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GRAZING MANAGEMENT ON SEMIDESERT RANGES IN SOUTHERN NEW MEXICO

by

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We will attempt to discuss some of the features of managing arid, southern New Mexico ranges, with some emphasis on benefits of various practices. Much of this research work was conducted at the Jornada Experimental Range, near Las Cruces, New Mexico. The Jornada Range was established in 1912. The major emphasis of the research program has been on grazing management and range ecology. It has only been in recent years that we have also given some attention to brush control and seeding.

Climatic Features

Before going into any specific program it is imperative that we review some of the features of our climate. Weather - day to day, month to month, and year to year - is the overwhelming factor influencing our range management decisions, particularly in arid areas. There are many in the field of range management who still think that a fixed carrying capacity can be established and that stocking can be maintained at that level over a period of years. Furthermore, some think that a pasture rotation based on moving livestock on a fixed calendar date is "the system". That is impossible, if maximum sustained production is desired. The major factor is the weather and how it affects plant growth. Phenological and physiological stages of plant growth vary from year to year as the weather varies.

Rainfall, or rather the lack of it, is the most important feature of the weather but temperature and wind movement also are important. Our average annual precipitation is 9 inches (225 mm) while the average growing season rainfall, July through September, is 5 inches (125 mm). Incidently, our average annual evaporation from a Weather Bureau pan is

about (2,250 mm), or 10 times the precipitation. However, what do averages mean? To elucidate the occurrence of precipitation - during the past 53 years, 3 years out of 5 have had below-average seasonal precipitation. Furthermore, 45% of the years have had seasonal precipitation of less than 85% of average. These years are generally considered drought years by climatologists. Similarly, 34% of the years have had seasonal precipitation greater than 115% of average. Only 21% of the years have had precipitation within 85 to 115% of average. Furthermore, summer rainfall occurs as localized, convectional thunderstorms. The actual time when moisture is available for plant growth ranges from less than 30 to 80 days. These various features of the precipitation are the major factor responsible for our grazing management problems.

Our average maximum and minimum temperatures for January are 55 F (13 C) and 25 F (-4 C), respectively. Cool night-time temperatures limit growth of some of our warm-season plants in the spring and in the fall when moisture is available. However, since May and June are often very dry, and since other spring and fall moisture is unreliable, cool temperatures have little effect on the major growth of our plants. The average maximum and minimum temperatures for July are 95 F (35 C) and 65 F (18 C), respectively. High daily maximum temperatures, ranging from 100 to 106 F (38 to 41 C), occur during dry periods in the summer. This places a great deal of stress on many of our growing plants, and it is particularly harmful to seedlings.

Our average annual wind movement is 10,560 miles (17,000 km). March through mid-June is our windy season, and this coincides with our driest season. One severe windstorm can dry out any carry-over soil moisture from winter.

To sum up weather effects, we must remember we are dealing with arid rangeland. There are drought periods even in the years of above-average precipitation. They may be shorter than in the drier years but they also place stress on plants and animals alike.

Major Plants

Now let's examine some of our major forage plants. One of our major species on light to medium textured soils is black grama (Bouteloua eriopoda). It makes virtually all of its growth in the summer growing season. It cannot persist on shifting sand and soon dies when sand is deposited on it or blows out from its base. This is one major reason why it cannot stand overgrazing. The sandy sites are so fragile that wind erosion is always a problem, and once wind erosion starts, black grama will soon die out. Black grama spreads almost entirely by stolens and tillers. Rooting at the nodes of prostrate stems followed by separation from the parent plant, and the development of new stems from the perimeter of the root crown, are especially prominent in favorable moisture years, if the plants have not been over-utilized the previous season. Over-utilized plants will have little or no reproduction, regardless of how favorable the following season may be. Black grama and tobosa (Hilaria mutica) both have perennial culms; i.e., they do not die back to the crown each year but remain green through the winter and spring period. The stems store plant

reserves, as do the crowns and roots. That is why these plants are especially sensitive to over-utilization even during the dormant season. Grasses that die back to the crown each year can probably withstand a level of over-use during the dormant season.

Tobosa and burrograss (Scleropogon brevifolius) grow on the heavier-textured soils. Both of these grasses are quite productive on well-watered flood plain sites. When it is mature, tobosa is relatively unpalatable.

Forty years ago, the Jornada was primarily made up of the black grama type and the tobosa-burrograss type. At that time, the Jornada grazing system consisted of grazing the tobosa-burrograss type in summer and early fall, and then grazing the black grama type from late fall until the next summer. We have lost a large part of our black grama due to the severe drought of the early 1950's and an explosion of mesquite (Prosopis juliflora). This has forced us to alter our grazing system. Now we have other vegetation types made up of a multiplicity of forbs and a few grasses which can provide a considerable part of our forage crop in some years. Their production is not as reliable as the long-lived perennial grasses, but livestock performance is improved when they do occur.

One of the species increasing on drought-depleted sandy sites was mesa dropseed (Sporobolus flexuosus). Seedlings may be especially numerous following a dry year. Generally, we do not have the proper environmental conditions for seedling emergence and establishment often enough to maintain an area in a good stand of mesa dropseed. Red threeawn (Aristida longiseta) and alkali sacaton (Sporobolus aieoides) are other perennial grasses that

may be locally important. These grasses make some spring growth when moisture conditions are favorable but a high percentage of the annual growth is made during the summer growing season.

Sixweeks grama (Bouteloua barbata) is a summer annual occurring in all but the driest years. In years having some effective winter-spring precipitation, we often have a stand of bladderpod (Lesquerella fendleri). Common summer perennial forbs are: desert baileya (Baileya multiradiata), leatherweed croton (Croton corymbulosus), woolly paperflower (Psilostrophe tagetinae), and globemallow (Sphaeralcea subhastata).

Tickseed (Corispermum nitidum) and sumpweed (Iva dealbata) are annual forbs growing in summers having average or above-average rainfall. Russian-thistle (Salsola kali) emerges primarily in late winter in years that have precipitation at that time. Deer's tongue (Cryptantha crassisepala), Wislizenus spectaclepod (Dithyrea wislizeni), and whitestem stickleaf (Mentzelia albicaulis) are annual forbs that make most of their growth in the spring in the years with spring precipitation.

Some of the shrubs and shrub-like plants valuable to grazing animals in our area are: fourwing saltbush (Atriplex canescens), longleaf mormon-tea (Ephedra trifurca), and soaptree yucca (Yucca elata).

Best Pasture Grazing System

Using weather and plant information, and considering livestock needs, we have developed a grazing system that will maximize livestock production while maintaining or improving the range resource. The system may be termed, "Best Pasture". The grazing system consists of having an objective

for each pasture and stocking accordingly. The system is opportunistic in that we attempt to maximize the use of forbs and short-lived grasses, because they are of little value to the permanent range resource. The preferences shown for certain plants by livestock, determined for various times of the year, assisted in developing the grazing plan. When a species is less palatable than others at a certain time of the year, the preferred species can be grazed, while in effect deferring the species that is less preferred at that time.

To illustrate the system, we will use four pastures dominated by different vegetation types. Pasture 1 is predominantly tobosa and burrograss. Tobosa is very unpalatable except during the summer growing season and early fall. Since it occurs on flood plain sites, it is also very productive. Therefore, the tobosa should be used after it has greened up following summer rains, and in the early fall months. Use at any other time of the year could be obtained only by confining the livestock to the tobosa. Burrograss may be used when it is green in the spring in those years with spring moisture, or any other time of the year when additional grazing is needed. This pasture, having primarily medium- to heavy-textured soils, will also occasionally have a spring crop of forbs, such as Wright's verbena (Verbena wrighti) and sumpweed. The cattle prefer these forbs to the grasses.

Pasture 2 is primarily good condition black grama on sandy soils. It should be grazed only in the winter and in those years having dry springs. Areas such as this will often have a stand of soaptree yucca. The yucca blooms, occurring in some years in May and early June, are very palatable

to cattle at a time when there is little other green forage. The leaves of the yucca plants are browsed during droughty spring periods.

Pasture 3 is dominated by mesquite sand dunes. It has some fourwing saltbush and longleaf mormontea. These latter plants are valuable browse in late winter and early spring. If we have some effective winter-spring precipitation, this pasture also would have a stand of forbs such as Wislizenus spectaclepod, bladderpod, globemallow, and russianthistle. These forbs have excellent grazing values in the April through June period.

Pasture 4 is a poor to fair condition black grama range on sandy soils. It is made up primarily of mesa dropseed, sixweeks grama, and forbs such as desert baileya, leatherweed croton, woolly paperflower, globemallow, tickseed, russianthistle, deer's tongue, and whitestem stickleaf. There would also be a remnant of black grama as well as some soaptree yucca. The objective for this pasture might be to improve the stand of black grama. Cattle may be placed in this pasture anytime that there are other species available, except in February and March. In other words, cattle will only graze black grama in late winter if other plants are available during the remainder of the year.

A brief synopsis of our theoretical four-pasture ranch would show that the primary livestock use of pasture 1, the tobosa-burrograss pasture, and pasture 4, the depleted sandy land pasture with mesa dropseed and forbs, would be in the summer and fall. Pasture 2, the good condition black grama pasture, and pasture 3, the mesquite sand dune pasture, are grazed in the winter-spring period. However, a salient feature of the Best Pasture Grazing System is flexibility. For example, if it rains in a part of a

rested pasture, and green forage develops in the form of forbs or yucca blooms, cattle can be moved to that area to take advantage of this ephemeral growth. Yucca blooms, forbs, and annual grasses should be fully utilized when they occur because there is little advantage in saving them. Making use of this kind of vegetation is the primary reason why our cattle have sufficient vitamin A even during the driest years. In addition, supplemental feeding of energy and protein is required only in the driest springs.

Pastures with other vegetation types can easily be incorporated into the Best Pasture System. All that is involved is to determine the major forage species and when it should be grazed and rested, and to stock accordingly. If it rains only on one part of the ranch, cattle can be moved to that area to take advantage of any ephemeral growth. We believe these principles can be used over wide areas, even where there is only one vegetation type. It involves a rotation scheme where the livestock are moved at no pre-determined calendar date. Instead they are moved when the vegetation on a rested pasture can be grazed to the advantage of both plants and animals. In this system, it if were necessary to use the reserve forage each year - the reserve would be the long-lived perennial grasses and browse plants - then the ranch would be overstocked. Conversely, if a pasture was not grazed each year, it would be possible to add some livestock. Along this line, if it is necessary to use supplemental feed to supplement the quantity of available forage, the ranch is overstocked.

The Best Pasture System is superior to any other system based on stocking on a calendar basis because our plants do not grow that way. It provides the flexibility needed to maximize use of the range plants and to maximize livestock production.

Flexible Herd Management

Let us now turn our attention to herd management. The term grazing capacity usually implies a constant level of stocking that a range will support year after year without damage to the forage resource. This concept cannot be applied to semidesert ranges, because their forage production varies greatly from year to year. The only place for the grazing capacity concept is to indicate average stocking, for example, 3 animal units per section recognizing that actual stocking has varied from 4 to 12 animal units per section. A fluctuating forage crop is a fact-of-life in this area. To assume that a range unit can be stocked at a constant level, based on average years, is to invite catastrophic destruction of the range resource. If a range unit must be stocked at a constant level it must be at a level low enough that forage species are not extensively overgrazed during the inevitable drought periods. This, of course, would result in a waste of forage during the average and above years. Thus, to make maximum use of the forage resource without inflicting irreparable damage, it becomes necessary to have some form of flexible stocking.

Table 1 shows the mean and range of the perennial grass production for the 1941-66 period for two range sites on the Jornada Experimental Range. The 1941-50 period was prior to the severe drought of 1951-56. During the drought there was a shift in species composition on the deep sand site from black grama to mesa dropseed. These data illustrate the tremendous fluctuation in production that was occurring in our area.

Table 1. Perennial grass yield (kg/ha).

		Shallow Sand	Deep Sand
1941-50	Mean	794	523
	Range	469 - 1,015	293 - 739
1951-66	Mean	306	127
	Range	123 - 506	12 - 301

Our recommendations for a flexible stocking plan are to have the herd composed of not more than 55 to 60 percent breeding animals during the average years. The remainder of the herd is composed of yearlings and replacement heifers. Flexible herd management, as applied to this area, begins with an appraisal of forage production each fall after the growing season. In years of low forage production, adjustments in the size and composition of the herd are planned for the winter-spring season to bring the herd within the capacity indicated by the forage appraisal. Adjustments are made in this manner: first, weaner calves are sold; second, holdover yearlings are marketed; and third, a heavier than normal culling is made in the cow herd and, when necessary, even some of the replacement heifers are sold.

In the years of above-average forage production, additional stock are added to the herd that are carried through the winter-spring period. All the natural increase from the breeding herd can be held over until spring, and additional weaner calves can be purchased for winter pasturing. Depending upon the market and forage conditions, these yearlings are sold in the spring or the next fall when forage production is again appraised and the herd adjusted to meet the new situation.

The economics of flexible herd management may be studied by comparing two periods on the Jornada Range. During the period of 1927-34 an average of 1,110 animal units grazed on the Range, and 377 pounds (171 kg) of beef per animal unit were sold. Under the flexible system of management, an average of 780 animal units grazed the Range from 1940-51 and produced an average of 495 pounds (225 kg) of beef. When the same prices

are used for comparing the two periods, there was a slightly higher income during the 1940-51 period despite the fact that there were 330 fewer animal units per year grazing the Range because of drier conditions and brush invasion. The major difference in the sale animals was in the numbers of weaner calves and yearlings sold. During the first period, before flexible herd management, weaner calves made up 36.5 percent of the beef sold and yearlings made up 30.3 percent of the beef sold. During the 1940-51 period, weaner calves made up only 10.0 percent of the beef sold while yearlings made up 56.4 percent of the beef sold. Flexible herd management has resulted in these added advantages: (1) more uniform annual sales, (2) a higher percentage calf crop, and (3) lower losses.

The key in implementing a program of flexible herd management is keeping records--records of stocking by pastures; records of precipitation; records of forage conditions in the fall; and records of degree of grazing use actually obtained on the pasture before the next growing season begins. Collection of such data for several years builds up records that may be used for appraisal purposes, and to develop future plans. Longtime records let the manager know how the forage plants respond to fluctuating weather conditions, and how grazing management can be adjusted to fit the environment that prevails in the arid Southwest. No constant stocking rate can compare with flexible stocking because the latter takes into account forage availability.

The Best Pasture Grazing System and Flexible Herd Management have these advantages when compared to systems that include over-utilization of forage species as part of the scheme:

1. They maximize soil protection.
2. The primary forage plants maintain their vigor so they can take advantage of the erratic rainfall.
3. They permit full use of available forage.
4. They consider both plant and animal requirements.
5. Therefore, they are more profitable to operator.