Range Ecology and Condition-- Their Relation to Management

Most soils form over a long period of time from weathered rock. They are affected by topography or position, by organisms, and by the climate that prevails in a local situation. The ability of soil to support life is affected by these factors. Soil depth, texture, structure, and color—all are characteristics the land-owner learns about in order to improve soil and, therefore, plant production. The range soil resource can be improved or torn down by our management practices. Range soils characteristically are relatively shallow, occur on sloping as well as level terrain, and often are quite rocky. The total environment is harsh and range soils often have been discounted as a resource since they are not cultivated and cannot be cropped.

All aspects of soil are important, but the overriding influence for rangelands of the West is weather—moisture for plant growth, in particular. Moisture-holding capacity and the time of moisture availability to plants strongly influence what plants will grow and how they will grow on a particular location.

The Plant Community

The ability of a plant species to grow, reproduce, and survive is governed by five basic factors—*the soil* on which it grows, *the location* or position it has or topography, *the time* over which it has been there, *the other organisms* in its environment, including man, and *the climate* in the immediate area as well as overall climatic influences. In essence, soil and the plants thereon develop together and not independently of one another. When any of these factors is changed the plant species may change or the growth characteristics of the same species may be altered.

Plant species are adapted to different conditions. On any one area changes in plant species composition will occur with the passage of time. Some species are replaced by others that can grow and compete, and reproduce there. The progressive change through time is termed plant succession. A theoretical endpoint is called climax, as used in the term "climax plant community." This concept holds that a pinnacle of soil and plant development will occur, which is in dynamic equilibrium. All usable spaces, called niches, are filled. The only disturbance accommodated in the concept is natural and outside the influence of man.

The concept has primary relevance for one major reason. Climax plant communities are important tools in characterizing what is termed a range or ecological site. When the climax community is composed of different species or sometimes of similar species but of different proportions, the sites on which such communities grow are different. Thus, the designation, "Ecological Site A, Site B, . . ." The sites are given names according to the physical descriptions or to the major plant species which form the climax or potential plant community. To repeat, ecological sites are characterized by the total environment—soil, slope, climate, and species composition of the potential community.

Ecological condition

This term, sometimes known as range condition, embodies management and incorporates the influences that man or other factor changes can have on the plant composition. To illustrate, plant species have varying tolerances to particular influences—grazing, fire, flooding, etc. Livestock eat plant species, as do wild animals and insects.

The reaction of plant species to grazing has been described in the context of decreasers and increasers or of invaders (those who were not present in the climax community). This concept says if a climax plant community were grazed repeatedly, in whatever manner, that some species would decrease, that some would increase, and if the activity went on long enough, that some species (very often annuals) would invade.

The same concept can apply to other influences—fire as an example. Some shrubs are tolerant to fire and sprout back; others are killed and reproduce by seed. If both big

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sagebrush and gray rabbitbrush occurred with resident bunchgrasses and a fire occurred during a season when bunchgrasses were not damaged, the rabbitbrush would act as an increaser to the influence of fire whereas the sagebrush would act as a decreaser. In time, seedlings would come in. If the same plant community were strongly influenced by grazing, the responses could be different. Some grasses would decrease and some would increase, whereas both shrubs would increase. This sounds confusing but it is what happens. This complex relationship demonstrates the importance of all the interwoven issues of site, weather, species, and management.

The departure from climax, for whatever reason, is termed as excellent, good, fair, or poor ecological condition, and is expressed as a percent of the potential community in terms of its species composition. This is a way of describing the range on its successional or ecological gradient. In other words, for each site that has been studied, a particular species composition will fit one of the condition classes. Management can deal with this concept because we can recognize an ecological site on the ground, map it, and describe the ecological (range) condition, which probably varies from place to place throughout the site. Forage productivity is not always highest in a climax grassland or shrub-grass plant community, but for general considerations on most sites, it will be. Managing for excellent condition may be impractical; in fact, it often is. Climax herbaceous plant species are not necessarily the most preferred species. The important point is to know that the species that occur are a way to "read the range," and through various practices, you can adjust species composition, forage production, and ecological condition.

Forested plant communities must be viewed in a different ecological context. Since succession proceeds toward trees from the point after logging, the more the canopy closes in, the closer to excellent condition, and the lower the production of the herbaceous understory. From a grazing standpoint, excellent condition is poor and poor condition (when herbaceous plants should abound) is desirable. Poor ecological condition of a forest situation is probably desirable game habitat, too.

Using the ecological condition concept

Building on the knowledge that ecological or range condition is a way to describe vegetation, it follows that with enough knowledge about the productivity by condition for a site, objectives can be phrased in terms of condition. As stated before, except for forested communities, an improvement in ecological condition often means an increase in forage production. Managing for high or good condition on all ecological sites becomes a management goal that can be measured. Species composition at present determines where we are. If the successional patterns are known, we can recognize when goals are being reached.

Without knowing the successional changes, managers can either (1) expect more progress to be made than is possible for the site and be dissatisfied with results, or (2) not be taking advantage of the site potential. In either case, you need to know what plant species shifts will occur for each site as ecological condition changes.

Trend in condition

Upward-downward-stable—these represent trend in range-condition terms. Trend in condition for a site is determined at two points in time, preferably at least 5 years. Exercise caution in interpreting what you find. Very good and very poor precipitation years can affect production and relative species composition. You would expect faster recovery when good years occur and the converse in poor years. Accurate production records to supplement trend information will aid in its interpretation.

Management affects condition

Cattle can be managed to influence condition. By knowing inherent grazing preferences and adjusting seasons of use and numbers of stock, some plant species will increase and some will decrease. Removing grazing pressure to allow plants to grow back is important. The proportion of cool and warm season species, and even the proportion of annuals to perennials, may be influenced directly by cattle management.

Plant communities can be "shocked" into more rapid condition changes under some circumstances. Using appropriate herbicides has considerable merit. Invading species such as fringed sagewort can be sprayed from plains grassland and succession speeded up. Some grasslands that are heavy to forbs can be sprayed, or even fertilized, allowing grasses to increase and hastening succession. Big sagebrush spraying will reduce the increased brush, allowing more ecological stability and at the same time higher forage production. Fire has an ecological role. Some species are tolerant of fire and can survive and prosper under periodic burning. Other species are not tolerant of fire. Western juniper and certain other non-sprouting junipers are examples. They are confined to rocky sites where there is insufficient fuel to carry fire. But, in the absence of fire they have spread onto better soils and over time have become dominant.