RESEARCH NOTES
SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION[1]
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WAYS AND MEANS TO MINIMIZE THE ILL EFFECTS OF DROUGHT ON BLACK GRAMA RANGES

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Drought is not a Serious Menace to Southwestern Livestock Production

Black grama ranges of southern New Mexico and adjacent portions of Arizona and Texas have the largely unmerited reputation of being excessively vulnerable to drought. Actually, a complete failure of the forage crop is as rare here as is the complete failure of crops in regions of higher rainfall. Climatic data support this statement and provide the best index to the frequency of lean years.

Long-time precipitation records taken at the Jornada Experimental Range[2] and supporting experience indicate that each 10-year period may be expected to include 1 year of drought and 2 or more critically dry years. During these dry years the forage growth is far below that of the average year. Forage estimates and grazing capacity figures indicate that the feed supply will vary 60 percent or more between good and poor years. With complete annual use, the current forage crop cannot always be depended on year in and year out to support an unvarying number of cattle. Clearly, if sustained grazing capacity is to be maintained, the feed produced in drought years must be supplemented in some manner.

Experimental Studies Indicate That Effects of Droughts can be Reduced

How best to provide continuous yearlong feed for a constant number of livestock grazed on black grama ranges has been a major objective of the experiments conducted on the Jornada Experimental Range since 1915. From the outset it was believed that this problem should be solved "right out on the range with the cattle." Preliminary observations substantiated the soundness of this viewpoint. Biological evidence and ordinary business experience indicated that the most practical approach to the solution was one that should involve only the native vegetation and the cattle that ate it. On the range there was ample indication that a part of the forage produced in the more bountiful years could be carried over and used to

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1/Maintained at Tucson, Ariz., by the Forest Service, U. S. Department of Agriculture, and covering the States of Arizona, New Mexico, and the Western third of Texas.

2/Rainfall records at Headquarters Station, Jornada Experimental Range, a branch of the Southwestern Forest & Range Experiment Station, located 23 miles northeast from Las Cruces, N. Mex. Annual average 9.07 inches, range 3.54 to 17.73 inches. Summer seasonal average 4.76 inches, range 1.74 to 8.53 inches.

supplement the short crop of the less productive seasons. Obviously, if this basis were a sound one, it would only be necessary to determine the rate of stocking that would, in effect, "level out" the forage supply; a method of range management that would permit a "cut and fill" process to operate.

Ungrazed Black Grama Plants of This Year Will Provide Good Feed Next Year

Black grama grass (Bouteloua eriopoda) is the most abundant of two or three southwestern grasses that retain their grazing value for a long period beyond the growing season. Stems of this grass 2 or more years old are still good feed. This prolonged season of usability is brought about by a rare property of this forage plant. Its ungrazed stems remain green for two or more seasons after the main growth is completed, whereas other grasses usually die and become less nutritious after the end of the growing season. On the advent of autumn frosts the black grama plant, unlike its associates, increases in relative forage value. By this characteristic, black grama is made a natural source of reserve feed.

Quite often in highly productive years there is a large amount of unused feed. It is a rare instance, however, that this incidental surplus of good years is maintained in amounts equal to the need in seasons of drought. Only when a reserve of feed is held over in average years and so planned ahead of the exigency can one be assured that always the demand for forage can be met. Under this system of management, as illustrated in figures 1 and 2, the forage conditions before and after drought should be as follows:

Forage conditions before drought:

An adequate reserve of black grama forage usually is not built up in one season. The reserve stand is not even-aged. Some of the stems in the stand shown in figure 1 are 2 or more years old. Older stems have been grazed, and their place in the reserved stand taken by stems of more recent growth. In this manner the reserve is maintained. This stand of grass remaining ungrazed at the beginning of the new growing season demonstrates exactly the character and extent of reserved feed required to keep the range on a sustained yield basis.

Forage conditions after drought:

The efficiency of this method of management is illustrated in figure 2. The usual number of cattle were grazed and all survived the drought. No waste of forage is apparent. The range is closely grazed, but it can withstand an occasional year of close use when the plants are in excellent physical condition. The practice of reserving a part of the feed each year has allowed the plants to increase in vigor and resistance to grazing. If persistent, such close use would eventually be fatal to the most vigorous plants.

Years of Experimentation Have Determined the Amount of Reserve Necessary

Since the mastery of drought was not achieved in the first attempt, certain excerpts from the history of Jornada Pasture 10 (the site of the experiment) are herein presented in chronological order. Detailed

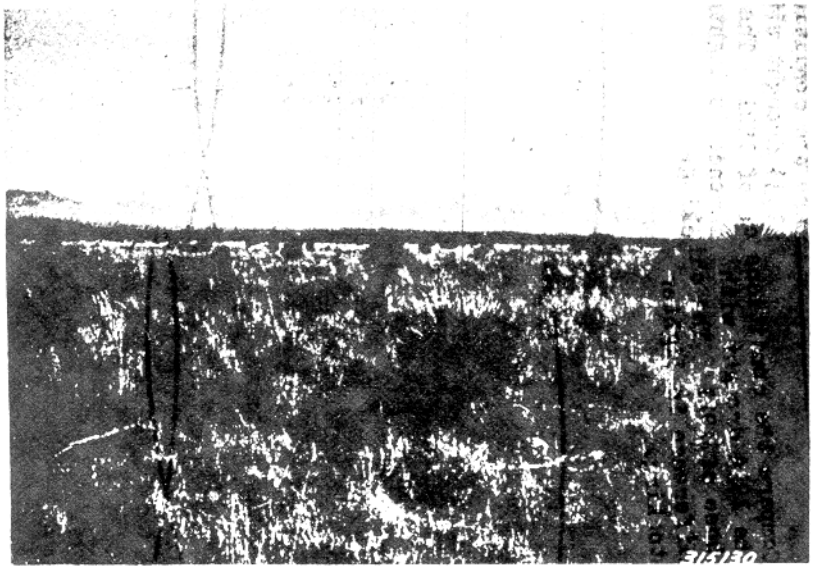

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Figure 1.- Jornada Pasture 10. Black grama range in late spring of 1934 showing reserve forage on the range at the end of approximately a full season of grazing. Conservative stocking at the average rate of 11 head per section during the previous 5 years has resulted in holding over each season 25 percent of the current forage crop as reserved food for use in the event of drought.

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Figure 2.- Same pasture July 9, 1935, at the close of the "1934" drought. The 1933 forage crop plus the reserve forage and a small amount of new growth in 1934 supported the usual 11 cows per section from July 1, 1933, to June 30, 1935. Little of the forage remains unused, but the cattle all lived through in good shape. Beyond the usual drought setback, the range was not damaged.

Prosperity on the Range

Range in good condition at the start of the experiment. Note that the percent of all grasses is high - also black grama.

A Forage Grass Depression

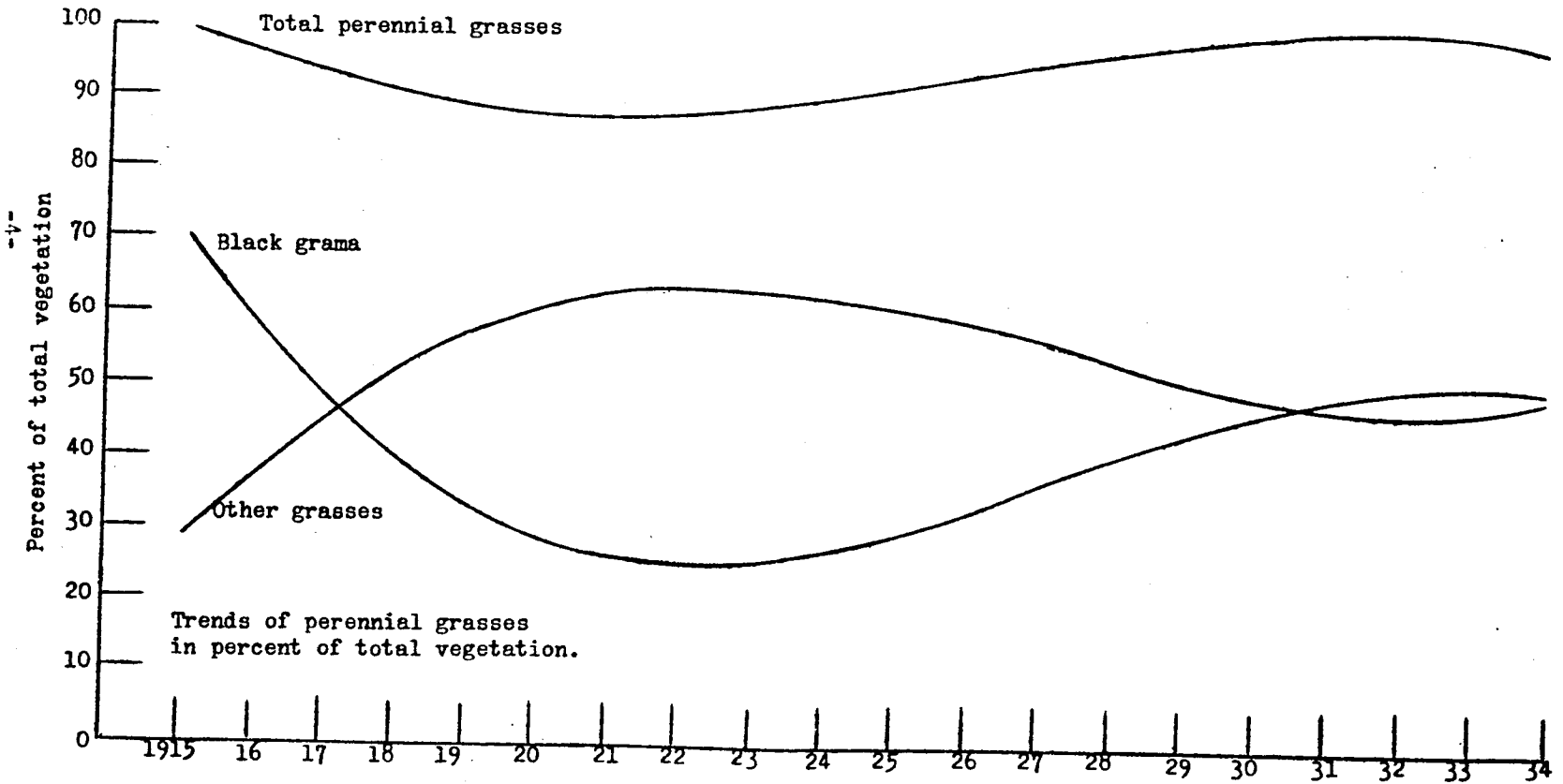
Droughts and heavy stocking. Grass is being depleted and black grama is falling way behind.

The Upward Trend

Under lighter stocking the total stand of grass is improving and black grama is coming up.

The Results of Conservation

Compare the conditions of the 1934 drought with those of 1921. The chief difference is lighter stocking.



Trends of perennial grasses in percent of total vegetation.

information necessary to explain and to emphasize essential facts which point the way to successful application of range management for a sustained forage supply is set forth in the following paragraphs.

A graphic record of the vegetational changes for the intervening years of the experiment is presented in figure 3. These curves represent the computed trends in percent of perennial grasses, percent of black grama, and percent of other grasses for the 21-year period. Comparisons which can be made on this chart indicate the character of the results obtained concerning vegetation but do not tell all of the story.

On Good Range the Bad Effects of Heavy Stocking Were Soon Apparent

At the beginning of the experiment in 1915 the total vegetation as measured on representative quadrats averaged 414 square centimeters of tuft area per square meter of soil surface. The high forage value of the type is indicated by the fact that 98 percent of the vegetation was comprised of perennial grasses, of which 78 percent was black grama. Other grasses, principally sand dropseeds (Sporobolus spp.) and three-awns (Aristida spp.), covered the remaining 20 percent of the area occupied by grasses.

No one knew in 1915 exactly what the grazing capacity of such ranges might be. As a result, the initial stocking rate set up in 1915 is an example of the usual optimistic offhand estimate of grazing capacity. Forty-five head of cattle per section, or one cow year long to each 14 acres of range, were grazed during the first 2 years. At the close of the second year the stocking was reduced approximately one-third. Subsequent reductions by 1921 amounted to a 53-percent cut in stocking, all made necessary by shortage of feed. The average rate for the 7-year period (1915-21) was just under 29 head per section. This greatly reduced stocking rate was still too high. Drought in 1921 proved that the forage produced by 3.49 inches of summer rainfall was not sufficient to carry the stock and supplemental feeding was necessary to save the cattle from starvation.

As would be expected, drought and the rate of stocking had a marked effect on the density and relative composition of the vegetation. Trend curves (figure 3) indicate the average extent and direction of these changes. The measured amounts of change occurring between 1915 and 1921 are as follows:

1. Average total perennial grass cover per meter-square quadrat dropped from 405 cm^2 to 68 cm^2.

2. Weeds and other less palatable plants increased from 2 to 9 percent of total vegetation.

3. Perennial grasses dropped from 98 to 91 percent of total vegetation.

4. Black grama dropped from 78 to 57 percent.

5. Other grasses increased from 20 to 34 percent.

Lighter Stocking is the First Step in Range Improvement

The force of drought and overstocking had reached its full effect in 1922. Only 17 percent of the original stand of perennial grasses remained alive. An extremely drastic reduction in rate of stocking from 1922 to 1927 and an increase in rainfall contributed to a speedy range recovery. In 1923 trends began to reverse their previous courses. Total perennial grasses and black grama made an upturn. Grasses other than black grama began to drop in percent of vegetational composition.

Vegetational trends maintained their previously stated directions until 1930-31, when they leveled off for a time under the impact of the drought that reached its maximum intensity in 1934.

Forage Reserves Built up During Favorable Years Save the Range and the Cattle

Stocking was increased in 1928 but under a major change in management. Conservative stocking based on the average forage crop had not proved entirely successful. In years following 1928, therefore, an additional 25 percent of the usable grass of the average forage crop was left ungrazed at the beginning of the new growing season. That is, under ordinary conservative management practices, sufficient vegetation to provide for the necessary physiological processes and regrowth of the forage plants would be left at the end of the grazing season, but under this plan the basis of stocking was such as to provide for an additional reserve of 25 percent of forage during years of average precipitation. It was possible in this manner to build up a drought reserve (see fig. 1). As a result of this practice the second test, which came in 1934, returned results that have established the soundness of the method in the following ways:

1. The density of forage grasses was more nearly maintained through a drought (1934) that is unequalled in severity at any time during the period of the experiment. (Compare 1921 and 1934 in figure 3.) At the close of the 1934 drought the same meter-square quadrats as were measured in the beginning of the experiment in 1915 had an average plant cover of 398 cm^2 —a loss of 16 cm^2 as compared to a loss of 212 cm^2 at the end of the drought in 1921. Of this vegetation, perennial grasses represented 96 percent, black grama 57 percent, and other grasses 39 percent.

2. Under this method of range management the productiveness of the forage plants during drought years was practically twice as great as that in other pastures where a 25-percent reserve was not maintained. Comparable areas under less conservative grazing use produced a forage crop of approximately 15 percent of average in 1934 while the experimental pasture under consideration produced 29 percent of average crop.

3. The reserved feed carried over from more productive years enabled this pasture to carry its quota of cattle through the 1934 drought without any supplemental feeding of concentrates and with no loss of animals due to starvation. Overuse was apparent, but no permanent grazing damage to the range resulted (see fig. 2).

4. The offspring of the herd in this pasture during the 1934 drought was normal in regard to numbers, physical condition and weights

of the calves showing that feed carried over had the necessary nutritional qualities for a normal calf crop.

5. During the period in which forage was provided by the reserve feed and the 1933 forage crop, specifically July 1, 1933, to June 30, 1935, stocking was maintained at the average rate for the previous 5 years. On an area basis, this rate was 11 cows year long to each section of land.

Planned Livestock Management on a Conservative Basis is the Secret of Successful Mastery of Drought

Certain points concerning the proper management of black grama ranges for the purpose of minimizing the ill effects of drought are indicated by these results. The more important of these points are:

1. A 25-percent forage margin should be allowed above the needs for conservative use in average years.

2. The benefits from this practice include an improvement in the range, an increase in profits through decrease in losses during poor forage years, and a lower operating cost due to eliminating the necessity for the purchase of commercial feeds.

Other material relating to this subject includes the following:

Research Notes (Mimeographed):

No. 26. "Tentative Range Utilization Standards - Black Grama (Bouteloua eriopoda)" by R. S. Campbell and Edward C. Crafts

No. 35. "Vegetation Density and Composition of Black Grama Type Ranges as Influenced by Semideferred Grazing" by R. H. Canfield.

No. 52. "How to Establish Black Grama on Depleted Semidesert Ranges" By George E. Glendening

Department of Agriculture Publications:

Leaflet No. 180. "How to Keep and Increase Black Grama on Southwestern Ranges" by R. S. Campbell and Edward C. Crafts

Technical Bulletin No. 681. "The Effect of Intensity and Frequency of Clipping on Density and Yield of Black Grama and Tobosa Grass" by R. H. Canfield.

As long as the supply lasts copies of any of the above releases will be sent on request addressed to the Director, Southwestern Forest and Range Experiment Station, Tucson, Arizona.