Within the Agricultural Research Service (ARS), range is mixed with pasture and forage research. Within the FS, range is lumped with wildlife and fisheries. Within the Cooperative Research Service Inventory System, range is combined with several other activities rather than as a resource commodity (as forestry is treated).

These and other reasons indicate that range and rangelands should have separate identity in USDA and be treated as a land resource with several commodities and uses.

4. Development And Application Of New Range Conservation Technology Is Imperative If Rangelands Are To Meet The Increased Demands Of An Affluent Population

Over half the rangelands of the U.S. are seriously degraded and suffer reduced productivity caused by ill effects of past mismanagement, overgrazing, and erosion. Only 34% of the U.S. rangelands are in good or better condition. Ranges in fair condition constitute 45%, while 16% are rated poor. Ranges in fair condition are providing goods and services at less than half their ecological potential while those in poor condition are producing at less than 25% of their potential. Rangelands in these lower condition classes are much more susceptible to erosion and drought than those in good condition. With the considerable amount of additional pressure that will be placed on American rangelands by recreationists, hunters, and demands for increased water yield in the next two decades it is essential that range research and range technical assistance be accelerated. We cannot afford further range deterioration. The productive potential of our nation's rangelands must be maintained where it has not deteriorated and enhanced where it has. To accomplish this, range conservation must truly become a part of the total U.S. agricultural commitment. It must receive resource allocations in proportion to its value to the nation.

5. Federal Soil Conservation And Range Management Programs Need To Be Redirected To Stop The Diversion Of Federal Assistance From Range And Related Grazing Lands.

The SRM lauds the priorities set by the National Program of Soil and Water Conservation (NCP). Reduction of erosion and conservation of water are vital to this nation's welfare. We are concerned, however, that rangelands have not received their share of the conservation effort. The Special Areas Conservation Program of the SCS, by using erosion as the sole criterion and the Universal Soil Loss Equation (USLE) as the major measure of erosion, heavily favors "targeting" toward cropland. The result is continued rangeland degradation and a declining effort in range conservation because of migration of funds and manpower to predominantly cropland regions.

6. The Rangelands Of The United States Are A Primary Source Of Increased Water Supply

The 853 million acres of rangeland are a vast watershed, and although much of it is in the semi-arid west, it provides significant water for municipal and agricultural uses. It has the potential to provide even more. A 1983 report issued by the Office of Technology Assessment cautions Congress that brush encroachment on the nation's rangeland poses a major threat to long-term productivity. Excessive brush is also reducing our nation's water supply. Improvement of range condition not only enhances on-site water use by plants but reduces soil erosion, and increases off-site water quality and yield. Noxious brush and weeds now infest 350 million acres of privately owned rangeland. A 50% reduction of these noxious plant infestations would make 12.2 quadrillion gallons of water available each year for other uses.

7. The Criteria Used To Determine Cost-Effectiveness Of Range Conservation Practices Should Consider All Benefits, Not Just Increased Livestock Production

We urge that USDA recognize that benefits of range conservation practices accrue to the public as well as the land owner. Increased grazing is not the only value derived. In addition to increased forage production range improvements: (1) enhance fish and wildlife habitat; (2) enhance the recreational opportunities; (3) enhance water conservation on-site and both quality and quantity off-site; (4) reduce flood damages; and (5) reduce siltation and sedimentation downstream. All are for the social good, and all should be considered when evaluating the benefits of range conservation practices. The Economic Research Service should be tasked to support range products research.

VIEWPOINT: Use of USLE on Rangelands

Kenneth G. Renard

Having read the SRM position statements in *Rangelands* 6(3):139-140, I was pleased to see that SRM is involved in taking stands on issues they feel affect the membership. Not being familar with Coastal Marsh problems, I cannot comment on that portion of the position statement. The discussion of USLE contains a number of errors and misconceptions which I feel have done a great deal of harm to those concerned with stewardship of the soil resources of rangeland.

The transmittal letter of SRM President J.L. Schuster states, "Until technology is developed to replace it . . . the USLE as inapplicable on rangelands, and adopt proven and acceptable techniques for evaluating vegetation as a more accurate and earlier indication of degradation of the total rangeland resource." It is a foregone conclusion that the USLE was never intended to assess anything other than the erosion that would be expected over a long period as a result of the process of water erosion. Perhaps that is where the problem lies. Is this technology being used to assess water supply, water quality, wildlife, plant resources, etc.? If so I can't imagine how. ARS scientists are attempting to develop

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such technology with models such as SPUR (Wight 1983) and EPIC (Williams et al. 1983). I suspect it may be some time into the future before all the varied conditions encountered on rangelands can be studied and validation data for these models obtained. What is the land manager to do in the meantime? The evolving models can be used with caution recognizing that better information *will be* forthcoming as our technology and understanding advance. Recognize however, that the models cited also use USLE or some modification thereof.

What are the considerations involved in assessing the health and quality of rangeland resources? Any list we might develop would be long but would certainly consider the following:

1. The present health of plant, animal, soil, etc. communities must be considered, along with the time scale involved in a change. It is important to recognize that the time scale of impact may be different for different communities. For example, the soil may respond more slowly than perhaps does vegetation. Also, the interactions among communities must also be considered.

2. Not only must the current health of the system be assessed, but the rate of change must also be considered. The current state of health may be acceptable, but there may be indicators that show that the system is changing, and perhaps changing at such a rate that serious degradation may occur by perhaps 50 years; and unless something is done now, the change may, by that time, be irreversible.

3. Indeed, the current soil resource on a particular rangeland site may be adequate, but erosion may be degrading it. The vegetation may be allowing excessive erosion that could be slowly degrading the soil. Perhaps in 50 years, the erosion will have irreversibly damaged the soil. The point is simply this: estimating erosion is an important component of the assessment of the quality of rangeland, as is the evaluation of vegetation. To ignore erosion is as serious as using erosion as the sole measure of quality of rangeland. Therefore, there is a need to estimate erosion on rangeland, and estimating erosion is clearly a useful activity of USDA. How those estimates are used is an issue, but not a USLE issue!

Consider the use of two rangeland sites in the same climate and physiographic region. One pasture (call it A) is observed to have flat slopes and short slope lengths whereas pasture B has steep slopes and long slope lengths. Both have been abused such that they are classified as having a "poor" range condition. What are the implications of using USLE or "range condition" as indications of a national problem and how our precious resources should be used to rectify the problem? USLE would say that erosion losses on pasture A are small and would not likely result in loss in potential productivity over a long time period while on pasture B, there will likely be a loss in soil productivity. Thus technical and financial assistance would be directed to B and not to A. On the other hand, if we use "range condition", both are in poor condition (as a result of mismanagement?) and technical and financial assistance goes to both with result (under a budget constraint) that the real social problem pasture, B, is underfunded. It seems that the "range condition" definition rewards the poor manager in such an example. Furthermore, society's interest in such instances where there are "off-site" effects or potential permanent losses in soil productivity potential may justify use of public resources.

4. Having established that erosion must be estimated in order to conduct a complete and proper assessment of range-land health, the next question is choice of an erosion prediction method. Does one choose the USLE or some other method? In spite of its recognized shortcomings, no other method overall is as satisfactory as the USLE. Various federal agencies, ARS, BLM, FS, and SCS, as well as university scientists, are actively pursuing research and making major improvements in the USLE. No other method has been proposed nor is there any research that is likely to produce an alternative method any time soon that will work as well as the USLE, at least within five years. Inasmuch as we recognize shortcomings in the USLE, with the exceptions of estimating erosion on a storm-by-storm basis using a rainfall and runoff driven model, no available theory or data suggests that the USLE is basically unsound or that erosion estimates will radically change in a relative sense with a new equation. Current work with rainfall simulators will refine absolute values and basically shift things like ground cover curves up or down.

The position statement iterates: "... Whereas the universal soil loss equation has been prescribed as the formula for measuring (a more correct word is *estimating*) sheet and rill erosion (correct statement), it has not been validated for land uses other than cropland" (an incorrect statement). Although we would certainly like to have more validation of individual parameter values, some work has been done on rangelands and forest lands. Furthermore, the factors considered in the USLE are widely acknowledged to have major effects on water erosion, whether it be on cropland, rangeland, forest land and/or urban land. The data embedded in the values of the terms of the USLE represent over 10,000 plot years of natural and simulated data. Yes, most of the data were from areas east of the Rocky Mountains, but is water erosion there a different mechanism than on rangelands of the western United States? Does a plant physiologist or grass breeder use a different technique on grasses in an eastern pasture compared to western range grasses? The answers to these questions are, I suspect, that the tools used should be similar, but the relative magnitudes may vary. Thus, we need more calibration/validation, a statement difficult to refute.

The statement continues, "Whereas, the plant, animal and water resources will be severely deteriorated on most rangelands prior to the USLE indicating soil erosion problems;" which, again, may be partly true. If the positive emphatic verb phrase *will be* were replaced by *may be,* the statement might be partly believable. What proof is there for such an emphatic and positive statement? Finally, as stated above, USLE erosion estimates cannot be used as an indication of plant and animal resource status, although, other things being equal (RKLS and P), a high soil loss indicates a lower vegetation density. The USLE can and does indicate potential problem areas as indicated earlier.

The statement "Therefore, . . ., adopt proven and accepted techniques for evaluating vegetation responses as a more accurate and earlier indication of degradation of the total rangeland resource . . ." is admirable, but it certainly does not solve the immediate problem of most rangeland managers. Furthermore, much progress has been made adopting USLE parameters values to conditions encountered on rangelands

(Johnson et al. 1984; Simanton et al. 1980; Simanton et al. 1984; Renard 1982). What technique(s) might be involved? When might such techniques be available? Some of the natural resource simulation models mentioned earlier might help (e.g. SPUR and EPIC), but there are still gaps in some of this technology and research is underway to define the necessary parameter values needed for simulation over the varied topographic, climatic, soil and plant communities encountered on western rangeland. Furthermore, ARS scientists, working with BLM and SCS scientists, are developing a handbook for applying the USLE on rangelands which incorporates the most recent data available from rangelands. It is difficult to speculate what techniques might be used if these do not suffice or if the techniques were discarded in the preparation of the position statement.

Both research and user communities have complained for some time about the poor estimates that the USLE provides. Such complaints are often the result of limited data (remember the soil loss is an average value that would be expected over a long period, presumably at least for the 20-year plus record used in most of the development), or worse yet, data from a few individual storm events. I have been as guilty of this criticism as anyone. Unfortunately, for years, if not decades, the support for a research effort on rangeland erosion has remained grossly inadequate. However, we still must try to apply what we know about erosion principles to develop some technology for rangeland managers. If one asks a land manager to list the things in C that affect erosion, a list of 5 to 10 items will surface. To make tables to cover all of these items then produces a horrible matrix of tables that are confusing to use. Thus, we propose incorporating these items in equation form, which will lend itself readily to the continuous modeling efforts that are evolving. If the user wants tables for field use, he can then produce his own from the equation/algorithm. In the rangeland USLE handbook that is being developed, we are proposing to use a subfactor approach for evluation of the C (cover-management) factor, in the USLE. The user community is complaining that the subfactor method is too involved and requires too many resources to use. Nothing is free and if we need to reflect specific cause-effect relationships, this can only be accomplished by greater detail.

The final statement, I presume, was intended to say that additional research on range resources is needed. As one involved in research, I support such a statement. However, the statement says, "... to develop improved techniques for monitoring all components indicating the health and trend of the rangeland ecosystem and its response to treatment." Certainly there is more needed from research than just monitoring. Research must develop ways to improve the rangeland ecosystem to overcome not only present but past abuses, develop new and better vegetation capable of withstanding the pressures of the competing range resource uses, develop ways to use the limited water resources more efficiently, etc.

Recognizing the weakness of the USLE, let us also recognize its potential. If soil loss can be related to site variables such as soil surface condition, vegetation and weather with equations such as USLE, then range deterioration in terms of soil loss can be predicted from site measurements. And, through the use of models such as SPUR and EPIC (which use USLE), long-term simulations can be used to predict and make comparisons of infinite scenarios of treatment and management practices. Monitoring is somewhat an after-the-fact observation. And for some rangelands, recovery from management-induced deteriorations is a process that occurs on a geological time scale. Thus if we all work together (including encouraging the support for research on rangeland resources), we will get to the point where we can truly manage rangelands as the society name implies for the benefits of all who use this vast and important resource.

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