Grazed Plant Utilization Method[1]

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Highlight

The purpose of this study was to determine if one regression line for crested wheatgrass and one for needleandthread grass could be used to determine utilization on different sites in different years. Regression lines were developed for each of 4 sites and 2 years and then compared by covariance analysis. It was determined that a common linear regression line was satisfactory for field application.

El Método de Planta Pastoreada para Determinar Utilización

Resumen

Se usó el método de planta pastoreada para determinar el porcentaje de utilización por peso para *Agropyron desertorum* y *Stipa comata*; el método fue exacto, rápido y de fáciluso aunque tuvo ciertas limitaciones. No se pudieron determinar mayores grados de utilización arriba de 57% para *Stipa comata* y 75% para *Agropyron desertorum* debido a que en estos puntos el 100% de las plantas fueron pastoreadas (Fig. 1 y 2). Tampoco se pudo determinar la utilización para ambas especies en áreas con menos de 5% de las plantas pastoreadas.

Los datos indican que una sola ecuación de regresión puede usarse para la determinación de utilización de esas especies en diferentes sitios y en diferentes años. Una regresión lineal sirvió satisfactoriamente en diferentes sitios y años en el área donde se llevó a cabo el estudio (cerca de Craig, Colorado). Le ecuación de regresión que se determinó para *Agropyron desertorum* es similar a la determinada por Springfield (1959, 1961) en Nuevo México, lo cual indica que una ecuación de regresión puede tener una aplicación amplia para esta especie.

Early studies have shown the grazed-plant method to be of value in determining range utilization because it is rapid, easy to use, and reasonably accurate. The method has been tested by Roach (1950) in Arizona, Hurd and Kissinger (1953) in Idaho, Mattox (1955) in Montana, Springfield (1959, 1961) in New Mexico, and Springfield and Peterson (1964) in New Mexico. The method involves making field determination of the percent of plants grazed. Then from a regression line, which correlates degree of use with percent of plants grazed, degree of utilization can be determined. The purpose of this study was to determine if a single regression line could be used to determine utilization of crested wheatgrass and needleandthread grass on different sites in different years.

Methods

Field data used in this study were collected at the Great Divide Experimental Range located 30 miles northwest of Craig, Colorado. A "Rolling Upland" site, the vegetation is characterized by big sagebrush (*Artemisia tridentata*) and the soils by a sandy loam texture. The average annual precipitation for 11 years of record is 10.68 inches.

Mature plants of crested wheatgrass (*Agropyron desertorum*) and needleandthread grass (*Stipa comata*) used in developing height–weight tables were collected in 1964 and 1965 on four sites in the pastures of the experimental range. These sites included the north slope, south slope, ridge top, and swale bottoms. Thirty plants of each species were collected on each site in 1964 and 15 plants were collected on the same sites in 1965 as a check on the annual variation in growth form. Height–weight graphs were constructed for each site in each year following the procedure described by Mattox (1955).

Utilization data was also collected in 1964 and 1965. Different degrees of utilization were sampled on each site to provide a range of values upon which to base the regression relationship of number of plants grazed to weight of forage removed. One hundred plant-paced transects were used to collect utilization data and plants were recorded as being grazed or ungrazed. For grazed plants the average stubble height was recorded. For ungrazed plants the compressed maximum height was recorded.

Percentage utilization for each grazed plant, based on stubble height, was determined from the height–weight charts. These individual percentages were totaled for each transect and the average utilization based on the total number of plants per transect was computed. Percentage of plants grazed was also computed for each transect. These data were then used to determine the regression equations. Separate regression analyses were computed by sites and years for each species. These regression lines were then compared by analysis of covariance.

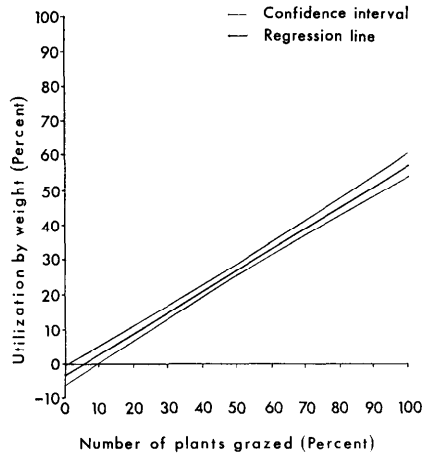

FIG. 1. Relationship between percentage of number of plants grazed and percentage utilization by weight of *Stipa comata* with a 99% confidence interval.

Results and Discussion

A close correlation was found between the percentage of plants grazed and percentage utilization in both needleandthread grass and crested wheatgrass. In this study, regression relationships were computed for eight groups of data for each species. These groups constituted different sites in different years. The purpose in testing these regressions was to determine if one regression line could be used to predict percentage utilization on different sites as well as in different years.

The tests of the individual regression lines showed that a curved line fitted the points only slightly better than a straight line and that all points fit the line very closely. The correlation coefficient of the straight line for crested wheatgrass was 0.99 and for needleandthread grass 0.98. These were higher than those computed by Roach (1950) and equivalent to those computed by Mattox (1955) and Springfield and Peterson (1964).

Considering the tests in light of the data used, it was determined that a common linear regression line could

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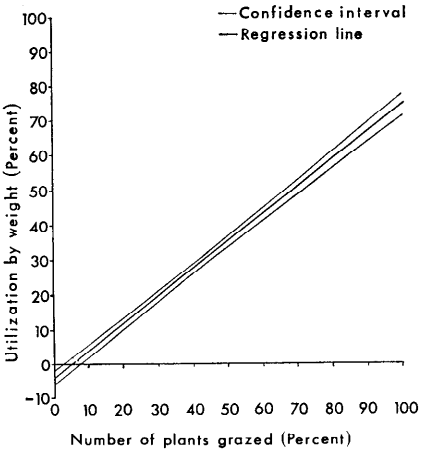

FIG. 2. Relationship between percentage of number of plants grazed and percentage utilization by weight of *Agropyron desertorum* with a 99% confidence interval.

be used to predict percentage utilization from percentage of plants grazed, using a separate regression line for each species. The regression equation for needleandthread was $Y = -3.0623 + 0.6036x$ and the equation for crested wheatgrass was $Y = -4.0165 + 0.7874x$, where x = percent of plants grazed and Y = percent utilization. The R^2 for needleandthread grass was 0.95 and for crested wheatgrass it was 0.98. Fig. 1 shows the regression line for needleandthread grass and Fig. 2 shows the regression line for crested wheatgrass, each with a 99% confidence interval.

Previous studies have found that one is unable to predict utilization at very low and very high degrees of use with this method (Springfield, 1959, 1961; U. S. For. Serv., 1960; Springfield and Peterson, 1964). The regression equation in this study limited the determination of utilization to less than 57% for needleandthread grass and to less than 75% for crested wheatgrass because at these points 100% of the plants were grazed. This latter figure is only 3% greater than the upper limit of 72% found by Springfield (1959, 1961) on crested wheatgrass.

Because of the slope of the line, utilization could not be determined on areas with less than 5% of the plants grazed, which also corresponded to the lower limit of Springfield (1959, 1961). The similarity of the regression equation determined for crested wheatgrass in this study and that used by Springfield (1959, 1961) in New Mexico, indicates that the regression relationship for this species may have quite wide applicability.

Conclusion

The general conclusion was that the grazed-plant method of determining utilization on crested wheatgrass and needleandthread grass is an accurate, rapid, and easy to use method. Based on the data collected, a common linear regression relationship is satisfactory on different sites and years in the area where the study was conducted. The regression relationship on crested wheatgrass in particular may extend over a greater area than that in this study.

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