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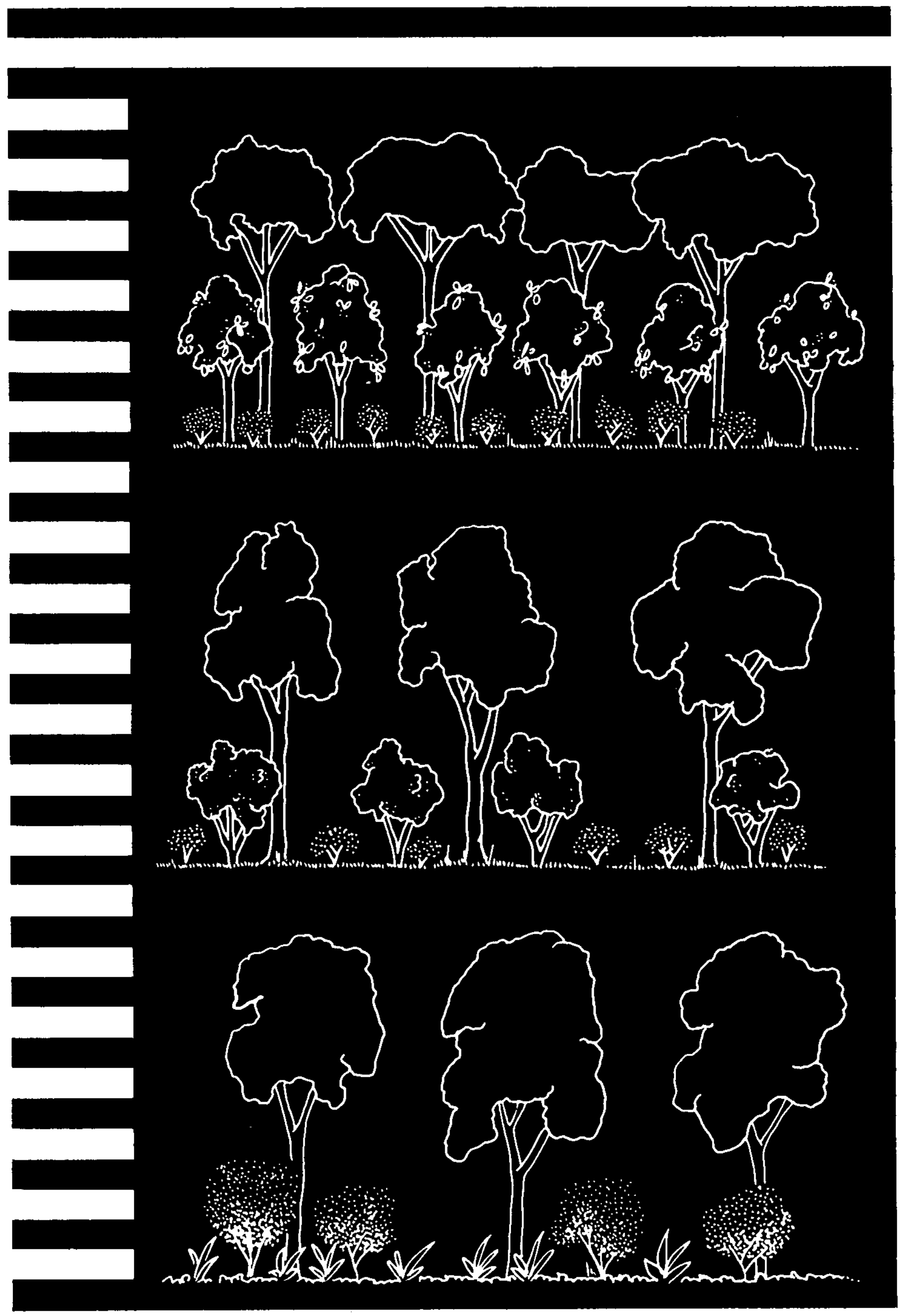
# Vegetation Classification System for California: user's guide

Serena C. Hunter Timothy E. Paysen



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# GLOSSARY

**Biogeographic:** Geographic distribution of an organism in relation to the mechanism or process that caused distribution. For example, disjunct populations of a conifer species on mountain tops may be the result of seed dispersal by animals followed by extreme geomorphic action and climatic shifts (glaciation, then heating and drying).

**Broadleaf:** Angiosperm: leaf that is not needlelike or scalelike. See *Conifer*.

**Canopy:** Aggregate tree and shrub crowns forming a layer (often broken) of cover above ground.

**Chaparral:** Shrubs with sclerophyllous (leathery, waxy skinned) evergreen leaves, generally adapted to Mediterranean-type climate (hot, dry summers; wet winters). Often refers to a conglomerate of vegetation characterized by these shrubs, in the same sense as *forest*. Specific class in the Subformation category of the Classification System.

**Codominant:** Plant species that shares stand dominance with another species in the overstory canopy or any subordinate layer. See *Vegetation layer.*

**Community:** Assemblage of plants with a characteristic species composition that occurs under uniform environmental conditions.

**Conifer:** Cone-bearing tree with evergreen needle or scalelike leaves. Includes the genera *Pinus* (pine), *Calocedrus* (incense-cedar), *Juniperus* (juniper), and *Cupressus* (cypress).

**Crown cover:** Vertical projection of a tree or shrub crown perimeter to the ground.

**Cryptogam:** Primitive plant (moss, club moss, lichen, or fern) that lacks true flowers or seeds, and reproduces by spores.

**Cushion plant:** Forms a low-growing mat of vegetation. Individuals spread at the outer edge, sometimes rooting at nodes or branch tips.

**Diameter at breast height (d.b.h.):** Diameter of a tree trunk at 4.5 ft (1.37 m) above ground.

**Dominant:** Plant in a vegetation unit that exerts a controlling influence on the environment by reason of size or numbers. For this publication, group of plants that provides more cover than others in a given layer of vegetation.

**Ecotone:** Transition zone between two ecological units, most often characterized by vegetation changes.

**Forb:** Broadleaved herbaceous plant.

**Forest:** Plant community whose overstory is dominated by tree crowns that (mostly) touch (60 percent crown cover or greater). See *Woodland*.

**Graminoid:** Grasslike. or relating to grasses. At the Formation level, refers to communities dominated by such plants.

**Grass:** Herbaceous plant with narrow leaves, of the family Poaceae.

**Herbaceous:** Herblike, or composed of herbs. Describes plants with soft, usually green leaves and no woody tissue.

**Levels of community organization:** The resolution and perspective with which associated entities are perceived for the purpose of defining a system and its distinctive components.

**Overstory:** Taller plants in a vegetation type that form the uppermost canopy layer, providing crown cover of at least 25 percent. Not necessarily a tree layer that humans walk beneath. Though unconventional, overstory can be a grass layer. Here, cover must be at least 2 percent, and the canopy is such only to very small creatures.

**Physiognomy:** Characteristic structure of vegetation. Physical configuration of a vegetation unit, including its vertical profile and physical structure of plants in a given layer.

**Riparian:** Generally, a kind of terrestrial ecosystem strongly associated with water. Also designates components of such an ecosystem: plants along the bank of a stream, river, or lake zone are called riparian vegetation. A strict definition is lacking and the term varies. Water above ground is not imperative; for example, sycamores in a swale may be termed riparian vegetation by some classifiers.

**Savannah:** Generally, grassland containing scattered trees or shrubs.

**Sclerophyllous:** Leatherlike; thick, hard, resistant to water loss. Describes leaves such as those that characterize chaparral species.

**Sedge:** Grasslike or rushlike herb of the family Cyperaceae. Distinguishable from grass by its leaves, commonly three-ranked (occur at three sides of the stem). Grass leaves are always two-ranked. Sedge stems are commonly angled, often triangular in cross-section.

**Shrub:** Short, low-branching woody perennial; sometimes several main stems arise from a central point in the root system. Multiple stems, though not unique to shrubs, are often cited as the defining characteristic. Genetic shortness is the only true criterion. Woody plant species generally accepted as short, or less than 15 ft (5 m).

**Succulent:** Characteristic of water storage in the cells of stems or leaves, making these parts soft and thick in texture.

**Understory:** Plants with canopy heights at a lower level than the tallest vegetation layer in a vegetation unit.

**Vegetation layer:** Vertical level of canopy or plant crowns that can be seen in vegetation. For example, the overhead canopy of trees constitutes a layer; a canopy of brush constitutes another layer. Some vertical layers are easy to distinguish, others blend with one another and are distinguishable only through careful observation.

**Woodland:** Plant community dominated by tree crowns that for the most part are not touching, forming an open canopy whose overstory crown cover is between 25 and 60 percent. Any kind of tree can form a woodland.

## INTRODUCTION

The Vegetation Classification System for California is an unbiased system of defining and naming units of vegetation. The concept was devised by an interagency, interdisciplinary team (Paysen and others 1980, 1982). The system derives its uniqueness from its impartiality to any particular agency or resource discipline, thus providing a long-needed link between diverse classification methodologies. The user must meet only three system rules: to identify accurately (preferably by species) the herbs, shrubs, and trees of the classification site; to understand the concept of a plant community as it relates to the system; and to be able to differentiate these communities on the ground.

The classification system is universal. The system does not require a specific vegetation, zone, or region. The system, for example, has been adopted by the State of Hawaii in its cataloging of tropical vegetation (Buck and Paysen 1984). It is compatible with the Land (Site) Classification System for the United States, developed by the Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture (Driscoll and others 1983), and can be a source of input to the international system for classifying and mapping vegetation (United Nations Educ. Sci. Cult. Org. 1973).

This report explains the design and use of the Vegetation Classification System for California. It offers practical suggestions for simplifying the classification process.

## DESIGN OF THE SYSTEM

The user should first understand the basic design of the classification system and what it classifies.

### Basic Classification Unit

The basic unit of this classification system is the plant community −a general term for a group of plants that, because of its composition and apparent link to a specific set of environmental conditions, has an observable group identity. Such groups are observable at many levels of community organization. A community organization can be seen within a vegetation layer on a small site (the microflora beneath a dandelion rosette, for one example) or the plant cover on a large region of land (the plant community of the Great Basin region of the United States, for another). Thus, different plant communities are discernible at different levels of organization. *Plant community* as interpreted by the Classification System for California is intermediary to these two extremes *(fig. 1)*.

The term *plant community* as defined by this system is site-specific: that community organization which is observable by standing at one point and viewing the surrounding vegetation layers. The community's character is distinguishable by the unique combination of plant species that compose each vegetation layer. In this report, the term *plant community* as defined above is restricted to the Vegetation Classification System for California. No other interpretation is implied.

### Structure of the System

The system has four hierarchical levels. In order of increasing descriptive detail, they are:

- Formation
- Subformation
- Series
- Association

Generally, each Formation is composed of several Subformations; each Subformation, several Series. A plant community can be classified broadly (the Subformation level) or specifically (the Association level). Any level of the hierarchy can be qualified by the *Phase* category to dilineate (sic) functional or technical detail *(fig. 2)*. To distinguish classes and levels in the system as it is applied to California, consult the criteria *(tables 1 and 2)*.

*Formation* is the broadest level in the hierarchy. Classes at the Formation level are defined according to physiognomic criteria, or physical appearance. For example, a plant com-

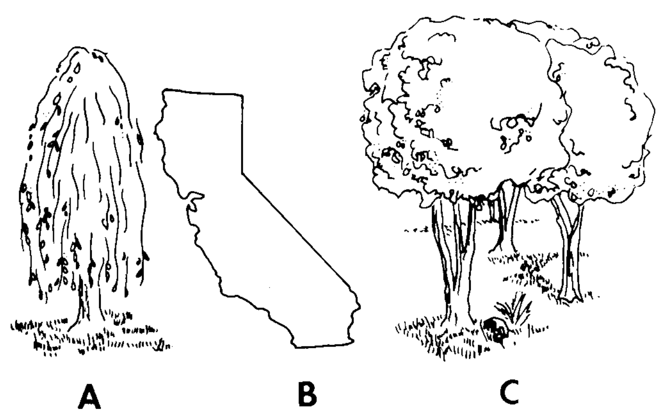


**Figure 1**−Plant community is a general term applied at any scale or level of precision. For the purposes of this classification system, community levels (A) and (B) are too narrow and too broad, respectively. Community level (C) should be applied.

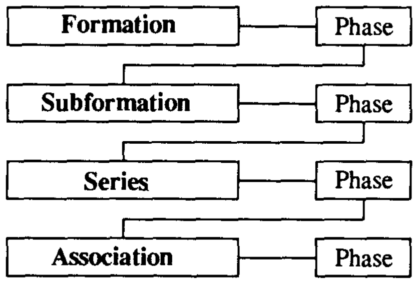


**Figure 2**–Components of the vegetation classification system. Four hierarchical levels constitute the basic classification categories. The optional Phase category qualifies classes at any level in the hierarchy.

munity with a closed forest structure obviously belongs to the closed forest Formation. Five Formations currently are recognized in California:

- Closed forest
- Woodland
- Shrub (including succulent-stemmed species such as cactus, not normally classified as shrubs)
- Dwarf shrub
- Herbaceous

To determine the Formation for a plant community, consult the key *(fig. 3)*.

*Subformation* is determined by the leaf and stem morphology (structure) of the dominant species in the overstory of a plant community *(fig. 4)*. For example, with the closed forest Formation, some plant communities are dominated by needle-leaved trees, others by broadleaved trees; these communities belong to the conifer and broadleaf Subformations, respectively. To identify each Subformation in California, consult the criteria *(table 1)*.

*Series is* determined by the dominant overstory species in a plant community (usually that species which constitutes more than 50 percent of the total overstory crown cover) *(fig. 5)*. For example, any community whose dominant overstory species is interior live oak is in the interior live oak Series.

Occasionally, Series reflects the genus of the dominant overstory vegetation when it seems impractical to distinguish species. Several species in the genus *Ceanothus* may be similar in morphology and play essentially the same ecological role, but at different locations. In this case, the benefits gained by identifying individual species may not be worth the added detail in a list of Series names for an area. On the other hand, individual species within a genus (say, *Ceanothus leucodermis*) may be distinct or important enough to be classified in a Series separate from other species within its genus. When in doubt, classify by species, not genus.

A list of suggested Series names published earlier for use in southern California (Paysen and others 1980) has been expanded, and other lists are in progress for other parts of the State. Ideally, a set of standard Series names should be established and periodically updated by committee review. Until

Table 1–*Class identification criteria for the Formation and Sub formation levels of the classification system*

| | |
|---|---|
| | **Formation** |
| Closed Forest | Overstorv of deciduous or evergreen trees; 15 ft (5 m) tall; crowns mostly interlocking: overstory crown cover 60 percent or greater |
| Woodland | Overstory of deciduous or evergreen trees; 15 ft (5 m) tall; crowns not touching; overstory crown cover 25 to 60 percent |
| Shrub | Overstory of shrubs 1½ to 15 ft (0.5 to 5 m) tall at maturity (includes succulent-stemmed species); overstory crown cover 25 percent or greater |
| Dwarf Shrub | Overstory of shrubs 1½ ft (0.5 m) tall or less at maturity; overstory crown cover 25 percent or greater |
| Herbaceous | Overstory of grasses, sedges, rushes, forbs, or freshwater plants; herbaceous crown cover 2 percent or greater |
| | **Subformation** |
| Conifer Forest | Overstory dominated by conifers |
| Broadleaf Forest | Overstory dominated by broadleaf species |
| Conifer Woodland | Overstory dominated by conifers |
| Broadleaf Woodland | Overstory dominated by broadleaf species |
| Succulent Woodland | Overstory dominated by succulent-stemmed or succulent-leaved species |
| Chaparral | Overstory dominated by plants that have sclerophyllous leaves and woody stems and twigs, such as chamise |
| Soft Chaparral | Overstory dominated by plants that have softly sclerophyllous leaves and semiwoody stems, such as black sage |
| Woody Shrub | Overstory dominated by plants that are as Chaparral but have membranous leaves, such as rose spp. |
| Succulent Shrub | Overstory dominated by plants that have succulent leaves or succulent stems, such as *Opuntia* spp. |
| Cushion Plant | Overstory dominants are cushion plants, usually of genus *Eriogonum* |
| Woody Dwarf Shrub | Overstory dominants are nonsucculent dwarf shrubs that are not cushion plants |
| Succulent Dwarf Shrub | Overstory dominants are succulent dwarf shrubs |
| Graminoid | Grasses and grasslike plants dominate |
| Forb | Broadleaved herbaceous plants dominate |
| Aquatic | Dominants require water for structural support |
| Cryptogam | Dominated by Cryptogam species |

then, users of the system should document exactly which dominant overstory species are included in the Series designations that they use.

An *Association* is a plant community, specified by the dominant overstory species (the Series designation) plus the dominant species in each subordinate layer (midstory, understory) *(fig. 6)*. It is the most specific classification level in the system hierarchy. It reflects the character of all vegetation layers in a plant community. The nomenclature of the Association reflects the dominant species in each layer; for example, pinyon pine/mountain mahogany/phlox, or interior live oak / manzanita / needlegrass. Because of their great number, the Associations found in California cannot be described here; they must be identified by the classifier in the field.

The classifier should strive to discriminate as many layers as necessary to distinguish the unique character of a community. However, caution against extremes. Do not associate a distinct layer with every conceivable height class in a plant community. Doing so will severely limit the value of a classification. Overzealous classification of communities will lead only to a cumbersome data base. The supposedly distinct communities will be difficult to bring into relationship with

Table 2–*Rules of nomenclature for plant Associations and Series*

| Classification level and criteria | Nomenclature rule | Example |
|---|---|---|
| **Association** | | |
| Single-layered | Name by dominant species | Chamise Association, Red fir association |
| Multilayered | Name by dominant species in each layer; start with the herb layer, if present. Separate layer names with a slash (/). | Jeffrey Pine/Sagebrush/Squirreltail grass Association |
| Multilayered overstory | Name overstory layer by component layers | Bigcone Douglas-fir Canyon live oak Associa-tion |
| Single species dominant in a layer | Name by dominant species in the layer | Jeffrey pine/Sagebrush Association (overstory dominated by Jeffrey pine; shrub laver dominated by sagebrush) |
| Mixed species dominant in a layer; proportion of layer cover allocated to each codominant species is within 10 percent of that of each of the other codominants | Name the layer by codominant species separated by hyphens. Where distinct synusia within a layer characterize an Association, treat as codominants. | Jeffrey pine-White fir/Greenleaf manzanita Association; Chamise-Scrub oak Association |
| Sparse overstory layer; species is ecologically significant but insufficient to define a Formation (10 to 25 percent cover) | Include sparse laver in parentheses | Foxtail fescue-Black mustard (Blue oak) Association; Plicate coldenia/Desert dichoria (Creosote bush) Association |
| **Series** | | |
| Association overstories dominated by a widespread species in an ecological zone or region, or by a species with distinct geographic/environmental affinities | Name by unique Series name for the domi- nant species | *Ceanothus leucodermis* Series; Red fir Series |
| Association overstories dominated by a locally important species or species that has ecological homologues in the same genus in adjacent ecological regions, zones, subregions, etc. | Name by genus of the dominant species | Ceanothus Series<br>Manzanita Series<br>Sagebrush Series<br>Cypress Series |
| Mixed species dominant in overstory; proportion of overstory allocated to each codominant species is within 10 percent of that of the other codominants | Name the Series by codominant species separated by hyphens. Where distinct synusia within the overstory characterize a series, treat as codominants | Jeffrey pine-White fir Series<br>Chamise-Scrub oak Series |
| Multilayered overstory in Associations | Series name is a combination of component layers | Bigcone Douglas-fir; Canyon live oak Series |
| **Association and Series** | | |
| Local usage | Use common names if available | Foxtail fescue-Black mustard (Blue oak) Association<br>Manzanita Series |
| Official correspondence outside of administrative region, community documentation, scientific reports, etc. | Use Latin or scientific names | *Festuca megalura-Brassica nigra (Quercus douglasii)* Association<br>*Arctostaphylos* Series |

one another, and will be hard to deal with operationally. Avoid this pitfall. Try to recognize simple tree, shrub, and herb layers, then characterize distinctions within each layer. For example, some ecosystems are characterized by plant communities of two or more tree layers, each composed of distinct species that occupy different vertical layers within that plant community *(fig. 7).* A maximum of four layers should be sufficient to describe Associations in California.

*Phase,* used in conjunction with the other levels of the hierarchy, accounts for the variability within classes. For example, Phase can specify growth stages such as size class of timber *(fig. 8),* or condition of vegetation such as percent of dead fuel in chaparral. The Phase category is intentionally adaptable and flexible. This category links the Vegetation Classification System for California with traditional inventories. You can design Phase categories that correspond to commonly accepted timber, wildlife habitat, fuel, and other classification schemes in specific geographic areas. However, Phase schemes must be clearly documented and consistent in any given application *(Appendix).*

A community can be described by more than one Phase category. The Phases illustrated for the closed forest Formation *(Appendix),* for example, are based on six d.b.h. size class ranges, two overstory cover ranges, and five understory ranges. A Phase code or index can simplify the field recording process. A community in the closed forest Formation might be dominated by trees that average 15 inches in diameter and provide a crown cover of 90 percent. Understory vegetation

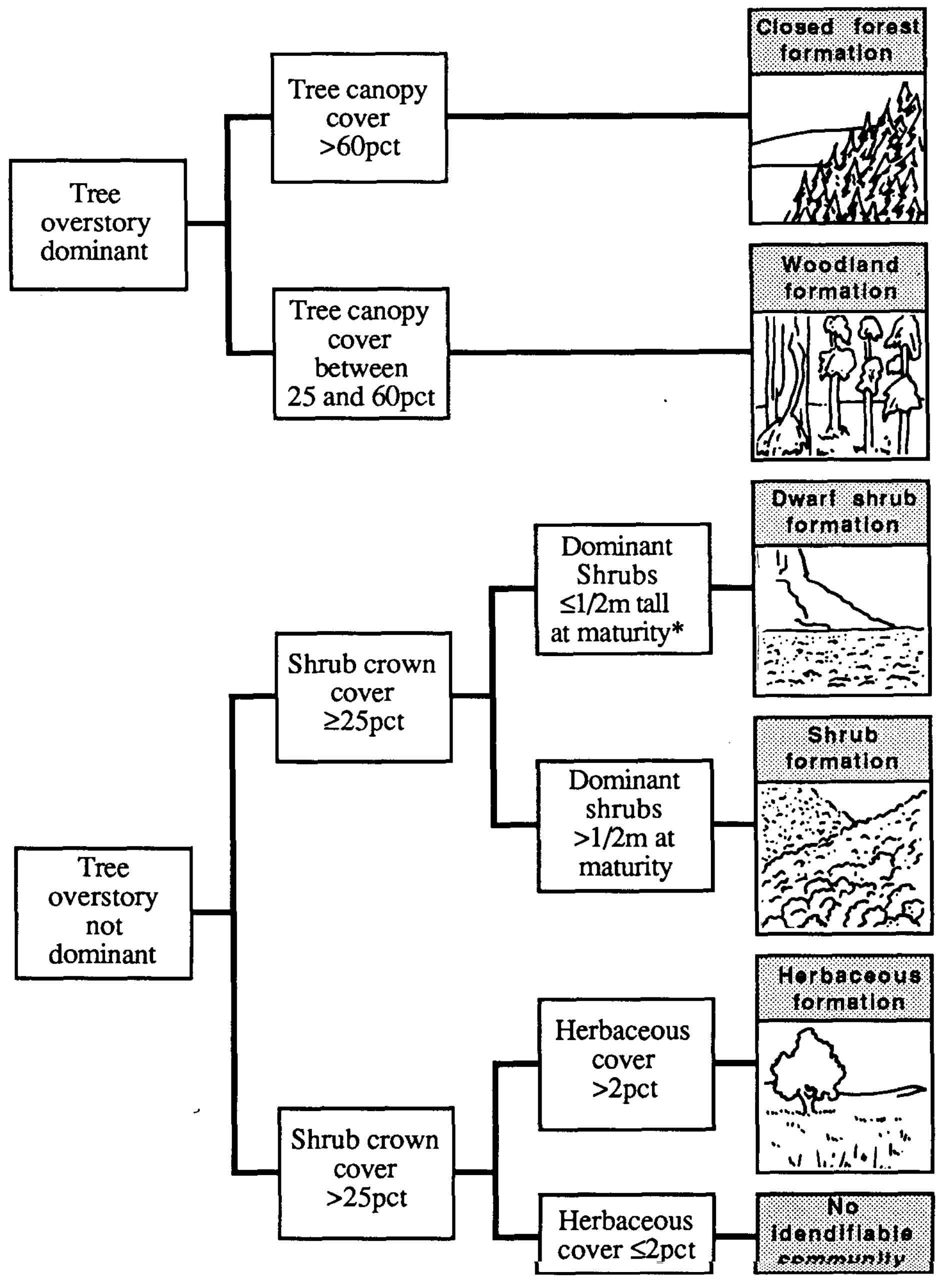


**Figure 3**–Key to Formations. See *Table 2* for tree or shrub crown cover between 10 and 25 percent.

* 10-20 years after disturbance for most sites, more for Alpine

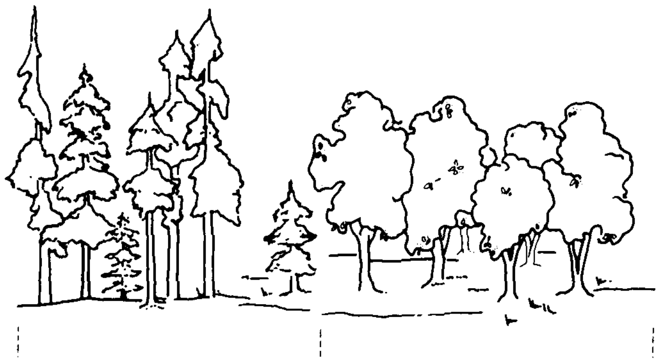

**Figure 4**–Two distinct Subformations within the Closed Forest Formation, distinguished by the leaf and stem morphology of the dominant overstory species, are Conifer and Broadleaf.

**Figure 5**–Two communities that represent two distinct Series within the Conifer Subformation, since different conifer species dominate the overstory in the two communities.

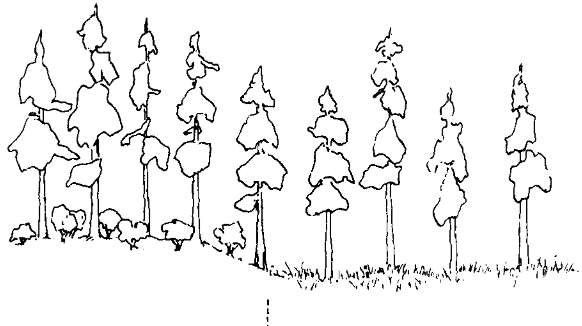

**Figure 6**–Two communities that represent two distinct Associations within a Series. They share the same dominant overstory species, but differ in understory species.

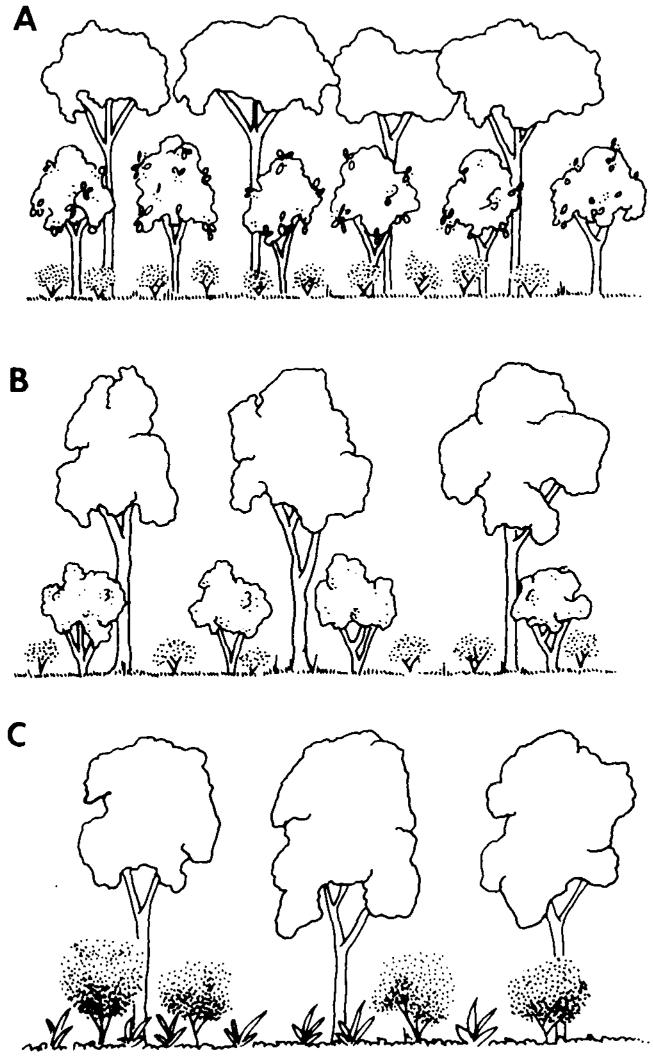


**Figure 7**–Some communities may have more than one tree (A), shrub (B), or herb (C) layer. These layers emerge from species characteristics, rather than transient differences in age among individuals.

might provide a cover of 40 percent. Based on the sample Phase categories in the *Appendix,* the community within the closed forest Formation would be designated 4-3-3.

## IDENTIFYING THE PLANT COMMUNITY

Proper use of this classification system requires a sound grasp of the plant community concept. A plant community is defined as an assemblage of plants of characteristic species composition that occurs under a uniform set of environmental conditions (Ecol. Soc. Am. 1952, Schwartz and others 1976). However, subjectivity in identifying a community is inescapable. For this reason, some practical guidelines are offered.

The plant community may vary in size, but each Formation must have in its overstory layer enough vegetation to establish a measure of cover. A single plant would not normally be enough: a single-tree community would always have 100 percent crown cover in the overstory–hardly reason enough to call it a closed forest. Shifts in species composition of any layer of a plant assemblage must be extensive enough to establish distinct, new overstory/understory relationships for multilayered communities. One manzanita bush beneath an extensive overstory of Jeffrey pine is not enough to establish a unique overstory/understory relationship in the community sense; the relationship exists only in the single plant sense.

The plant community may vary in shape. For example, plant communities associated with riparian systems may be linear, sometimes as narrow as the width of a stream bank. A community that springs up along a fence row would have a linear shape. The plant community in a small wet meadow may be round; communities in a vernal pool may look like a set of concentric rings; a community with a ridgetop affinity may look like a broken set of hound's teeth. The possibilities are endless.

A candidate community must be evaluated in relation to surrounding communities and to its physical environment. The distribution patterns of plant species in surrounding communities and the arrangement of environmental factors are important clues to the individuality of a plant assemblage.

The bounds of the plant community are determined by the interaction of several environmental factors, including soil, light, moisture regime, natural and human disturbance, slope, aspect, and biogeographic history. Changes in these factors over a landscape may also create apparent changes in vegetation *(figs. 9, 10).* The effects of some environmental factors are obvious; for example, a plant community may appear on the north aspect (direction of slope), but not the south. The importance of some physical features as clues to environmental change may not be obvious at first. For example, rocks and swales often affect the moisture regime; or the aspect of a slope along with its steepness and shape (concave, convex) can affect moisture, light, soil depth, and other conditions. Therefore, gently undulating terrain may produce a distinct pattern of plant communities *(fig. 11).* And the top of a hogback, or sharply crested ridge, may have a plant community that is different from the communities on the side slopes. Therefore, it is important that the classifier develop a sensitivity to changes in the environment and to physical patterns over the landscape.

Precise identification of community boundaries is not important in the classification process. Boundaries become critical to the inventory process and when mapping plant communities or estimating areas covered by communities. When moving from one community to another, it is sufficient simply to describe a change in composition.

Community boundaries may be distinct, as where disturbances such as fire, logging, or clearing have caused radical vegetation changes. Or these vegetation changes may be gradual, in which case community boundaries are less precise. Such examples are ecotones–transition zones–between two distinct communities, or transitional ecological zones where a gradual shift occurs in the predominant plant community.

The key to correctly distinguishing communities is proper visual perspective. Observe the surrounding area. Look for overstory and understory patterns. Often, you must move beyond the specific area of concern to achieve the needed perspective. Sometimes natural variability in a community is distorted when viewed from one location. Is a particular cluster of one species signaling a unique community, or simply representing the nature of species distribution within a larger, more complex community *(fig. 12)?* It usually is beneficial to survey an area to determine species dominance and apparent species-site relationships before attempting to classify individual communities *(fig. 13).*

Ecotones exist between two plant communities. Sometimes these areas are imprecise and hard to distinguish. At other times, an ecotone supports vegetation unique enough to be designated a distinct community. Ecotones can be small, with quick transition from one vegetation complex to another; or large, with gradual transition. Ecotones can be identified relative to any plant species or vegetation layer. They are often associated with a predominant overstory species.

Normally, the rules for defining a community (based on percent cover and dominance) and accurately recognizing change in a vegetation layer are sufficient to determine if an ecotone qualifies as a distinct community. However, sensitivity to the nuances of natural variability and significant change help to prevent overclassifying plant communities.

Difficulties in determining transition zones arise when species distribution patterns are obscure, with no observable

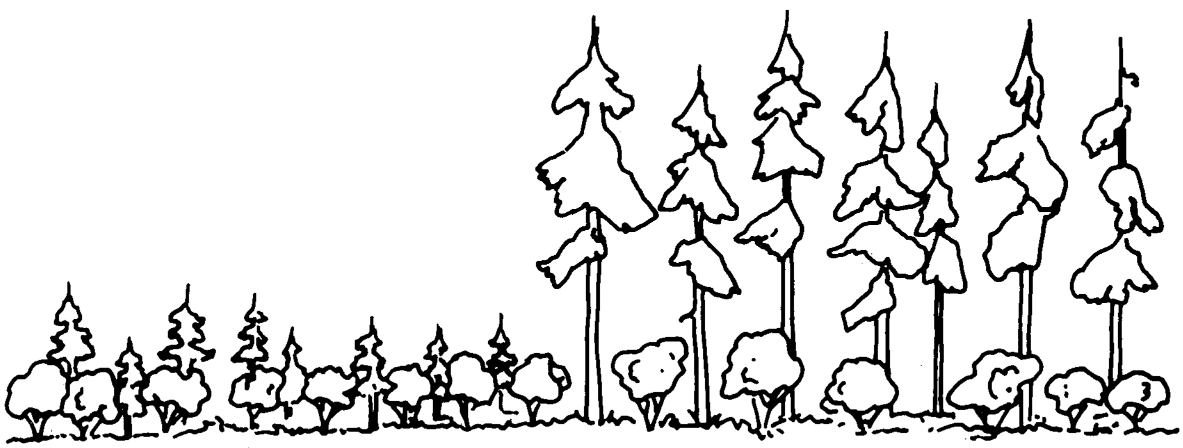

**Figure 8**–Communities may share the same dominant overstory and understory species and represent the same Association, but Phases could vary due to size or age differences. The Phase category extends classification to those characteristics that are important to the classifier.

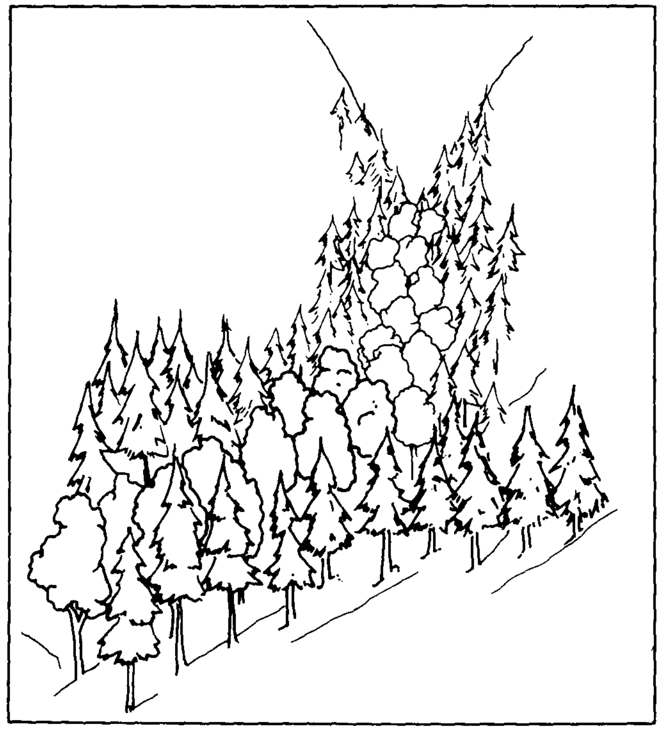

**Figure 10**–At least two distinct communities are represented here. Broadleaf trees occupy the canyon where soil is deeper and moisture is more available. Conifers occupy the higher, drier slopes.

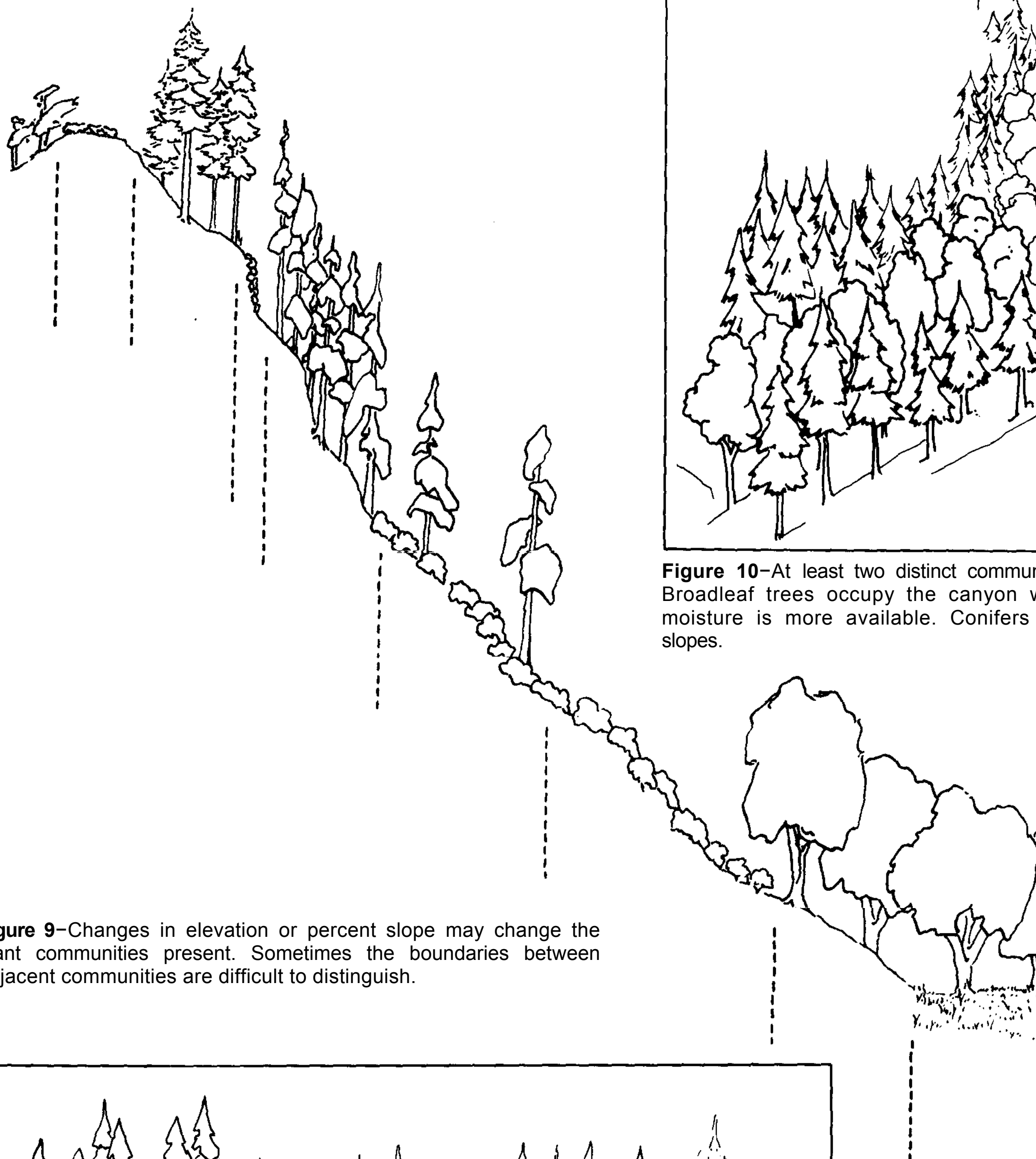

**Figure 9**–Changes in elevation or percent slope may change the plant communities present. Sometimes the boundaries between adjacent communities are difficult to distinguish.

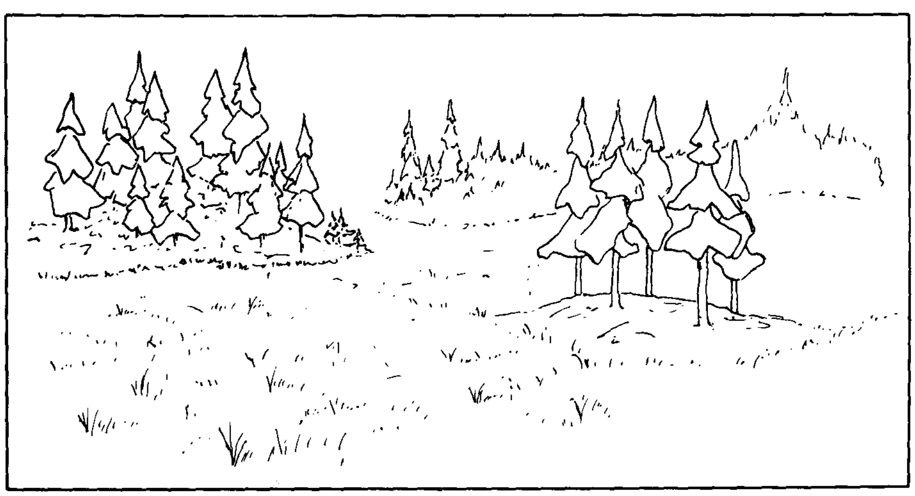

**Figure 11**–The two groups of trees in the middle foreground may represent the same plant Associations, but are distinct communities separated by the herbaceous community.

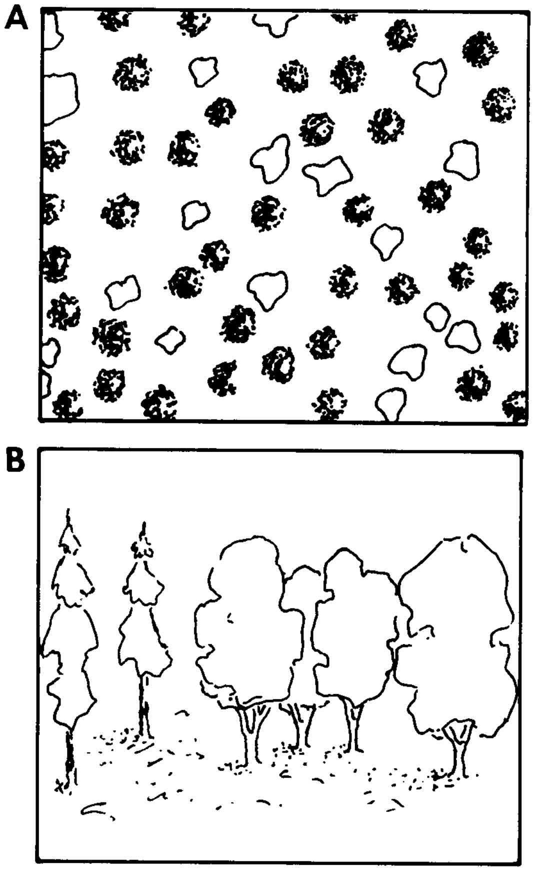


**Figure 12**–The simulated aerial view (A) of a Woodland community with clumped patterns of conifer and broadleaf trees in the overstory shows why it is important to evaluate what you are looking at in relation to what surrounds you. The pocket of broadleaf trees in (B) could well be a small, unique community, but is actually a pattern element from the community in (A).

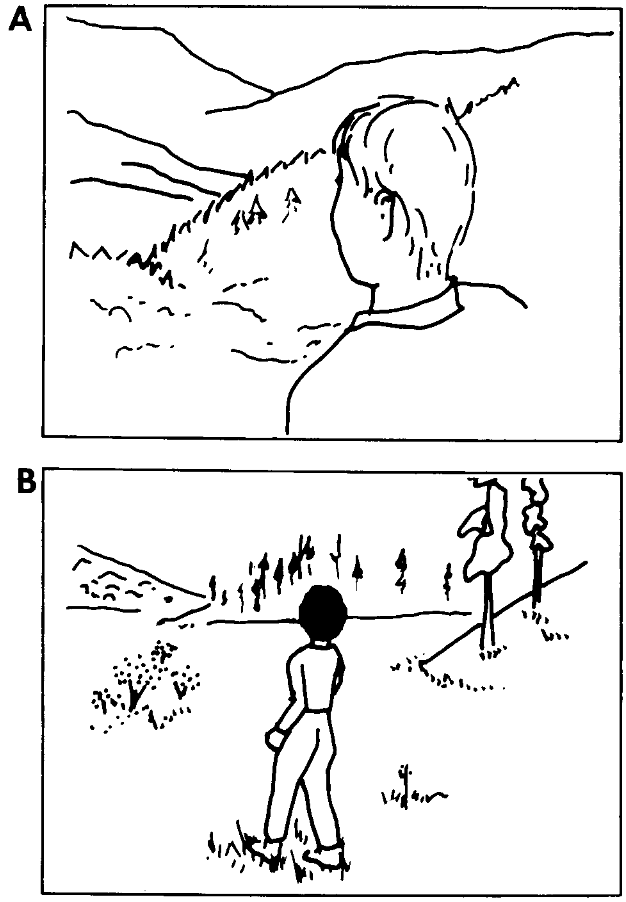


**Figure 13**–Before attempting to classify a community, establish some perspective with regard to species dominance patterns over the landscape. Gain a broad visual perspective if possible (A), and walk through communities in an area to establish a sense for possible site relationships (B).

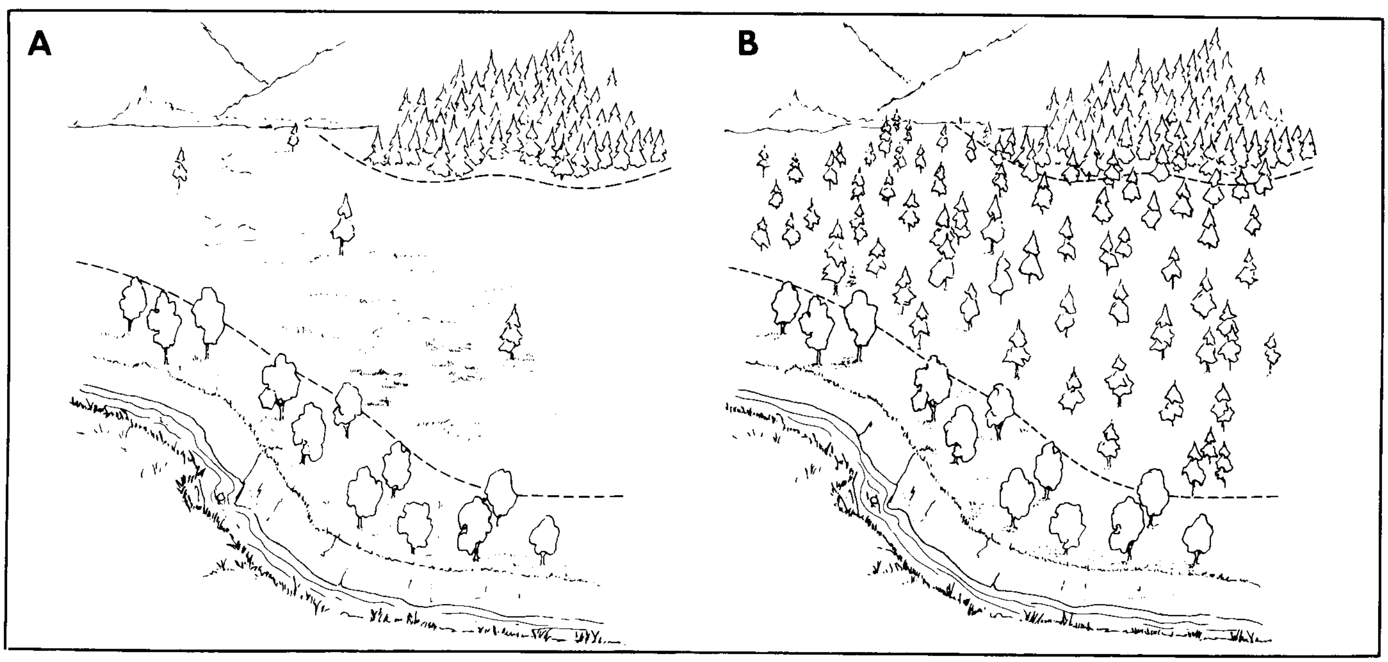


**Figure 14**–The sharp breaks between conifer, herbaceous, and broadleaf communities (A) simplify delineation of community boundaries even though isolated conifers occur in the grassy area. However, community boundaries become less clear when density decreases more gradually (B). Look at understory patterns as well as the crown cover of overstory dominants when identifying communities.

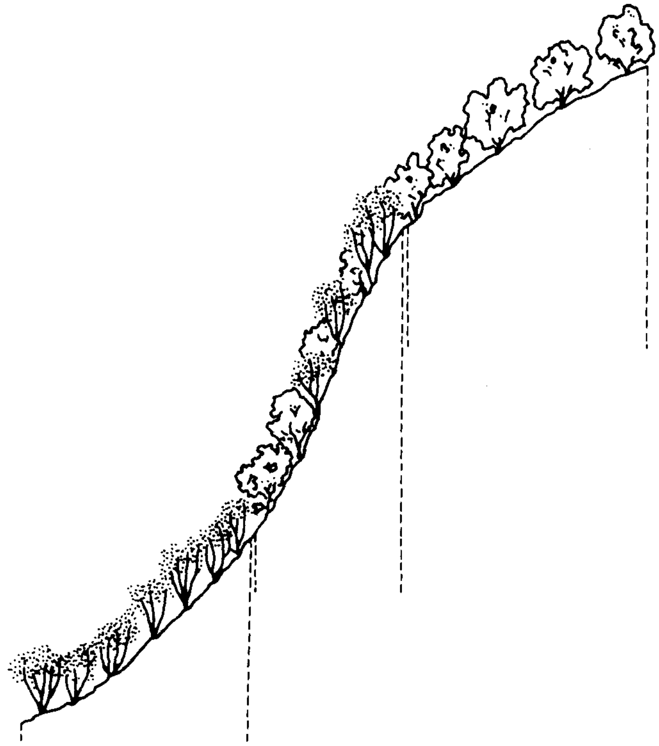

**Figure 15**–The ecotone – or transition zone – between two distinct communities may or may not be classified as a distinct community. Though not absolute determinants, clues are size of the zone and whether or not the vegetation mix is repeated over the landscape.

environmental basis for detecting a unique community. For example, the vegetation between two species-rich communities may contain representatives of both communities; distinctions between the transition zone and the two communities may be difficult to pin d own. In another instance, a transition may be between two communities whose plants are characteristically distributed in clusters, or pockets, of one species or the other. Looking at the boundary of one of these pockets, you may wonder if the seemingly distinct change in a vegetation layer is signaling the existence of a different community, or is it yet another instance of a community already defined? In both of these cases, the character of the transition zone must be carefully assessed, particularly in relation to the communities on either side of it *(fig. 14).*

The size of a transition zone and the extent to which its species complement is repeated in the landscape are helpful in determining if vegetation in that ecotone rates community status. When the vegetation of an ecotone does not rate community status, the logical boundary between two adjacent communities may be on either side or within the area of changing vegetation *(figs. 15, 16).*

In defining a community, look for a unique cause and effect relationship between the community and its environment. Incorporate as much information as possible about the history of the site. Realize, however, that obvious environmental causes may not always be associated with vegetation changes. You must rely principally on recognition of vegetation patterns.

## *Naming the Plant Community*

The rules for naming a plant community and identifying a plant community are identical. The dominant species in a layer or layers of vegetation, which identify a community at a given classification level, are used to name the community at that classification level. For example, the dominant overstory species that identifies a community Series is also used as the Series name.

The Association name is the most informative. It is also the most complex classification level and the one with which users of the system will have the most difficulty–both in identifying and in naming. Therefore, more rules are required to name Association than any other system level. All rules are logical combinations of basic naming conventions for a specific layer of vegetation. These comprehensive rules of nomenclature–applicable to different situations-have been compiled, with examples of each *(table 2).*


**Figure 16**–Transition zones. A distinct pattern of vegetation characterizes an identifiable zone between conifer and broadleaf communities (A), which might qualify as a distinct community. In contrast, the nondescript area between the conifer and broadleaf communities (B) simply represents a change from one community to another.

## *Survey Procedures for Classifying Vegetation*

Any technique that provides a properly classified community is sufficient. A strict, formal procedure is not really necessary. Classification of community structure and composition is often a matter of simple observation; at other times, sampling techniques may be necessary to determine species dominance in complex communities.

The procedures used depend on the size and topography of the area inventoried, the level of classification, the complexity of the vegetation, and the skill of the person using the system. Formation and Subformation designations can be based on aerial photographs with a minimum of ground verification. Where vegetation types are fairly uniform, Series and (to some extent) Associations may also be identified on aerial photos. The more detailed the classification, the greater the need for verification.

The percent of crown cover can be estimated in several ways. One simple method is to delineate a square area, either on the ground or on an aerial photograph. Then mentally move into one corner of the square all individuals of a given species from the canopy layer being sampled. By visualizing the individuals grouped crown to crown, you can estimate what percent of the area of the square the group occupies. Another method is to use a dot grid on an aerial photograph. If accuracy is important, the ground surface area covered by each plant can be measured directly.

## *Steps to Classification*

Regardless of the inventory technique, the classification process is the same. The steps in classifying a plant community to the Association level are:

1. Identify the limits of the community you wish to classify by noting understory/overstory vegetation patterns as they have been influenced by environmental factors.

2. Identify the Formation *(fig. 3)* by determining the dominant overstory in the community to be closed forest, woodland, shrub, dwarf shrub, or herbaceous.

3. Identify the Subformation by studying the leaf and stem morphology of the dominant overstory vegetation *(table 1).*

4. Identify the Series by determining the dominant or codominant overstory species as determined by the 10 percent rule *(table 2).*

5. Identify the most characteristic associated species. If the stand is multilayered, identify the dominant species in each layer (tree, shrub, herbaceous). Designate an Association name that reflects the order of dominance in the Association as specified by the nomenclature *(table 2).*

6. Optionally, classify the community or portions of the community by Phase categories.

In order to complete step 1, you will in practice need to assess steps 2 to 6, since the limits of the community will be defined by changes in vegetation characteristics. As you become familiar with this system and its classification procedure, the process of evaluating a site will become increasingly automatic.

# APPENDIX

## SAMPLE PHASES CODED FOR THE FIVE CLASSIFICATION FORMATIONS

### Closed Forest

| Size (d.b.h., 2 in) | Overstory cover (pct) | Understory cover (pct) |
|---|---|---|
| 1. <1 | 1. <25 | 1. <10 |
| 2. 1-5 | 2. 25-60 | 2. 10-25 |
| 3. 6-11 | 3. >60 | 3. 26-50 |
| 4. 12-21 | | 4. 51-70 |
| 5. >21, <180 yrs | | 5. >70 |
| 6. >21, >180 yrs | | |

### Woodland

| Size (d.b.h., 2 in) | Overstory cover (pct) | Understory cover (pct) |
|---|---|---|
| 1. <1 | 1. <25 | 1. <10 |
| 2. 1-5 | 2. 25-60 | 2. 10-25 |
| 3. 6-11 | | 3. 26-50 |
| 4. 12-21 | | 4. 51-70 |
| 5. >21 | | 5. >70 |

### Shrub

| Overstory cover (pct) | Understory cover (pct) | Annual cover (pct) | Litter cover (pct) |
|---|---|---|---|
| 1. <5 | 1. <5 | 1. <2 | Expressed in percent cover and composition |
| 2. 5-10 | 2. 5-10 | 2. 2-10 | |
| 3. 11-25 | 3. 11-25 | 3. 11-25 | |
| 4. 26-50 | 4. 26-50 | 4. 26-50 | |
| 5. 51-70 | 5. 51-70 | 5. 51-70 | |
| 6. >70 | 6. >70 | 6. >70 | |

### Dwarf Shrub

Cover (pct)

| | |
|---|---|
| 1. <2 | 4. 26-50 |
| 2. 2-10 | 5. 51-70 |
| 3. 11-25 | 6. >70 |

### Herbaceous

| Productivity | Living vegetation cover (pct) | Litter cover (pct) |
|---|---|---|
| Pounds per acre (optional) | 1. <2 | 1. <25 |
| | 2. 2-25 | 2. 25-50 |
| | 3. 26-50 | 3. >50 |
| | 4. 51-70 | |
| | 5. >70 | |

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A system for classifying plant communities has been developed. Guide lines for recognizing plant communities in the field require that a practitioner be able to identify and inventory plant species. No formal sampling technique is required. Rules for naming plant communities to one or more of four different classification levels are based upon cover dominance by species in each vegetation layer found in a given community. A flexible phase category enhances the description of plant communities or links classification categories to other systems of classifying vegetation.

*Retrieval Terms:* vegetation classification, plant community classification, vegetation types, plant communities



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