The land unit — A fundamental concept in landscape ecology, and its applications

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Keywords: landscape survey, land unit concept, land unit mapping, land unit systems, landscape classification

Abstract

The land unit, as an expression of landscape as a system, is a fundamental concept in landscape ecology. It is an ecologically homogeneous tract of land at the scale at issue. It provides a basis for studying topologic as well as chorologic landscape ecology relationships. A land unit survey aims at mapping such land units. This is done by simultaneously using characteristics of the most obvious (mappable) land attributes: landform, soil and vegetation (including human alteration of these three). The land unit is the basis of the map legend but may be expressed via these three land attributes. The more dynamic land attributes, such as certain animal populations and water fluxes, are less suitable as diagnostic criteria, but often link units by characteristic information/energy fluxes.

The land unit survey is related to a further development of the widely accepted physiographic soil survey (see Edelman 1950). Important aspects include: by means of a systems approach, the various land data can be integrated more appropriately; geomorphology, vegetation and soil science support each other during all stages (photo-interpretation, field survey, data processing, final classification); the time and costs are considerably less compared with the execution of separate surveys; the result is directly suitable as a basis for land evaluation; the results can be expressed in separate soil, vegetation, land use and landform maps, or even single value maps.

A land unit survey is therefore: a method for efficient survey of land attributes, such as soils, vegetation, landform, expressed in either separate or combined maps; a means of stimulating integration among separate land attribute sciences; an efficient basis for land evaluation. For multidisciplinary projects with applied ecologic aims (e.g., land management), it is therefore the most appropriate survey approach.

Within the land unit approach there is considerable freedom in the way in which the various land attribute data are ‘integrated’. It is essential, however, that: during the photo-interpretation stage, the contributions of the various specialists are brought together to prepare a preliminary (land unit) photo-interpretation map; the fieldwork data are collected at exactly the same sample point, preferably by a team of specialists in which soil, vegetation and geomorphology are represented; the final map is prepared in close cooperation of all contributing disciplines, based on photo-interpretation and field data; the final map approach may vary from one fully-integrated land unit map to various monothematic maps.
Introduction

The concept of the ‘land unit’ is presented in this paper as a central concept in landscape ecology. It is a logical consequence of the main hypothesis that the landscape can be considered as a system, and follows the holistic assumption that it consists (as the whole of nature) of hierarchical wholes.

One of the main characteristics of landscape ecology is that it contributes to holistic theory by describing hierarchical wholes from organisms and society to the Earth as a total system. It does so by combining the systems approach developed in biology (‘ecosystem relationships’) with the methods developed by geography for describing tangible tracts of land. The land unit concept is treated in this paper as synonymous with that of the hierarchical whole.

Although it is a hypothetical construct, the land unit concept is used for very practical purposes:

- To reduce the costs of surveys of landscape attributes (resources): the land unit or physiographic survey (mapping) approach in soil, vegetation and landscape surveys;
- As a basis for the evaluation of the suitability of landscape for any kind of land use.

Thus the land unit is being used by landscape ecologists and related scientists for three purposes:

1. As a central concept in landscape ecology hypotheses.
2. As a mapping tool.
3. As a means of transferring landscape knowledge, via evaluation, to application. It is therefore important to describe the concept clearly to avoid misunderstanding. This paper is an attempt to fulfill this task.

What is a land unit

In the context of this paper, a land unit is a tract of land that is ecologically homogeneous at the scale level concerned. The terms land, ecological, homogeneous and scale level and also the concept of holism deserve some explanation.

Land

Land, as used here, is synonymous with landscape in its meaning as ‘the total character of a part of the Earth’s surface’ (von Humboldt), or the tangible ecosystems including all biotic and abiotic aspects as they can be recognized visually at the Earth’s surface. ‘Landscape is a part of the space on the Earth’s surface consisting of a complex of systems, formed by the activity of rock, water, air, plants, animals and man and that by its physiognomy forms a recognizable entity’ (WLO 1975, translated in Zonneveld 1979); or ‘Landscape is an entity formed by the mutual working of the living and the non-living nature on a recognizable part of the Earth’s surface’ (WLO 1975, translated in Zonneveld 1976); or ‘Land comprises the physical environments including climate, relief, soils, hydrology and vegetation to the extent that these influence the potential for land use’ (FAO 1976). The last definition includes the results of past and present human activity on soils and vegetation, but purely economic and social characteristics are not included in the concept of land (see also Fig. 1).

The point all these definitions have in common is that they emphasize the study of a complex body, one part of which is studied by soil scientists, another by vegetation scientists and others by geomorphologists, biologists, human geographers, climatologists and hydrologists.

Certain geographers and landscape ecologists claim that they study landscapes as a whole, not emphasizing one side or the other. Various mono-disciplinary land attribute scientists (vegetation, soils, geomorphology) also often use the word landscape, for example soil landscape and vegetation landscape. Landscape is even used by some geomorphologists as a compilation of landforms.

Ecological

Ecology in ecologically homogeneous is used here as ‘the household of life’, hence the land as the ba-

* In translation to Spanish, there is a problem because two terms are used: ‘paisaje’ and ‘tierra’. The latter is used commonly in relation to land evaluation, the former in the context of basic landscape ecology and also of the visual aspects of landscape.