Ecoregions of Western Washington and Oregon

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregions are directly applicable to the immediate needs of state agencies, including the development of biological criteria and water quality standards, and the establishment of management goals for nonpoint source pollution. They are also relevant to integrated ecosystem management, an ultimate goal of most federal and state resource management agencies.

The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of the patterns and the composition of biotic and abiotic phenomena that reflect differences in ecosystem quality and integrity (Wiken 1986; Omernik 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level. A human nominal hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions, with level II dividing the continent into 51 regions. At level III, the conterminous United States contains 98 ecoregions (United States Environmental Protection Agency (USEPA) 1996). Level IV is a further subdivision of level III ecoregions. Explanations of the methods used to define the USEPA ecoregions are given in Omernik (1995), Griffith and others (1994), and Gallant and others (1989).

This level III and IV ecoregion map was compiled at a scale of 1:250,000; it depicts revisions and subdivisions of earlier level III ecoregions that were originally compiled at a smaller scale (USEPA, 1996; Omernik, 1987). The project is the product of a collaborative effort presently between the USEPA Region 8, the USEPA National Health and Environmental Effects Research Laboratory (Corvallis, Oregon), the Oregon Natural Heritage Program, the United States Department of Agriculture - Forest Service (USFS), the United States Department of Agriculture - Natural Resources Conservation Service (NRCS) (formerly the Soil Conservation Service), the United States Department of the Interior - Geological Survey (USGS) - Earth Resources Observation Systems (EROS) Data Center, the Washington State Department of Natural Resources (Washington DNR), and the Washington State Department of Ecology.

This project is associated with an interagency effort to develop a common framework of ecological regions. Resulting final objectives require recognition of the differences in the conceptual approaches and mapping methodologies that have been used to develop the most commonly used existing ecoregion-type frameworks, including those developed by the USFS (Bailey and others, 1994), the USEPA (Omernik, 1987, 1995), and the NRCS (United States Department of Agriculture - Soil Conservation Service, 1981). As each of these frameworks is further developed, the differences between them are becoming less. Regional collaborative projects such as this one in Washington and Oregon, where agreement can be reached among multiple resource management agencies, is a step in the direction of ensuring commonality and consistency in ecoregion frameworks for the entire nation.

Bailey, R.G., Avers, P.E., King, T., and McNab, W.H., eds., 1994, Ecoregions and subregions of the United States (map [illegible]): Washington, D.C., U.S. Department of Agriculture, Forest Service, scale 1:7,500,000.

Griffith, G.E., Omernik, J.M., Azevedo, S.H., and Bailey, R.G., 1994, Ecoregionalization as a tool for managing environmental resources: Corvallis, Oregon, U.S. Environmental Protection Agency EPA/600/R-94/074, [illegible] p.

Gallant, A.L., Whittier, T.R., Larsen, D.P., Omernik, J.M., and Hughes, R.M., 1989, Regionalization as a tool for managing environmental resources: Corvallis, Oregon, U.S. Environmental Protection Agency EPA/600/3-89/060, [illegible] p.

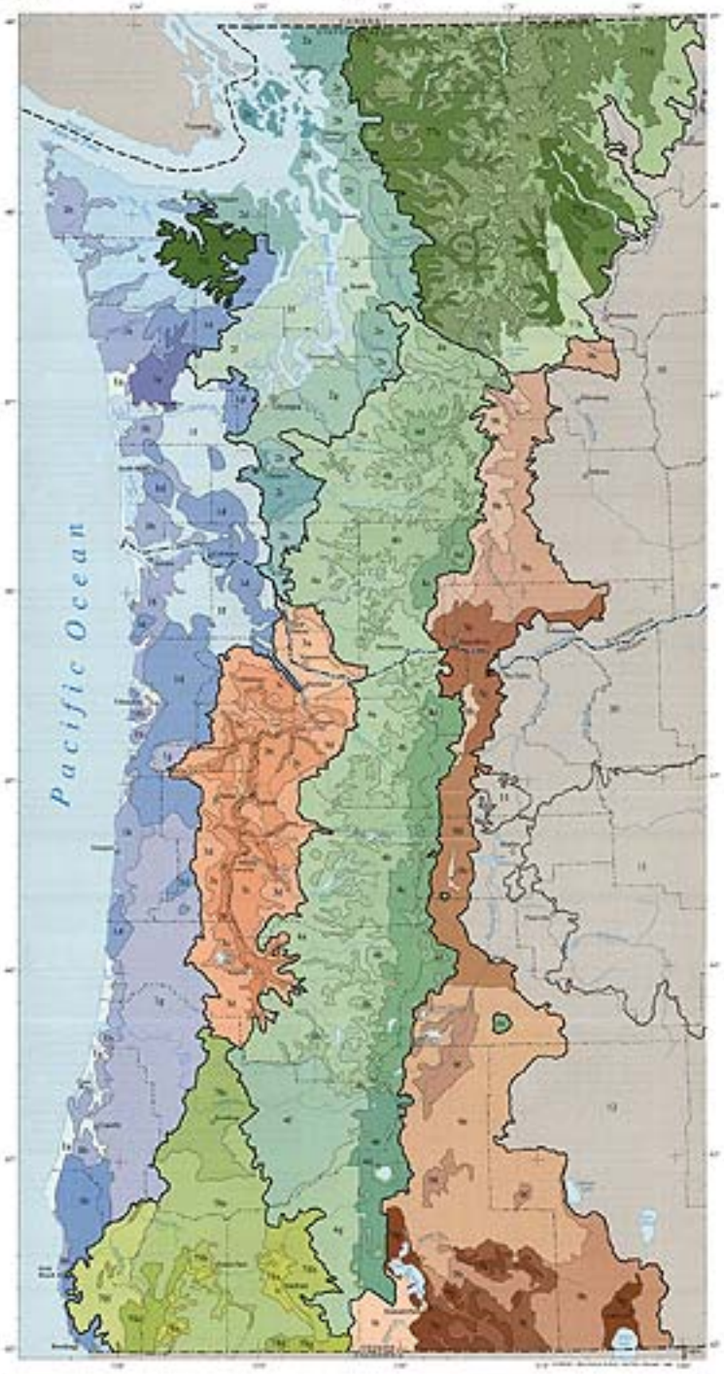
Omernik, J.M., 1987, Ecoregions of the conterminous United States (map supplement): Annals of the Association of American Geographers, v. 77, no. 1, p. 118-125, scale 1:7,500,000.

Omernik, J.M., 1995, Ecoregions - a framework for environmental management, in Davis, W.S. and Simon, T.P., eds., Biological assessment and criteria - tools for water resource planning and decision making: Boca Raton, Florida, Lewis Publishers, p. 49-62.

U.S. Department of Agriculture, Soil Conservation Service, 1981, Land resource regions and major land resource areas of the United States: Agriculture Handbook 296, 156 p.

U.S. Environmental Protection Agency, 1996, Level III ecoregions of the continental United States (revision of Omernik, 1987): Corvallis, Oregon, U.S. Environmental Protection Agency - National Health and Environmental Effects Research Laboratory, Map M-1, various scales.

Wiken, E., 1986, Terrestrial ecozones of Canada: Ottawa, Environment Canada, Ecological Land Classification Series no. 19, 26 p.



1 Coast Range
1a Coastal Lowlands
1b Coastal Uplands
1c Low Olympics
1d Volcanics
1e Dunes
1f Willapa Hills
1g Mid Coastal Sedimentary
1h Southern Oregon Coastal Mountains
1i Redwood Zone

2 Puget Lowland
2a Puget Lowland
2b Eastern Puget Riverine Lowlands
2c San Juan Islands
2d Olympic Foothills
2e Eastern Puget Uplands
2f Central Puget Lowland
2g Southern Puget Prairies
2h Cowlitz/Chehalis Foothills
2i Cowlitz/Newaukum Prairie Floodplains

3 Willamette Valley
3a Portland/Vancouver Basin
3b Willamette River and Tributaries Gallery Forest
3c Prairie Terraces
3d Valley Foothills

4 Cascades
4a Western Cascades Lowlands and Valleys
4b Western Cascades Montane Highlands
4c Cascade Crest Montane Forest
4d Cascades Subalpine/Alpine
4e High Southern Cascades Montane Forest
4f Umpqua Cascades
4g Southern Cascades

9 Eastern Cascades Slopes and Foothills
9a Yakima Plateau and Slopes
9b Grand Fir Mixed Forest
9c Oak/Conifer Eastern Cascades Columbia Foothills
9d Ponderosa Pine/Bitterbrush Woodland
9e Pumice Plateau Forest
9f Cold Wet Pumice Plateau Basins
9g Klamath/Goose Lake Warm Wet Basins
9h Pumice Plateau Forest
9i Southern Cascades Slope
9j Klamath Juniper/Ponderosa Pine Woodland

77 North Cascades
77a North Cascades Lowland Forests
77b North Cascades Highland Forests
77c North Cascades Subalpine/Alpine
77d Pasayten/Sawtooth Highlands
77e Okanogan Pine/Fir Hills
77f Chelan Fopha Hills
77g Wenatchee/Chelan Highlands
77h Chiwaukum Hills and Lowlands
77i High Olympics

78 Klamath Mountains
78a Rogue/Illinois Valleys
78b Siskiyou Foothills
78c Umpqua Interior Foothills
78d Serpentine Siskiyous
78e Inland Siskiyous
78f Coastal Siskiyous
78g Klamath River Ridges

Level III ecoregion
Level IV ecoregion
County boundary
State boundary
International boundary

SCALE 1:250,000

Universal Transverse Mercator Projection, Zone 10

PRINCIPAL AUTHORS: Kevin S. Pater (Oregon Cooperative Studies in Rural Mountain Communities, Univ. of Montana, Office of Water Resources, Oregon State University), Thomas R. Loveland (EROS Data Center), and Alan J. Woods (Pacific Northwest Laboratory)

COLLABORATORS AND CONTRIBUTORS: Bruce C. Aust (OSU), Duane Landers (USFS), Thomas Gaul (USFS), Robert Messmer (USFS), Kenneth Rank (USFS), Earl Davis (USFS), Thomas Loveland (USGS), and R. Francis Pasker (USGS, emeritus)

This project was partially supported by funds from the USEPA - Office of Research and Development - Regional Applied Research Effort (RARE) program.

Washington State Department of Natural Resources

Oregon Natural Heritage Program

EPA

USGS

1. Coast Range

The Coast Range ecoregion is a gently sloping line of glacial materials that is dominated by industrial timber plantations. It lies outside the zone of marine influence and has lower stream flows than most other parts of the Coast Range (1).

1a The Coastal Lowlands zone gives moderate temperature regimes, frost-free dates, fairly warm streams, and dense forest cover and land from sloping. Elevations range from sea level to 300 feet. Channelization and diking have converted many of its wetlands into dairy pastures, associated stream quality degradation has occurred.

1b The Coastal Uplands ecoregion extends to an elevation of about 900 feet. The climate of Ecoregion 1b is marine influenced with an extended winter rainy season, though fog during the summer dry season is rarer than in the Lowlands. Streams and a lack of extended surface water exist. The ecoregion roughly corresponds with the historic distribution of Sitka spruce. The extent of the original forest has been greatly reduced by logging.

1c The Low Olympics ecoregion contains foothills and mountains and rises to an elevation of approximately 4000 feet. Climate precipitation ranges 200 inches/year supports a lush, amphibious rich assemblage of western hemlock, Douglas-fir, red cedar, and Douglas-fir. Much of the region is in the Hoh Indian of Supply. However, a portion of the region lies within the Olympic National Park and contains ancient forests.

1d The Volcanics ecoregion varies in elevation from 1000 to 4000 feet and is dissected. Colluvium and pillow basalt underlie forest. Its mountains may have been efficient moisture-sensitive amphibians, including the endangered Oregon slender salamander and tailed frog, and dwelling.

1e The Dunes ecoregion is a gently sloping line of glacial materials that is dominated by industrial timber plantations. It lies outside the zone of marine influence and has lower stream flows than most other parts of the Coast Range (1).

1f The Willapa Hills ecoregion has sandstone and clay soils. Drainage density is lower than in other parts of the Coast Range (1) that are also underlain by sedimentary rock. Industrial timberland has almost completely replaced the historic forests of the ecoregion.

1g The Mid-Coastal Sedimentary ecoregion is commonly underlain by massive beds of siltstone and sandstone. The dissected terrain ecoregion is more rugged than in Ecoregion 1 and has greater relief. Streams are more steep than the regional zones is somewhat. Stream gradients and flow are intermediate and low light.

1h The Southern Oregon Coastal Mountains is a transitional ecoregion with an inland dissected terrain. It is a transitional area between the Siskiyou Mountains and the Coast Range and is underlain by largely sandstone, metamorphosed sedimentary, granite, and serpentine. Much of the geology of Ecoregion 1h is complex. Not that of the Siskiyous Mountains, but its mountains are lower and are not as dissected. The distribution of northern and southern vegetation blend together here and species diversity is high.

1i The Redwood Zone is the northernmost tip of an ecoregion that extends to San Francisco Bay. Remnants of untogged redwood forest survive east of Brookings. The redwood forest, which is restricted to an inner ecosystem, moderated by cool marine breezes by atmosphere or coastal fog and by dwelling.

2. Puget Lowland

This broad rolling lowland is characterized by a cool maritime climate and forms the intermediate one condition of Puget Sound. It occupies a combination glacial trough and has many islands, peninsulas, and bays. Coniferous forest originally grew on the ecoregion's glacial moraines, outwash plains, floodplains, and terraces. The distribution of forest species is affected by the rainshadow from the Olympic Mountains.

2a The Puget Lowland ecoregion is composed of glacial drift plains, terraces, and some floodplains. Undulating terrain, a short, cool climate, and productive pastureland are characteristic. This ecoregion has the highest dairy farm concentration in Washington.

2b The Eastern Puget Riverine Lowlands ecoregion is composed of floodplains and terraces. Western red cedar forest, western hemlock forest, and wet meadows and wetland habitat were common before the 19th century. Subsequently, many of the wetlands were drained. Pastures, cropland, forests, and urban centers now dominate the landscape.

2c The glacial scoured San Juan Islands ecoregion is underlain by metamorphic rock. Well-drained, shallow soils are typical. It is in the rainshadow of the Olympic Mountains. The dense vegetation typical of the Puget Lowland (2) gives way here and include Douglas-fir-grand fir forests, and woodlands, and grasslands.

2d The Olympic Foothills ecoregion receives, on the average, only 35 to 45 inches of precipitation each year depending on its areas. Streams on the till plains have low discharge, and their drainage pattern is often arrangeled or internal. In basins, soils tend to retain moisture better than the soils of the San Juan Islands (2c) and support pastureland, cropland, and woodland.

2e The Eastern Puget Uplands ecoregion is made up of rolling moraines and foothills and is a zone of transition. Both Puget Lowland and Foothills vegetation associations occur with the latter more common.

2f The Central Puget Lowland ecoregion is the heart of Puget Sound both in area and human access. In undulating drift plains are heavily influenced by the sea and more rural and forested at the west. Well-drained, gravelly soils are common and exhibit limited moisture holding capacity and rather low agricultural productivity.

2g The Southern Puget Prairies ecoregion is composed of nearly level to rolling glacial outwash plains and glacial moraines. Well-drained soils generally a loam over dense, of Douglas-fir/western hemlock forest, prairie, oak woodlands, cropland, and pastureland.

2h The Cowlitz/Chehalis Foothills are rolling to steeply sloping. The potential natural vegetation, western hemlock and western red cedar forest, is similar to Ecoregions 2a, b, d, e, f, and i. However, in contrast to much of the Puget Lowland (2), Ecoregion 2h was unaffected by continental glaciation.

2i The Cowlitz/Newaukum Prairie Floodplains ecoregion is a transitional zone between the Puget Lowland (2) and the Willamette Valley (3). Its vegetation, soil, and climate are similar to those of the Southern Puget Prairies (2g) and the Eastern Puget Riverine Lowlands (2b). Here, cool, mild, but dense, clouds, and Lowlands continental glaciation.

3. Willamette Valley

Rolling prairies, dissected terraces, forests, and riparian habitats characterized the pre-settlement landscape of the broad lowland valley. Ecoregion 3 is distinguished from the adjacent Coast Range (1) and Cascades (4) by lower precipitation, less relief, and a different mosaic of vegetation. Landforms consist of terraces and floodplains, interlaced and surrounded by rolling hills. Produced very mild and a temperate climate makes it one of the most important agricultural areas in Oregon.

3a The Portland/Vancouver Basin ecoregion is composed of undulating terraces and floodplains with numerous wetlands, oxbow lakes, and ponds. Historically, prairie and oak woodland grew on better drained sites while wetlands, Oregon ash, and Douglas-fir occurred elsewhere in the basin much more. Today, Ecoregion 3a is dominated by urban and suburban development patterns, and nurseries. Weather here is often affected by cold air masses passing through the Columbia River Gorge.

3b In the Willamette River and Tributaries Gallery Forest ecoregion, meandering, low gradient streams and oxbow lakes are lacked with broad floodplains. Riparian vegetation forms dense gallery on the banks, although such have been largely replaced by agriculture and rural residential, suburban, and urban development.

3c The rolling Prairie Terraces ecoregion is dissected by low gradient, meandering streams and rivers. Its Pleistocene terraces supported prairie and oak woodlands which were transformed by logging, Oregon ash and Douglas-fir occurred in wetter areas. Today, grass seed and grass crops are commonly grown.

3d The Valley Foothills ecoregion is a transitional zone between the Willamette Valley (3) the Cascades (4), and the Coast Range (1). It has less rainfall than adjacent more mountainous ecoregions and consequently, its potential natural vegetation is intermediate. Ecoregion mixed and Douglas-fir forest, dominated the valley. Great residential development transformed fundamental vegetation into farms and suburban communities.

4. Cascades

Timber extraction and plantation forestry are active in the Cascades ecoregion of Ecoregion 4.

The mountainous ecoregion underlain by Cenozoic volcanics has been affected by alpine glaciation. It is characterized by steep ridges and river valleys in the west, a high plateau in the east, and both active and dormant volcanoes. Elevation range upwards to 10,000 feet. In west, temperate climate supports an extensive and highly productive coniferous forest. Subalpine meadows occur at high elevations.

4a The Western Cascades Lowlands and Valleys ecoregion is characterized by a variegated of steep ridges and narrow valleys. Elevations are generally less than 3,000 feet and are the lowest in Ecoregion 4. The red, mild climate promotes leaf forests that are dominated by Douglas-fir and western hemlock. It is one of the most important timber producing areas in the Northwest.

4b The Western Cascades Montane Highlands ecoregion is composed of steep glaciated mountains that have been dissected by high gradient streams. It has fewer temperatures than Ecoregion 4a and is characterized by a dense mixed conifer pack. Soils are of the frigid and cryic temperature regimes and support forests dominated by Pacific silver fir, western hemlock, mountain hemlock, Douglas-fir and other fir.

4c The Cascade Crest Montane Forest ecoregion consists of an undulating plateau punctuated by volcanic buttes and cones that reach a maximum elevation of about 4500 feet. In Pleistocene and Pleistocene volcanics were glaciated leaving numerous lakes in their wake. The ecoregion is extensively forested with western hemlock and Pacific silver fir.

4d The Cascades Subalpine/Alpine ecoregion is an area of high glaciated volcanic peaks that rise above subalpine meadows. Elevations range from 5000 to 12000 feet. Active glaciation occurs on the highest volcanoes and the classes from north to south. The climate are very cold and the growing season is extremely short. Plants and fauna adapted to high elevations include subalpine meadows vegetation and scattered pine have of mountain hemlock, subalpine fir, and whitebark pine.

4e The High Southern Cascades Montane Forest ecoregion consists of an undulating glaciated plateau punctuated by volcanic buttes and cones. Maximum elevation is about 5000 feet. Its cool and dry climate is characterized by numerous hemlock and Pacific silver fir. Great fir, white fir, Douglas-fir and lodgepole pine are also present and increase in the south and east. Ecoregion 4e tends to be drier than Ecoregion 4c and has larger periods of moisture drought and more widespread volcanics.

4f The Umpqua Cascades ecoregion is a transitional zone between the Inner and interior forests of Ecoregions 4a and 4b to the north and the drier forest of the Southern Cascades (4g) and the Klamath Mountains (78). Vegetation is a mix of grand fir, white fir, western hemlock, Pacific silver fir, and Douglas-fir with Sharp red fir also occurring and increasing in the south. Vegetation diversity is greater than in Ecoregions 4a and 4b which have similar climates.

4g The Southern Cascades ecoregion is drier than others in the Cascades (4). It is characterized by gently sloping mountains, broad valleys, a long summer drought, and high vegetation diversity. While the climate is similar to the Crescent Mountains (4e), the vegetation is adapted to the prevailing dry, continental climate and is highly susceptible to a fire. Volcanic cones and lava are common in much of the region.

9. Eastern Cascades Slopes and Foothills

Ecoregion 9 is at the northeastern of the Cascade Mountains. Its climate exhibits greater temperature extremes and less precipitation than ecoregions to the west. Open forests of ponderosa pine and some lodgepole pine distinguish this region from the higher ecoregions to the west where hemlock and fir forests are common and the lower, arid ecoregions to the east where shrubs and grasslands are predominant. The vegetation is adapted to the prevailing dry, continental climate and is highly susceptible to a fire. Volcanic cones and lava are common in much of the region.

9a The eastern zone Yakima Plateau and Slopes ecoregion is characterized by plateaus, buttes, and canyons, in a dry continental climate, and open woodlands dominated by ponderosa pine. Fire is an integral part of its ecosystem.

9b The Grand Fir Mixed Forest ecoregion is mostly outside the limit of maritime climate influence. It is characterized by high, glaciated plateaus and mountains, frigid soils, and a more dominated, continental climate. The vegetation is a mix of grand fir, Douglas-fir, and ponderosa pine.

9c The Oak/Conifer Eastern Cascades Columbia Foothills ecoregion is more diverse than any other within the Eastern Cascade Slopes and Foothills (9). Soil climate and landforms are all highly variable and contribute to a mosaic of vegetation types that includes grasslands, oak woodlands, Douglas ponderosa pine forests, and western hemlock/Douglas-fir forests. Maximum weather systems entering into Ecoregion 9c via the Columbia River Gorge and moderate to otherwise continental climate.

9d The Ponderosa Pine/Bitterbrush Woodland ecoregion has a mixed environment by underlying volcanic plateaus and canyons. Its soil dominate frigid soils are often derived from ash and support mostly bunchgrasses stands of ponderosa pine. Bitterbrush grows at lower elevations. Stands of lodgepole pines are largely absent in contrast to the Pumice Plateau Forest (9e) to the south.

9e The Pumice Plateau Forest ecoregion is a high volcanic plateau that is mostly covered by Mt. Mazama ash and pumice. Its weather soils are commonly excessively drained. Spring frost events, therefore, and a very brief season. Forests of ponderosa pine are common in slopes, colder depressions and flats are dominated by lodgepole pine. Winters are commonly cold and precipitation rich density in snow. Summers tend to be cool.

9f The Cold Wet Pumice Plateau Basins ecoregion occupies broad, flat, Klamath Marsh and Lost Prairie. All these areas function as cold air catch basins during the winter and have lower minimum temperatures than Ecoregion 9e. Its marshes and forested wetlands are commonly 4000 to 5000 feet in elevation and are important habitat for migratory waterfowl. The Lost Prairie is underlain by fresh incentive deposits that with the high percent water tables during the spring years. Such.

9g The Klamath/Goose Lake Warm Wet Basins ecoregion is drier than elsewhere in Ecoregion 9, yet it contains floodplains, marshes, and a glacial lake basin. The lake, sedge, and wetland wetlands have largely been drained for agriculture. Superficial and bunchgrass occur in upland areas.

9h The pumice of the Fremont Pine/Fir Forest ecoregion is composed of volcanoes and high plateaus. Its continental climate and diverse terrain support a range of vegetation types. Ponderosa pine woodlands are common at lower elevations while white fir is more prevalent in higher areas.

9i The Southern Cascades Slope ecoregion is a transitional zone between the Cascades (4) and the drier Eastern Cascade Slopes and Foothills (9). Forests of ponderosa pine blended the mountainous landscape, where fir, Sierra red fir, and Douglas-fir grow in higher elevations. Much of Ecoregion 9i typically receives more precipitation than Ecoregion 9e (9i, 9e 5 g, and 9).

9j The mosaic of the Klamath Juniper/Ponderosa Pine Woodland ecoregion consists of undulating hills, escarpments, and plateaus. Mean annual temperatures range from 47 to 50 inches per year. Bunchgrass are the landscape and are important to livestock ecologists. The natural vegetation was mainly juniper in the south and a mix of ponderosa pine and juniper in the north today, a mosaic of pastures and woodland mosaic.

77. North Cascades

The Cascade Crest Montane Forest ecoregion is composed of high rugged mountains. It contains the greatest concentration of active alpine glaciers in the conterminous United States and has a variety of climatic zones. A dry continental climate exists in the east and mild, maritime, coniferous conditions are found on the west. It is underlain by sedimentary and metamorphic rock as contrasted to the adjoining Ecoregion 4c which are composed of volcanics.

77a The North Cascades Lowland Forests ecoregion is composed of low mountains, broad glaciated valleys, and glaciated basins that receive, on average, 80 to 90 inches of precipitation per year. Extensive, productive coniferous have developed under the mild maritime climate and are dominated by western hemlock, Douglas-fir, and western red cedar. Tomatoes occur in the valleys.

77b The Landscape of the North Cascades Highland Forests ecoregion consists of steep, glaciated ridges, high gradient streams, and harsh, frigid climate, conditions, deeper more stark, and Pacific silver fir dominated hemlock forests, distinguish it from Ecoregion 77a.

77c The North Cascades Subalpine/Alpine ecoregion is characterized by high elevation peaks, bare rock, glaciers, sharp horns, glaciated precipitation, and unbroken forest glacial and alpine climates. Subalpine meadows occur around the tallest peaks, their flora and fauna is adapted to the prevailing subarctic climate.

77d The Pasayten/Sawtooth Highlands has colder or more temperatures than elsewhere in Ecoregion 77 and has experienced less commercial and alpine glaciation. Its landscape of high ridges, plateaus, and brought valleys is dominated by subalpine, lodgepole pine grows in the northern. Ecoregion 77e is drier or fewer in forest elevations, and many subalpine occur. Mean precipitation is from 35 to 55 inches per year and varies according to elevation and slope aspect. Its low than that received by Ecoregions 77a, b, c, and which occur in the west.

77e The glaciated Okanogan Pine/Fir Hills ecoregion has rounded mountains and broad, U-shaped valleys. Elevations are lower and slope angles are gentler than further west in the jagged, mountainous zone of the North Cascades (77). Mean precipitation ranges from 20 to 35 inches per year falling mostly as snow. It is lower than elsewhere in Ecoregion 77 and drougthy conditions prevail. Precipitation and temperatures both vary according to elevation, aspect, and topography, and slope aspect and affect the distribution of vegetation. Ponderosa pine grows on lower, drier areas and Douglas-fir is found at higher elevations. Mountain ecoregions is common in the underwater of the south and higher lies or grows in the north.

77f The steep, glaciated Chelan Fopha Hills ecoregion is dominated by steep depiction of granite, volcanic rocks which contribute to the character of this dry, inner-side region. Elevations range from 1500 to 7500 feet. Ponderosa pine grows in lower areas Douglas-fir occurs in the mid-elevations, and subalpine fir is found above 5000 feet in elevation.

77g The glaciated Wenatchee/Chelan Highlands ecoregion is characterized by mountains and ridges, open, U-shaped valleys, and dissected high gradient streams. Lowland climate conditions prevail. Douglas-fir, grand fir, and subalpine fir are common. Subalpine pine and Engelmann spruce also occur. Average precipitation ranges from only 15 to about 40 inches per year.

77h The Chiwaukum Hills and Lowlands are composed of indigous rock substrate, and are unlike neighboring ecoregions which are underlain by metamorphic and igneous rock. In low mountains, hills, and valleys, can be highly variable and unstable. Streams have high sediment yields and are in U-shaped valleys, their sediment forms a fluffy pattern.

77i The High Olympics ecoregion contains rising glaciated mountains that reach an elevation of 8000 feet. It is characterized by rock outcrops, tarns, sediment-filled pools, alpine glaciers, and high gradient, glacial fed streams. Its vegetation includes subalpine mountain hemlock and Pacific silver fir. Elevations of 4-6 in alpine meadows. Subalpine fir occurs on the west side of the Olympic mountains areas.

78. Klamath Mountains

The Klamath Mountains ecoregion is physically and biologically diverse. Highly dissected, folded mountains, foothills, terraces, and floodplains occur and are underlain by igneous, sedimentary, and some metamorphic rock. The mild influence climate of Ecoregion 78 is characterized by a lengthy summer drought. It supports a regional mix of northern California and Pacific Northwest conifers.

78a The Rogue/Illinois Valleys ecoregion consists of floodplains and terraces that have a local relief of 100 to 600 feet. It is characterized by hot, dry summers and a mix of vegetation of Oregon white oak, madrone, California black oak, ponderosa pine, and grasslands. Today, a mix of orchards, cropland, pastureland, oak woodland, pine woodland, and rural residential development occurs. Vegetation and land use are more similar to those of northern California's inland valleys than those of the Willamette Valley (3).

78b The Siskiyou Foothills are affected by a Mediterranean climate that is similar to Ecoregion 78a. The direct zone occupies most of Medford and is dominated by oak woodlands, ponderosa pine, and Douglas-fir. The wetter foothills adjacent to the Illinois Valley support Douglas-fir, madrone, and incense cedar.

78c The Umpqua Interior Foothills ecoregion is an intermingling of narrow valleys, terraces, and foothills, in contrast with the interior of the more mountainous inland Ecoregion 78e. A mix of oak woodlands, Douglas-fir, ponderosa pine and madrone intermingle with agricultural vineyards orchards and row crops. The vegetation and land use are similar to those of Ecoregions 78a and 78b. Summers are hot and dry and, although the climate is intermediate to that the Willamette and Rogue valleys, it is more similar to the Rogue Valley.

78d The serpentinite Serpentine Siskiyous ecoregion is highly dissected and is underlain by Jurassic serpentinite. Rare endemic species and sparse woodlands grow on its unique soils. Mining and access roads have qualified pressures on it.

78e The Inland Siskiyous ecoregion is mountainous. Climatic and endemically rich underlie the ecoregion and distinguish it from the volcanic mountains of the Cascades (4). Inland Fire Frequently, low annual precipitation, longer summer drought, and a lack of volcanic differentiate it from the Coastal Siskiyous (78f).

78f The Coastal Siskiyous ecoregion has a warmer and a milder maritime climate than elsewhere in the Klamath Mountains (78). Productive forests composed of tanoak, Douglas-fir and some from Driftless occur over the diversified topographic landscape.

78g The Klamath River Ridges ecoregion has a dry, continental climate and receives, on average, 35 to 55 inches of rain annually. Low elevation and south-facing sites have a more drought-resistant vegetation that characterizes the Klamath Mountains (78) such as juniper, chaparral, and ponderosa pine. Higher areas and north-facing slopes are occupied by Douglas-fir, white fir, and Sharp red fir. Ecoregion 78g has less precipitation, more sunny days, and a greater number of cold, clear nights than the Inland Siskiyous (78e).