Habitat-Type: A Review

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The continuing Range Inventory Standardization Committee (RISC), of the Society for Range Management, is considering basic units in rangeland inventory, including habitat-type. The habitat-type approach is here regarded as impracticable, even though the habitat-type concept may have merit in detailed research where whole communities may reflect differences in habitats not at first evident from physical site factors. Study of the concept showed little indexing of habitat-type in ecology textbooks. The book shelf of most range managers would not provide a reference.

The following texts did not include habitat-type in their indices: The *Study of Plant Communities,* 1948 by Oosting; *Principles of General Ecology,* 1956 by Woodbury; *The Plant Community,* 1961 by Hanson & Churchill; *Range Ecology,* 1962 by Humphrey; the British text *Vegetation and Soils, a World View,* 1963 by Eyre; and all references by J.E. Weaver and F.E. Clements. Three texts with painstaking glossaries: *Plant Geography,* 1944 by Cain; *Biogeography, an Ecological Perspective,* 1957 by Dansereau; and *General Ecology,* 1978 by McNaughton & Wolf, did not include habitat-type.

In 1968, *Plant Communities: A Textbook of Plant Synecology* by Daubenmire presented, defined, and defended the term *habitat type,* with no reference to other authors. (He did not hyphenate the term.)

Several textbooks then followed without indexing the term: *Fundamentals of Ecology,* 3rd. ed., 1971 by Odum; *Dynamic Ecology,* 1973 by Collier, Cox, Johnson & Miller; *Introduction to Ecology,* 1973 by Colinvaux; *Ecology,* 1974 by Kendeigh; *Aims and Methods of Vegetation Ecology,* 2nd. ed., 1974 by Mueller-Dumbois & Ellenberger; *Communities and Ecosystems,* 2nd. ed., 1975 by Whittaker; *Natural Resource Measurements,* 1975 by Avery; *Principles of Ecology,* 1979 by Brewer; *Ecology, the Experimental Analysis of Distribution and Abundance,* 2nd. ed., 1978 by Krebs; and *Terrestrial Plant Ecology,* 1980 by Barbour, Burk & Pitts. It is noteworthy that Avery (1975) does index *Site,* both *Site-forest* and *Site-range* but not *habitat-type.* Under *Site-range* he includes the statment "Range sites are approximately equivalent to habitat-types of Daubenmire (1968)." Liberal interpretation of "approximately equivalent" is necessary.

Two texts were found that did index habitat-type. One is *The Description and Classification of Vegetation,* 1971 by Shimwell, Department of Geography, Manchester, Pub. Univ. Wash. He states: "Habitat-type: a group of communities resembling one another through habitat relationships." The other is *Forest Ecology,* 3rd. ed., 1980 by Spur and Barnes. It states: "The case for use of vegetation in assessing forest productivity is presented by Daubenmire (1976). Although still applicable, the method would be increasingly difficult to apply as topographic differences diminish and as forests become more disturbed. Reliance on soil and drainage conditions would be increasingly appropriate." Range managers will find parallel difficulties but, of course, substituting concern with infiltration and storage of soil moisture for concern of foresters with drainage, except in Wetland, Subirrigated and Overflow range sites.

In "Phytosociology"Vol. 6 of *Benchmark Papers in Ecology,* 1978 by Robert McIntosh, he states: "Daubenmire developed the concept of *habitat-type,* defining it as 'The collective area which an association occupies or will come to occupy.' Daubenmire, in a manner similar to Sukachev, recognized the association as a homogeneous community defined by a combination of tree and understory demonants (Unions)."

Phytosociology has been popular in much of western Europe, while in the U.S.A. and U.K. along with British Commonwealth nations, the akin plant synecology places more emphasis on physical (abiotic) factors of environment, especially in in recent decades on continua of gradients in these factors as related to gradation of volunteer vegetation. Types of habitats are not differentiated by elaborate lists of species, as in plant sociology. The term *association,* a vital part of the habitat-type approach, has no generally accepted definition in the texts mentioned above. The result is that some currently widely used ecology texts no longer index it. Surprisingly, a definition was found in *The American College Dictionary,* as follows: "7. *Ecol.* A group of plants of one or more species living together under uniform environmental conditions and having a uniform and distinctive aspect." This would fit many fields of clean-cultivated row crops such as cotton or corn (maize). But it might also be broadly enough interpreted to fit concepts of the long-time standard text *Plant Ecology,* 1929 and onward past the 2nd. ed. 1938 by Weaver & Clements; or *Bio-Ecology,* 1936 by Clements & Shelford. Their continental Tall, Mid, and Short Grass Associations were presented as structure within the Climax Grassland Formation.

Habitat type was defined in the 1968 text by Daubenmire, referred to earlier, as follows: On page 32, "All the areas (sum of discrete units) that now support, or within recent time has supported, and presumably is still capable of supporting, one plant association will be called a *habitat type* (Syn. homece, equivalent environment)."; and on page 260, "All parts of the landscape that support, or are capable of supporting, what seems desirable to consider as the same type of relatively stable phytocenosis (homogeneous as to dominants in all layers) in the absence of disturbance, comprise one habitat type."

The two quotes are given to show how the term "plant association" is employed in the first instance but with emphasis on abiotic factors ("equivalent environment"), while in the second instance the emphasis is on biotic factors "(homogeneity as to dominants in all layers) in the absence of disturbance." In either case, in the presence of disturbance it seems obvious that physical site factors must be taken into account to infer a habitat-type, with its lengthy description of "dominants in all layers." If we accept any

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climax use of the term *plant association,* then disturbed areas could be related to an association only by gradients in climatic and edaphic factors as related to observed gradation in climax vegetation as interpolated or extrapolated from relicts.

"Climax vegetation" in the preceding sentence is used in the commonly accepted sense, but not in the sense of the 1968 textbook under consideration. There, climax terminology is in conflict with well-established tenets and common usage. There, three "Primary" climaxes are proposed, including "Topographic Climaxes" as well as Climatic and Edaphic. Also advocated is the term "Zootic Climax" to describe relatively stable vegetation deteriorated due to animal disturbance. A series of "zootic" climaxes could then, I presume, be proposed as a kind of range condition classification. Moreover, "plant sucession" which, since Clements' 1916 monumental Carn. Inst. Pub., has referred to changes in plant communities *toward* a climax, is here also used to refer to changes during degeneration and termed "Retrogressive Succession." Returning to "topographic climax" the classification of variable physical habitat factors by Weaver & Clements has much merit and seems worthy of mention in this connection. In their table below, note that influences of topographic factors are remote, operating indirectly to influence factors that affect plants directly.

Direct	Indirect	Remote
Water Content	Precipitation	Altitude
Humidity	Soil Composition	Slope
Light	Wind	Exposure
Temperature	Pressure	Surface
Solutes		
Soil Air		

In rangeland inventories we cannot map Direct factors but we can map precipitation zones (from isohyets) and relevant soil (edaphic) factors as well a telling much about humidity, light, and temperature by specifying a limited geographic area; e.g., Saline Upland 10-14" P.Z., E. Wyo. Thus, a type of community habitat is simply and briefly designated using only the most stable and relevant abiotic features. This is quite unlike the habitat-type approach reviewed here.

Odum (1971 above) has stated quite logically I believe, "The habitat of an organism includes other organisms as well as the physical environment. A description of the habitat of a community would include only the latter." And, as Whittaker (1975) points out, "A species may occupy a range of different habitats. . . ." This is readily verified by brief review of the natural distribution of major range plants, occurring as they do across many states with great differences in latitude and corresponding differences in annual temperature regimes. They may carry the same botanical name, but we know they differ greatly genetically. Blue grama and little bluestem from near the Canadian border have little in common physiologically with their taxonomic counterparts from near the Mexican border.

It appears that at best the habitat-type approach, with its list of species, is a cumbersome method of designating habitats. Along with this, it can be untrustworthy because of genetic variation in widespread species of climax vegetation, or inapplicable in extensive disturbed areas except by reliance on gradients in abiotic factors as related to known gradation in natural vegetation. Such continua of gradients and gradation are now accepted as the rule, while the "discrete units" of the habitat-type definition in the 1968 text are the exceptions. The Soil Survey Manual of the USDA had by 1951 described normal soils as a continuum, and we know arid, semiarid, and subhumid climates do not abruptly change at lines as shown on maps. Hence, most map delineations of rangeland habitats will ordinarily reflect a modal set of characteristics with degree of subdivision determined by range management needs. Sharp, easily mapped, boundaries (discrete units) do indeed occur at abrupt changes in relief, soil material, or land treatment and are most common in mountainous areas; but they are not the rule for rangelands with their vast plains of tundra, desert, steppe, prairie, savannah, and coastal marsh. ★

Viewpoint: Building a Stewardship Ethic

E. William Anderson

Coordinate resource management and planning (CRMP) is now widely accepted in principle. It has been nationally institutionalized in the U.S. by an interagency memorandum of understanding (1975 Rev. 1980). Several Congressional Acts governing the management of federal renewable resources more-or-less mandate that federal agencies coordinate and consult with owners of dependent private lands and resource-user groups. At least 10 states now have memos of understanding committing their federal and state renewable resource agencies to some type of CRMP activity. *Stewardship,* which essentially is a synonym for *conservation*[1], has become the current key word expressing the preferred working relationship between users and managers of public lands.

One outcome of this progressive and desirable situation is that public land-management field personnel will be working more closely and more frequently with owners of dependent private lands than ever before. It is imperative, therefore, that these agency employees realize that they also will be essentially assisting, or at least influencing, the private landowner in the development of his/her stewardship ethic and personal conservation plan. This activity will augment the program of the Soil Conservation Service, working through organized conservation districts which are legal subdivisions of State governments, that historically and still is the primary source of federal technical assistance to private agricultural landowners. It will also augment the activities of extension agents and consultants who represent the primary

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[1] *Conservation:* the use and management of natural resources according to principles that assure their sustained, highest economic and/or social benefits without impairment of environmental quality (Society for Range Management 1974).