THE CONCEPT OF HABITAT TYPES IN THE CLASSIFICATION OF LANDS SUPPORTING GRASSLAND VEGETATION

GEORGE R. HOFFMAN
Department of Biology, University of South Dakota, Vermillion, SD 57069

Abstract. A habitat type is that land area which supports, or is capable of supporting, the same climax vegetation. The concept is applicable to grasslands in both basic and applied contexts. The concept provides a means of classifying grasslands which is consistent with the same concept used in classifying National Forest lands over much of the Rocky Mountains.

INTRODUCTION

The aim of this paper is to discuss the concept of habitat types (HT's) with special reference to lands supporting grassland, and rangeland vegetation.

The HT concept was defined by Daubenmire (1952). Later the Daubenmires (1968) described in detail the forest HT's of eastern Washington and adjacent Idaho, and in 1970 Daubenmire described the grassland HT's of eastern Washington. The 1968 and 1970 monographs are the first complete descriptions of forest and grassland HT's for a given geographic region. In numerous later studies investigators have adopted the same ecologic concept in describing HT's for various other regions, mostly in the western United States. The U.S. Forest Service has sponsored most of these studies; their aim has been to describe all the major HT's in the Rocky Mountain Region. This has been an impressive endeavor and the results will represent a classification of forested lands of the largest geographic area over which the sampling scheme and the ecologic interpretation of the vegetation has been uniform throughout. The stand data, published by the U.S. Forest Service primarily, are relatively complete records of the vegetation and in some cases of soil data, physiographic data, animal components, etc. The records are valuable for later verification, refinement, or modification by other investigators. Where remnants of climax vegetation are being eliminated, the stand data recorded may be the only record remaining which adds to its importance.


DEFINITIONS

Because of apparent confusion and misunderstanding among some range scientists regarding HT's (Dyksterhuis 1983, Anderson 1983) it is appropriate to present here definitions of certain terms used in the concept of HT's. One assumes, initially, that the classification of vegetation, and/or the lands supporting it is a worthy endeavor. Certainly much time and effort has been devoted to it by those in both basic and applied areas of ecology. Management of grasslands and/or forest lands is certainly enhanced by a classification of some kind.

Climax vegetation -- that which has attained an equilibrium with its environment such that species population structures no longer exhibit unidirectional change.

Climatic climax vegetation -- that which occurs on normal topography, over deep, loamy, moderately well-drained soils.

Edaphic climax vegetation -- that which is distinct from climatic climax vegetation as a result of stable soil characteristics which differ from those of soils supporting climatic climax vegetation.

Topographic climax vegetation -- that which is distinct from climatic climax vegetation as a result of the predominant influence of topography which fosters a microclimate with distinctive vegetation.

Fire climax -- stable vegetation which is distinguished by the influence of periodic recurring fires.

Zoetic climax -- stable vegetation which is distinguished by the influence of a particular level and intensity of animal influence.

Fire climax and zoetic climax are disclimax (disturbance climaxes), and climatic, edaphic, and topographic climaxes are primary climaxes. If the recurring disturbance of fire or grazing were removed, the disclimax would theoretically change in a direction of developing into one of the primary climaxes. Only primary climaxes are the bases of determining habitat types.

Habitat type -- those land areas which support, or are capable of supporting, a distinctive climax vegetation.

APPLICATION OF THE HABITAT TYPE CONCEPT

The words above and the concept of succession are not new in the ecological literature, and the concept of HT's is not a radical idea. Assuming the definitions given above, which are based to a considerable extent on Tansley's 1935 paper, are sound theoretically and can be demonstrated in the field, then the HT concept should provide a rational ecological basis of land classification. If site potential is best indicated by the vegetation, as generally thought, then climax, or near-climax vegetation probably is the best indicator of site potential (Alexander 1974, Major 1978). Recognizing site potential in terms of such vegetation requires an understanding of both vegetation dynamics and the autecologies of the species involved. Once completed, a study to delimit HT's of a region should yield a valuable framework on which to base additional studies and plans for management as well.

The HT concept can apply to range management, which is an applied science. Some apparent confusion among range scientists regarding the HT concept (Dyksterhuis 1983, Anderson 1983) stems from less than an ecologic view of their resource - range or rangeland both terms of which are rather ill-defined and arbitrary in a landscape classification. In Oregon Anderson (1983) observed the Agropyron spicatum - Festuca idahoensis HT on north-facing slopes at 1,000' elevation under 9-12' ppt., on undulating topography at 2,000' elevation under 12-15' ppt., and on south-facing slopes above 4,000' elevation under 15-20' ppt. That environmental factors compensate for one another along environmental gradients has been an axiom of ecology for many years and the presence of the Agropyron - Festuca HT on north-facing slopes at low elevations, on uplands at intermediate elevations, and on south-facing slopes at high elevations illustrates the principle. The essentially identical stands of this HT possibly represent the soil potential to best advantage, and if this is true, then "ecological site" (sensu Anderson 1983) must refer to something other than climax or near climax stands of vegetation (Daubenmire 1984, Hoffman 1984). If the fundamental difference between HT and "ecological site" concepts is that management strategies can be inferred only from "ecological site," this can be true only by definition. We seem to be hung up with definitions. By definition 90% of the rangeland in South Dakota can be classified into 10 range sites, modified to a degree by geographic location in the state (Schumacher and Johnson 1980). The authors point out that
the full name of each range site includes the soil name and geographic area and this identifies the "natural plant potential." Even though the names of the range sites do not include plant names, the designations "Silty Western" or "Clayey Eastern" must relate that which is pertinent about "natural plant potential" for these two range sites in South Dakota. In the Black Hills of South Dakota and Wyoming the Pinus ponderosa - Juniperus communis HT occurs at elevations of 5,000' to 7,150' on level to sloping topography with slopes up to 17%, and on aspects ranging from 0° to 350°. Additionally, soil textures range from clay loam to silt loam, loam, and to sandy loam. We have also shown that a relationship exists between growth of ponderosa pine and HT in the Black Hills (Fig. 1). If sites of the HT's described for the Black Hills were classified using a range site grouping, many would be regrouped differently than HT's would indicate. Though sites of the Pinus-Juniperus HT indicate similarities in potential vegetation, they apparently are of different ecological sites (sensu Anderson 1983) and of different range sites (Schumacher and Johnson 1980). Whether or not a range site classification would ever be attempted in the Black Hills is irrelevant. What is relevant is whether or not a basic ecological concept is applicable to forests, grasslands, shrublands, etc. It seems apparent that land classification concepts expressed by Schumacher and Johnson (1980) and by Anderson (1983) are specialized for very limited use, and have little ecological basis.

In western North Dakota, South Dakota and adjacent Montana we have described HT's of both grassland and forest (Hansen et al. 1984, Hansen and Hoffman 1985). In this region the following are HT's which support climatic climax vegetation:

- **Stipa comata** - Carex filifolia HT
- **Stipa comata** - Carex heliophila HT
- **Festuca idahoensis** - Carex heliophila HT

In this region the complex topographic and edaphic conditions have resulted in a complex vegetational pattern. In all we described 21 HT's of which 18 are edaphic or topographic climaxes. The *Agropyron smithii* - *Carex filifolia* HT is one of the edaphic climaxes. Under grazing, stands of the **Stipa comata** - *Carex filifolia** and *Agropyron smithii* - *Carex filifolia* HT's gain a considerable degree of similarity. This results from a decline in vigor and abundance of both *Stipa* and *Agropyron* and an increase in the vigor and abundance of *Bouteloua gracilis* which is common to both HT's. Vegetation of these two HT's may then be lumped into a single vegetation type dominated by *Bouteloua gracilis*. Whether these two HT's should be distinguished by the range managers can only be answered by them. The plant ecologist would separate them on the basis of perhaps only a few plant species plus some consistent environmental distinctions. Certain it is that range site designations such as "silty," "clayey," or "sandy" (Schumacher and Johnson 1980) will not distinguish these two HT's, nor most others we have studied in this region.

**LITERATURE CITED**


