1978

Ecosym-Plant Community Classification

Jan A. Henderson

Neil E. West

ECOSYM - Plant Community Classification of Vegetation

by

Jan A. Henderson and

Neil E. West

INTRODUCTION

Classification and mapping of plant communities is a fundamental part of most ecosystem studies and management or land-use plans. It is therefore one of the more important and commonly used components of ECOSYM.

The objective of the plant community classification system is to identify and classify units of the vegetation which are sufficiently homogeneous that it is possible to make biological and managerial generalizations about them. We make no presumptions about whether these units are "natural" or "artificial", that is irrelevant to our purpose. We hope that the classes we define are as natural as possible, but in many cases the boundaries between classes are purely arbitrary.

The plant community classification is based on the structure and taxonomy of the communities and pertains only to the current vegetation as it exists today and thus is distinguished from the closely related "habitat type" or potential vegetation component. The classification strategy is divisive in that we start with the phytosphere and systematically subdivide it into smaller and smaller relatively homogeneous and recognisable units. At the broadest level, the earth's phytosphere is broken into Realms (Fig. 1) based on similarity of evolution. Each realm is divided into Orders based on gross physiognomy. Each order is divided into cover types based on

taxonomic similarities of the overstory layer in the community and each cover type is divided into community types based on similarities in the understory layer.

REVIEW OF EARLIER WORK

THE CLASSIFICATION SYSTEM

Within the Holarctic realm we first recognize Physiognomic Orders which are based on the gross structure of the tallest growth form of plants present in the community. The common Physiognomic orders in the holarctic realm are forest, shrub, and herb. Heavy reliance of the growth form presumes that it exerts the greatest influence on the community and allows use of remote sensing imagery in mapping.

If trees are present and are taller than the ground vegetation and have a combined coverage of at least 5% a community is classified as a "forest." Degrees of stocking and species will determine if it is a "savannah", "woodland", or "forest" in the popular sense. Five percent cover of the overstory is deemed sufficient to exert a significant influence on the community.

If the community has less than 5 percent cover of trees, the coverage of shrubs, if they are among the codominants of the vegetation, or taller is considered. If the shrubs are clearly taller than competing vegetation, 5% ground cover is sufficient to recognize the shrub physiognomic order. If shrubs codominate the tallest layer with grasses or forbs then there must be at least 25% cover of shrubs.

If there is not at least 5% cover of trees or shrubs which overtop the community or at least 25% cover of shrubs codominating with grasses or

forbs, then the herb physiognomic order is recognized. In cases of sparce vegetation, (i.e., less than 25% cover for all species), the shrub order may be recognized if shrubs account for at least 25% of the total cover of the community. If the shrubs are overtopped by herbaceous plants with at least 25% cover, the community is classified as herb.

Key to the Physiognomic orders:

1. Trees the tallest growth form (seedlings don't count if they are overtopped by other vegetation) and at least 5% absolute cover of all tree species . . . . . FOREST

1. Trees absent or if present totaling less than 5% absolute cover or overtopped by other vegetation.

    2. Community with greater than or equal to 25% total cover.

        3. Shrubs the tallest growth form and with at least 25% cover . . . . . SHRUB

        3. Herbs the tallest growth form or less than 25% cover of overtopping shrubs . . . . . HERB

    2. Community with less than 25% total cover

        3. Shrubs the tallest growth form and comprising at least 25% of the total community cover . . SHRUB

        3. Shrubs either not the tallest growth form or less than 25% of the community cover contributed by shrubs . . . . . HERB

It is sometimes useful to recognize suborders based on broad taxonomic criteria or strategy of reproduction, i.e., within the forest order, we recognize needleleaf and broadleaf dominated communities; within the Herb order annual grass, sod grass, bunchgrass, annual forb, and forb-dominated communities are sometimes recognized as suborders.

Within the physiognomic orders and below suborders if recognized, we recognize Adaptation Classes based on the apparent morphological and physio-

logical adaptation of the dominant overstory species to the environment. Therefore communities dominated by trees which are adapted to the dry part of the environmental gradient are called xerophytic forest communities. Trees adapted to wet environments are hydrophytic and trees adapted to standing water (e.g., Taxodium distichum) are aquaphytic).

Adaptation classes are interpretive and determined by concensus. It is important that this level in the vegetation hierarchy be delimited even though hard and fast rules for recognizing new classes cannot, at this time, be specified.

The adaptation classes that we recognize at this time are:

A. Xerophytic - plants of dry habitats (<20" pptn)

B. Mesophytic - plants of mesic habitats (>20" pptn, <50" pptn)

C. Hydrophytic - plants of wet habitats (topo-edaphic conditions, with soil at or near field capacity most or all of the year).

D. Aquaphytic - plants of habitats with topo-edaphic conditions which produce standing or flowing water all or most of the year.

E. Borophytic - plants of cool habitats characterized by winter snow packs at least 1 m deep for 6 months or more of the year, average July temperature usually less than $15^{o}C$.

F. Cryophytic - plants of cold habitats, alpine or arctic habitats, average July temperatures $< 9^{o}C$, soil freezing and thawing common.

G. Psammophytic - plants of sandy habitats

H. Lithophytic - plants of exposed bedrock (lichens, etc.)

I. Halophytic - plants of salty habitats

When a community qualifies for more than one adaptation class then it can be included in a combination adaptation class. Combination adaptation classes which may be most commonly recognized are Boro-xerophytic (EA), Halo-xerophytic (JA), Boro-hydrophytic (EC). Mesophytic is never used as part of a combined adaptation class name.

Within the adaptation classes we recognize Cover Types which are identified and named by the dominant species of the tallest growth form present. A cover type may sometimes occur within more than one class or order. In such a case, the order name or symbol must accompany the cover type name. An example of this is where a species may occur as both a tree and shrub growth form such as subalpine fir as a tree and as Krummholz.

The Society of American Foresters recognizes forest cover types if they meet these three criteria.

1. The cover type must actually be found occupying large areas in the aggregate. It does not require that it should cover any single large area in a solid stand, but that it should be the characteristic composition found typically through a considerable range of country.

2. The cover type must be distinctive and easily separated from other types which most closely resemble it.

3. Within the foregoing limitations every important combination of cover must be recognized as a forest type.

That is, only those types of distinctive character and considerable area merit formal recognition as a type. Thus the types are predefined and recognized by a board or panel and new types are not to be recognized casually or without scrutiny.

In the broad context it does not seem necessary to preclude potential cover types from recognition because they have limited distribution as would be suggested by criterion 1. For example, a cover type of special interest because it is the major habitat for a rare or endangered animal or plant species should be included in such a classification system which has broader application than as a basis for timber types.

Criterion 2 is impossible when extensively applied as all students of vegetation or plant community ecology know. We hold that only criterion 3 is necessary to retain as part of a multi-natural resources classification system.

Within cover types we recognise plant community types. These are community types in the abstract sense, i.e., phytocoenoses (sensu Braun Bnakquet _____ or Krajina, 19____) or Associations (sensu _____ or _____ but not Daubenmire, 19____).

Community types are units of vegetation which are relatively homogeneous with respect to both overstory composition and structure (in the gross sense only, e.g., the distinction between closed forests of subalpine fir and Krummholz of the same species). They are recognized and named on the basis of the overstory dominants (cover type) and the understory or ground vegetation dominants or indicators.

There is a similarity here between community type in the vegetation classification hierarchy and the naming of species in the plant or animal taxonomy hierarchies. In plant taxonomy the genus can stand alone but not the specific epithet. Likewise the cover type can stand alone but not the part of the community type name which is added to denote the understory vegetation. In some plant ecology circles this name is used separately to denote an understory vegetation "union" but the union is not incorporated into the ECOSYM vegetation classification system.

Names for community types are formed by separating species names in different physiognomic layers with a slash (/) and when two names within the same layer are used they are separated by a hyphen, e.g., a community dominated by subalpine fir in the overstory and Berberis repens in the understory is identified and written as:

Abies lasiocarpa/Berberis repens (Abla/Bere)

if the understory is codominated by Berberis repens and Pachistima myrsinites, the trinominal is formed by hypenating the two understory species, e.g.,

Abies lasiocarpa/Berberis repens - Pachistima myrsinites

Mostly, binomials are preferred and trinomials or larger names are to be avoided if possible. Excessively long names can be avoided by choosing one species of an understory union to be the indicator for that group of species and only using that one species in the name.

The community types are subdivided into structural or condition classes which recognize differences in size, spacing and successional status of the community. These condition classes are denoted by the following symbol:

$$\frac{A - B - C}{D - E}$$

Where the numerator indicates the size, cover and successional status of the overstory layer and the denominator indicates the cover and successional status of the understory layer. Written another way, this condition class fraction is:

$$\frac{\text{Size of overstory - cover of overstory - successional status of overstory}}{\text{cover of understory - successional status of understory}}$$

The size classes for trees are:

1 = $\geq$ 1 dm DBH (seedlings and saplings)

2 = 1-3 dm DBH (poles)

3 = 3-6 dm DBH (mature)

4 = $>$6 dm DBH (standard)

5 = >12 dm DBH

The cover classes are:

1 = $<$0.5%

2 = 5-25%

3 = 25-50%

4 = 50-75%

5 = 75-95%

6 = 95-100%

The successional status classes are:

1 = The community is clearly pioneer, representing the earliest stages of secondary succession after disturbance.

2 = The community is early seral but past the pioneer stage. Climax species may be present but the community structure and composition is mainly that of early successional development.

3 = The community is in a middle to late successional stage. Usually many "climax" species will be present but also many that are considered to be seral. The structure of the community is still not what would be expected of a climax or near-climax community.

4 = The community is clearly climax when considering both species composition and community structure.

IMPLEMENTATION PROCEDURES

Field work

Plot location

Plot layout

Methods of analysis

Mapping

APPENDIX I

Summary of cover types by order and class in the ECOSYM test strip area:

Physiognomic order: I = Tree (forest)

suborder: I_a = conifer, I_b = Angiosperm

Adaptation class: A - Xerophytic

B - Mesophytic

E - Borophytic

Cover types - Xerophytic conifer forest (I_aA)

1. Pinyon-juniper
2. Juniper

- Mesophytic conifer forest (I_aB)

1. Blue spruce
2. Douglas-fir
3. White fir

- Borophytic conifer forest (IaE)

1. Subalpine fir
2. Engelmann spruce
3. Subalpine fir - Engelmann spruce

- Mesophytic Angiosperm forest (IbB)

1. Quaking aspen
2. Gambel oak

Physiognomic order: II = Shrub

Adaptation classes: A = Xerophytic

B = Mesophytic

C = Hydrophytic

E = Borophytic

Cover types: Xerophytic shrub (IIA)

1. Big sage
2. Rabbitbrush
3. Bitter brush

Mesophytic shrub (IIB)

1. Snowberry
2. Chokecherry
3.

Hydrophytic shrub (IIC)

1. Willow

Borophytic shrub (IIE)

1.

Physiognomic Order III Herb

Adaptation class: A = Xerophytic

B = Mesophytic

C = Borophytic

D = Hydrophytic

Cover types: Xerophytic Herb (IIIA)

1. Bluebrush wheatgrass
2. Sitanion
3. Elymus
4. Trisetum?

Mesophytic Herb (IIIB)

1. Lupine - geranium meadow
2. Veratrum

Hydrophytic Herb (IIIC)

1. Sedge

Borophytic Herb (IIIE)

1. Subapline Meadow types

Summary of community types by cover type

IaA1 - Pinyon-juniper

IaA2 - Juniper

IaB1 - Blue spruce

IaB2 - Douglas-fir

IaB3 - White fir

IaE1 - Subalpine fir

IaE2 - Engelmann spruce

IaE3 - Subalpine fir - Engelmann spruce

IbB1 -Quaking aspen

IbB2 - Gambel oak

IbB3 - Big tooth maple

IIA1 - Big sage

IIA2 - Rabbitbrush

IIA3 - Bitterbrush

IIB1 - Snowberry

IIB2 - Chokecherry

IIB3 -

IIC1 - Willow

IIE1 -

IIIA1 - Bluebush wheatgrass

IIIA2 - Sitanion

IIIA3 - Elymus

IIIA4 - Trisetum

IIIB1 - Lupine - geranium meadow

IIIB2 - Veratrum

IIIE1 - Subalpine meadow types

IIIC1 - Sedge