How Livestock Grazing Habits and Growth Requirements of Range Plants Determine Sound Grazing Management

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To a stockman the main objective of a range livestock enterprise is sustained maximum livestock production and sustained maximum dollar income. These can be realized only when forage production on the range is maintained at a maximum level. Unfortunately many livestock ranges in the West have deteriorated and are producing only part of their capacity of forage and livestock. Restoration of forage production on these ranges is a major problem that has not yet been satisfactorily solved.

Management of Grazing All-Important

The basic requirement for range improvement is proper management of grazing. It is true that ranges can be improved by artificial reseeding, weed and brush control, water spreading, and similar cultural measures, but usually the total area that can be treated economically in these ways is relatively small. Furthermore, once the range is improved by these methods, maintenance of range production still depends on proper grazing management.

What constitutes grazing management? For a given kind of livestock it consists of the manipulation of only four factors: (1) Stocking rate, (2) season of grazing, (3) livestock distribution, and (4) frequency of range grazing. A range deteriorates or improves and livestock production is efficient or inefficient depending on how these factors are applied.

Almost every range presents a different grazing management problem, so there is no set formula for manipulating these factors. Good grazing management rests mainly on an understanding of certain facts concerning range and livestock behavior, supplemented by management experience and good judgment. Knowledge of livestock grazing habits and plant growth habits can be used to determine good grazing practices—particularly for those phases of management that affect the improvement and maintenance of the range. This generalization is based chiefly on research and observations of cattle grazing on mountain summer ranges in northeastern California where the grazing season is about four months, June to October.

Selective Grazing Main Cause of Deterioration

Most western ranges are covered by, or have the capacity to grow, bunchgrass type vegetation. This type of vegetation reproduces from seed. Improvement of the type for grazing depends mainly on getting reproduction of desirable forage species in the right places.

A close look at how bunchgrass ranges react under grazing use reveals the fundamental answer to the problem of range improvement. The grazing habits of livestock play a dominant role in range deterioration. Cattle, for example, graze the range selectively, eating certain plants on certain areas more closely and more consistently than on others. Preferred forage species on readily accessible, preferred sites are utilized closely even under light or moderate stocking of the range as a whole. Lending emphasis to this point are several recent utilization studies—by the California Forest and Range Experiment Station at the Burgess Spring Experimental Range in Northeastern California, by Johnson (1953) on pine-timber cattle ranges in Colorado, and by Woolfolk (1949) on sheep ranges in Montana.

At the Burgess Spring Experimental Range, for example, utilization of Idaho fescue in open areas in a pine timber stand averaged 43 per cent at the end of a particular grazing season. The average height of the remaining plant growth was 4 inches. However, 40 per cent of the plants in this stand were grazed to a 1-inch stubble, 29 per cent to a 2-inch stubble, 13 per cent to a 3-inch stubble, 3 per cent to a 4-inch or taller stubble, and 15 per cent were ungrazed. Other studies have indicated that clipping Idaho fescue to a 1.5-inch stubble for only one season was harmful to the plant; it reduced both basal area and flower stalk production the next year. So in this case, although the average utilization of the stand was only 43 per cent, more than 40 per cent of the stand was harmfully grazed.

Now the unfortunate part about selective grazing is that plants and areas that are grazed heavily one season tend to be grazed heavily the next season, and those grazed lightly once tend to be grazed lightly again. Even during the season, livestock tend to regraze the same plants rather than eat ungrazed ones. This consistent pattern of use is the result of the grazing habits of the livestock.

Therefore, under season-long grazing year after year, as now practiced generally on mountain ranges in California and elsewhere throughout the West, the better forage species on the more accessible and preferred grazing sites are gradually killed out (Fig. 1).

[1]*The California Forest and Range Experiment Station is maintained at Berkeley in cooperation with the University of California.*

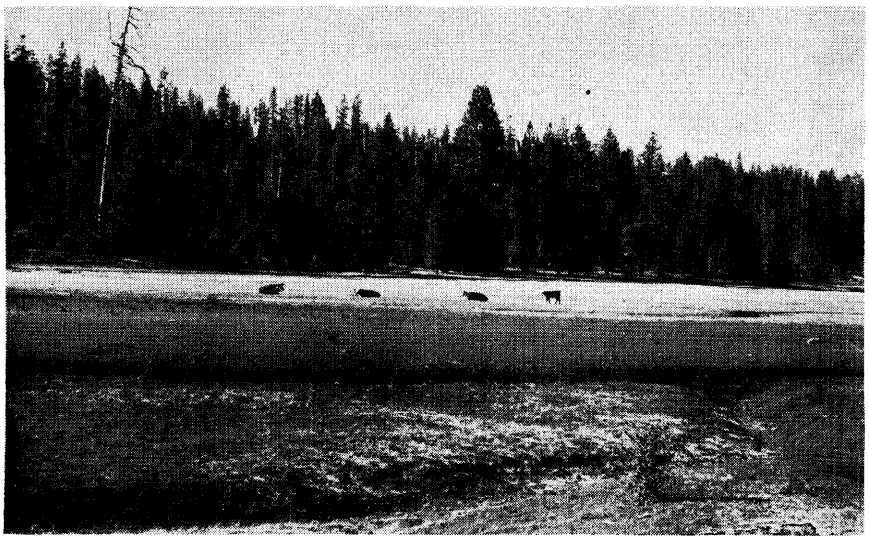

FIGURE 1. Continuous grazing of particular forage plants and range areas by livestock is the prime cause of range deterioration.

At the Burgess Spring Experiment Range about 29 per cent of the Idaho fescue stand in the pine-timber type was destroyed by 8 years of moderate seasonal grazing. As closely grazed sites become bare and exposed to soil erosion or become covered with less desirable forage species, depending on local circumstances, livestock are forced to graze the less desirable species or move to less accessible areas. This process leads to ever-enlarging areas of deterioration. Range breakdown is spotty because of selective grazing. Also some sites deteriorate more rapidly than others under the same grazing pressure because of differences in soil, slope, vegetation and related factors. Evidence that ranges deteriorate in this manner is stamped on practically every mountain range in northeastern California.

Rest Essential for Range Improvement

The crux of the problem of range improvement, therefore, is to maintain the relatively small part of the total plant cover that is closely cropped each year. The question is: How can grazing be regulated so as to prevent close use of these plants? The answer is: It can't.

Clearly no livestock distribution measure can prevent selective grazing. Even on the smallest area, livestock tend to graze the palatable species and leave the unpalatable ones.

Nor can close cropping of plants on the preferred areas be prevented by regulating stocking rate. The general effect of reducing stocking is to reduce the total area grazed and the number of plants that are closely cropped. But close use—as close as under heavy stocking—still prevails on the preferred areas. There is no practical point on the stocking scale where close grazing of a part of the vegetation does not occur. Stocking rate simply determines the size of the closely cropped area and the rate of vegetation change due to grazing.

Varying the season of grazing provides little opportunity for preventing injury to the vegetation. In the first place, close cropping is damaging to the vegetation practically throughout the grazing season—even when the vegetation is mature. It is particularly harmful just before flowering time when the vegetation is green and growing most rapidly. Shifting livestock about to relieve grazing pressure on the vegetation at critical stages of plant growth is impractical. Time is too short. Furthermore, frequent moving of livestock reduces their total weight gains during the season. Nor is it desirable for livestock production to forego use of the vegetation when it is most susceptible to grazing injury; that is the very time of maximum grazing values.

Persistent close cropping of a portion of the vegetation, therefore, cannot be entirely prevented so long as the range is grazed. But the harmful effects of grazing can be overcome by controlling the frequency of grazing, that is, by withholding grazing at intervals long enough to give all plants a chance to recover normal vigor, produce seed (Fig. 2), and establish reproduction (Fig. 3). The fundamental answer to range improvement and maintenance, therefore, is periodic resting of the range from grazing. Now this does not mean that stocking rate, season of grazing, and livestock distribution do not have some bearing on range improvement and maintenance. They do. But these factors bear more importantly on the efficiency of range use and livestock production.

The idea of resting ranges to effect improvement is not new. A. W. Sampson reached this conclusion from studies started in the Wallowa Mountains of Oregon in 1907 and designed what is known as the deferred and rotation system of grazing. Many other range investigators, including Frandsen (1950), Hull and Johnson (1955), Hutchings and Stewart (1949), Jones and Love (1945), McCarty (1938), McCarty and Price (1942),

Table 1. Schedule of grazing treatments to encourage reproduction of Idaho fescue.

Year	*Treatment*
1st	Graze closely first half of season for full herbage use. Rest during second half of season.
2nd	Rest entire season to restore vigor of grazed plants.
3rd	Rest during first half of season to protect developing seed crop from being grazed. Graze closely during second half of season for full herbage use and to get seed trampled in the soil.
4th	Rest entire season to insure establishment of seedlings.

have concluded that some form of rest and rotation grazing is needed for range improvement and maintenance. Grazing studies conducted at the Burgess Spring Experimental Range from 1935 to 1951, have led to the same conclusion. However, these studies have indicated the need for longer rest periods than have been generally recognized before.

How to Provide the Needed Rest

The amount of rest needed in a particular case is determined by the growth requirements of the vegetation—in fact by the key forage species on the range. A key species is one that is most desired for grazing value and soil cover. Idaho fescue, the key species at Burgess Spring, was found to need one full season of rest to restore normal plant vigor after one season of grazing. A half season of rest was needed to protect the developing seed crop from grazing, and a minimum of one season of rest was needed to insure seedling establishment.

A grazing schedule based on these growth requirements and designed to enourage establishment of reproduction would be as shown in Table 1. Grazing and resting in this schedule are timed so that the benefits of resting are not nullified by grazing.

Operation of the plan would require subdivision of the range into four units. Each unit would receive the four treatments in order during a 4-year period (Table 2). The different range units would be grazed and rested over a 4-year period in rotation. Thus two units would be rested and two grazed each year. At the beginning of the season all of the livestock to be grazed on the range would be placed in unit 1 (see first year in Table 2). Then about midseason after seed ripens the livestock would all be moved to unit 3. At the end of each 4-year period the grazing schedule would be started over again.

The specific grazing schedule outlined here serves to illustrate the principles in a rest-rotation grazing system. The important measure is to provide sufficient rest at the right time to permit establishment of reproduction. Some key species may require less rest than that found necessary for Idaho fescue; then fuller use would be made of all the forage on the range and fewer treatments and therefore fewer subdivisions of the range would be needed. Other key species may need more rest and, therefore, more treatments and more units. Once the range is built up to a maximum or near maximum herbage production capacity, units that are normally rested in the building-up process can be opened to grazing from time to time to permit fuller use of the forage on the entire range.

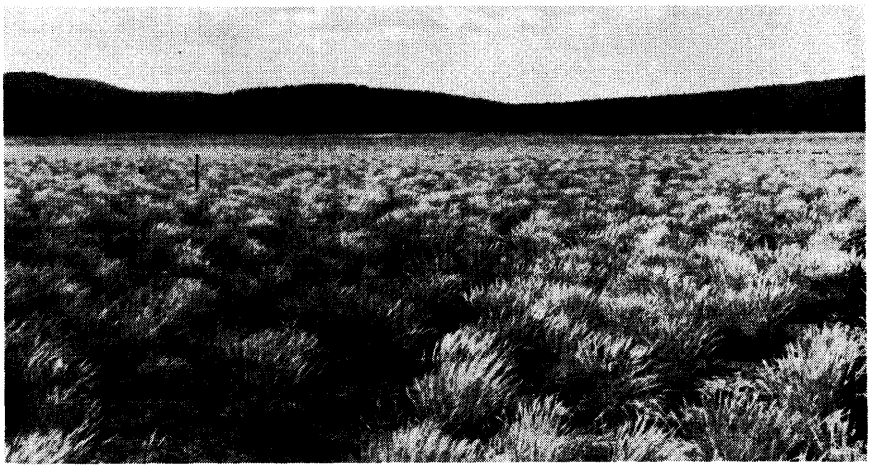

FIGURE 2. Vigorous plants and heavy seed crops are needed for adequate establishment of reproduction of desirable forage species. The necessary seed can be obtained in the proper places only by resting the range from grazing at intervals.

A rest-rotation grazing plan provides positively for continuous establishment of reproduction, weather and site conditions permitting. Each year a different range unit is given an opportunity to produce seedlings. Because the rest periods are long, encompassing entire grazing seasons, they satisfy the growth requirements of most of the other plant species associated with the key species on any given site. These broad requirements also satisfy the needs of vegetation over a uniform climatic region. A grazing system based on Idaho fescue, for example, is suited to mountain ranges throughout most of the east slope Sierra-Cascade region of California and Oregon.

The merits of rest-rotation grazing systems for restoring the productivity of bunchgrass type ranges have not been fully explored. They should be tried and tested more adequately. A practical-scale test of such a system based on Idaho fescue is now under way on the Harvey Valley Cattle Allotment on

Table 2. Operation of grazing schedule on a four-unit range area.

	Unit			
Year	1	2	3	4
1st	½ Graze ½ Rest	Rest	½ Rest ½ Graze	Rest
2nd	Rest	½ Rest ½ Graze	Rest	½ Graze ½ Rest
3rd	½ Rest ½ Graze	Rest	½ Graze ½ Rest	Rest
4th	Rest	½ Graze ½ Rest	Rest	½ Rest ½ Graze

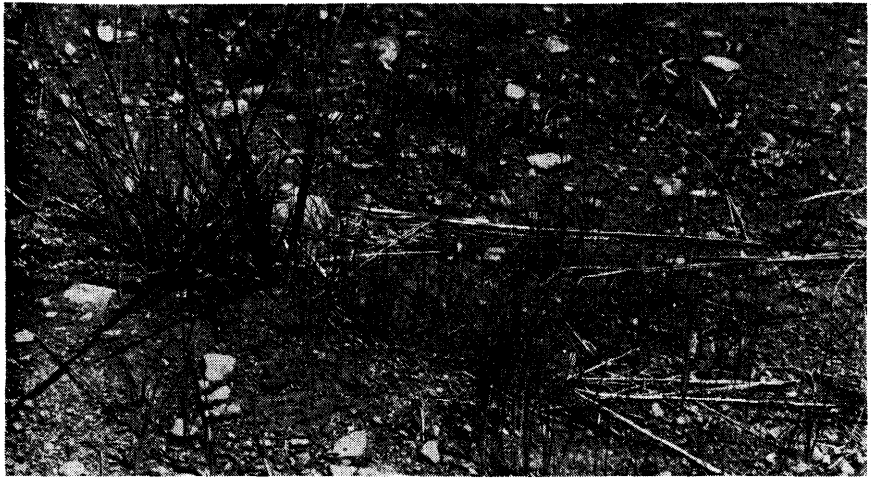

FIGURE 3. Improvement and maintenance of the range and maximum sustained livestock production depend on the continuous establishment of reproduction of desirable forage species.

the Lassen National Forest in northeastern California. This allotment encompasses more than 32,000 acres and has a grazing capacity of 500 animal-units at present. The grazing plan requires use of five range units. The first overall appraisal of the effectiveness of the plan in increasing grazing capacity on the allotment will be made in 1960 when each of the units will have had one opportunity to produce a seedling crop. The results obtained to date are encouraging.

Summarizing, then, selective grazing of the vegetation is the prime cause of range deterioration. Selective grazing cannot be prevented, but its harmful effects can be overcome by resting the range from grazing at intervals. Resting must be timed so as to provide the key forage species on the range the opportunity to reproduce on a continuous basis. There is little doubt that periodic resting from grazing is essential for the improvement and maintenance of bunchgrass type ranges and for maximum sustained livestock production.

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