and management" could stand some documentation. International acceptance of any system of classifying soil, vegetation, climate, etc., might seem ideal, but nations (as well as individuals!) are inclined to be individualistic, and loath to use concepts or terminology originating beyond their own limits. In fact, it is remarkable that the habitat type has been used in a broad spectrum of published work by foresters, range managers, game managers, and by botanists. It has been applied to forest, scrub and grassland, and has been used throughout the Rocky Mountains and as far east as Ohio. After gaining acceptance by many foresters, the concept has been getting increasing attention from range scientists.

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Viewpoint:

Habitat Types: A Supportive View

George R. Hoffman

I am presenting a viewpoint supporting the concept of *habitat types* in the classification of landscapes and their vegetation. This is in response to viewpoints of Dyksterhuis (1983) and Anderson (1983), who suggested the concept is too "academic" or too "cumbersome" or otherwise unsuited to their purposes. Because of certain misunderstandings apparent in the viewpoints of both Dyksterhuis and Anderson, I should like to attempt a clarification of the concept.

Many investigators are currently using the habitat type concept in classification studies of western forest and range lands, particularly in the Rocky Mountain and intermountain region of the west. The long-range impacts of these studies should be interesting and worthwhile. They are being done with the use of a consistent sampling scheme; and uniform ecologic concepts provide the basis for interpretation. So far, most habitat type studies have been published by the U.S. Forest Service and have included extensive tables of stand data. These will be invaluable for verification, refinement, or other interpretations by subsequent investigators. Alexander (1974) pointed out that the worth of the habitat type concept is only beginning to be realized in forest management in the Rocky Mountains. I suggest it be given a serious try in range management before it is tossed aside.

The concept of *habitat type* discussed here and referred to by Dyksterhuis and Anderson was introduced in 1952 by R. Daubenmire. The Daubenmires' 1968 monograph on the forest vegetation of northern Idaho and eastern Washington is often referenced regarding the concept of habitat type and its definition.

The theoretical basis of the habitat type concept is neither radical nor out of line with much ecological thought expressed variously over the years. Persons interested in vegetation, from early botanists to current-day plant ecologists, have shown interest in classifying vegetation. One must assume that vegetation classification is of sufficient scientific value to merit the attention given to it.

In addition, ecologists have described and categorized plant succession and the resulting climax communities.* In 1935 Tansley suggested recognizing climax vegetation based on major controlling influences, and used the terms *climatic climax, edaphic climax* and *physiographic climax*. The last-name is usually referred to as topographic climax at present. These three are *primary climaxes* and can develop in the absence of disturbance. Of course, he also discussed climax vegetation based on periodic recurring disturbances such as fire climax and biotic climax. These are disclimaxes (disturbance climaxes) and the names reflect the influence of major, recurring environmental disturbances. Only primary climaxes provide the basis for habitat type classifications.

Habitat refers to the physical location of a single plant or an entire plant community (Odum 1971). Early definitions of

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*Editor's Note: See also the discussion of vegetation classification in the September 1984 *JRM*, pages 427-429.

habitat also focused on physical location or area (Nichols 1917). If a habitat is of a type which supports, or will come to support, a particular climax community, that habitat represents a particular *habitat type.* Indeed the inference goes beyond a specific location to all the areas of the same type which support, or can support, that particular climax community. Though vegetation is the basis for naming habitat types, and certainly the focus of many basic and applied studies, investigators also attempt to document other biotic and abiotic components of habitat types. Habitat types, then, denote not only the land unit but also imply *ecosystems* of particular characteristics and theoretically can be studied and managed as whole systems.

For convenience climax vegetation (plant association) is used in identifying habitat types. Where the vegetation is seral, and most of it is in many places, the potential climax vegetation is still the basis for naming the habitat types. Theoretically this is possible by deciphering the path(s) along which succession proceeds and climax species again gain dominance in a habitat. A habitat which has been grazed or burned retains the capacity to regenerate the primary climax community assuming the disturbance was not so catastrophic as to alter significantly the intrinsic characteristics of the habitat or destroy the flora which makes up the vegetation.

For range and forest vegetation, disturbed habitats normally present mixtures of species which, over time, as succession occurs, change in the direction of eliminating "invader" species, reducing "increaser" species and reestablishing dominance of climax species. Of course, there are exceptions; cheat grass, to name one, is an apparently permanent member of more than one habitat type. There is some question whether lodgepole pine and/or aspen in the Rocky Mountains are always seral though they may have established in a habitat following fire. If succession occurs, and if the concept of succession is acceptable and accepted in studies of rangeland classification, it should be possible to interpret vegetation dynamics on habitats that are disturbed. This is critical; without the interpretation we lack the basis of habitat type classification.

Initially, studies which recognize, delimit and describe habitat types are likely to be detailed. But once studied and described, habitat types may be recognized by others who may lack the particular ecological viewpoint or the taxonomic expertise to initially determine habitat types. With a modicum of botanical training, however, they should have little difficulty in recognizing habitat types in regions studied and classified.

Habitat types do have management implications and indeed have been utilized in management practices. If habitat types convey a biotic potential of the habitats indicated, habitats of the same habitat type should reflect equivalent biotic potentials, whether the individual sites are south-facing or north-facing or at different elevations. Management practice might yield different biotic potentials of areas within particular habitat types. This can be judged by appropriate studies during management regimes and compared to the biotic potential of unmanaged stands.

Obviously combinations of slope and exposure can compensate for changes along elevation, moisture, or temperature gradients. The bluebunch wheatgrass-Idaho fescue habitat type in Oregon occurs on different positions of the landscape, as recognized by Anderson (1983). Should it matter in management practice if a particular habitat type occurs on a north-facing slope at lower elevation than on a south-facing slope at higher elevation.? If the habitat type is the same in both locations, why can that information not be the key to management? It seems to me a critical test for range managers is to show, under uniform management practice, any significant differences in biotic potential in different locations of the same habitat type, especially on different slopes and/or elevations within a limited geographic region. Under these conditions, differences in vegetation response may prove to be more valuable than similarities.

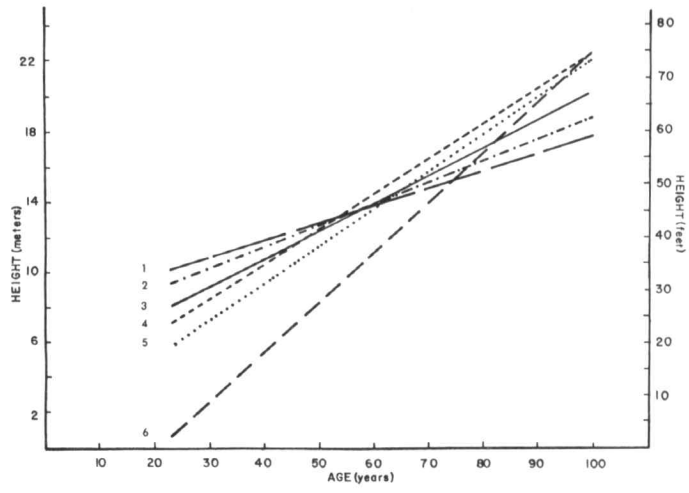

Fig. 1. *Linear regressions of height on age of ponderosa pine in the following six habitat types of the Black Hills National Forest: 1-Ponderosa pine/snowberry; 2-Ponderosa pine/common junipers; 3-Ponderosa pine/ Knick-knick; 4-White spruce/whortleberry; 5-Ponderosa pine/dry spike sedge; 6-Ponderosa pine/rough-leaved rice grass. Redrawn from Rioux (1984).*

The habitat type concept has been tested in some management-related studies and has shown to be sound. For example, growth of Ponderosa pine is related to some of the habitat types in the Black Hills and the regressions of height on age are significantly different from one another among six of the pine and spruce dominated habitat types (Rioux 1983, Fig. 1). This in spite of the fact that stands within a single habitat type occur at different elevations and on level to quite steep topography. Based on physical factors alone, a range site classification would surely separate some of the stands of nearly any pine or spruce dominated habitat type in the Black Hills. Based on physical factors of the habitats, and ignoring the potential climax vegetation of the habitats, one would have to reclassify the pine forest habitats there quite differently than we classified them based on *habitat types.* It seems to me it would be necessary then to justify separating stands that show similarity in potential vegetation and distinctive potential for pine growth. Potential for range management should also be tested critically on some of these same habitats types.

Long lists of plant species are not required to identify habitat types. This is apparently a concern among some

managers. In northwestern South Dakota and adjacent Montana we have identified 21 habitat types supporting steppe, forest, and woodland vegetation. An individual knowing 20 to 25 plant species possibly could identify these 21 habitat types. In western Colorado the 14 forest habitat types of the Routt and White River National Forests can be identified on the basis of about 20 species (Hoffman and Alexander 1980, 1983). Long lists of species are certainly part of the initial descriptions of habitat types as one tries to document as completely as possible the composition of the plant communities. In addition, detailed stand studies done over the geographic extent of each habitat type permit the broadest possible basis on which to understand the variability of the habitat type. Other information from each habitat, including soil profile description, edaphic characteristics, slope, exposure, elevation, possible pests, etc., add to the completeness of the description. Some studies have documented relations of big game to habitat types (Mackie 1970) as well as small mammal distributions to habitat types (Rickard 1960, Hoffman 1960). Where last vestiges of climax vegetation are being eliminated, stand descriptions may be the only record of a vanishing resource, and the documentation takes on added importance for that reason. For academic purposes, and for management purposes eventually, if not now, the more documentation about nature the better. No doubt greater efforts will be necessary for all of us to understand more, teach more, and manage more intelligently the resources left.

The habitat type concept is being adapted on a realistic scale by the U.S. Forest Service in classifying forest lands. My viewpoint is that the same concept, because it is a basic ecologic concept, is equally well-suited to classifying rangelands on a similar scale. A start has been made (Mueggler and Stewart 1980, Hironaka, Fosberg and Winberg 1983, Hansen and Hoffman 1984 unpublished).

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