Plant Associations as Ecosystems: Issues in Application to At-risk Status

WILLIAM H. MacKENZIE

Ministry of Forests, Research Branch, Bag 6000, Smithers, BC, V0J 2N0, Canada, email Will.Mackenzie@gems1.gov.bc.ca

Abstract: In British Columbia, the plant association is used as an ecosystem unit for the purposes of conservation planning, notably in the tracking of rare or at-risk ecosystems. The association is an abstract concept that describes a group of individual communities believed to represent a particular 'type' of ecosystem. The classification of plant associations is primarily on the basis of floristic similarity; however, there are no existing objective criteria to decide how unique or consistent an association needs to be. Furthermore, the necessary subjective decisions when creating units will differ based on the approach and purpose of the classification. In this paper, I discuss the effect of these issues on the use of the association in conservation planning and propose a series of criteria for assessing the strength of existing associations.

Key Words: ecosystem classification, rare ecosystems, plant associations, similarity indices, conservation planning, British Columbia

Introduction

One of the most important tools for understanding ecosystems and applying ecosystem management principles is an ecologically-based classification system. Classifications allow for the ordering, comparison, synthesis, mapping, and inventory of information and give resource workers a common language to communicate results. Biogeoclimatic Ecosystem Classification (BEC) is well developed in British Columbia, and has been used extensively in many aspects of natural resource management. This system has its basis in the field known as phytosociology, a European tradition which creates a hierarchical classification of discrete vegetation communities known as associations. This approach to vegetation classification has experienced a renaissance in North America as it has become necessary to have a definable ecosystem unit to identify representative ecosystems for management and conservation planning. This modest goal has recently been extended to using the association as a listed entity for at-risk and rarity status. The listing and tracking of ecosystems is a move beyond a single species focus to identify and conserve representative ecosystems, good quality habitats, and/or unique habitats for rare species, or as a proxy for biodiversity. From a management perspective, the classification of plant associations may also be used to create a legal entity for regulation. The requirement for clearly delineated and distinct units is important for each of these purposes; however, using the

association in these contexts is not without risk as listing implies that the association is definitive and defensible.

Conceptual Limitations of Association

The association describes a recurring plant community that has specific diagnostic species, a characteristic range in species composition, and a defined range in habitat conditions and physiognomy or structure. The association classification is a valuable tool because it uses a standardized methodology based on actual data, and thus allows for comparison and coordination of regional classification. However, classification units are not inherent in the data but are the result of subjective decisions made by the creators of the classification:

- Associations are abstract classes which group together a number of communities by some characteristics that they share.
- The use of different characteristics will lead to different classifications.
- In any classification, the boundaries between community types will be somewhat arbitrary, as these boundaries are determined by the characteristics chosen for classification and the ecologist's choice of where to place the boundaries.
- The form of the hierarchy is a human construction; it is not inherent in the vegetation but is determined by an ecologist's choice of assumptions about classification and ways of applying these assumptions.

Therefore, community classification is justified not by theory but by usefulness.

The nature of an association leads to several conceptual limitations to using the association as a listed entity. First, an association is not a real thing but an abstraction, and thus cannot be treated like a species. The value of an association is its value for species. Second, classification ignores outliers; therefore, a list of described associations may not include the uncommon ecosystem types that are the focus of a rare ecosystem tracking list. Third, units are not inherent in the data and will have fuzzy boundaries; consequently, it will be difficult to precisely define defensible units. And fourth, since classifications are purpose built, can we assume the currently recognized associations are acceptably distinct enough to be tracked?

Use of Existing Associations to At-risk Status

In British Columbia, the majority of vegetation classification work has been carried out by the Forest Service. The intent of the Forest Service classification is to recognize features which indicate important differences in site quality for forestry rather than features that suggest distinct units. Often these site differences are marked by minor changes in species composition or cover. Of the 236 forested associations currently recognized, 190 (80%) have at least one other association that would be considered similar (> 60% similarity) and 60 (25%) of these have at

least one unit that would be considered very similar (> 70% similarity). For purposes of descriptive ecology, this situation is not critical as the assignment to an association is primarily to help organize and order existing site series information; however, an 'off-the-shelf' application of existing BEC associations to a tracking list may produce a list of units that are relatively indistinct. For tracking at-risk ecosystems, uniqueness will matter. Weak units should not be listed and a reanalysis is probably required. Distinct ecosystems will be more defensible, will better meet the intent of the tracking process, will facilitate comparisons with other jurisdictions, and will be more clearly differentiated in the field.

Guidelines to Application

The following are some proposed minimum standards for vegetation units that are to be listed and tracked. These guidelines relate to internal measures of integrity and external comparative tests of distinctness. Descriptive attributes of all units should be accompanied by these measures.

Internal Measures

- Mean plot similarity ('Integrity') = 1 − squared relative Sorenson similarity. Integrity > 0.6 is considered a minimum for good consistency
- Unit 'Strength' = mean similarity x (1 − Chi distribution with DF = 5). Strength > 0.5 should be a minimum value
- The 'Homotoneity' of a unit measured by the ratio of high constancy (IV + V) to low constancy (II + III) species should approach 1.0

Comparative Measures

Associations are valid only in context of other units. All existing and proposed associations should undergo comparison with all others, and units that have not been compared should be indicated as 'provisional'. The following indicators of uniqueness should be applied for comparison purposes:

- The unit has a clearly defined diagnostic species group
- There are no related units that are > 70% similarity as measured by relative Sorenson similarity
- The unit meets a statistical test of difference through multi-response permutation procedures (MRPP)