Management decisions based on utilization—Is it really management?

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Land management agencies have become imbued with the idea that measurement of utilization will provide all the information needed to manage the range resources. We contend that nothing could be farther from the truth.

As our society has become more complex, we often tend to simplify complex concepts. Utilization is one of those concepts. The use of utilization data to adjust management programs, particularly with a simple mathematical formula, is an oversimplification of resource management. Costello (1957) noted, "Oversimplification leads to poor interpretation and poor interpretation leads to poor management."

Early range managers put a lot of stock in measuring utilization. Studies by Sampson and Malstem (1926) emphasized the importance of intensity and frequency of grazing that might be allowed if plant cover and forage production were to be maintained or improved. This was in spite of Sampson's earlier (1913) support of specialized grazing systems. At about the same time, the U.S. Forest Service intensified utilization standards research.

Because of a perceived urgent need for plant utilization information on National Forest ranges, a request from the Administrative Division of Range Management to the Division of Range Research for a special study on utilization standards led to the development of a cooperative western-wide project on the subject (Division of Range Research, Forest Service 1944). The project was initiated in 1936 under the supervision of Dr. Robert S. Campbell. The charge given to Dr. Campbell was to formulate sound utilization standards and simple practical methods of measuring degree of forage utilization (Campbell 1937). Campbell stated that "continued productivity or gradual death of a good forage grass may depend upon a difference in foliage removal of as little as 10%." Consequently, a measurement of utilization more accurate than experienced judgement appeared to be important.

Campbell's (1937) premise that the productivity of grass may depend on a difference in foliage removal of as little as 10% does not seem to be valid. Harris (1954) found that utilization of bluebunch wheatgrass varied from a high 69% to a low of 38% over a ten-year period, without detriment to the stand. Utilization levels of crested wheatgrass under light use at Point Springs in southern Idaho in the spring (Sharp 1970) averaged 54%, but varied from 31% to 79% between 1957 and 1969. Utilization in the moderate use pasture varied from 28% to 82% and in the heavy use pasture from 49% to 89%. Forage utilization thus would appear to be an unreliable basis for managing the range resources. The primary reason for this is the variation in production from year to year, well illustrated in the article by Sharp et al. (1992).

In developing utilization standards, Campbell (1943) recognized "that the problem was complex, involving several stages of plant succession, differences among species as to relish with which they are eaten by livestock at different seasons, resistance to grazing, and variation of individual plant processes of growth, maintenance and reproduction." In spite of the complexity of the problem Campbell (1943) stated, "The strategy of the cooperative study was to form the results of previous and present studies into simple, readily applicable facts for use by busy range administrators and managers." Thus, the syndrome of simplifying a complex subject was begun and continues today.

"Proper use" became the nomenclature or the standard with which current utilization could be compared. Proper use or "palatability" tables of plant species were compiled by agencies or interagency groups for particular areas or regions, by season of use and kind of livestock. Many of these were compiled on the basis of experienced judgement and compromise. Federal and State experiment stations initiated studies, clipping and grazing, to improve the proper use standards for plant species and plant communities.

Proper grazing use implies an advantage or benefit to be gained in contrast to improper use. It implies that ranges or forage plants properly used will provide the optimum output of animal products, domestic livestock and wildlife, and assure maintenance or improvement of other land values such as watershed production, timber production, and recreational activities. Anderson (1969) pointed out the advantages of proper range use in achieving efficiency in the use of our rangelands, but did not indicate specifically how proper use was obtained. This is our problem. In spite of all the work done to date, we are no closer to specifying proper use, percentage wise, for a range area or a species than before.

In contrast to the "proper use philosphy" Stoddart (1952) stated that "Nothing but ecological knowledge plus range-managing experience will suffice to determine a standard of utilization. . . . No accurate method of grazing capacity determination has yet been devised which does not rely upon experience founded upon comparable range of proved grazing capacity." Cook and Stoddart (1953) asserted that ". . . if management is based upon the

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ecological principles considered in range condition and range trend analyses, it is not necessary for the rancher or land administrator to make precise determinations of percent utilization for individual forage species."

Agreeing with these critics of proper use, Hormay (1970) stated that "to accept the 'philosophy' that there is some proper use standard for a plant species or range area in the conventional sense is unrealistic. Grazing habits of livestock make proper use level for plants meaningless as a device for regulating stocking. In addition, proper use standards were predicated on the premise that the foliage would be removed annually at some given level." No thought was given to level of defoliation in one year followed by years with no defoliation. Sharp (1971) pointed out that in spite of all the early writing on the benefits of rotation, deferred-rotation, or deferred grazing, grazing on public lands still consisted of season-long grazing regulated by utilization standards.

In a more recent discussion of forage allocation on arid and semiarid grazing lands, Caldwell (1984) stated, "The PUF (proper use factor) will necessarily be influenced by a variety of factors such as the relative abundance of different species on the site in question, the competitive environment of the species in question, season of year, the vagaries of the weather from year to year, previous grazing of the site, the type of livestock, animal familiarity with forage plants and so on. . . . While one cannot deny the wisdom of an experienced range manager and the value of his subjective assessment of proper management, setting grazing practices according to proper use factors must be done with the realization that PUF is a subjective evaluation specific to a certain site and set of circumstances." These are the same factors that Campbell (1943) encountered when he was asked to develop standards for utilization.

Lewis (1980, cited by Van Dyne et al. 1984) pointed out "that herbage yield, determined from a single measurement is far less than actual shoot production of the vegetation in the field. The greater the diversity of the site, the greater diversity of the vegetation, the longer the growing season, and the greater consumption of the unmanaged herbivores, the greater the difference between standing crop and production. In most grazing lands about two thirds of the net primary production is unconsumed. Of that consumed, the amount by insects or other small organisms may be much greater than that consumed by livestock. This point is extremely important to forage allocation in defining allowable use. Lewis emphasizes the point that perhaps we can manage on the basis of overall range condition and bypass many of the allocation decisions. High range condition usually provides high plant species diversity and results in vegetation that will support multiple uses."

Menke (1987) concluded that ". . .species level proper use factor (PUF) is an inviting theoretical concept, which in practice is almost useless. Since the animal selectivity for a forage species is dependent on the botanical composition of the grazed vegetation patch within the community, and this composition is almost never constant within or known throughout a grazing unit, it is nearly impossible to quantify the production capacity of a grazing unit based on PUF's." Caldwell (1984) agreed, "Employment of proper use schemes as an integral component of forage allocation should be done with considerable reservation. If taken at face value, these factors imply a level of precision and understanding of plants and community dynamics that for the most part do not exist. While these factors might provide some guidelines for appropriate forage utilization, the numerical values may create an impression of more precision than is warranted."

The interpretation of utilization data is extremely difficult, even with considerable detail as to how this level of use was obtained—much more detail than we can obtain with time investment in this activity. Total herbage growth is commonly less with grazing than if the plants are not defoliated. The use of herbage weight obtained from caged areas to calculate utilization will usually indicate higher utilization than values calculated from actual yield. Cook and Stoddart (1953) found that, using the accumulated yield from clippings through the season, calculated use was 53.6%. The same residue remaining, compared with the weight of comparable plants only in the fall, showed utilization to be 81.7%. Thus when we communicate about utilization data, do we understand what is expressed? As a case in point, utilization of crested wheatgrass at Benmore, Utah (Frischknect et al. 1953), and in northern New Mexico (Springfield 1963) was calculated on the basis of caged plants, whereas use at Point Springs in southern Idaho (Sharp 1970) was calculated on the basis of total annual growth. Fifty percent use at Point Springs would probably be 15% to 30% greater than the same indicated use level at Benmore and in New Mexico. When each research investigator, in this case, recommends moderate use (65% utilization), one may be recommending a substantially higher grazing intensity level than the others.

In the above example only one species of grass was involved. If the range contains other plant life forms, the problem of interpreting utilization is further complicated. When 22% of the weight of plant material produced by western valeriana was used, 80% of the weight of leaves, 10% of the stems, and 2% of the heads had been grazed (Cook and Stoddart 1953).

Many of the conventional methods of measuring utilization give only a rough approximation as to degree of defoliation (Heady 1949). This is particularly true of the estimate methods. Weight measurements, providing the sample is large enough, should give a better indication of foliage removal than estimate methods. Herbage weight before and after grazing can be measured. Utilization can then be calculated if grazing occurs during the non-growing period. Calculation of utilization is complicated when animal grazing and plant growth are concurrent.

Shortcut methods, such as the percentage of the grass grazed closer than a two-inch stubble height (Canfield 1944), a height-weight relationship (Lommasson and

Jensen 1938) and the percentage of plants ungrazed (Roach 1950), require calibration for each area and often for each year. In studying the validity of the premise of the height-weight relationship, i.e., that grass species have a constant growth form, Clark (1945) found that form varied markedly between samples from different years, from different elevational zones, and from different sites within zones in each year. Schmutz et al. (1963) recommended development of a photo guide to fit each condition encountered, rather than one guide to fit all conditions, for their grazed-class method of estimating utilization. However, in practice only one set of guides has generally been developed. Production at Point Springs has been five times more in a good year than in a poor year (Sharp 1970). Utilization of 80% or less in a good year would leave more residue on the ground than was produced in a poor year.

The effect of time of defoliation within the growing season on plant vigor and community stability is not well understood. Similar utilization levels, as determined by measurements following growth, may have entirely different impacts on the vigor and productivity of the plant if use occurred early vs late in the growing season. Late season harvesting in crested wheatgrass caused a more rapid decrease in herbage yield from year to year than early season harvesting (Cook et al. 1958). Root growth, however, was depressed more by early season grazing than grazing after early May (Hyder and Sneva 1963). Thus, the impact on plant growth would be different with early or late grazing within the growing season although a utilization check at the end of the growing season may indicate the same degree of use.

"Rules of thumb" and simplistic guides, such as utilization standards, are not an acceptable substitute for experienced on-the-ground management, based on sound, long-term range trend information. Reliance on utilization standards alone to make management decisions is "policing" the range, not managing it.

In lieu of time consuming utilization measurements, we recommend taking photographs of the range at various times during the year. Several well selected, permanent photo points per pasture can be taken in the time it takes to read one utilization transect. The photos will provide not only utilization information, but more importantly, range trend information. The photographs should be supplemented with weather data, actual use records and field notes on insect, rodent, and wildlife activity. This information will provide the range manager with a much better tool than utilization data to assess whether management actions are meeting management objectives.

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