Conservationists' pen points

Further thoughts on desertification

To the editor:

Dregne provides an excellent overview of the desertification problem ("Desertification: Man's Abuse of the Land," January-February JSWC, vol. 33, no. 1, pp. 11-14). He states, "...desertification is an insidious process" and "its effects rarely seem important until they reach major proportions. By then, reversing the process may be so costly that individual landdowners cannot afford the effort."

A factor contributing to this dilemma is that much of the semiarid rangeland in the western United States is held in public trust and used by private individuals through grazing leases. Thus, there is little incentive for proper stewardship of the land. The land management agencies try to control grazing intensity to maintain long-term carrying capacity, but damage may occur during drought periods, when ranchers generally do not reduce cattle numbers because they cannot reduce their stock numbers without economic loss.

Dregne advances three major causes of desertification (overgrazing on rangeland, lack of erosion control on dry-farmed land, and improper water management on irrigated land). These causes are difficult to disagree with. The first two causes involve some reduction of infiltration or, conversely, an increase in runoff. The problem, therefore, is to create conditions where infiltration is increased. Less water thus moves over the land surface to transport sediment. Dixon (*1*) showed that it is possible to alter land surface conditions to enhance infiltration. He subsequently developed equipment to assist with both reseeding of deteriorated rangeland and enhancing infiltration (*2*). LeHouerou (*4*) listed still another factor contributing to desertification, namely, demographic growth. This factor has been widely identified with some of the problem areas in Africa, and similar rapid population increases are occurring in the southwestern United States, creating demands for land that may accelerate erosion.

Langbein and Schumm (*3*) showed that erosion can be related crudely to the annual precipitation required to produce runoff. They found, after analyzing data from 94 sampling stations, that sediment yield is maximum in low precipitation (arid and semiarid) areas (Figure 1). Although annual water yield may be low generally, high-intensity storms generate high sediment concentrations and yields per unit area. For effective precipitation values below about 12 inches, water is generally insufficient to move sediment. For higher values, the vegetative cover improves and protects the soil. The relationalization of the Langbein-Schumm result is important in understanding the delicate ecological balance of semiarid areas. Such lands have sparse vegetation to protect the land surface from the erosive force of the raindrop impact. High-intensity thunderstorms (common in the southwestern United States) exert an extreme shear force on the land surface.

In the section "Erosion of Dry-farmed Areas" Dregne states that "water erosion is the greater problem in winter rainfall regions" and that "wind erosion is worse in summer rainfall areas." Such blanket statements are incorrect for some areas and can create a false impression among planners. For example, on southeastern Arizona rangeland, air-mass thunderstorms dominate runoff as they do in much of the

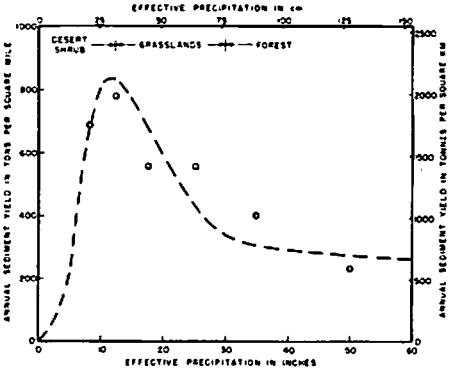

Figure 1. Effect of rainfall variation on sediment yield, determined from records at sediment stations (*3*).

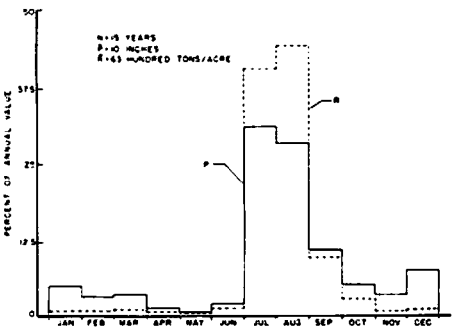

Figure 2. Distribution of the average annual rainfall and erosion index by month for a raingage on the lower elevation of the Walnut Gulch Experimental Watershed near Tombstone, Arizona. This 10-inch average annual rainfall is considerably below the long-term, 14-inch average for the Tombstone gage.

arid southwestern United States. About 70 percent of the total annual rainfall and 85 percent of the rainfall erosion index (R) occurs during this summer monsoon season (Figure 2). Figure 2 also shows the distribution of the rainfall erosion index (R) by months, like that used in the universal soil loss equation (*6*). Precipitation other than that during the summer monsoon season is generally not of sufficient intensity to produce runoff or erosion. The distribution of this index, which correlates very well with erosion, is more peaked than that of precipitation. Almost all of the annual index value occurs in the summer. In other parts of the western United States (e.g., Palouse area of Idaho, Oregon, and Washington), winter precipitation is dominant in terms of erosiveness. Dregne's generalization regarding water erosion, therefore, is not true, but rather climate-dependent.

He states that the potential for range improvement is poor on southern ranges and "that even the exclusion of livestock for 20 or 30 years may not bring about significant changes in range conditions." Evidence is certainly sufficient to substantiate this statement. However, livestock manipulation is not necessarily the ultimate solution for range management and restoration. Other practices that can have a profound impact on range condition include mechanical and chemical brush control; mechanical treatments such as pitting, ripping, and contour furrowing; seeding with desirable native and exotic species; fertilizing alone or in combination with other treatments; and developing stock-water facilities to provide a more uniform distribution of grazing over the range. Intensive management can eliminate water and nutrient stresses and result in production of more forage than was obtained before man's impact was felt. Then, proper livestock management is necessary to maintain this production, but it is not a panacea that will correct past abuses by itself.

The socioeconomic impact of desertification presented by Dregne is very helpful. More information on the economics of erosion control are needed. In some instances poor soil fertility may be as important as limited water in causing desertification. A recent article (5) showed that the loss of nutrients with erosion can be appreciable.

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