Ecological site AX001X03X003
Mesic Aquic Forest

Last updated: 1/23/2025
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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 001X–Northern Pacific Coast Range, Foothills, and Valleys

This long and narrow resource area stretches along the Pacific Border Province of the Pacific Mountain System in Oregon and Washington. The area is bounded by the Olympic Mountains on the north and the Klamath Mountains on the south. Most of the area consists of hills and low mountains with gentle to steep slopes. The parent materials are composed primarily of young Tertiary sedimentary rocks with some minor volcanic rocks. Glacial till and outwash deposits are found in the northern half of the area within Washington. In the far southern portion of the area, near the Klamath Mountains, the sedimentary rocks are older and some have been metamorphosed. The average annual precipitation ranges from 60 to 200 inches, increasing with elevation.
The dominant soil orders in this MLRA are Andisols, Inceptisols, and Ultisols. Soil depth ranges from shallow to very deep. While most soils in the area are well drained and occur on foothills, mountain slopes and ridges, floodplain and depressional soils can range from well drained to very poorly drained. Soil textures are typically medial, loamy, or clayey. The dominant soils in the area have a mesic or frigid soil temperature regime and a udic soil moisture regime; however, soils with an aquic soil moisture regime or cryic soil temperature regime do occur.

LRU notes

The Central Pacific Coast Range land resource unit (LRU 3) of MLRA 1 ranges from the Olympic Peninsula south into northern Oregon. LRU 3 is located south of the Olympic National Forest and extends to the Siletz River in Oregon. LRU 3 is bounded on the west by MLRA 4a Sitka Spruce Belt and MLRA 2 Willamette and Puget Sound Valleys to the east. Several major rivers have headwaters in this LRU or carved valleys through the landscape depositing more recent alluvium. These include the Chehalis, Columbia, Grays, Humptulips, Klaskanine, Nehalem, Satsop, Siletz, Willapa, Wilson, Wynoochee, and Yamhill Rivers.

Ecological site concept

This ecological site is found on the western Coast Range in the Pacific Northwest from southern Washington to northern Oregon. It is located at low elevations (less than 2,000 ft.) with abundant precipitation. The site is strongly influenced by physiography and hydrology, which provide rare and unique habitats in the coastal range. It consists of forested wetlands in depressions, on terraces, and in seeps of mountain slopes that have a seasonal high water table.
The most common overstory species are western hemlock (Tsuga heterophylla), western redcedar (Thuja plicata), bigleaf maple (Acer macrophyllum), and red alder (Alnus rubra). As a result of soil saturation during much of the year, conifers may be restricted to nurse logs or higher microsites and they commonly are short and stunted (Roccio, 2015). Shrubs may be sparse or entirely absent in some areas. Shrubs may include salmonberry (Rubus spectabilis), devilsclub (Oplopanax horridum), evergreen huckleberry (Vaccinium ovatum), vine maple (Acer circinatum), red huckleberry (Vaccinium parvifolium) and salal (Gaultheria shallon). The herb layer commonly is dominantly American skunkcabbage (Lysichiton americanus), deer fern (Blechnum spicant), and slough sedge (Carex obnupta).
The most common natural disturbance is ponding. The volume and longevity of the ponding determine the effect on

the dynamics of the forest. The site is vulnerable to windthrow following large coastal storms. Trees in this site are particularly susceptible to windthrow due to the shallow rooting depth in response to the seasonal high water table and long periods of ponding that extend into the growing season. Fallen trees that have exposed root systems and large woody debris are common. The fallen trees result in more canopy openings. The openings allow more sunlight to reach the forest floor, which leads to a shrubby understory. Disturbances in adjacent areas may alter the hydrology and increase the susceptibility to infestation by invasive species.

Associated sites

AX001X03X001	**Mesic Udic Riparian Forest** Ecological Site AX001X03X003, Mesic Aquic Forest is typically located adjacent to Ecological Site AX001X03X001, Mesic Udic Riparian Forest. Mesic Aquic Forest is located on alluvial terraces, moraines, and depressions. The site has poorly drained soils and is influenced by ponding.

Table 1. Dominant plant species

Tree	(1) *Tsuga heterophylla* (2) *Alnus rubra*
Shrub	(1) *Rubus spectabilis*
Herbaceous	(1) *Lysichiton americanus*

Legacy ID

F001XC003OR

Physiographic features

This ecological site is located at low elevations (less than 2,000 ft.) and is strongly influenced by physiography. It consists of forested wetlands in depressions, on terraces, and in seeps of mountain slopes that have a seasonal high water table.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Terrace (3) Depression (4) Mountain slope > Seep
Flooding frequency	None to frequent
Ponding frequency	None to frequent
Elevation	0–2,000 ft
Slope	0–15%
Water table depth	0–18 in
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The climate has warm, moist summers and cool, wet winters. Mean annual precipitation ranges from 60 to 110 inches and occurs mostly as rain, when snow occurs it does not persist. Average annual temperatures range from 44 to 54 degrees F.

Table 3. Representative climatic features

Frost-free period (characteristic range)	122-135 days
Freeze-free period (characteristic range)	157-211 days
Precipitation total (characteristic range)	52-109 in

Frost-free period (actual range)	116-147 days
Freeze-free period (actual range)	157-215 days
Precipitation total (actual range)	49-119 in
Frost-free period (average)	129 days
Freeze-free period (average)	183 days
Precipitation total (average)	80 in

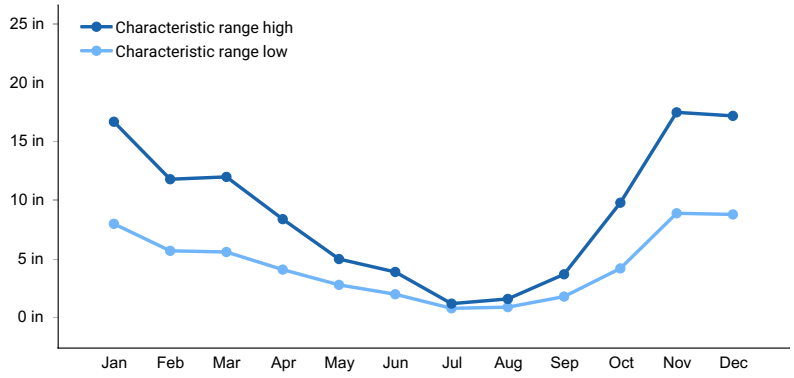


Figure 1. Monthly precipitation range

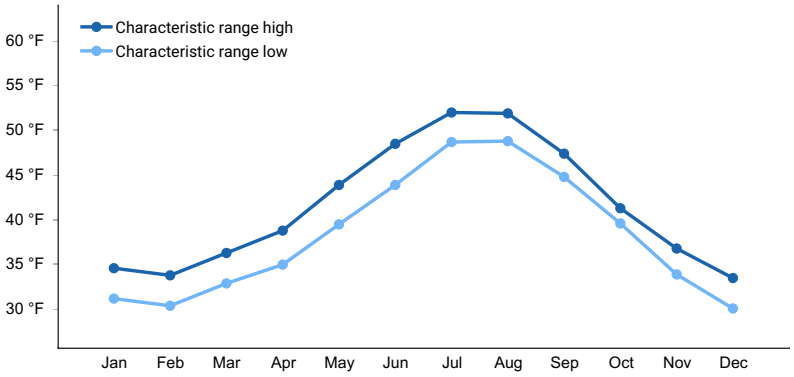


Figure 2. Monthly minimum temperature range

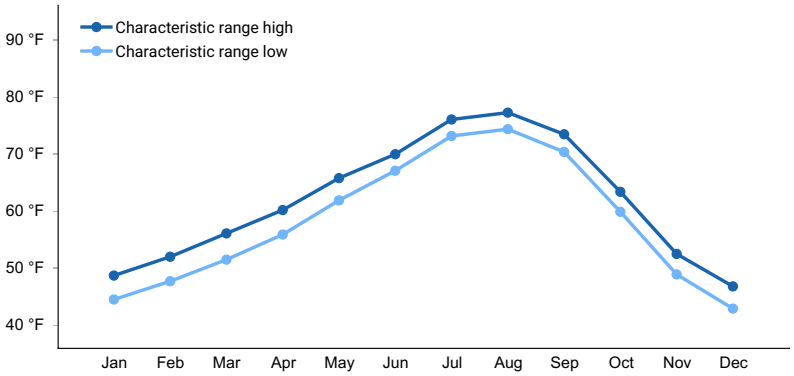


Figure 3. Monthly maximum temperature range

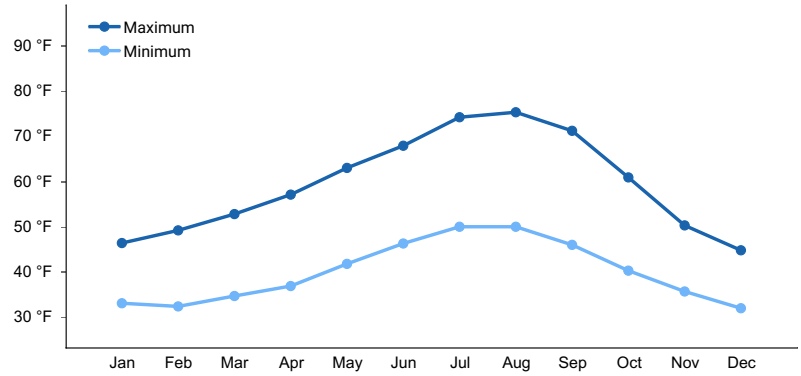


Figure 4. Monthly average minimum and maximum temperature

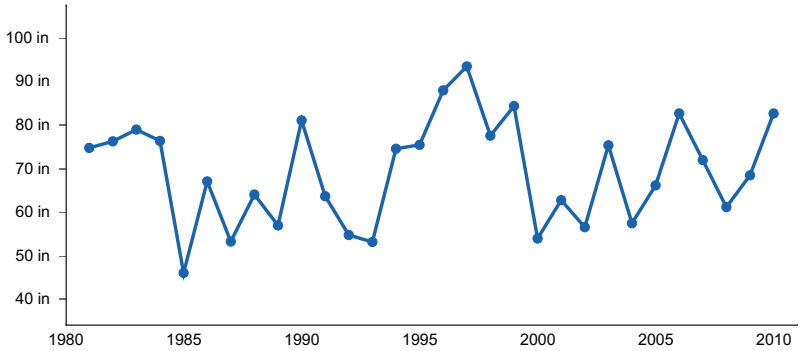


Figure 5. Annual precipitation pattern

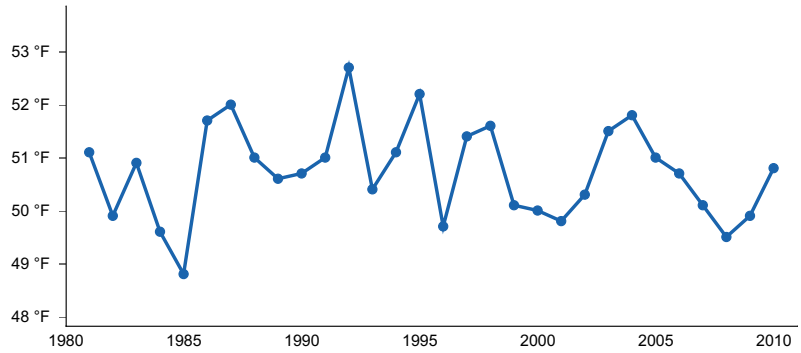


Figure 6. Annual average temperature pattern

Climate stations used

- (1) VERNONIA NO 2 [USC00358884], Vernonia, OR
- (2) LAUREL MTN [USC00354776], Falls City, OR
- (3) CLATSKANIE [USC00351643], Clatskanie, OR
- (4) ELMA [USC00452531], Elma, WA
- (5) GRAYS RIVER HATCHERY [USC00453333], Grays River, WA

Influencing water features

This ecological site consists of forested wetlands that have a seasonal high water table. The volume and longevity of the ponding determine the effect on the dynamics of the forest.

Soil features

Soils that support this ecological site are in the mesic soil temperature regime and aquic soil moisture regime. This site is subject to residual ponding or a seasonal high water table. The water table commonly is at or near the surface much of the growing season, and the rate of organic decomposition is slow due to anaerobic conditions. The seasonal high water table and ponding dynamics may be altered by artificial drainage of the site or adjacent

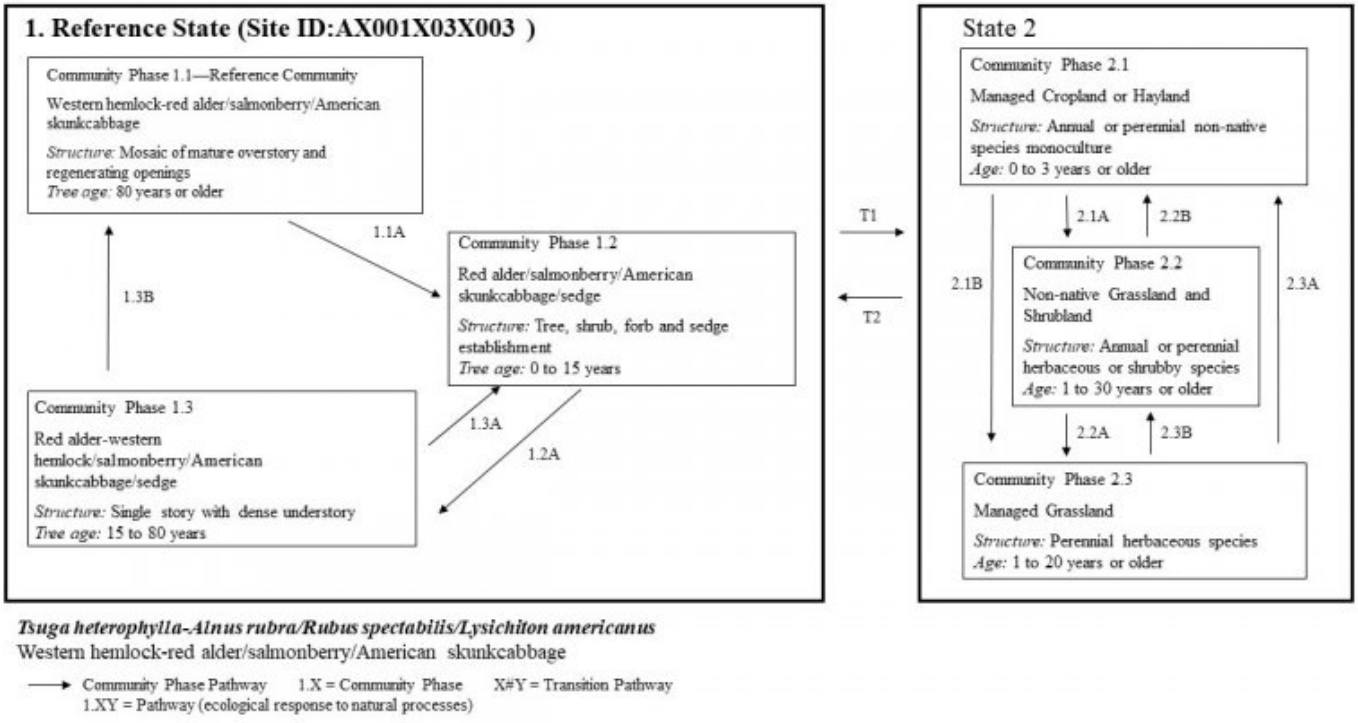
areas. A thin organic horizon consisting of decomposing twigs, needles, and litter is on the surface, which helps to protect the soils from water erosion.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Loess
Surface texture	(1) Silty clay loam (2) Silt loam
Drainage class	Very poorly drained to poorly drained
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Clay content (0-7in)	15–38%
Subsurface fragment volume <=3" (1-60in)	0–57%
Subsurface fragment volume >3" (1-60in)	0–5%

Ecological dynamics

State and transition model



State 1
Reference

Community 1.1
Western Hemlock, Red Alder, Salmonberry, and American Skunkcabbage

Western hemlock-red alder /salmonberry/American skunkcabbage Structure: Mosaic of mature overstory and

regenerating openings The reference community represents a lack of major disturbance from windthrow or ponding for at least 80 years, which allows the pioneering species to form a mature canopy. Western hemlock and red alder are the dominant overstory species. Western redcedar and Douglas-fir may be present, but they are limited to drier microsites such as nurse logs and mounds. Shrubs commonly are restricted to nurse logs, stumps, and higher microsites. Understory species include salmonberry, devilsclub, salal, American skunkcabbage, red huckleberry, swordfern (*Polystichum munitum*), deer fern, and sedges (Carex spp.). Common disturbances include small gap dynamics (1/2-acre openings or smaller) following windstorms and excessive ponding.

Dominant plant species

- western hemlock (*Tsuga heterophylla*), tree
- red alder (*Alnus rubra*), tree
- bigleaf maple (*Acer macrophyllum*), tree
- western redcedar (*Thuja plicata*), tree
- salmonberry (*Rubus spectabilis*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- California huckleberry (*Vaccinium ovatum*), shrub
- vine maple (*Acer circinatum*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- salal (*Gaultheria shallon*), shrub
- American skunkcabbage (*Lysichiton americanus*), other herbaceous
- deer fern (*Blechnum spicant*), other herbaceous
- sedge (*Carex*), other herbaceous
- western swordfern (*Polystichum munitum*), other herbaceous

Community 1.2
Red alder, Salmonberry, American Skunkcabbage, and Sedge

Red alder/salmonberry/American skunkcabbage/sedge Structure: Tree, shrub, forb, and sedge establishment Community phase 1.2 represents a forest that is undergoing regeneration or stand initiation immediately following excessive ponding or windthrow. Scattered remnant mature trees and shrubs may be in some areas, and woody debris is abundant. Loss of the overstory and the fallen trees may impact the hydrology by resulting in more frequent, longer periods of ponding. Successful regeneration is dependent on the local seed source, an adequate seedbed, and sufficient light. Rapid recolonization is limited to plants that are well adapted to saturated soil conditions much of the year. Red alder is the primary tree and will establish quickly with an open canopy. Salmonberry, American skunkcabbage, and sedges will begin to re-establish during this phase.

Dominant plant species

- red alder (*Alnus rubra*), tree
- salmonberry (*Rubus spectabilis*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- American skunkcabbage (*Lysichiton americanus*), other herbaceous
- deer fern (*Blechnum spicant*), other herbaceous
- sedge (*Carex*), other herbaceous

Community 1.3
Red Alder, Western Hemlock, Salmonberry, American Skunkcabbage, and Sedge

Red alder-western hemlock/salmonberry/American skunkcabbage/sedge Structure: Single story with dense understory Community phase 1.3 is an early seral forest in regeneration. Scattered remnant mature trees may be present. Western hemlock will regenerate on hummocks and mounds and will begin to establish a canopy. Shrubs are sparse, but species such as salmonberry, devilsclub, red huckleberry become established on fallen trees and in higher microsites. Understory species may include deer fern, American skunkcabbage, and sedges.

Dominant plant species

- red alder (*Alnus rubra*), tree

- western hemlock (*Tsuga heterophylla*), tree
- western redcedar (*Thuja plicata*), tree
- salmonberry (*Rubus spectabilis*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- deer fern (*Blechnum spicant*), other herbaceous
- American skunkcabbage (*Lysichiton americanus*), other herbaceous
- sedge (*Carex*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

This pathway represents excessive ponding that results in a shallow rooting zone. The trees are susceptible to windthrow, which may create pockets of fallen trees larger than 1 acre in size. Catastrophic windstorms may be stand replacing.

Pathway 1.2A
Community 1.2 to 1.3

This pathway represents growth over time with no further major disturbance.

Pathway 1.3B
Community 1.3 to 1.1

This pathway represents no further major disturbance. Continued growth over time and ongoing mortality lead to increased vertical diversification. The community begins to resemble the structure of the reference community, including small pockets of regeneration (both deciduous and coniferous) and a more diversified understory.

Pathway 1.3A
Community 1.3 to 1.2

This pathway represents excessive ponding that results in a shallow rooting zone. The trees are susceptible to windthrow, which may create pockets of fallen trees larger than 1 acre in size. Catastrophic windstorms may be stand replacing.

State 2
Converted

Community 2.1
Managed Cropland or Hayland

Managed Cropland or Hayland Structure: Annual or perennial non-native species monoculture Community phase 2.1 may consist of a range of crops, including annually planted species, short-lived perennial species, and more permanent shrubby plants. Hay and grasses and legumes for silage are included in this community phase.

Community 2.2
Non-Native Grassland and Shrubland

Non-native Grassland and Shrubland Structure: Annual or perennial herbaceous or shrubby species Community phase 2.2 is characterized by low-level agronomic or management activity such as adding soil nutrients, intensive grazing management, regular mowing, or weed control. This plant community commonly consists dominantly of introduced weedy species. Areas that have extremely low fertility or are subject to heavy grazing pressure have a higher proportion of annual, stoloniferous, or rhizomatous species. Wetland areas commonly support dominantly non-native rhizomatous grasses. The plant community may include remnants of introduced pasture species that commonly are seeded.

Community 2.3
Managed Grassland

Managed Grassland Structure: Perennial herbaceous species Community phase 2.3 receives regular agronomic inputs, including adding soil nutrients and other soil amendments such as lime, implementing grazing management plans, regular mowing, controlling weeds, and reseeding as needed. This plant community typically includes introduced perennial pasture and hay species that commonly are seeded. In areas of historic native grassland, mixtures of perennial and annual native species may be seeded and managed by appropriate agronomic and livestock management activities. Minor amounts of introduced species that commonly are in non-native grassland and shrubland communities (community phase 2.2) are in this phase.

Pathway 2.1A
Community 2.1 to 2.2

In the absence of agronomic and livestock management activities, seeds from surrounding weedy plant communities will be transported to the site by wind, animals, or vehicle traffic. Adapted species will become established. Management activities include tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Pathway 2.1B
Community 2.1 to 2.3

This pathway represents agronomic and livestock management activities, including tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Pathway 2.2B
Community 2.2 to 2.1

This pathway represents agronomic activities such as tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, and planting to desirable crop species.

Pathway 2.2A
Community 2.2 to 2.3

This pathway represents agronomic and livestock management activities, including tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Pathway 2.3A
Community 2.3 to 2.1

This pathway represents agronomic activities, including tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, and planting to desirable crop species.

Pathway 2.3B
Community 2.3 to 2.2

In the absence of agronomic and livestock management activities, seeds from surrounding weedy plant communities will be transported to the area by wind, floodwater, animals, or vehicle traffic. Adapted species will become established. Management activities include tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Transition T1A

State 1 to 2

This pathway represents a change in land use. Land management includes modifications to the hydrologic function to develop pasture and agriculture. Non-native seed disbursement is introduced (intentionally or unintentionally), which alters the reference community.

Transition T2A
State 2 to 1

This pathway represents restoration of the natural hydrologic function and native plant habitat. Native seed sources and extensive management and mitigation of brush and invasive species are needed to restore the community.

Additional community tables

Inventory data references

Other Established Classifications for Ecological Site

National vegetation classification: G853 Tsuga heterophylla – Alnus rubra / Lysichiton americanus Swamp Forest Group

USDA Forest Service Plant Association and Management Guide of the Northern Oregon Coast Range: western hemlock/devilsclub Northwest Oregon Coast and western hemlock/salmonberry

Washington Department of Natural Resources Ecological Systems of Washington State- North Pacific Hardwood-Conifer Swamp

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Contributors

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Approval

Kirt Walstad, 1/23/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	12/14/2021
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state**

for the ecological site:

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17. **Perennial plant reproductive capability:**
