where it occupied less than its prescribed channel and was flowing approximately 36 cubic feet per second and the fall was 6 feet and decreasing.

During the 115.5 hours from the first observation to the last, the channel cut headward 1210 feet, or an average of 10.5 feet per hour. Approximately 395,000 cubic feet of material was removed during this time at an average rate of over 3410 cubic feet per hour. Examination downstream showed that an additional 3,300 feet of new channel had been eroded during this erosional phase in late May-early June, 1983, and an estimated 1,580,000 cubic feet of material (total) was washed downstream. The channel was approaching the point of no fall. The new channel has a slope 60 feet per mile.

Chriss Creek is presently dry, but forecasts indicate that runoff in the spring and summer of 1984 for this part of Utah is expected to be equal or greater than 1983. The case of Chriss Creek was only one of several rapid erosion creeks in central Utah during 1983. This erosion could be minimized by upstream diversion of placing hard-to-erode material at the head of the arroyo.

Percent Composition versus Absolute Units of Measurement—A Viewpoint

E. William Anderson

The 1983 report by S.R.M. Range Inventory Standardization Committee (RISC) recommends some worthwhile improvements in concepts and definitions applicable to contemporary rangeland procedures. Of these, the terms range condition, ecological status, and resource value ratings are significant and require attention to several factors, one of which is the procedure used to document the make-up of a plant community.

Historically, the degree to which each species occurs in the plant community has been expressed in terms of percent composition. For example, guides to determining range condition (RISC recommends the use of the term ecological status) have shown the percent composition of each species in the potential natural plant community (PNC). Range condition class has been determined by comparing the percent composition of species, or groups of species, in the present plant community with that of the PNC for the site being rated. Trend in range condition has been judged on the basis of changes in percent composition of species as compared to previous readings. The identification of decreaser and increaser species and their dynamics in the stand has been based on comparison of percent composition of these species in the present plant community with that of the PNC.

While composition is a useful term when used properly, e.g., 40% of the total canopy cover (or other absolute measurement) consists of grasses (or a species), it is not a quantified or absolute measurement. It merely expresses the relative proportion of one species, or a group of species, to the total of all the species in the plant community. The total composition of all species always equals 100%, irrespective of the make-up or density of the stand. As the RISC report states, 'specifying the amount of a species in a plant community implies that an absolute measure is required, rather than a species list or the composition alone'. Quantified or absolute measurements of a species include cover, density, frequency and weight. Non-quantified measurements of a species include cover classes, dominance ratings and percent composition.

Using percent composition as a measurement of a species involves a number of erroneous interpretations. This is illustrated by Figure 1 which depicts three hypothetical plant communities: A, B, and C. For illustration purposes, each plant community consists of the same two major species; one large, the other small.

Plant community A has twice as much total quantity as plant community B for a given area, yet the proportion of the large species to the small species is identical in both plant communities: 70% composition large species and 30% composition small species. This points out that percent composition does not necessarily reflect the density of a species in the plant community.

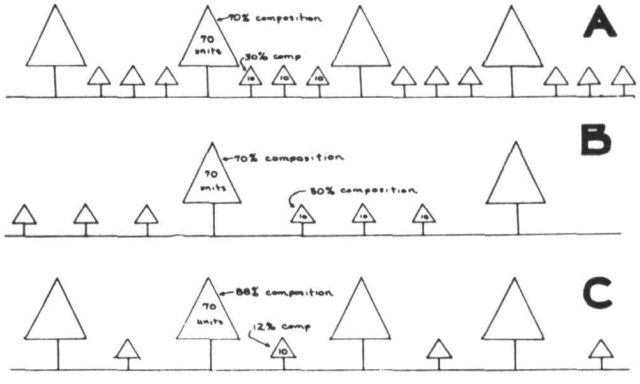

Fig. 1: *Three hypothetical plant communities consisting of the same two major species; one large, the other small.*

Numerous reports cite changes which have occurred in plant communities in terms of percent composition. This is a useful way of describing, in general terms, what has taken place. Nevertheless, the quantitative measurements of such changes should be made available for scrutiny because changes in composition do not necessarily coincide with quantitative or physical changes that take place. A comparison between plant communities A and C in Figure 1 illustrate this point.

Plant community C represents a deteriorated stage of plant community A in that two thirds of the small species has been destroyed, hypothetically, by past grazing. Quantita-

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tively, the small species has been reduced to one third of what it was in plant community A, whereas no physical change in the large species has taken place. The proportion of the large species in plant community C is larger as a result of reduction in the small species. Total units were reduced from 100 (in A) to 80 (in C) by the loss of the small species. The result is that 70 is a larger proportion of 80 units than it is of 100 units.

To describe these changes from plant community A to plant community C, in terms of percent composition, it would be said that the large species has increased from 70% composition to 88% composition and the small species has decreased from 30% composition to 12% composition as a result of past grazing. This is true. Actually, however, there has been no physical change in the large species. It was the small species that changed and, even though it was reduced to one third of its original amount, which was 30% composition, it now constitutes 12%, instead of 10%, of the composition of plant community C.

This illustrates how the arithmetic of computing proportion of a total, which is what percent composition is, can create an incorrect interpretation of the data and precludes the use of percent composition as a measurement of ecological dynamics within a plant community. Quantitative or absolute data are needed to measure the make-up of plant communities.

The hypothetical changes cited from plant community A to plant community C occur in actuality as illustrated by Figure 2. These three photos are of the Arid Rolling Hills ecological site in northcentral Oregon. This site occurs at an elevation of about 700 to 2000 feet, precipitation averages 9 to 11 inches which occurs between October and May, and the growing season begins about the first of March and ends about the middle of June. The top photo shows the site in Excellent condition (RISC recommends the use of the term PNC) in which bluebunch wheatgrass and a dense understory of Sandberg bluegrass dominate the cover. The middle photo , taken on a long-time sheep ranch, illustrates how heavy spring-time grazing by sheep for many consecutive years has depleted the preferred forage—Sandberg bluegrass—but not affected the stand of bluebunch wheatgrass. The lower photo, taken on a long-time cattle ranch, illustrates how heavy spring-time grazing by cattle for many consecutive years had depleted the preferred forage—bluebunch wheatgrass—but not affected the dense understory of Sandberg bluegrass. The large plants in the lower photo are primarily gray rabbitbrush. This phenomenon is known as class overgrazing which is depicted in different ways according to ecological site, season of use and class of grazing animal.

The RISC report, fortunately, has focused widespread attention on the need to clarify concepts and terminology to be consistent with contemporary resource management. Accordingly, the historical use of percent composition to represent the amount of each species in a plant community deserves careful scrutiny. Continuing the misuse of a perfectly good term—percent composition—by using it as a measurement should not be continued merely because it has become common through historical use. Now is the time to correct this procedure in those localities where the need is evident.

Reference Cited

Range Inventory Standardization Committee. 1983. Guidelines and terminology for range inventory and monitoring. (unpublished report). Society for Range Management, 2760 West Fifth Avenue, Denver, CO 80294. 13 pg.

Fig. 2: *An arid ecological site in northcentral Oregon showing (top photo) the approximate potential plant community of bluebunch wheatgrass and understory of Sandberg bluegrass; (middle photo) the stand of bluebunch wheatgrass virtually the same as for PNC but the stand of Sandberg bluegrass much diminished; and (bottom photo) the reverse, in which Sandberg bluegrass stand is virtually the same as for PNC but the bluebunch wheatgrass stand is much diminished.*