Chapter 8

Vegetation

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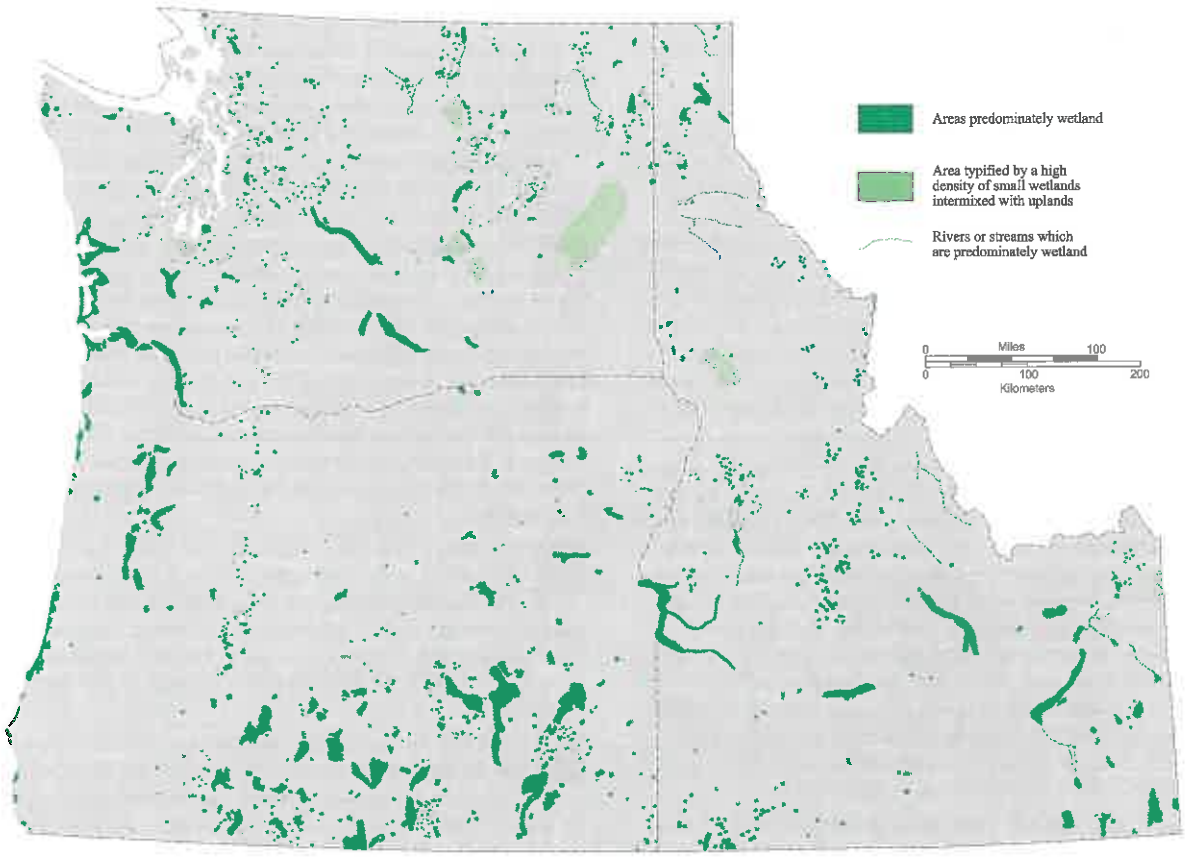
The vegetation of the Pacific Northwest exhibits a complex pattern reflecting diversity in climate, soils, relief, incidence of fire, biotic interaction, and history. Recent impacts on pristine vegetation by logging, agriculture, grazing, industrial development, and urbanization have greatly altered the natural pattern. Although it is possible to map this altered pattern and create a map of actual vegetation, map 8-2 shows the natural plant cover as it might appear if the effects of logging, agriculture, and urban-industrial use were not present.

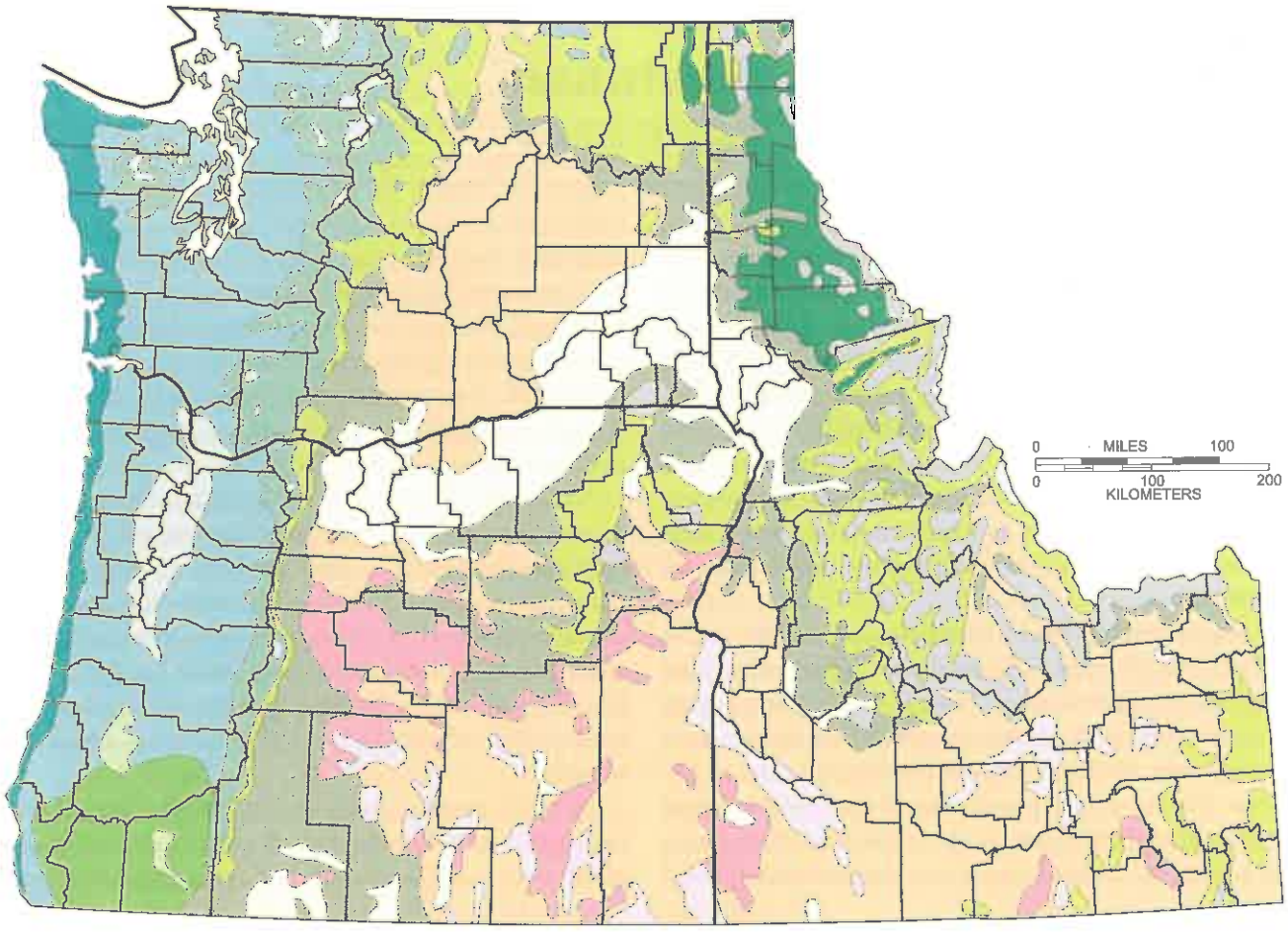
Major vegetation differences, especially those determined by regional climate, are reflected by three vegetation provinces—Forest, Shrub-Steppe, and Alpine—embracing fifteen vegetation zones or zone complexes. As used here, a vegetation zone is the area within which maturely developed soils support a specific climatic climax vegetation. It is a broad area of relatively uniform regional climate and typical regional topography within which one plant association is capable of becoming dominant under prevalent climatic conditions over a long period of time. In practice, alteration of plant cover has been profound. As a result, the potentially dominant species characteristic of the mapped vegetation zones may not currently prevail.

Numerous plant communities exist within a given vegetation zone. When fully described by their species composition and structure, these plant communities are called plant associations. The classification and description of these localized plant associations and related habitat types has been well developed in the Pacific Northwest under the leadership of the U.S. Forest Service research scientists.

Despite much research, the vegetation of the region is imperfectly known. A general review of the plant cover of Oregon and Washington was con-



Map 8-1. Wetlands, 2000



Map 8-2. Vegetation Zones

Forest Province

Sitka Spruce Zone. Confined to the coast, this coniferous zone extends from Alaska to southwestern Oregon and has been extensively altered by logging and fire. Sitka spruce (*Picea sitchensis*) characterizes the zone although in many places western hemlock (*Tsuga heterophylla*) and Douglas-fir (*Pseudotsuga menziesii*) dominate. Red alder (*Alnus rubra*) often forms patches in disturbed areas and riparian situations, while western redcedar (*Thuja plicata*) characterizes swampy habitats. Besides stabilized dune communities in which shore pine (*Pinus contorta*) is a prominent successional species, there are salt marsh communities in estuaries and communities associated with shifting dunes. The Sitka Spruce Zone grades into Western Hemlock Zone to which it is closely related.

Western Hemlock Zone. Mantling both the Coast Range and western slopes of the Cascades, this zone is one of the most extensive in the region, stretching from British Columbia to California. Although named for the shade-tolerant western hemlock characterizing the persistent vegetation, the dominant tree is often the seral Douglas-fir. Extensive logging has occurred throughout the area. Communities within this zone have been studied in detail and have been related to site characteristics. Some important species are western recedar in moist sites and, in the south, ponderosa pine (*Pinus ponderosa*) and incense cedar (*Calocedrus decurrens*). In disturbed moist sites, red alder and bigleaf maple (*Acer macrophyllum*) are common. Western hemlock gives way to Douglas-fir in drier sites and Pacific silver fir (*Abies amabilis*) at higher elevations.

Cascade Subalpine Forest Zone Complex. A group of zones marked by heavy snow flanks the Cascades and Olympics and extends into British Columbia. This group includes the Pacific Silver Fir Zone marked by *Abies amabilis*. At higher elevations, silver fir gives way to a more stunted forest of mountain hemlock (*Tsuga mertensiana*) and subalpine fir (*Abies lasiocarpa*) and forms a parklike pattern of open meadow and forest stringers. In areas of volcanic ash or areas recently disturbed by fire, even-aged stands of lodgepole pine (*Pinus contorta* var. *murrayana*) prevail. In southern Oregon, the zones bear close relationship to the California red fir forest.

Grand Fir and Douglas-fir Zones. Mesic coniferous forests occur in interior areas and exhibit a broad distribution. Often both grand fir (*Abies grandis*) and Douglas-fir occur in mixed stands, although Douglas-fir tends to be more prevalent in Idaho. Other trees of importance, in order of increasing moisture tolerance, are ponderosa pine, western larch (*Laris occidentalis*), and lodgepole pine, the latter two species are fire-responsive pioneers. In northern Idaho, western recedar and western hemlock are prominent. Oregon boxwood (*Pachystima myrsinites*) and common snowberry (*Symphoricarpos albus*) dominate two prevalent understory communities.

Ponderosa Pine Zone. In a broad belt below the Grand Fir and Douglas-fir zone, is an open coniferous forest dominated by *Pinus ponderosa*. Understory vegetation varies from shrubby mats of bitterbrush (*Purshia tridentata*) and snowbrush (*Ceanothus velutinus*) in central Oregon to meadows of Idaho fescue (*Festuca idahoensis*) further to the east. This zone has been severely altered by timber harvest.

Western Redcedar Zone. At moderate altitudes in moist locals in the northeastern portion of the region, this zone occurs between the more xeric Grand Fir and Douglas-fir zones and the spruce-fir type. Dominant trees include western redcedar, western hemlock, and western white pine (*Pinus monticola*), but grand fir and western larch are found in drier sites. Understory unions in this zone are often similar to those of the Grand Fir and Douglas-fir zones.

Engelmann Spruce and Subalpine Fir Zones. Confined to higher elevations to the east, this type if the counterpart of the Cascade Subalpine Forest. Varying from dense to open parklike stands of subalpine fir and Engelmann spruce (*Picea engelmannii*), the zone has occasional intrusions of subalpine larch (*Larix lyallii*) and whitebark pine (*Pinus albicaulis*) at higher elevations and Douglas-fir at lower elevations.

Mixed Needlefleaf-Broadleaf Forest Zone Complex. A highly intricate set of zones closely related to plant communities in California, this mixed evergreen forest straddles the Siskiyou Mountains in southwestern Oregon. Edaphic, fire history, and climatic contrasts lead to sharp breaks in plant cover. Douglas-fir dominates the upper canopy, but various sclerophyllous trees and shrubs are found in the understory including tanoak (*Lithocarpus densiflorus*), canyon live oak (*Quercus chrysolepis*), Pacific madrone (*Arbutus menziesii*), and golden chinquapin (*Castanopsis chrysophylla*). Serpentine soil bears a distinctive flora and sparse vegetation, and other dry rocky areas support sclerophyllous broadleaf chaparral.

Rogue-Umpqua Forest-Shrub Zone Complex. Occupying valleys in the rainshadow of the Siskiyou Mountains is a vegetation mosaic exhibiting many xeric characteristics. Woodlands are dominated by Oregon white oak (*Quercus garryana*), with California black oak (*Q. kelloggii*) on mesic sites. Pacific madrone, ponderosa pine, sugar pine (*Pinus lambertiana*), and incense cedar distinguish this zone from Willamette Valley forest. On shallow soils, south slopes and recently burned areas, sclerophyllous shrub communities are found with narrow-leaved buckbrush (*Ceanothus cuneatus*) and white-leaved manzanita (*Arctostaphylos viscida*).

Willamette Forest-Prairie Zone Complex. Confined to bottomland and adjacent slopes of the Willamette Valley is a mosaic of forest, woodland, open savanna, and prairie. Prairie and oak savanna at the time of first settlement was maintained by aboriginal burning. Woodlands dominated by Oregon white oak have since been invaded by Douglas-fir and grand fir, with bigleaf maple important on north-facing slopes. Grasslands maintained by grazing include many introduced species and occupy drier sites. Lacing this mosaic of forest and prairie are bands of riparian woodland in which Oregon ash (*Fraxinus latifolia*), black poplar (*Populus trichocarpa*), and willow (*Salix* spp.) are prominent.

Western Juniper Zone. This open woodland dominated by western juniper (*Juniperus occidentalis*) is the northern counterpart of the Pinyon-Juniper type of the Great Basin. Shrub-steppe dominated by big sagebrush (*Artemisia tridentata*) and Idaho fescue typically comprises the understory of this zone. Throughout the arid regions of interior Oregon, juniper woodland characterizes rimrock habitat where local moisture supplies permit establishment of this xerophytic tree.

Shrub-Steppe Province

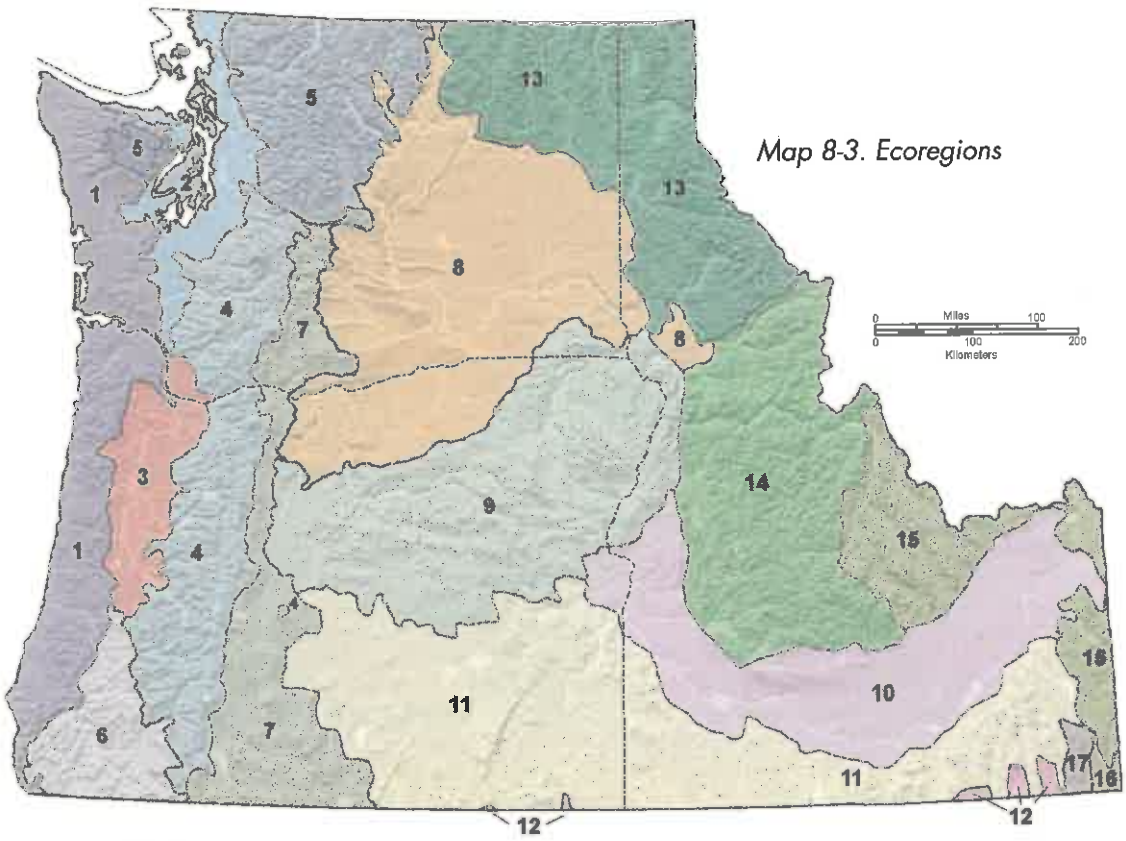
Steppe Zone Complex. Grassland without shrubs mantles areas of north-central Oregon and the Palouse of southeastern Washington and adjacent Idaho. Among the various communities within this grassland is the *Agropyron-Festuca* type characterized by bluebunch wheatgrass (*Agropyron spicatum*) and Idaho fescue. In moister situations, Sandberg's bluegrass (*Poa sandbergii*) and Idaho fescue are prominent together with many forbs and shrubby common snowberry. The steppe type is intermediate between ponderosa pine forest and more xeric shrub-steppe, and the communities of the Steppe Zone Complex form understory unions in these adjacent vegetation types.

Big Sagebrush Zone. This most widespread vegetation zone in the Pacific Northwest extends from Canada to Nevada and from the Cascades to the Rockies. Dominated by big sagebrush, the zone intermingles with juniper woodland in central Oregon and supports noninteensive grazing. Plant communities have been identified based on understory grasses, shrub cover, soils, and slope. Two prominent communities are *Artemisia tridentata/Festuca idahoensis* and *Artemisia tridentata/Agropyron spicatum* associations, the former with greater moisture requirements. Low sagebrush (*Artemisia arbuscula*) frequently replaces big sagebrush in eastern Oregon on shallow stony soils. Other prominent shrubs include several species of sagebrush and rabbit brush (*Chrysothamnus* spp.). Commonly referred to as "high desert," this shrub-steppe in this zone consists of nondesert species and exhibits a shrub-grass structure which is distinct from true desert.

Desert Shrub Zone Complex. Occupying pockets within the Big Sagebrush Zone, the Desert Shrub Zone Complex is the most xeric of the region. Frequently the type occupies playas where saline conditions prevail, but also occurs in the rainshadow of several mountain ranges in southeastern Oregon and southern Idaho. Important shrubs, most of which are halophytic, include shadscale (*Atriplex confertifolia*), salt sage (*A. nuttallii*), greasewood (*Sarcobatus vermiculatus*), and spring hopsage (*Grayia spinosa*). Grasses and forbs are occasionally found in this open vegetation.

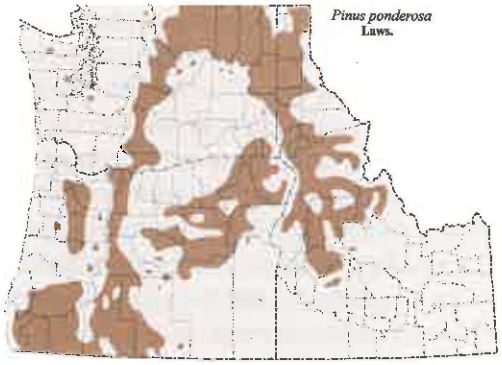
Alpine Province

Alpine Zone Complex. Found near and above the tree line, this zone complex is narrowly represented in the Cascades and more extensively in the Rocky Mountains. Mainly comprising herbaceous plants and low shrubs, these zones contain a few trees displaying krummholz form and occupying protected habitats. Alpine health communities of the subalpine park land extend into the alpine zones, and glaciers, permanent snow fields, and extensive areas of talus and rock cover much of the area.

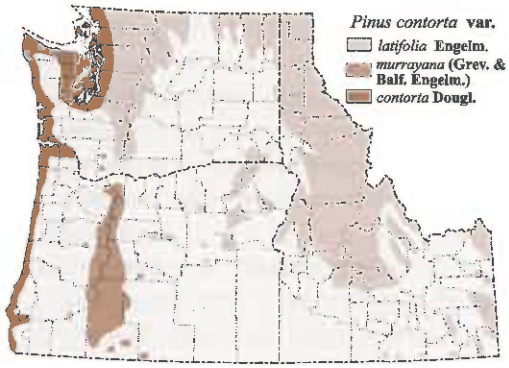


Map 8-3. Ecoregions

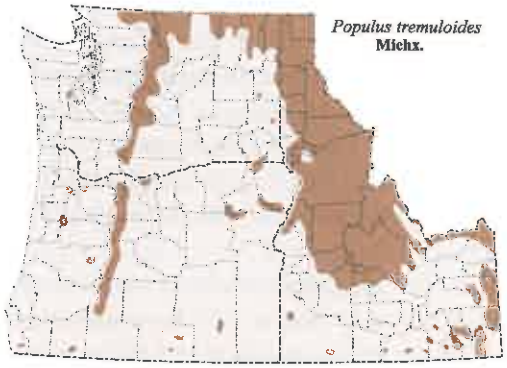
1 *Coast Range*
2 *Puget Lowland*
3 *Willamette Valley*
4 *Cascades*
5 *North Cascades*
6 *Klamath Mountains*
7 *Eastern Cascades Slopes & Foothills*
8 *Columbia Plateau*
9 *Blue Mountains*
10 *Snake River Plain*
11 *Northern Basin & Range*
12 *Central Basin & Range*
13 *Northern Rockies*
14 *Idaho Batholith*
15 *Middle Rockies*
16 *Wyoming Basin*
17 *Wasatch & Uinta Mountains*



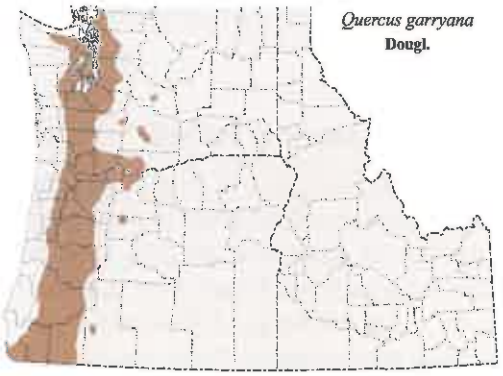
Map 8-4. Ponderosa Pine



Map 8-5. Shore Pine/Ponderosa Pine

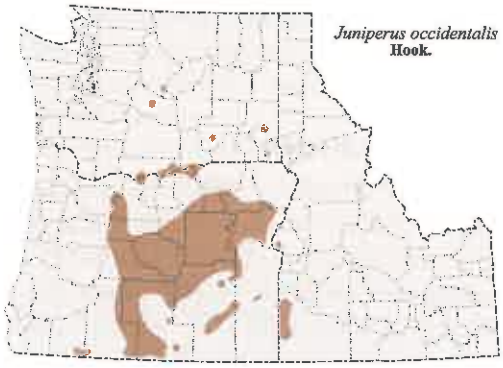


Map 8-6. Quaking Aspen

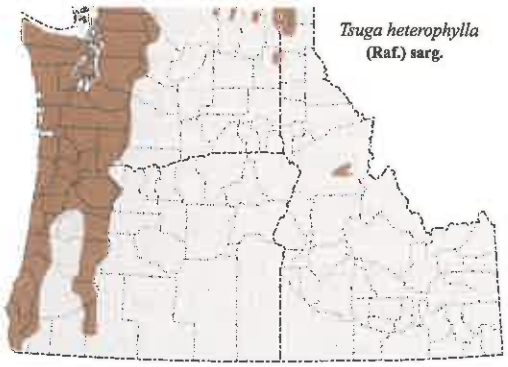


Map 8-7. Oregon White Oak

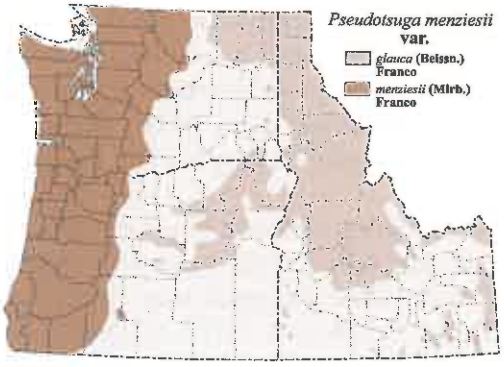
Map 8-8. Engelmann Spruce



Map 8-9. Western Juniper



Map 8-10. Western Hemlock



Map 8-11. Douglas-fir

ducted by Franklin and Dyrness (1988). Other major works introducing the interested individual to broad aspects of Pacific Northwest vegetation include a detailed study of steppe vegetation (Daubenmire 1970), a description of the forest vegetation of eastern Washington and northern Idaho (Daubenmire and Daubenmire 1968), and many comprehensive technical reports for Oregon and Washington issued as "Regional Guides" by the U.S. Forest Service, Pacific Northwest Region 6, Portland, Oregon, such as the report by Henderson et al. (1989). For Idaho, comparable studies are published as "General Technical Reports" by the U.S. Forest Service at the Intermountain Research Station, Ogden, Utah, such as the report by Steel et al. (1981).

Species Range and Ecotype

A quite different concept from that of vegetation zones concerns the distribution of individual plant species within the region of their occurrence, termed a species' range. An organism does not occupy all the area within its range, through differences in soil, topography, and local climate. Plant species often consist of a series of races, genetically adapted to localized ecological conditions, called ecotypes. Maps 8-4 to 8-11 show the ranges of eight prominent tree species and some major ecotypes in the Pacific Northwest.

Ecoregions

Regional variations in climate, vegetation, soil, and landforms in the Pacific Northwest are integrated into a single map of ecoregions (map 8-3). An outgrowth of regional planning at the federal level, ecoregion mapping helps with (1) planning where broad management problems must be considered; (2) organizing and retrieving resource inventory data; and (3) interpreting and analyzing these data. This system has been useful in assessments required under the Resources Planning Act and the National Forest Management Act, and for various regional and national studies conducted by the U.S. Environmental Protection Agency, and in the National Wetlands Inventory conducted by the U.S. Fish and Wildlife Service.

Although combining different kinds of physical and biological data into a single system of regionalization is not new, the ecoregion map developed by R. G. Bailey (1976 and 1978) establishes a hierarchical system based on independent databases. Since broad similarity in zonal heat and moisture availability is the major control on physical systems, the Pacific Northwest is first divided into two domains, the Humid Temperate Domain and the Dry Domain. Each domain includes several divisions based on more specific macroclimatic criteria at the level of broad climatic types, e.g., Warm Continental Climate Division. At the third level, each division is divided into several provinces reflecting bioclimatic and soil criteria as generally expressed at the level of soil order and vegetation formation, e.g., Douglas-fir Forest Province.

This hierarchical system of regionalization may be refined at lower levels; for example, provinces are subdivided into sections reflecting potential natural vegetation types, and sections are broken down into districts based on land surface form. Ultimately, the system is capable of defining a site, a more or rless homogeneous unit of land with respect to local climate, landform, soil, and vegetation for which a management prescription can be effectively prepared (Bailey 1982).

A very similar system has been refined by Omernik and Gallant (1986) in which ecoregions in the Pacific Northwest are synthesized from independent regional data sets describing (1) land surface form, (2) potential natural vegetation, (3) land use, and (4) soils.

Wetlands

Wetlands are those transitional lands between terrestrial and aquatic environments in which water saturation is the dominant factor governing soil development and plant and animal communities. Seasonal wetlands are saturated only for short periods of time during the growing season; other areas such as marshes and many swamps are saturated, or even inundated, throughout the year. In the Pacific Northwest wetlands constitute a very small proportion of the total land area, less than 1.5 percent (see map 8-1).

Once considered waste places, many wetlands have been drained, filled, or otherwise destroyed. Nationally, the United States has lost approximately 50 percent of its wetland resources (Tiner 1984, Dahl et al. 1991, Frayer et al. 1983). In the Pacific Northwest losses are about 39 percent, most of which were caused by historical draining of interior freshwater wetlands for farming. Idaho has lost 56 percent of its wetlands, Oregon 38 percent, and Washington 31 percent (Dahl 1990). Coastal wetlands, the majority of which are salt marshes, constitute probably less than 5 percent of the total wetland acreage.

Conversion of coastal wetlands has nonetheless been profound, with losses varying from 30 to 90 percent per estuary.

In the early 1970s, the multiple values of wetlands began to be recognized. These resources provide critical habitat for wildlife, help purify polluted water, reduce flooding, and provide important areas for recreation, education and research. Today, many practices that damage wetlands are regulated as required under federal and state legislation, yet still the region continues to lose wetlands, particularly by the conversion of wetlands to urban and commercial uses.

The U.S. Fish and Wildlife Service is in the process of inventorying the wetlands of the nation. The National Wetlands Inventory is based on the interpretation of aerial photographs, and identified wetlands are classified and mapped at the scale of U.S. Geological Survey quadrangles. The inventory is complete for Oregon and Washington and is in progress for Idaho. The small-scale map of Pacific Northwest wetlands (map 8.11) is based on the national map of Wetland Resources of the United States (Dahl 1991). In part, mapped wetlands represent aggregated data from the National Wetlands Inventory and the judgement of staff in the regional offices of the U.S. Fish and Wildlife Service. Mapped are (1) areas that are predominantly wetland and (2) areas within which there is a high density of small wetlands. Deepwater habitats are excluded from the map.

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