Determining Grass and Soil Relationships[1]

WILLIAM R. MEINERS

Range Conservationist, USDA
Soil Conservation Service
Yakima, Washington

RANGE, AS WE have come to know our native grasslands, is a natural resource that was in the past, and in many cases still is, taken for granted. There are many evidences though that this attitude is changing. More and more people are becoming intrigued by grass and how it grows, the effect of climate on grass, and the soil differences associated with different grass communities. We in the Soil Conservation Service are working in this field with the primary purpose of making practical use of such information in helping livestock operators develop realistic range-management programs.

Those of you who have worked in the field undoubtedly have noticed differences in the vegetative cover on north and south slopes, though the difference in exposure may be slight. Why do the wheatgrasses dominate the south exposure, while Idaho fescue is in immediate evidence as the exposure tends north? What are the soil or other relationships that are responsible? What is the critical depth that enables one species to grow while another is absent? What are the reseeding possibilities on these sites?

Observations must be based upon climax or near climax vegetation (original plant cover). This is necessary because as a range site deteriorates plants that have a wider range of adaptability than climax plants tend to obscure site differences. Accordingly, we need to know what grass grew where, what percentage of the climax community it comprised, the associated soils, the effect of climate, exposure, and position, and finally, the amount of usable forage that can be produced. When the climax vegetation has been removed, we need to be able to identify the site, determine its present condition, and decide on the measures of improvement needed. The following procedure is used by soils and range technicians of the Soil Conservation Service to gather desired information.

The first step is to determine the problem areas, which are based on a similarity in conservation problems, agriculture, geology, and other factors that tend to make the area a more or less homogeneous unit. The five problem areas

[1] Paper presented at Northwest Scientific Association Meeting, Missoula, Montana, December 28, 1954.

in Eastern Washington are the Blue Mountain Area, Columbia Plateau, Columbia Basin, Okanogan Highlands, and the East Slope of the Cascades.

The problem areas are then subdivided on a basis of the major kinds of soil materials. Seven major materials were designated, with others to be added or present designations modified as experience dictates. They are: residual, loessial, glacial drift, glacial outwash, lake sediments, valley fill, and volcanic material.

As the final step, the range sites within the above areas are identified.

Each of the range sites are climax communities whose floristic composition, or yield, differs from others sufficiently to require different management—generally a different rate of stocking or season-of-use. The climax vegetation for each site is described in quantitative terms; that is, not only describing the kinds of plants but telling the amount of each. The range-site description also indicates the significant soils or soil complexes, topography, or rainfall conditions that consistently accompany the plant-community characteristic of that site. Each site is given a distinct name based on local usage or topographic features. The name may indicate the dominant species found growing on the site in climax condition.

Mapping units in range surveys are thus based on soil classification and vegetative communities, with due regard to the degree of detail consistent with the intensity of land use. Mapping standards are in accordance with those used in the soil survey.

The above information is recorded in such terms and such a form that it can be used by both technicians and ranchers to recognize the sites described in the field. When the above procedure is put into practice the following type of information becomes available for range areas.

Columbia Plateau Problem Area

Location and Description

The area is located in the south and east portion of the state of Washington and includes all or parts of Whitman, Adams, Spokane, Lincoln, Douglas, Franklin, Asotin, Columbia, Garfield, Walla Walla, Benton, and Klickitat counties. Roughly, this is a 90-mile square area in southeastern Washington, which has become popularly known as the "Palouse Hills," or, generally speaking, that area characterized by loessial (wind-deposited) soils.

Climate

The area has a temperate climate with wet winters, dry summers, and low humidity. The annual precipitation varies from approximately 8 inches in the lower Snake River Valley to about 25 inches at the higher elevations. The

temperatures vary from summer high readings of 102 at Bickleton, 116 at Lind, and 104 at Pullman, to winter low readings of —11 at Bickleton, —33 at Lind, and —21 at Pullman.

The frost-free period varies from 110 days at Davenport to 163 days at Pullman. In the Snake River Valley, the growing season is longer and temperatures are milder.

Agriculture

This area has mainly a wheat and livestock economy, but some green and dry peas are also produced. In the eastern and southern portions, the precipitation is enough for annual cropping with legumes in rotation. The wheat-fallow system is practiced in the western portion of the problem area.

In general, the size of farms and ranches varies from 500 to 2,000 acres, but a few are much larger.

Irrigation is increasing, especially by pumping from the Snake River or local streams and from wells in the uplands. This permits irrigated-pasture development where it is needed to grow supplemental feed, either hay or pasture, for winter or summer periods.

Problems

Wind and water erosion are active over most of the area. Wind erosion is most severe in the western portion, and water is the major cause of erosion in the eastern and northern portions.

1. *On Cultivated Areas.* Moisture conservation is necessary where precipitation is low and soils are droughty. The soils in the higher-precipitation areas need organic matter and good management practices to protect them from erosion and increase the water intake. Water-disposal problems are coupled with poor drainage in some of the higher valleys. Soils in the Snake River Valley are light-textured and droughty. Therefore, they need irrigation for best production.

2. *On Range Areas.* Initiating a system of grazing the grasses in their proper seasons-of-use and getting adequate livestock distribution over the range pose problems in grass management. These are aggravated by a lack of water; shallow, droughty soils or low-producing sites; and a scarcity of basic knowledge about grass and how it grows. Topography over most of the area is not so rugged as to prohibit use by livestock. Some areas of unfenced range, and some fenced units, are too large for adequate management.

A range-forage-improvement program must be correlated with all problem phases in the development of a sound conservation program for a farm or ranch operation.

Parent Soil Materials—Loessial (one of several)

This wind-blown material, called *loess,* is usually silty in character and has a yellowish-buff color, unless it is markedly weathered or carries a large amount of humus. The larger particles are usually unweathered and angular. Quartz seems to predominate. The vertical walls and escarpments formed where this deposit is deeply eroded are one of its most striking physical characteristics. The soils are usually deep, medium-textured, and high in fertility, and have a neutral reaction.

Most of the deeper soils are in cultivation. Areas still in native grass cover are usually less than 20 inches deep or are too steep for cultivation.

Range Sites (one of several)

Rolling Uplands-Wheatgrass. This site is found on rolling topography of from 0 to 30-per-cent gradient. Precipitation varies from 9 to 15 inches annually, with most occurring as rain or snow during the winter months. Summers are hot and dry. The major soils are formed from loessial material, are medium-textured, and vary from 10 to 20 inches in depth over basalt bedrock. Moisture is readily absorbed, and plant roots are found throughout the entire soil depth. Basalt bedrock outcrops may occur.

Soil type and series—Walla Walla Silt Loam, shallow phase
Ritzville Silt Loam, shallow phase

The more important species making up the climax vegetative cover of this site are: Bluebunch wheatgrass, 60-75%; Big bluegrass, T-5%; Sandberg bluegrass, 15-30%; Yarrow, 0-3%; Lupine, 0-3%; Big sagebrush, 0-5%. Estimated yield of usable air-dry forage: 450-600 pounds per acre.

In summary, I suggest that we need to take the following steps to evaluate our native grasslands adequately:

1. Identify the problem area in which we are working.
2. Identify the major parent soil materials within the problem area.
3. Delineate range sites, based on the climax vegetative cover, and determine by clipping studies the usable air-dry forage each site is capable of producing.
4. Record significant soil differences associated with climax vegetative cover found growing on site.
5. Use the information gathered in this inventory as a basis for developing a range-forage-improvement program.

Grass management is the use and treatment of range lands to produce the maximum forage consistent with soil productivity. This will result in the highest practical returns from livestock, recreational, watershed, and other related uses.

Received January 20, 1954