth stimulates production of new plants.

6. Grazing all the stems of tobosa grass at a height of four inches apparently did not cause deterioration of site or otherwise damage the vegetation.

Inherent Characteristics

Any method or range management and any system of range utilization which can be successfully applied on black grama and tobosa grass ranges must first of all be based upon the natural peculiarities of these main forage grasses and upon their resistance to grazing by cattle, always keeping in mind that the grazing of cattle is an introduced, artificially controlled influence.

Inherent characteristics which make necessary the special and different grazing treatment for each of the grasses are: (a) Different season of palatability; (b) different habit of growth; (c) different method of vegetative reproduction; and

(d) different susceptibility of their respective sites to deterioration. These contrasting characteristics may be briefly summarized as follows:

1. Black grama, while palatable year-long, is preferred forage during the dormant periods of varying durations which fall between growing seasons. Tobosa grass is palatable only during the summer growing season.

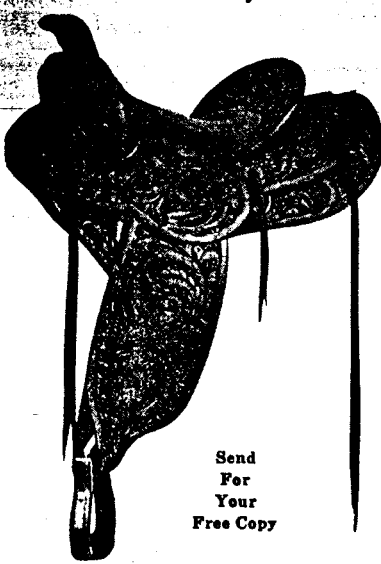
2. Black grama retains its forage value indefinitely. Stems two or three years old will be eaten during periods of drouth. Tobosa grass is forage only for a period of about 90 days while the plants are green and succulent.

3. Black grama foliage is comprised chiefly of stem leaves. Tobosa foliage is chiefly basal, springing from the parts

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of the plant near the ground. Cropping all stems at two inches practically defoliates black grama, while the cropping of tobosa grass at the normal grazing height of four inches takes away about one-half of the leafage of this plant.

4. Black grama reproduces principally by stolons, or stems which grow along the top of the ground, and under favorable conditions root a new plant at each joint which comes in contact with moist sandy soil. Tobosa grass also propagates chiefly by a vegetative method. However, rhizomes (modified underground stems) are employed by this grass.

5. The black grama site is characterized by good surface drainage and a sandy loam soil with a top layer of loose sand which serves as a mulch. The black grama land is easily eroded by wind and water when the protective cover of vegetation has been removed. Sheet erosion on this type is very prevalent on over-utilized ranges. Tobosa grass occurs as a dominant plant in the heavy clay soils of the low swales which are flooded by run-off water from adjacent black grama areas. This clay soil is not susceptible to wind erosion so long as the stubble and roots of the vegetation remain on the ground. Water erosion does not occur because there is usually no surface drainage of tobosa sites.

Practical Application of Results

By correlating the previously enumerated inherent characteristics of the two principal forage grasses, and the results obtained in the cropping experiments, the following simple, practical, and safe rules for the long-time grazing use of semi-desert ranges made up of black grama and tobosa grass types, can be formulated. In each case these rules represent minimum requirements of the range and a maximum degree of stocking under which a sustained yield of forage may be maintained.

1. Adjust the seasonal distribution of cattle in accordance with the available forage and the seasonal palatabilities of the principal grasses. This means that the proper seasonal distribution plan must provide that (a) the tobosa grass areas be grazed during the summer while the grass is green and succulent, (b) the black grama areas be saved for winter use and during dry periods between growing seasons.

2. On black grama areas provide a degree of stocking which will utilize an evenly spread 65 to 75 per cent of the black grama stems grazed to not less than a height of two inches. A degree of grazing use which removes 100 per cent of the stems of black grama at a height of two inches or less will kill the established plants and soon destroy the site.

3. On tobosa grass provide a degree of stocking which will leave a stubble of four inches when grazed as often as once each week during the growing season.

It is realized that the reserve of forage here recommended may mean drastic cuts in the number of stock now carried on many semidesert grassland ranges. However, when the future values of the range and the advantages of reduction in death of cattle resulting from starvation, increases in per cent and average weight of calf crop, and savings represented by the cost of commercial feed which need not be purchased in times of drouth provided a reserve of black grama is available, are weighed against the value of the forage so reserved, the balance is greatly in favor of conservative grazing.

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