

## Appendix A. Glossary of Ecological Terms

This was taken directly from WInthers et al. 2005, then edited for updating and to reflect use in the Pacific Northwest Region of the Forest Service.

**abiotic.** Pertaining to the nonliving parts of an ecosystem, such as soil particles, bedrock, air, water (Helms 1998).

**abundance.** The total number of individuals of a taxon or taxa in an area, volume, population, or community. Often measured as cover in plants (Lincoln et al. 1998).

**accuracy.** The degree to which a measured quantity approaches the true value of what is being measured (Lincoln et al. 1998). **accuracy assessment.** The process by which the accuracy or correctness of an image (or map) is evaluated.

**alliance.** (1) A grouping of associations with a characteristic physiognomy, and sharing one or more diagnostic species, which, as a rule, are found in the uppermost or dominant stratum of the vegetation (Jennings et al. 2004). (2) A physiognomically uniform group of associations sharing one or more diagnostic (dominant, differential, indicator, or character) species that, as a rule, are found in the uppermost stratum of the vegetation (FGDC 1997).

**arc.** In GIS, within a spatial context, a locus of points that forms a curve that is defined by a mathematical expression (FGDC 1998).

**attribute.** One of a set of descriptive terms; a characteristic (Lincoln et al. 1998).

**bedrock geology.** Characteristics of the consolidated material at the Earth's surface or that immediately underlies soil or other unconsolidated, surficial deposits, specifically lithology (rock type), weathering, structure (e.g., fracturing or bedding), and stratigraphy (the rock-unit age and designation).

**business needs.** Ongoing tasks related to a particular business or project and the information and other support contributing to the completion of these tasks.

**canopy closure.** The proportion of ground, usually expressed as a percentage, that is occupied by the perpendicular projection downward of the aerial parts of the vegetation of one or more species. It usually refers to the tree life form of the uppermost canopy, as seen from above, and cannot exceed 100 percent. It is similar in concept to absolute canopy.

**canopy cover.** (1) The proportion of ground, usually expressed as a percentage, that is occupied by the perpendicular projection downward of the aerial parts of the vegetation or the species under consideration. The additive cover of multiple strata or species may exceed 100 percent (FGDC 1997). (2) The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included (SRM 1998, USDA NRCS 1997). Canopy cover is synonymous with canopy closure (Helms 1998). For woody plants, canopy cover is synonymous with crown cover (USDA NRCS 1997, Helms 1998). 98 Terrestrial Ecological Unit Inventory Technical Guide

**canopy cover, absolute.** The canopy cover of a species in a plant community, regardless of the presence of other species. **canopy cover, relative.** The canopy cover of a species in a plant community, expressed as a percentage of the total cover of all species. **canopy structure.** The arrangement of vegetation layers

in a plant community. class. A group of individuals or other units similar in selected properties and distinguished from all other classes of the same population by differences in these properties (Buol et al. 1973).

classification. (1) The process of grouping similar entities together into named types or classes based on shared characteristics. (2) The grouping of similar types according to criteria that are considered significant for this purpose. The rules for classification must be clarified before identifying the types within the classification standard. The classification methods should be clear, precise, quantitative (where possible), and based on objective criteria so that the outcome would be the same whoever performs the definition (or description). Classification necessarily involves definition of class boundaries (FGDC 1997, citing UNEP/FAO 1995).

climax. A self-replacing plant community or species with no evidence of replacement by other plants. climax plant community. The stable community in an ecological succession that is able to reproduce itself indefinitely under existing environmental conditions in the absence of disturbance. Viewed as the final stage or end-point in plant succession for a site. The climax community develops and maintains itself in steady state conditions.

community. (1) A general term for an assemblage of plants living together and interacting among themselves in a specific location; no particular ecological status is implied. (2) Any group of organisms interacting among themselves (Daubenmire 1978). community composition. The kinds, absolute amounts, or relative proportions of plant species present in a given area or stand. It can be described qualitatively or quantitatively. The latter may use either absolute amounts or relative proportions of the plant taxa present. The amount of each plant taxon should be expressed as percent cover (FGDC 1997, Jennings et al. 2004).

community type. An aggregation of all plant communities with similar structure and floristic composition. A unit of vegetation within a classification with no particular successional status implied.

component. A subset of an ecological type used to describe the spatial arrangement of an ecological type within the map unit. A component may represent a narrower range of characteristics than the ecological type for which it is named.

composition. (1) The amount or proportion of the plant species on a given area (SRM 1989). (2) A list of the species that comprise a community or any other ecological unit (Lincoln et al. 1998).

constancy. The number of occurrences of a species in a group of plots divided by the total number of plots, expressed as a percentage. All plots must be the same size. For example, if a particular community has 10 plots and a species is found in 8 of the 10, the constancy of that species is 80 percent.

coordinates. In mapping, coordinates are pairs of numbers expressing horizontal distances along orthogonal axes; alternatively, triplets of numbers measuring horizontal and vertical distances (FGDC 1998).

cover. Usually meant as canopy cover that is the gross outline of the foliage of an individual plant or group of plants within a stand or plot. Expressed as a percent of the total area of the plot and may exceed 100 percent if more than one layer is considered. See canopy cover and vegetation cover.

cover type. A designation based on the plant species forming a plurality of composition within a given area (e.g., oak-hickory) (FGDC 1997). The Society of American Foresters Forest Cover Types (Eyre 1980) and the Society for Range Management Rangeland Cover Types (Shiflet 1994) are examples of cover types. data element. A logically primitive item of data (FGDC 1998). delineation. The process of separating map units (repeating sets of polygons) using a consistent set of criteria.

diagnostic species. Any species or group of species whose relative constancy or abundance clearly differentiates one type from another (Jennings et al. 2004). This definition implies that diagnostic species must be determined empirically through analysis of plot data (Mueller-Dombois and Ellenberg 1974). differential species. A plant species that, because of its greater fidelity in one kind of community than in others, can be used to distinguish vegetation units (Gabriel and Talbot 1984 as cited in Jennings et al. 2004).

differentiating characteristics. Properties selected as the basis for grouping individuals into classes (Buol et al. 1973). digital elevation model. Digital data file containing an array of elevation information over a portion of the Earth's surface (USDA Forest Service 1999).

digital orthophoto quadrangle. Digital representation of an aerial photo with ground features located in their "true" positions (Clarke 1999).

division. (1) In terrestrial ecological unit inventory, an ecological unit in the ecoregion planning and analysis scale of the National Hierarchy Framework corresponding to subdivisions of a domain that have the same regional climate (ECOMAP 1993). (2) In the Federal Geographic Data Committee (FGDC) physiognomic hierarchy, the level separating Earth cover into either vegetated or nonvegetated categories (Grossman et al. 1998).

dominance. The extent to which a given species has a strong influence in a community because of its size, abundance, or coverage. Strong dominance affects the fitness of associated species (Lincoln et al. 1998).

dominant. An organism exerting considerable influence on a community by its size, abundance, or coverage (Lincoln et al. 1998). dominant species. The species with the highest percentage of cover, usually in the uppermost layer (Kimmins 1997, as cited in Jennings et al. 2004).

ecological units. Map units designed to identify land and water areas at different levels of resolution based on similar capabilities and potentials for response to management and natural disturbance. These capabilities and potentials derive from multiple elements: climate, geomorphology, geology, soils, water, and potential natural vegetation. Ecological units should, by design, be rather stable. They may, however, be refined or updated as better information becomes available.

ecological type. A category of land with a distinctive (i.e., mappable) combination of landscape elements. The elements making up an ecological type are climate, geology, geomorphology, soils, and potential natural vegetation. Ecological types differ from each other in their ability to produce vegetation and respond to management and natural disturbances.

ecosystem. A functional system of interacting organisms and their environment (Whittaker 1962). Ecosystems have six major attributes: structure, function, complexity, interaction/interdependency, scale, and change over time (Kimmins 1997).

ecotone. The boundary or transitional zone between adjacent communities or biomes. A tension zone (Lincoln et al. 1998).

elements. The attributes of a landscape that describe its environmental characteristics. Examples include climate, bedrock geology, surficial geology, soils, and potential vegetation.

evaluation. The comparison of dynamic sampling results to management objectives consisting of predetermined standards, expected norms, threshold values, and/or trigger points.

existing vegetation. (1) The plant cover, or floristic composition and vegetation structure, occurring at a given location at the current time. (2) The plant species existing at a location at the present time. Contrast with potential natural vegetation.

Federal Geographic Data Committee (FGDC). An interagency committee, organized in 1990 under the Office of Management and Budget Circular A-16, that promotes the coordinated use, sharing, and dissemination of geospatial data on a national basis. The FGDC is composed of representatives from 17 Cabinet level and independent Federal Agencies (FGDC 1998).

fidelity. The degree of restriction of a plant species to a particular situation, community, or association (Lincoln et al. 1998).

flora. (1) All the plant species that make up the vegetation of a given area (Allaby 1994). (2) The plant life of a given region, habitat, or geological stratum (Lincoln et al. 1998).

floristic composition. A list of plant species of a given area, habitat, or association (Lincoln et al. 1998).

forbs. Broad-leaved herbaceous plants (FGDC 1997).

fuzzy logic. A type of reasoning designed to accommodate ambiguity. Using fuzzy sets in accuracy assessment permits explicit recognition of the possibility of ambiguity regarding appropriate map labels for some locations on a map/classification. This recognition can help the user determine the relative (not absolute) accuracy of a particular classification, and thus the usefulness of that classification for applications requiring varying levels of accuracy (Wirth et al. 1996).

Geographic Information System (GIS). A set of computer tools for collecting, storing, retrieving, transforming, and displaying spatial data from the real world for a particular set of purposes. Spatial data in GIS are characterized by their position, attributes, and spatial interrelationships (topology) (Burrough 1986).

geomorphology. The classification, description, nature, origin, and development of present landforms and their relationships to underlying structures, and of the history of geologic changes as recorded by these surface features.

geospatial data. Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth. This information may be derived from, among other things, remote sensing, mapping, and surveying technologies (FGDC 1998).

Global Positioning System (GPS). An array of space satellites and ground receivers that use geometry to provide information about the precise latitude, longitude, and elevation of a particular point (Wirth et al. 1996).

grid. A rectilinear arrangement. Examples include the Public Land Survey, raster GIS, and systematic field sampling schemes.

group. An aggregation of similar items. The word can also have specific meanings that vary with discipline (e.g., soil Great Groups and National Vegetation Classification System vegetation groups are very different entities).

image processing. A general term referring to manipulation of digital image data. Processing includes image enhancement, image classification, and image preprocessing (or rectification) operations (Wirth et al. 1996).

indicator species. (1) A species whose presence, abundance, or vigor is considered to indicate certain environmental conditions (Gabriel and Talbot 1984, as cited in Jennings et al. 2004). (2) A species that is sensitive to important environmental features of a site such that its constancy or abundance reflects significant changes in environmental factors. (3) A plant whose presence indicates specific site conditions or a type.

inventory. The systematic acquisition, analysis, and organization of resource information needed for planning and implementing land management (USDA NRCS 1997).

Landsat. Name for the series of Earth-observing satellites first launched in 1972 by National Aeronautics and Space Administration (originally named ERTS, for Earth Resource Technology Satellite). Landsat satellites serve as platforms for several sensors, including the return beam vidicon, Landsat Multispectral Scanner, and Landsat Thematic Mapper (Wirth et al. 1996).

Landform association (LFA). A subunit of landtype associations defined by a dominant geomorphic unit. As a defined and mapped unit, this concept is unique to the Pacific Northwest Region.

landtype association (LTA). Landscape scale map units defined by a dominant geomorphic process type, similar landforms, surficial and near-surface geologic formations, and associations of soil families and potential natural vegetation at the series level (Forman and Godron 1986, ECOMAP 1993, Cleland et al. 1997).

layer (GIS). A digital information storage unit, also known as a theme. Different kinds of information (e.g., roads, boundaries, lakes, and vegetation) can be grouped and stored as separate digital layers or themes in GIS (Wirth et al. 1996).

layer or stratum. (1) A structural component of a community consisting of plants of approximately the same height structure (e.g., tree, shrub, and herbaceous layers). (2) The definition and measurement of these structural components in their vertical and height relationships to each other (e.g., tree subcanopy layer, shrub understory layer) (Grossman et al. 1998).

life form. (1) The characteristic structural features and method of perennation of a plant species; the result of the interaction of all life processes, both genetic and environmental (Lincoln et al. 1998). Life form is related to growth form, physiognomy, and habit, but also includes consideration of the type and position of renewal (perennating) buds that the other terms typically do not include. (2) Includes gross morphology (size, woodiness, etc.), leaf morphology, life span, and phenological (or life cycle) phenomena (Barbour et al. 1980).

map. (1) A spatial representation, usually graphic on a flat surface, of spatial phenomena (FGDC 1998). (2) A representation, usually on a plane surface, of a region of the Earth or heavens (Robinson et al. 1978).

mapping. In its most generic sense, the process of using points, lines, polygons, or pixels to represent geographic features spatially.

map scale. The extent of reduction required to display a portion of the Earth's surface on a map and is defined as a ratio of distances between corresponding points on the map and on the ground (Robinson et al. 1978). Scale indirectly determines the information content and size of the area being represented. The mapping scale is determined by the agency's business needs and the characteristics of the data obtained for the project area. Maps generated from digital imagery can appropriately be displayed at a range of scales.

map unit. A collection of features defined and named the same in terms of a unifying theme (USDA NRCS 1993). Each map unit differs in some respect from all others within a geographic extent. Map units are differentiated in map unit design and defined in a map unit description. Design of map units generalizes the taxonomic units present to the smallest set that meets the objectives of the map at that scale, and that are feasible to delineate with available resources and technology. Terrestrial Ecological Unit Inventory Technical Guide 103 map unit characterization. The description of the elements in a map unit. In regard to ecological units, includes the "primary five" (geomorphology, geology, climate, soils, and potential vegetation), but also often includes supporting elements, such as hydrology, disturbance regimes, etc. map unit delineation. The criteria used to spatially differentiate between map units. For ecological units, the relative importance of these criteria varies with scale. For example, at landtype association scale, differences in geomorphology and geology are normally the primary delineation criteria between map units, whereas at land unit scale, soils and potential vegetation become more important.

map unit description (MUD). Describes the composition of ecological types (or components) as they occur in a map unit. These descriptions form the primary reference document for identifying the ecological types that occur within a map unit.

map unit design. The process establishing the relationship between classifications and map products depicting them. In this document, design considerations include the interrelationships between elements, component relationships within the map unit, and how the map unit relates to other scales.

map unit legend. A list of the map units that occur in a specific inventory area, including the map unit code and map unit name, and is developed using national coding and naming procedures.

map unit validation. The process of verifying the accuracy of ecological unit differentiation, delineation, and characterization.

metadata. Data about the data: the content, quality, condition, and other characteristics of a given set of data. Metadata is intended to provide a capability for organizing and maintaining an institution's investment in data as well as to provide information for the application and interpretation of data received through a transfer from an external source (Jennings, et al. 2004, as modified from FGDC 1997). Metadata often includes details on the methodologies used in data collection, relevant literature references, purpose of data collection, etc.

modeling. In reference to geospatial data, the process of creating a new GIS layer by combining or operating on existing layers. Modeling creates an image (or images) that contains several types of information comprised of several GIS variables (e.g., a scene could be considered in terms of its vegetation, elevation, water, and climate at the same time) (Wirth et al. 1996).

monitoring. (1) The systematic collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives (SRM 1998). (2) The collection and analysis of resource data to measure changes in the amounts, spatial distribution, or condition of resource types or parameters over time.

morphometry. The measurement and mathematical analysis of the configuration of the Earth's surface and of the shape and dimensions of its landforms (i.e., relief, elevation range, slope aspect, gradient, shape, and position, dissection frequency and depth, and drainage pattern and density).

National Hierarchy of Ecological Units. The Forest Service's multiple-scale, multiple-element system of map units used to characterize the natural world and provide a framework for national forest planning and management (Cleland et al. 1997). Other State and Federal agencies also use the National Hierarchy, particularly at broader scales. outlier. Referring to data, a sample or datum that has low similarity to all the other samples in the dataset.

overstory. The canopy layer of a forest. patch. A relatively homogenous nonlinear area that differs from its surroundings (Forman 1995). It can specifically describe forested patches, nonforest vegetation patches, rock/barren patches, or water patches. patterns. Repeating coordinated species abundances and groups of samples with similar species composition.

physiognomy. (1) The characteristic feature or appearance of a plant community or vegetation (Lincoln et al. 1998). (2) The overall appearance of a kind of vegetation (Daubenmire 1968, Barbour et al. 1980). (3) The expression of the life forms of the dominant plants and vegetation structure (Mueller-Dombois and Ellenberg 1974, Barbour et al. 1980).

pixel. Two-dimensional picture element that is the smallest nondivisible element of a digital (raster) image (FGDC 1998). Common pixel resolutions are 30 m and 90 m (i.e., each pixel represents a square of the Earth's surface 30 m or 90 m on a side).

plant association. A recurring potential natural plant community with a characteristic range in species composition, specific diagnostic species, and a defined range in habitat conditions and physiognomy or structure (Jennings et al. 2004). These occur as repeatable patterns across the landscape (FGDC 1997).

plot. (1) A circumscribed sampling area for vegetation (Lincoln et al. 1998). (2) Any two-dimensional sample area of any size, including quadrates, rectangular plots, circular plots, and belt-transects (which are merely very long rectangular plots). Belt-transects are often simply called strips or transects (Mueller-Dombois and Ellenburg 1974).

point. In reference to geospatial data, a dimensional-dimensional object that specifies geometric location. One coordinate pair or triplet specifies the location. Area point, entity point, and label point are special implementations of the general case (FGDC 1998).

polygon. An areal feature that occupies a unique spatial location.

potential natural vegetation (PNV). Approaches to PNV can be put in two categories: 1. The plant community that would become established if all successional sequences were completed without human interference under the present environmental and floristic conditions, including those created by man (Tüxen 1956, as cited in Mueller-Dombois and Ellenberg 1974). This can be referred to as *climatically-constrained PNV* and is the official Forest Service definition. 2. The plant community at the end of the sere, developing until there is a major disturbance. This can be referred to as *disturbance-constrained PNV*. This approach is used by all other agencies and is in favor because of the pre-eminence of fire as a issue shaping policy. Both approaches have strength and utility, and crosswalks are easily developed where needed. PNV as presented in this web portal is influenced by both concepts.

reflectance. The total solar energy incident on a given feature minus the energy that is either absorbed or transmitted by the feature. Reflectance is dependent on the material type and condition, and allows different features in a visual image to be distinguished (Wirth et al. 1996).

representative sampling. Employs systematic or random location of plots within strata, but rejection criteria may be necessary to avoid sampling obvious ecotones, which are of limited use for classifying vegetation. The gradsect technique or gradient-directed sampling is one example of this approach (Austin and Heylingers 1991, as cited in Jennings et al. 2004). It is a form of stratified random sampling that may be cost effective for sampling vegetation patterns along environmental gradients (Gillison and Brewer 1985).

resolution. The minimum difference between two independently measured or computed values that can be distinguished by the measurement or analytical method being considered or used (FGDC 1998).

remote sensing. (1) The gathering of data regarding an object or phenomenon by a recording device (sensor) that is not in physical contact with the object or phenomenon under observation (Wirth et al. 1996). (2) The science and art of obtaining information about an object, area, or phenomenon through the analysis of data acquired by device that is not in contact with the object, area, or phenomenon under investigation (Lillesand and Kiefer 1994).

scale. (1) The relationship between a distance on a map and the corresponding distance on the Earth. (2) In general, the degree of resolution at which ecological processes, structures, and changes across space and time are observed and measured (ECOMAP 1993). (3) Describes the proportion that defines the relationship of a map, image, or photograph to that which it represents, such as distance on the ground (Burrough 1986).

sensor. A device that records electromagnetic radiation or other data about an object and presents it in a form suitable for obtaining information about the environment (Wirth et al. 1996).

series. (1) In vegetation classification, an aggregation of taxonomically related plant associations that takes the name of climax species that dominate the principal layer. It is a group of associations or habitat types with the same dominant climax species. Conceptually it is analogous to an alliance, with the series being a potential natural vegetation concept (Driscoll et al. 1984). (2) In soil science, a group of soils having horizons similar in differentiating characteristics and arrangement in the soil profile, except for texture of the surface horizon (USDA NRCS 1993).

shrubs. Woody plants that generally exhibit several erect, spreading, or prostrate stems, and have a bushy appearance. In instances where life form cannot be determined, woody plants less than 5 meters in height will be considered shrubs (FGDC 1997).

site. An area delimited by fairly uniform climatic and soil conditions (similar to habitat). spatial data. Data that record the geographic location and shape of geographic features and their spatial relationships to other features (FGDC 1998).

spatial resolution. The measure of sharpness or fineness in spatial detail. It determines the smallest object that can be resolved by a given sensor, or the area on the ground represented by each pixel. For digital imagery, spatial resolution corresponds to pixel size and may be understood as roughly analogous to "grain" in photographic images (Helms 1998).

species. In biological classification, the category below genus and above the level of subspecies and variety. It is the basic unit of biological classification (Lincoln et al. 1998).

stand. A community, particularly of trees, possessing sufficient uniformity as regards to composition, age, spatial arrangement, or condition, to be distinguishable from adjacent communities, so forming a silvicultural or management entity (Ford-Robertson 1971).

stratum. In general, one of a series of layers, levels, or gradations in an ordered system. In the natural environment, the term is used in the sense of (1) a region of sea, atmosphere, or geology that is distinguished by natural or arbitrary limits or (2) a layer of vegetation, usually of the same or similar height (FGDC 1998).

structure. (1) The spatial arrangement of the components of vegetation (Lincoln et al. 1998). (2) A function of plant size and height, vertical stratification into layers, and horizontal spacing of plants. Physiognomy refers to the general appearance of the vegetation, while structure describes the spatial arrangement of plants in more detail. Physiognomy should not be confused with structure (Mueller-Dombois and Ellenberg 1974).

succession. Partial or complete replacement of one community by another (Daubenmire 1978).

surficial geology. The mode of deposition of unconsolidated deposits lying on bedrock or occurring on the Earth's surface, and the rock type(s) from which those deposits are derived, known as "kind" and "origin," respectively.

taxa. The plural form of taxon, which is a classification entity.

taxonomic unit. The basic set of classes or types that comprise a classification; in this document, a classification of environmental elements or integrated environmental elements (ecological types). Taxonomic units represent a conceptual description of ranges and/or modal conditions in environmental characteristics. A taxonomic unit (or taxon) is a class developed through the scientific classification process, or a class that is part of a taxonomy (USDA NRCS 1993). A taxonomic unit is the physical representation of a taxon, or the physical representation of a unit of a classification.

theme. (1) A group of data that represent a place or thing such as soils, vegetation, or roads. A theme could be less concrete such as population density, school districts, or administrative boundaries (FGDC 1998). (2) For a GIS context, see layer.

trees. Woody plants that generally have a single main stem and have more or less definite crowns. In instances where life form cannot be determined, woody plants equal to or greater than 5 meters in height will be considered trees (FGDC 1997).

user's accuracy. In reference to accuracy assessment, an accuracy measure based on a commission error as shown in the error matrix. Also known as reliability, user's accuracy is the probability that pixels classified on the map actually represent the category on the ground. User's accuracy is calculated by dividing the total number of correctly classified sites of a certain category by the total number of the certain category classified by the map (Wirth et al. 1996).

vascular plant. Plant with water and fluid conductive tissue (xylem and phloem), including seed plants, ferns, and fern allies (FGDC 1997).

vegetation cover. Vegetation that covers or is visible at or above the land or water surface. It is a subcategory of Earth cover. The percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of plants (FGDC 1997).

vegetation data. The attributes of the vegetation that are used to classify and characterize the vegetation type and to map vegetation stand. These data come from the interpretation of remotely sensed imagery, fieldwork, and other thematic data sources (FGDC 1997).

vegetation mapping. The process of delineating the geographic distribution, extent, and landscape patterns of vegetation types based on composition, physiognomy, and structure.

vegetation type. A named class of plant community or vegetation defined on the basis of selected shared floristic, physiognomic, and/or structural characteristics, which distinguish it from other classes of plant communities or vegetation (Jennings et al. 2004).

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