Estimating Perennial Grass Utilization on Semidesert Cattle Ranges by Percentage of Ungrazed Plants

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ANY utilization survey method must be simple, rapid, and accurate to be of use on commercial cattle ranches. It should require only the usual equipment found on the ranch and should be one that can be learned by the informed rancher in a matter of hours—not days. The method should be simple enough so that the ranch foreman can learn it easily and understand fully why the survey is made. Speed is the next requirement—a survey must move fast enough to cover large range areas in brief periods during and at the end of the grazing year. It should be possible to plan the surveys without sacrificing other important ranch jobs. Finally, the method must be reasonably accurate. A man must have faith in the utilization picture shown by the survey before he will do much moving of cattle.

Various utilization survey methods have been fully described and discussed by Pechanec (1937) and Heady (1949). Another method of judging utilization, the "percent ungrazed method," is presented here for consideration. This method has not yet been fully tested. However, it shows promise and deserves further study by range men in other localities. It has three advantages: (1) it is comparatively simple, (2) compared with a height-weight utilization survey, it cuts field time by half and office computation time by at least three-fourths, and (3) it gives utilization estimates within 5 percent of those obtained by the height-weight method.

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Basis of Method

A utilization measurement system based wholly on the percentage of grazed and ungrazed grass clumps was described by Canfield (1942). The percent ungrazed method is derived from Canfield's finding and from later studies by S. Clark Martin. It is based on the grazing habits of cattle and on the relationship between the percent of accessible perennial grass clumps grazed and the amount by weight of forage removed. Cattle grazing freely with ample forage available will, as a rule, graze a clump only once and then move on to a fresh clump. They will not return to a grazed plant unless forage is short or until the grass has put out new succulent growth. Only when forced will cattle graze the grass plants down to the ground line. Because of these grazing habits the percentage of clumps remaining ungrazed provides an index to the total grazing use of a range area.

A graph showing relation between the percent of ungrazed plants and the percent of total weight of herbage removed can therefore be used in judging utilization. In preparing such a graph one of the previously developed systems of measuring percent utilization can serve as a basis. The height-weight utilization gage, described by Lommasson and Jensen (1943), and prepared for use in Arizona and New Mexico by the Southwestern

Forest and Range Experiment Station, has been found suitable.

Preparation of the Graph

This is a job any trained range technician can do. The basic data needed consists of the percent of plants ungrazed and the associated percent of utilization by grazed. At the same time data necessary to determine the percent utilization by the height-weight method is recorded. In developing the method for a semidesert range, such as the Santa Rita Experimental Range, we classified lightly grazed plants with more than 8 inch stubble as ungrazed.

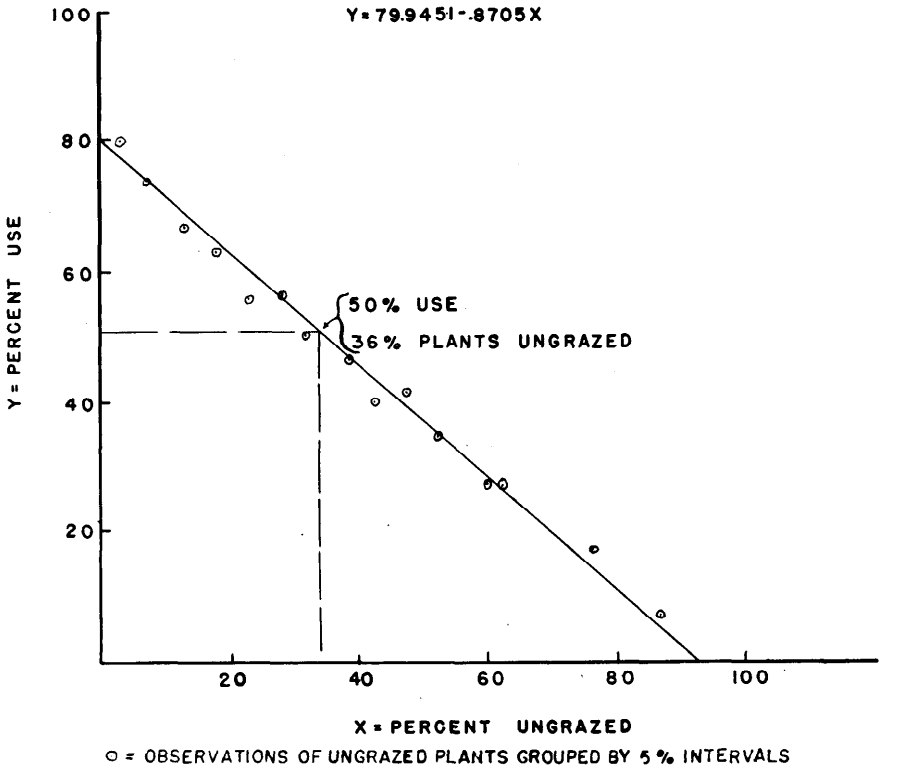

Figure 1. Percent use as determined by the weight of herbage removed in relation to percent of ungrazed plants of all important grasses on the Santa Rita Experimental Range, Tucson, Arizona.

weight on areas grazed to varying intensities. A counted sample, made on paced transects, is used to lessen the chance for personal bias. The number of transects depends on the degree of accuracy desired.

Each transect consists of a straight line of 100 double paces, usually across the drainage pattern. At each double pace the grass plant nearest the left (or right) toe is classified as either grazed or ungrazed. At the same time data necessary to determine the percent utilization by the height-weight method is recorded. In developing the method for a semidesert range, such as the Santa Rita Experimental Range, we classified lightly grazed plants with more than 8 inch stubble as ungrazed.

The data for percent ungrazed plants and percent utilization, as obtained from the height-weight gage, for each transect line is plotted and a regression line computed (Fig. 1). We have found that all principal perennial forage grass species on mixed-grass semidesert ranges can be grouped when plotting the data. After the graph is constructed the percent use corresponding to various percentages of

ungrazed plants can be presented in table form for field use. Experience has shown, however, that the graph is much simpler than a table to use in the field.

In preparing the graph we used a sample of 125 transect lines. The regression equation computed from these data was $Y = 79.9451 - 0.8705X$ where

X is the percent of principal forage plants ungrazed (or grazed very lightly —over 8 inch stubble height), and

Y is the percent grazing use calculated from measured stubble heights using the Southwestern Station utilization gage.

The correlation coefficient, 0.92, indicates a very constant relation.

The percent ungrazed method has been tested on the Santa Rita range over the last four years. The average difference between measured use (height-weight method) and estimated use (percent ungrazed method) has been 1.6 (Table 1). The greatest difference is 2.4. This shows fully adequate accuracy for practical administrative use.

TABLE 1.

Comparison of percent use on one Santa Rita Experimental Range pasture as estimated by the height-weight method and by the percent ungrazed method

YEAR	USE AS DETERMINED BY:		DIFFERENCE
	Height-weight Method	Percent ungrazed Method	
1947	51.7	49.3	2.4
1948	77.6	78.9	1.3
1949	73.1	71.9	1.2
Average			1.6

Use of Graph

In making a survey by the percent ungrazed method, the rancher needs only to determine the approximate percent of the principal forage grasses, regardless of species, that remain ungrazed or lightly grazed. This can be done by selecting enough locations, at which transects can be measured, to provide a representative sample of the pasture. The locations for transects may be selected entirely at random or they may be deliberately chosen so as to give an average picture of utilization on the pasture or on certain key areas. At each location transects are run in the same manner described in the preceding section, but records are made only of the grass plants ungrazed. After all the transects have been completed for an area the mean percent of ungrazed plants is entered on the graph, and the percent use read off directly. For example, returning to Figure 1, if 36 percent of the grass plants are ungrazed, the use is about 50 percent, commonly accepted as proper on southeastern Arizona ranges.

Proper use has been defined as the degree of forage removal that will result in maintenance of the stand of desirable forage species and preserve the soil. To achieve this, it is important that any palatable grass plants killed during the grazing season be at least replaced, ultimately, by surviving seedlings. One obvious means of adjusting the death loss so as to keep it below the replacement by natural revegetation is by control of percent of plants that are left ungrazed. Just what percentage of the plants should be left ungrazed to provide this adjustment, we do not know. But injury severe enough to kill individual plants can be judged better by using as an index the percentage of ungrazed plants rather than the weight of herbage removed. About 36 percent of the plants should be left ungrazed or lightly grazed, according to our best present knowledge of utilization. Our next problem is to determine the response to grazing of the remaining 64 percent to improve the basis for making adjustments in stocking.

The graph showing relation between percent use and percent of plants ungrazed must be prepared for each local grass type by experienced range technicians familiar with the locality. We have done this only on the Jornada and Santa Rita ranges. On both ranges, this method of judging utilization works well. The collection of enough data to prepare such graphs is not difficult nor particularly time consuming. Collection of data and preparation of the graph, which can be used over large areas, requires about two weeks of field and office time. If use has been judged in the local type by the height-weight method, all the necessary data can be taken from the field sheets.

SUMMARY

There is urgent need for an easily learned, fast, reasonably accurate means of measuring utilization of perennial forage grasses that can and will be applied by the southwestern rancher. He should use such a method in formulating his management plan and in keeping the utilization in harmony with the forage supply. A variety of methods for measuring utilization have been used, mainly by research personnel. But they have not been widely applied by ranchers.

The percent ungrazed method employs a graph of the relation between the percent of plants ungrazed and the amount of forage removed. Sampling has shown this relation to be fairly constant. The average percent of all palatable perennial grass clumps ungrazed, as determined by paced transects, is entered on a simple reference graph and percent utilization is read directly. So far, reference graphs have been prepared only for a limited number of semidesert range types. Such graphs can, however, be prepared for specific localities by competent range technicians.

After further testing, this method of measuring utilization should be ready for general use. Being simple, it can be easily taught to field personnel of the various state and Federal agencies and to livestock ranchers.

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CONTOUR WORKS IN RANGE CONSERVATION

The recently-introduced practices of ploughing level or contour furrows on grassland, and the diversion of water from gully-heads and its disposal by spreading over grassland, are becoming more general in the higher rainfall districts of Australia. By these means rain is retained and utilized on the hillsides to increase grass cover and protect the soil, and it was apparent during a recent soil conservation competition in Victoria that landholders are appreciating the value of this contour work in their efforts to stop erosion.

The Pastoral Review and Graziers' Record
Melbourne, Australia.