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Grazing management on rangelands

By Carlton H. Herbel

RANGELANDS are a major life-support system for mankind. They provide forage for livestock and wildlife, habitat for wildlife, recreational opportunities, water, and aesthetic values. Today's growing numbers of people are putting more and more demands on rangeland productivity. Forage-based livestock production reduces grain requirements, conserves energy, and uses resources not readily usable by other means.

To meet forage-fed livestock needs and provide the other products and services that people expect from rangelands, these lands must be managed wisely. If rangelands are mismanaged to the extent that plant cover fails to provide sufficient soil cover, the species composition of the plant communities changes, reducing productivity and soil protection. Continued abuse can result in severe soil erosion. This does not imply that proper grazing is destructive. Some native plant communities evolved over thousands of years with grazing use by native animals. But native plant communities are not always the most productive under intensive livestock grazing. Production can be increased on some sites with the use of improved forage plants.

Grazing management concepts

Range management involves both range improvement and grazing management practices. Range improvement generally has greater potential than grazing management for increasing production. Such practices as brush management, revegetation, and fertilization can increase range forage yields up to 10 times. Manipulation of grazing time and intensity, on the other hand, usually results in relatively minor changes in range productivity (*3*). In some cases, rangeland productivity may even decline with grazing unless certain principles are adhered to.

Long-duration grazing refers to continuous grazing or grazing periods of several months to more than a year. The periods of deferment from grazing may also extend from several months to more than a year. Single herds or several herds of animals may be involved.

Conversely, short-duration grazing involves one or a few herds of animals that are moved to a new unit every 2 to 28 days (*11*). Deferment from grazing extends from 42 to 180 days. Both grazing and deferment periods are important.

Long-duration grazing often requires a minimum outlay of capital for fence and water developments. Management inputs are also relatively minor because decisions on livestock numbers and when to move the animals to another unit are not critical so long as the permanent range resources, plants and soils, are not irreversibly damaged.

Short-duration grazing, on the other hand, may require a larger outlay of capital for fence and water developments. Decisions on movement of livestock are critical because young plants should only be grazed once before receiving some deferment from grazing (*11*). Therefore, the risk and management requirements are both greater with the more intensive short-duration grazing. Higher management inputs, whether they involve a grazing system or an improvement practice, do not guarantee higher returns to the operator, however.

Some example systems

Continuous, yearlong grazing in the Southern Great Plains can be successful for a number of reasons (5): (a) Herbage production depends primarily upon summer rainfall, and monthly summer herbage production can vary from 23 to 672 kilograms per hectare (20-600 pounds/acre); (b) most species are grazed by cattle at one time or another; (c) many "increaser" species are excellent plants for grazing, and they may be productive under certain environmental conditions; (d) cattle compete with natural losses of forages and with other forage consumers, such as rabbits, rodents, and insects; (e) young forage and regrowth forage is more palatable and more nutritious than mature forage; (f) grazed plants save soil water for later green growth; and (g) favorable growing seasons, combined with proper grazing management, allow ranges to recover a desirable species composition.

Additional reasons for the success of yearlong continuous grazing in the southern Great Plains are that use is light during the growing season, and lighter stocking per unit area means less soil compaction by livestock when the soil is wet. Some of these same reasons could be attributed to rotational schemes also.

In a four-unit rotation system on the Edwards Plateau of Texas, each unit was grazed by livestock for 12 months, then deferred from grazing for 4 months (*6*). During a four-year cycle, therefore, each unit was deferred once during each of the four-month periods. Stocking included a combination of cattle, goats, and sheep. After 11 years, the stocking rate of the units in the deferred-rotation system was increased 33

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percent (7). These units carried the increased livestock and showed greater improvements in range condition than did any of the units grazed continuously on a yearlong basis at three rates. An advantage of deferred rotation is the infrequency of livestock movement required. Under the system livestock must adjust to new forage and unit conditions only once every 12 months.

A rotation system using as many as 16 units, each grazed 2 weeks or less by one or two herds, has been studied in South Africa and Rhodesia (2, 9). Livestock are not moved at any set time, nor are the units necessarily stocked in sequence. When plants are growing rapidly, the livestock are moved frequently, perhaps as often as every 5 days, to prevent plant injury. When the plants are dormant, livestock movement is determined by the nutritional requirements of the animals.

An evaluation of grazing systems in South Africa produced these principles (9): (a) Slow rotation systems do not eliminate selective grazing; (b) in a 16-unit, high-intensity, low-frequency system, 12 units are grazed once for about a two-week period every six months, and the four other units can be used as reserve grazing in dry years or given a full year's rest in years of average precipitation; (c) high-intensity, low-frequency grazing is designed primarily to combine sufficient rest with efficient use to permit rapid restoration of denuded veld; there is less advantage to using this system on veld in good condition; (d) veld restoration may be retarded and greater abuse may occur if stocking intensity increases more rapidly than indicated by herbage production; (e) with variable precipitation, no system can eliminate selective grazing if set grazing periods and stocking rates are maintained, but high-intensity low-frequency grazing reduces selective grazing; and (f) high-intensity, low-frequency grazing, because it is an intensive system, may require more labor, fencing, and water development, but the relatively high capital investment required to implement this grazing may be justified by the increased carrying capacity.

Short-duration grazing or "cell" grazing (11) uses some of these same principles. Cell grazing, however, requires even shorter periods of livestock grazing when range plants are actively growing. This is a one-herd system with the units laid out somewhat like a wagon wheel. In the center are pens and watering devices. Movement of livestock to the next unit to be grazed is accomplished by opening the gate, which is located at the hub, and letting the livestock move themselves. Frequent movement among units prevents livestock from abusing individual plants.

Use of a grazing system may alter the species composition of a plant community. An increase in palatable plant species may permit increased use of the range resource. Nevertheless, the benefits obtained from improved grazing management practices are relatively small compared with those possible from manipulative range improvements.

Some additional principles

Manipulation of grazing livestock exemplifies the use of ecological principles in range management. The application of ecological principles to range science often means maintaining or improving native plant stands generally through grazing management. Many times range managers use a combination of extensive and intensive practices, for example, brush management combined with a grazing system, or revegetation and fertilization combined with a grazing system. A range manager can select the degree of intensity for a unit of rangeland depending upon potential for those sites within a unit of rangeland; economic, social, and political factors; and available technology. But no range manager should be bound by the use of terms. Rangelands can be managed for various objectives. Generally, range managers attempt to achieve a balance among management, social, economic, and environmental concerns.

Range managers must be flexible and innovative in planning operations on a range unit. Practices successful on one range unit may be less so on the next, or even unsuccessful on a unit nearby. No grazing scheme will eliminate the need for practicing all available, economic range management techniques. No practice will produce the desired results if the range manager does not understand and believe in the principles involved, keep records on the performance of units and animals, and adjust schedules and livestock numbers with changing conditions.

The following grazing management considerations exemplify the use of ecological principles in range management:

- *Proper utilization.* Desirable perennial plants produced on rangeland must be used moderately during the growing season. Thus, the old guideline, use half and leave half. Where additional soil protection is required, herbage utilization should not exceed 40 percent. Heavy use of perennial forage plants, followed by prolonged drought, can result in the death of many desirable plants. On the other hand, utilization greater than 50 percent is useful under some conditions. Ephemerals, often annual plants, generally are grazed by animals extensively when they are available. The forage crop may vary greatly from one time to another because of precipitation differences. It is not unusual for the annual forage crop on rangeland to vary from 50 to 150 percent of average.
- *Grazing intensity.* The animal unit month (AUM) quota is the livestock concentration multiplied by the proportion of time that a unit or portion of a unit is grazed (4). In a four-unit, rest-rotation scheme with one herd, the livestock con-

Revegetated rangeland in southern Utah reveals the productive impact of combining grazing management practices with range improvement practices.

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centration is 4.0 times and the AUM quota is 2.0 times as much as that that would occur if all units were grazed simultaneously throughout the grazing season. For the growing season, an AUM quota of 0.5 or less is considered a desirable stocking rate. There is no apparent justification for leaving a range unit ungrazed all year.

The primary purpose of range management is to eliminate excessive grazing. This is especially important during the growing season to increase the vigor and productivity of existing plants and, eventually, to improve species composition. An alternative to heavy grazing to obtain use of less desirable plants is to graze a unit during that time of year when less desirable species are more palatable than preferred plants. Another possibility is to use different kinds of livestock or wildlife to reduce the less desirable plants temporarily. In South Africa, it was found that the longer the period of grazing, the lower the carrying capacity and the more adverse the effect on the veld (*8*).

• *Stocking rate.* The main factor influencing animal production per unit area is stocking rate. But to achieve maximum production per unit area, live-weight gain per animal is reduced. Both high production per animal and per unit area can be achieved by varying the stocking rate during the grazing season. In a comparison of rotational grazing with continuous grazing at different stocking rates, significant increases in livestock performance were recorded from rotational grazing only when the stocking rate was at a high level (*1*).

• *Animal distribution.* For proper grazing use of forage plants, most situations call for an even distribution of livestock. In the large range units prevalent in most arid and semiarid areas, it is possible to find serious overgrazing near watering points and no use of forage in other portions of the unit. Animal distribution can be improved by (a) increasing the number of watering points, (b) establishing salting and supplemental feeding areas to 1 to 3 kilometers (0.6-1.8 miles) from watering points, (c) using more fencing (d) building trails, (e) fertilizing selectively, and (f) using a different class of livestock. Any practice that improves animal distribution will increase range productivity.

• *Proper plants.* Some major plant species in the Rocky Mountains and west of the Rocky Mountains did not evolve under grazing pressure as did species common to the Great Plains. Species that are not adapted climatically should not be considered important components of the range ecosystem. Plants must be adapted for grazing or browsing by animals and for soil protection. The value of all plants growing in an area must be considered. Even minor amounts of a few species may contribute much to animal performance in a brief but critical part of the year.

• *Reproductive potential.* In most range ecosystems, the desirable climax species are long-lived perennial plants. Often, these plants are poor seed producers and do not reproduce readily from seed. If these desirable species are depleted by overgrazing or drought, it is often difficult, if not impossible, to encourage their recovery by manipulating the grazing animal. Conversely, if seed production is important for reproduction, grazing use can be adjusted to encourage seed formation. Similarly, vegetative reproduction of certain species can be encouraged by manipulation of the grazing animal.

• *Flexibility.* Most grazing studies are established at a fixed stocking rate. Downward adjustments in livestock numbers are made only during severe drought. However, wide fluctuations in the forage crop, both amount present and plants that are prominent, occur frequently. When range operators adopt a grazing scheme, they often allow for flexibility in time of grazing and deferral from grazing as well as the number of livestock involved. This flexibility may be the difference between success or failure in the grazing scheme. Both plant and animal requirements must be considered. For example, some range units on a ranch may be manipulated to furnish highly nutritious forage during a period when livestock need greater nutrition. The critical growth stage of plants also varies over time because of weather conditions. Because of grazing history and weather conditions, it may be more important to defer grazing in some periods than in others. Range units should be grazed when the key plants are damaged least by grazing and when the forage best meets the nutritional requirements of the animals. This often means grazing in no set or predetermined sequence.

Grazing schemes should also be tailored to conform to a variety of vegetation types, soil types, physical facilities, and herd-management plans. There may be considerable variation in specific details for operating a certain grazing scheme among ranch operations. In some instances, it may be desirable to use a particular grazing system to attain a certain measure of improvement and then change to a different system for maximum net returns while maintaining the resource. South African research (*10*) suggests that the advantage of multi-unit schemes is the flexibility possible, which permits the range manager to alter the grazing scheme as the precipitation varies and as the specific requirements of each unit dictate.

• *Management plan.* When a grazing scheme is initiated, range improvements, such as brush management, revegetation, fencing, and water developments, are often not credited for improving rangeland productivity. The tendency instead is to credit the grazing scheme for improvements in range condition or animal performance. Any improvement that aids livestock distribution or increases forage yields will increase range productivity. Consideration of the overall management plan, including both range improvements and grazing scheme, is critical. All practices that are beneficial and economical should be integrated into the management plan.

Range units feature varying characteristics and must be managed accordingly. They may differ in their improvements, such as fencing and water developments; the proportion of various soils and types of vegetation; the numbers and kinds of livestock and wildlife supported; and the recreational opportunities they provide. Many times, cultural, economic, or political conditions determine the degree of management applied. As conditions change or technology improves, the range manager may decide to modify his or her objectives.

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