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A METHOD FOR RATING THE SUCCESS OF RANGE SEEDING[1]

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A fast and easily-used method which will provide an accurate sample of the success attained on seeded range land is needed. A list count of the number of grasses per unit area is a commonly-used procedure in the evaluation of stand density of bunchgrasses. However, (1) average numbers per unit area do not properly represent the distribution of individuals in heterogenous stands with thick spots and strips, (2) an accurate count is extremely difficult to obtain on mature stands characterized by tillering and closely-spaced individuals, and (3) counting may be overly time-consuming for practical field use. As a result of these difficulties and the lack of other adapted procedures, no practical sampling procedure has been available for general field use in evaluating seeding success. Fields are often described as failure, poor, fair, good or excellent without the benefit of sample information. It is believed that such ratings would be of more value if reported with a sampled quality of the stands of grass.

For this purpose the relative degree to which the community is closed by the seeded bunchgrass-species should be sufficient. The frequency method (Blackman 1935, Blackman 1942, Raunkiaer 1934) shows promise of effectively filling this need, and has been adapted after three years of sampling stands of seeded bunchgrasses. The procedure, described in this paper, is based on the percentage of square-foot units stocked by the seeded species.

List-count data is referred to as density, and percentage-stocked data is referred to as frequency.

SAMPLING PROCEDURE

A welded steel-rod frame 2 x 2 feet square, subdivided into four units 1 x 1 foot square, is used to determine the presence or absence of the seeded species in a sample consisting of 100 one-square-foot observation

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units (25 randomly-distributed frames). A unit is considered stocked if any portion of the basal area of the seeded species falls inside the one-square-foot frame. Observations are most easily made when the herbage does not obscure the basal portions of the plants.

The number of units stocked in 100 observations is accumulated on a tally register and recorded in percent as an expression of seeding success.

The number of samples (100 observations each) needed depends upon variation in the stand and the degree of accuracy desired. A minimum of five samples should usually be taken. Seven samples taken on a 2,200-acre field seeded to crested wheatgrass gave an average of 45 percent stocked.[2] Analysis of data from this area indicated that twelve samples would be required to obtain a mean frequency-percentage with fiducial limits (0.05 probability level) of five percent. The sporadic distribution of this stand made it a very difficult population to sample. From this and other studies, it appears doubtful that more than 12 samples would be required for reliable estimates of seeding success. In highly variable stands, areas of similar density should be delineated and sampled separately.

In addition to data for average percentage-stocked, an examiner using this procedure should present a success rating based upon annual precipitation and other considerations. The success rating is important because areas receiving nine inches annual precipitation might be given a success rating of excellent for a stand 35 percent stocked, whereas an area receiving fifteen inches annual precipitation might be rated excellent only when the stand averaged 90 percent or more.

The following success-rating scale appears to be suitable for areas receiving 10 to 12 inches average annual precipitation:

Success Rating	Percentage Stocked
Excellent	50% or more
Good	40 to 50%
Fair	25 to 40%
Poor	10 to 25%
Failure	9% or less

The success rating is intended to be an empirical and variable quality assigned through judgment as presently practiced by many field examiners when judging seeding success. The rating scale above was based largely upon herbage yield data; however, site quality and soil conservation requirements may influence the success rating used to describe any given stand, but have not been evaluated and are not discussed in this paper.

[2]The field sample data were obtained by William G. Leavall, Range Conservationist, and approved for presentation here by Howard R. DeLano, Disctict Range Manager, Bureau of Land Management, Burns, Oregon.

BASIS FOR CHOICE OF THE PERCENTAGE-STOCKED METHOD

The choice of a 1-square-foot observation unit in clusters of four observations per random point was made following a three-year period of sampling experimental plots by the list-count method, rather than by experimental comparison of different unit sizes. A number of comments have been received indicating that efficient size of observation-units varies from field to field, and that classes of conditions should be defined and the most efficient size be determined for field application. Since a lack of uniformity in the size and arrangement of observation units would not permit comparison of data from different fields, we suggest that a constant size and cluster arrangement is more useful. The one proposed has been satisfactory and meaningful. However, the number of samples required to obtain a mean value of sufficient accuracy will vary from field to field, and the interpretation of the mean value will vary also as pointed out previously in presenting the need for success rating. It may not be assumed without experimental evidence that different unit sizes and cluster arrangements will serve with equal facility, or that this proposal is equally applicable for sampling stands of sod-forming grasses or native stands of bunchgrasses. (See Ashby 1935, Blackman 1942, Cottam et al. 1953, Weaver and Clements 1938, p. 21).

COMPARISONS WITH THE LIST-COUNT PROCEDURE

Thirty-six plots included in a study of planting methods were sampled for seedling density and frequency of crested wheatgrass. In density sampling, 10 subsamples of five square feet each were taken on each plot. In frequency sampling, 100 one-square-foot observations units were sampled on each plot. Thus the sample by the frequency method included twice the total area sampled by the density method. With two examiners sharing the work in each procedure, the field time required was 71 and 60 minutes, respectively, for the density and frequency methods.

Standard analyses of variance of planting methods in the two sets of data were identical with respect to the factors found to produce significant variation. Correlation of sample densities obtained by the two methods was highly significant ($r = 0.71$). Linear regression analysis showed that an average density of one grass plant per square foot was equivalent to 57 percent stocked. With perfect homogeneous distribution, values of nearly 100 percent stocked could have been recorded for this stand of average density. The relative percentage-stocked rates thus indicate the extent of heterogeneity within the stands sampled.

Evaluation of planting methods by the frequency method showed that rolling treatments gave a more uniform distribution of seeded plants than other planting methods. On some soft seedbeds, dense stands of grass occurred in equipment tracks and few or no individuals occurred in other areas. In such stands, frequency data furnished more reliable information on differences due to treatments than density data. However, density samples gave the best expression of differences among dense stands of seedling grasses (Blackman 1942). Therefore, if determinations of differences among stands of seedlings are an important objective of research studies, both sampling procedures are of value.

The two sampling methods were also considered in relation to the measurement of yields in grass stands. Correlation coefficients of 0.80 and 0.86, respectively, were computed for density/yield and frequency/yield relationships. Frequency data provided the better expression of seeding success as measured in terms of herbage yield. Herbage yields of crested wheatgrass stands in their second growing season were near-maximum when 60 to 70 percent stocked. As the stands become older and the yields drop to a sustained level, it is believed that near-maximum yields will occur at a lower density, as expressed in the proposed success ratings.

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