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Introduction

Purpose

This classification describes common streamside plant communities and the typical riparian settings in which they are found. The purpose of the guide is to allow an observer to interpret site factors from the vegetation, or to project potential plant community development from key site factors. It should be useful in describing and inventorying native riparian vegetation and in choosing appropriate species for restoration projects.

Classification

Communities can indicate environmental conditions because the suite of species present integrates biophysical limits on establishment and survival. Where certain conditions repeat over the landscape, assemblages of species repeat with them.

Major environmental variables are temperature, moisture, light, nutrients, drainage, and disturbance regime. Precipitation, elevation, aspect, slope position, soil type, and steepness control vegetation patterns everywhere. Along creeks and rivers, though, there are other complicating factors.

Streams are dynamic. They change seasonally. Water levels move up and down dramatically. Floods carve new channels and fill in old ones. Landslides, debris flows, and log jams erase or create surfaces overnight. Erosion and deposition redefine the roles small landforms play in the riparian area. All these processes occur at different rates, at different times, overlap, and interact. The result is that the riparian area is a mosaic of small patches of plant communities.

The communities in this classification form parts of repeating patterns among all these changeable factors. The classification is mainly floristic, that is it relies on plant species composition and abundance to sort samples into groups. The analysis then explores what conditions the samples have in common. The major descriptors for these conditions are broad bioregional area, elevation, geomorphic surface, soil texture, soil depth, and substrate type. The broad bioregional area (Westside Cascades, Coast Range, Willamette Valley) determines large climatic environments: temperature, precipitation/fog. Elevation also controls temperature and precipitation but at a finer scale. Geomorphic surfaces are related to frequency and intensity of flooding, or, for steep sites, to stability. Geomorphic surfaces also are related to soil depth, soil texture, moisture and nutrient holding capacity. Sites subject to frequent high energy floods lose fine textured soil and organic matter. Higher surfaces with longer periods between disturbances can accumulate rich, deep soils capable of supporting upland species.

Scope/study area

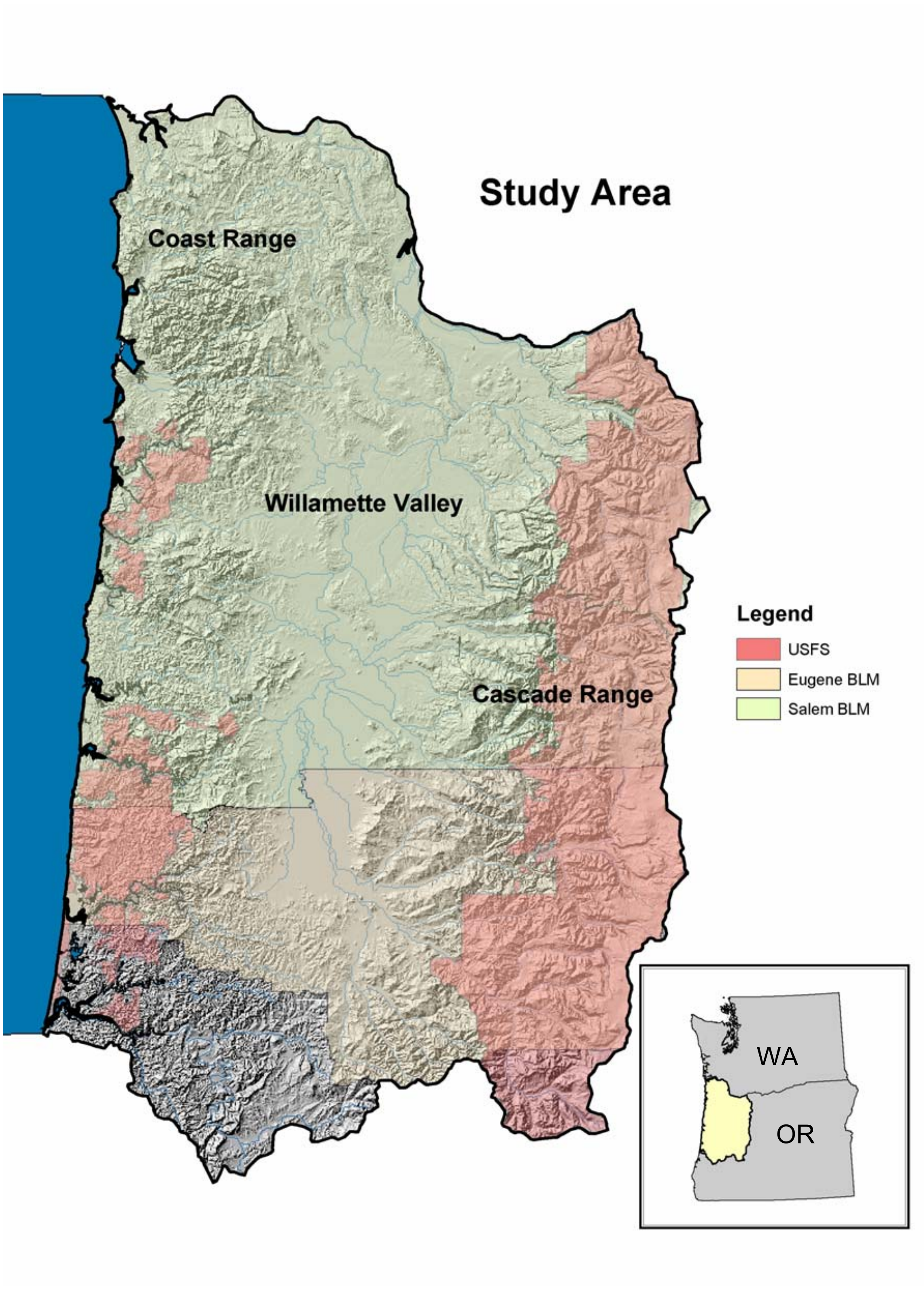
This guide is divided into the three major regions in Northwest Oregon. For the Westside Cascades and Coast Range, the community descriptions are organized along a geomorphic gradient: stream level, floodplain, terrace, to valley wall. The Willamette Valley section is not divided by geomorphic surfaces.

This guide describes the most common native communities in the riparian zones in Northwest Oregon. Not all of these meet the official wetland definition related to dominance of hydrophytic species (US Army Corps of Engineers 1987). Many of the types in this volume are dominated by upland or facultative wetland species (see Appendix I). However, locally the overall combination of species occurs primarily in association with creeks and rivers, and is considered here to be riparian. The strictly wetland communities are discussed separately in the wetland volume, though they are often found in the streamside mosaic on geomorphic surfaces where drainage is particularly restricted.

Sites were selected to represent relatively unmanaged reaches, though clearly overall watershed condition affected channel conditions and disturbance events. Sites with adjacent clearcuts or in stream buffers were not sampled.

Plots were excluded where communities were dominated by non-native species. Finding such relatively pristine conditions was most challenging for the Willamette Valley. It is clear that the samples from the Valley represent the rare exceptional remnants, and that the majority of similar geomorphic settings there support more altered, invaded communities. Given the nature of some of the non-native invasive species such as reed canarygrass, it may be difficult, if not impossible, to restore native communities on many sites.

Note that sample sites were “unmanaged”, not undisturbed. Riparian areas are constantly disturbed, and any event higher in the watershed can propagate effects into “unmanaged” areas below. The process section of the introduction (below) describes combinations some implications of multiple and continued disturbances on riparian plant communities.


Study Area
Coast Range
Willamette Valley
Cascade Range
Legend
USFS
Eugene BLM
Salem BLM
WA
OR

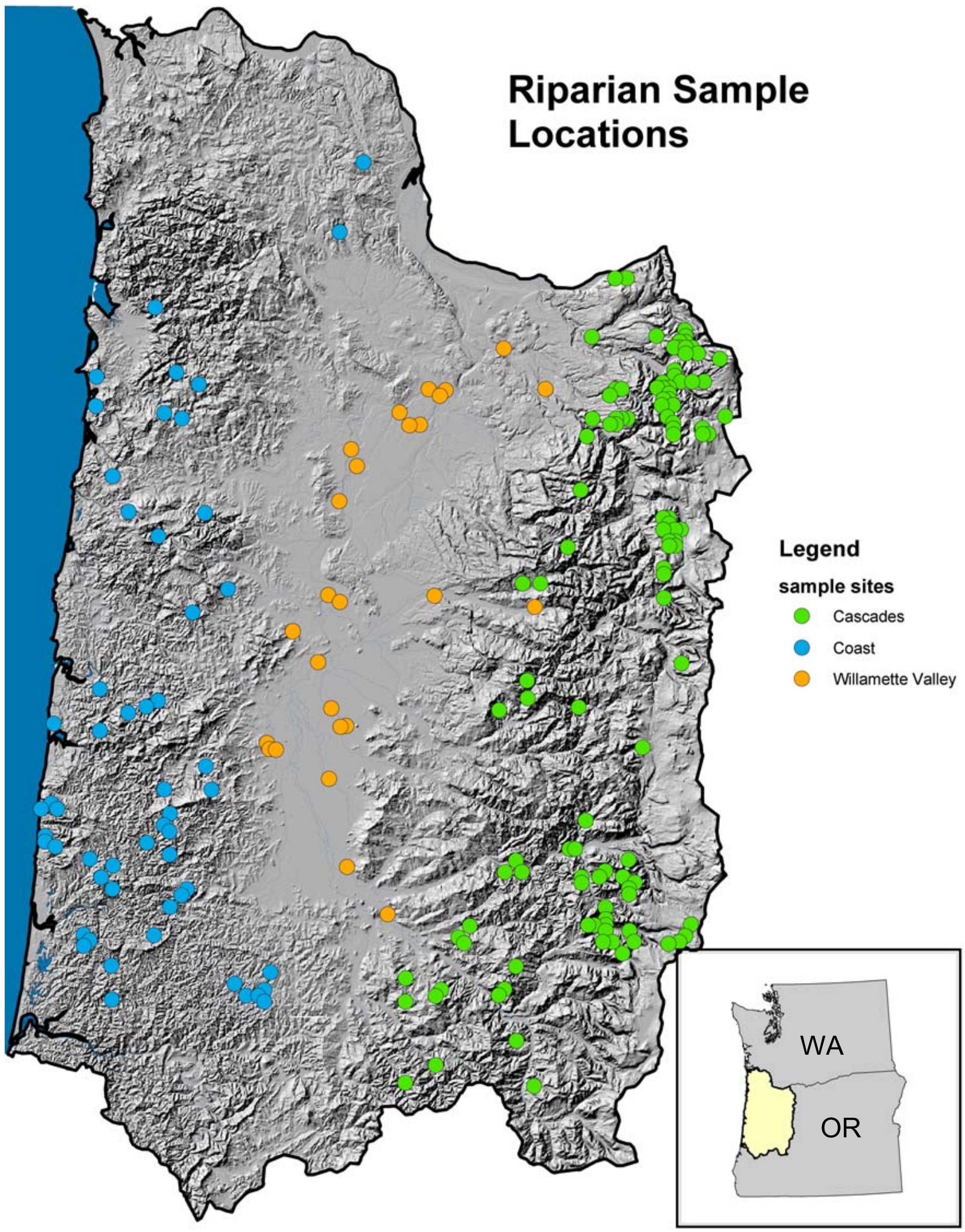
Methods

Data from several different though similar protocols have been integrated for this classification. Of the 680 plots assigned to plant communities, 441 were in the Cascades, 146 in the Coast, and 93 in the Willamette Valley. Information on some variables is incomplete, and is summarized in narrative descriptions in community descriptions. This is particularly true for soil data.

Two main sampling protocols were used. The first consisted of locating a cluster of plots at a site; each plot was located to represent a different community/geomorphic surface combination. A more complete description of the protocol used on the Mt. Hood is available in Riparian Ecological Types: Gifford Pinchot and Mt. Hood National Forests, Columbia River Gorge National Scenic Area (Diaz and Mellen 1996) where many of these communities were first described. The second protocol used a transect design with vegetation plots along the transect again representing different community/geomorphic surface combinations.

Mt. Hood data were collected in conjunction with the USFS regional fisheries program stream surveys. This concentrates sampling on a few streams but captures the elevation gradients affecting the vegetation. Because of the foucus on fish-bearing streams, there is a bias toward larger perennial streams. Few samples from high elevation sites were included. Samples from the Willamette Valley are often concentrated on a few sites such as state parks or wildlife refuges which have preserved native communities from development or agricultural conversion. Data from the Willamette NF include a large number of transects installed during the watershed analysis process for the South Fork McKenzie drainage. Plot clusters were also located on creeks across the whole Forest. Data from first order or intermittent streams in the Cascades are mostly from the South Fork McKenzie drainage transects. The Siuslaw NF, Eugene BLM, and Salem BLM have samples scattered across those ownerships to represent the range of unmanaged conditions present. However, in the Coast Range especially ownership patterns on these units largely concentrated samples on the steeper, smaller forested streams and excluded wide productive valley floors which are generally in private hands. First order or intermittent streams in these ownerships were not sampled. Estuaries were excluded from this project.

Map of ownership for the Oregon Coast and Willamette Provinces.



It should be noted that elevation ranges for many communities are poorly defined for two reasons. Many parts of the study area are undersampled; not all combinations of elevation and precipitation bands are represented. Also, sample sizes are small. Where relatively few plots are included, the elevations given can not be interpreted as indicating the upper and lower elevation bounds for the type. Mt. Hood data were collected in conjunction with the USFS regional fisheries program stream surveys. This concentrates sampling on a few streams but captures the elevation gradients affecting the vegetation. Because of the focus on fish-bearing streams, there is a bias toward larger, perennial streams. Few samples are from high elevations sites.

Plot methods

Variable plot sizes were used to fit geomorphic and community boundaries. Forested plots were generally 200 to 500 square meters. Steep bank plots could be as small as 5 to 10 square meters. For USFS and BLM plots, data included location, environmental factors (elevation, aspect, slope, etc.), geomorphic surface, substrate, and vegetation composition and abundance. Tree sizes and ages were collected for a sub-sample of trees rooted in the plot. No tree measurements were collected in the South Fork McKenzie transects. Valley cross-sections averaging 250 feet on each side of the creek are plotted for transect plots. Willamette Valley plots include floristics, but little information on geomorphic setting or soil condition.

Data analysis

Two-way indicator-species analysis (TWINSPAN) (Hill 1979) was the primary method in classifying the communities. Because the environmental variables were so inconsistent among the datasets, environmental factors were evaluated qualitatively in refining communities and interpreting relationships between the plant communities and physical settings.

Some species were excluded from the analysis: the epiphyte *Polypodium glychirrizae* (licorice fern), and plants identified in the field to group only (eg willow, grass, carex, composite, etc.) Also, a species was dropped from a plot if it was noted as occurring in that plot only on stumps or logs. Some datasets had limited information on whether tree cover was from trees rooted in the community or simply overhanging it. Where plot information showed that recorded tree cover for a plot was most likely coming from outside the community, the species was dropped from that plot.

Some communities were fairly rare in the sample because they aren't common under undisturbed canopies. Willow types are underrepresented in the guide for this reason, and also because they were sometimes identified only to genus when they were found on plots. However, several more willow types are described in the accompanying wetland guide.

Community descriptions

Each community description contains:

- table of the most common and abundant species
- plot elevation ranges
- short narrative on plant community
- description of the geomorphic environment and soils
- wetland rating
- description of similar types if applicable
- list of non-native species if any were found in the sample.

Each community description is titled with scientific name, common name, and PLANTS code from the USDA National Resource Conservation Service PLANTS database (USDA-NRCS 1999). Common names are from local references, especially from Pojar and MacKinnon (1994). Scientific names follow taxonomy consistent with the Oregon Flora Project unofficial 2003 working list, though taxonomy for that project will be finalized with publication of the *Flora of Oregon* (Dr. Scott Sundberg, personal communication, November 18, 2002). For forested communities where the overstory may be either or both of two species, the two species are listed in parentheses. For example (Red alder-big leaf maple) indicates that red alder and/or big leaf maple are found in the community. Sample size and plot origin are noted.
Each community description features a table summarizing the most common species present. The community tables are sorted by layer: overstory trees (>12' tall), tree seedlings (<12 feet tall), shrubs, and herbs. Within each layer, species are sorted by constancy (% of plots within the community which had the species), and then by abundance (typical cover--average cover for the species on those plots where the species occurred). In the Willamette Valley section, trees of all sizes are treated as a single layer. Note that names of exotic species included in the community tables are italicized. A more complete constancy table that includes less frequent species is included in Appendix II. Geomorphic setting, soils, and evidence for disturbance regime are discussed.

<u>Geomorphic surfaces</u>

Several geomorphic surface names are used to describe major physical settings. The table below has the most common terms used in the guide. Note that floristics and soils were more closely related than floristics and surface. However, since the soil and substrate are directly related to the geomorphic surfaces and their typical disturbances, the surface proves to be very important in understanding where and how the communities develop.

Substrate

Silt, sand, gravel, cobble, boulder, and bedrock are common terms in description of soil or substrate. Silts are fine texture, high in moisture and nutrient holding capacity. Sands are gritty, dry, and poor in fertility. Gravels, cobbles, and boulders make up bars and banks. High proportions of such coarse sediments generally indicate excessive drainage and poor moisture conditions during the dry season. Sites with bedrock near the surface often have very poor drainage.

GEOMORPHIC SURFACE	CHARACTERISTICS
Sand/gravel bars	Deposits of sands or gravels, often over coarser materials—generally within normal high water line
Cobble bar	Cobble surface generally within or adjacent to stream, on island or bank—under water during normal high flow; generally with shallow sandy soils
Boulder bar	Boulder dominated deposit—at least partially flooded annually; generally with shallow sandy soils, though some old glacial Cascades sites are exceptions
Active/annual floodplain	Flattish surface at or near water level even at low flow—under water during normal high flow
Floodplain	Flat to gently sloping surface subject to fairly frequent floods—soils generally enriched with fines; generally shallow water table
Lower terrace	Flat to gently sloping surface subject to infrequent floods-alluvial or colluvial origin; soils variable
Upper terrace	Elevated flat to gently sloping surface subject to catastrophic flooding only; often present at tributary junctions; generally deep well-drained soils
Steep bank/cutbank	Over-steepened slope with lower margin near active fluvial zone; sometimes slide scars; often unstable;
Valley wall	Generally steep slopes from valley floor to hillside slope break (inner gorge wall)
Toeslope	Gentle to steep slope at base of hillside, often well-watered
Overflow channel/old channel	Side channels active during high flow; often with obvious sub-surface flow

Substrate size classes

Cobble and boulder size rock in riparian areas often reveal their history in their shapes. Sharp, angular rocks are often colluvial, coming into the valley bottoms from the hillslopes in landslides or debris torrents. Rocks that have been tumbled in the stream channel long enough to smooth their outlines into the typical rounded river rock shape are alluvial. They are present due to fluvial processes. Many riparian areas show complex combinations of colluvial and alluvial effects.

Sand	<2 mm	Grainy
Fine gravel	2-24 mm	Pea to marble size
Coarse gravel	24-64 mm	Marble to tennis ball
Cobble	64-256 mm	Tennis ball to basketball
Boulder	256-1096 mm	Basketball and larger
Bedrock	> 1096 mm	Large solid surface

* Most substrate descriptions in this guide combine fine and coarse gravel.

<u>Wetland status</u>

An overall wetland status is assigned to the community. Data from each plot were compared to criteria for determining wetlands based on dominance of hydrophytic vegetation (US Army Corps of Engineers 1987). Hydrophytic character used in the analysis are listed in the following table.

INDICATOR	INTERPRETATION
OBL	Wetland obligates
FACW	Facultative wetland species, strongly associated with wetlands
FAC+	Facultative wetland species with a greater estimated probability of occurring in wetlands than FAC species
FAC	Facultative species found in wetland settings about as often as found in upland settings
FAC-	Facultative wetland species with a lower estimated probability of occurring in wetlands than FAC species
FACU	Facultative wetland species, strongly associated with uplands
UPL	Species strongly associated with uplands, seldom found in wetlands
UNK	Wetland indicator status not available; if identified to genus only, more than one species present in Oregon with conflicting wetland status

The key rule is that more than 50% of the dominant species are OBL, FACW, or FAC on lists of plant species that occur in wetlands. Dominant species are determined by the following method:

> “The ’50-20” rule is the recommended method for selecting dominant species from a plant community where quantitative data are available. The rule states that for each stratum in the plant community, dominant species are the most abundant plant species (when ranked in descending order of abundance and cumulatively totaled) that immediately exceed 50% of the total dominance measure for the stratum. The list of dominant species is then combined across strata (HQUSACE, 6 Mar 92).”

For the analysis, trees were considered a single stratum. Results for each plant community report percentage of plots which meet the wetland criteria, as well as the average and range of % of indicator species (FAC+, FACW, or OBL). Species' wetland indicator status was taken from the PLANTS database (USDA-NRCS 1999) where available. John Christy, author of the companion wetland volume (Christy 2004), supplied information for species not ranked in the PLANTS list.

More plots would have been labeled as wetland if the sorrel were reliably identified to species. Most of the sorrel in the riparian samples was probably *Oxalis trillifolia,* which is rated FAC+. Unfortunately, because often the sorrel was not distinguished from *Oxalis oregano* (UPL), in many plots the dominant sorrel was not credited to the positively wetland list.

Many community descriptions include references to similar communities, either in this volume or from other sources.

Exotic species recorded in the community are listed.

About keys

Keys are at the beginning of each section (Cascades, Coast, and Willamette Valley).

Keys are guidelines, not rules. If we could classify each and every possible condition in nature, we might be able to construct foolproof keys which would unerringly lead to identification of the correct community. However, in the real world, we work with a limited number of samples. Small constellations of species usually, but not always, occur in combinations and amounts that lend themselves to keys. Invariably, there are exceptions.

Use the key, then look at the description for the community. Does it have the right combination of major species? Does the environment (elevation, geomorphic surface, soil description) seem to fit? Ignore the trees for a moment. Does it have indicators such as coltsfoot, maidenhair, skunk cabbage? Does it have shrubs or not? Does it have salmonberry or stink currant? Both? Which saxifrages (piggyback plant, foamflower, coast boykinia, oval-leaved mitrewort)? More lady fern or more sword fern? What about sorrel? Follow the major leads to get to some reasonable choices.

If the plant-oriented key doesn't seem to lead to the right place, use the geomorphic surface as a guide. Look through the community descriptions that fit the physical setting for the community. Is it within the normal high water line (within channel)? On cobble bars or channel margins? On terraces or steep banks?

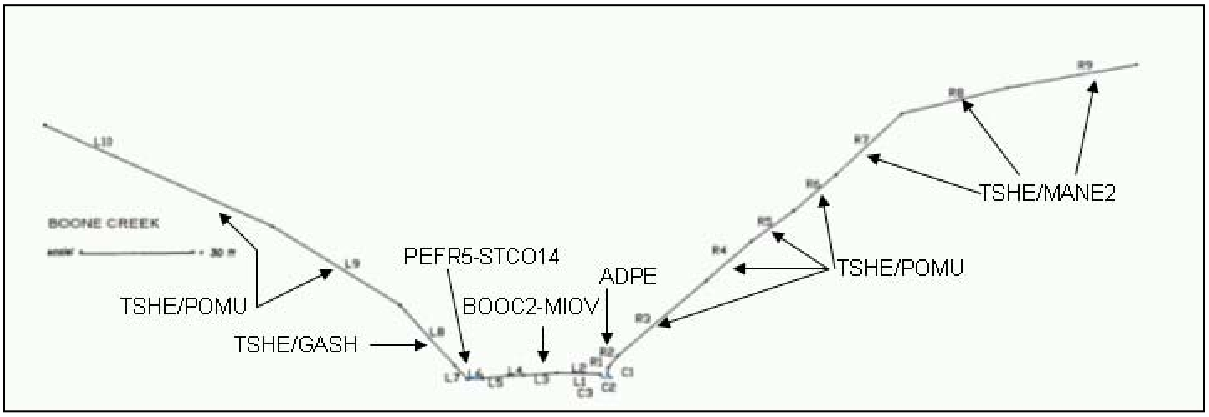
There can be groups of species which co-occur as indicators. The key may have a lead that says, “ if the sum of Species A, B, and C is greater than species X…”. In the field, you may have one or two of A, B, and C, and they may be about the same is species X. This sort of variability can be expected. If the rest of the community description fits your site, then this choice is reasonable.

The tree component seems particularly variable. Where tree names are included in the community name, it shows that most plots had the tree species. However, they also may be absent. The community name should be interpreted as indicating that the community has the potential to include mature trees. Note that with rather small sample sizes, not all of the trees that might occur were recorded. For example, it is very likely that some communities labeled as red alder types or big leaf maple types could easily support the other species. Where communities are named as hardwood types, conifers can occur, but are not consistent. If your site has conifers as well as hardwoods, it can still be included in the hardwood type.

Many riparian sites also include patches of wetlands where drainage is very poor. Most distinctively wetland communities are identified and described only in the Christy (2004) classification: Native Freshwater Wetland Plant Associations of Northwestern Oregon. Such wetland communities which commonly occur on floodplains are included in the streamside keys, with leads to the wetland association name and page number in the wetland guide.

Plant community distribution and valley cross-sections

Transect data supplied information for the short chapter on valley cross-sections and vegetation community distribution (following community descriptions). Patterns in conifer and hardwood basal area across the riparian zone for Coast and Cascades are compared. Valley cross-section illustrations are included for selected creeks from the Willamette NF's South Fork McKenzie River drainage, the Siuslaw NF (1995 samples), Eugene BLM, and Salem BLM. Riparian communities present along the transect are identified and the distribution of the upland communities along the transect is discussed. Sketches from the BLM transects are added. For some sites, conifer and hardwood basal areas along the transect are included in a table.



Valley cross-section of Boone Creek, in S. Fork McKenzie River watershed. Further information on this creek can be found in the "Plant community distribution: valley cross-sections" chapter of this guide.