USDA Natural Resources Conservation Service

Ecological site AX001X04X411
Mesic Udic Moist Forest

Last updated: 5/07/2024
Accessed: 05/14/2024

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 Southern Pacific Coast Range land resource unit (LRU 4) of MLRA 1 is located in central to southern Oregon State. The LRU extends from the Siletz River to the Rogue River and 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 carved valleys through the landscape depositing more recent alluvium. These include the Alsea, Coos, Coquille, Green, Yachats, Siletz, Siuslaw, Umpqua, and Rogue Rivers.

Ecological site concept

This ecological site is found on the western Coast Range in the Pacific Northwest from central to southern Oregon. It is located on footslopes, toeslopes, and backslopes. Elevations are typically between 50 and 4,000 feet with slopes ranging from 0 to 75 percent.
The most common overstory species are western hemlock (Tsuga heterophylla), Douglas-fir (Pseudotsuga menziesii), and western redcedar (Thuja plicata). Red alder (Alnus rubra) may be common where there are forest openings. Regeneration of red alder is limited by canopy cover and is commonly in gaps where sunlight is most available. Common understory species include salal (Gaultheria shallon), vine maple (Acer circinatum), salmonberry (Rubus spectabilis), Cascade oregongrape (Mahonia nervosa), western swordfern (Polystichum munitum), and Oregon oxalis (Oxalis oregana).
The most common natural disturbance is from windthrow of overstory trees, which results in patchy, small pockets of open areas. The shallow rooting zone causes roots to grow laterally, resulting in more frequent tip-ups in these saturated areas. This in turn creates more canopy openings which allow more sunlight to reach the forest floor, leading to a shrubby understory. Frequent tip-ups also cause these sites to have a hummocky surface with an abundance of down woody debris.
In addition, western hemlock is highly susceptible to rot diseases from fungi such as; Armillaria ostoyae,

Heterobasidion annosum, Phellinus weirii, and Echinodontium tinctorium which may exacerbate the extent and area of disturbance. The resulting openings in the canopy allow sunlight to reach the forest floor, benefiting the understory. Disturbance by fire is infrequent as a result of the high humidity and precipitation within the western hemlock zone; however, the site has a fire regime between 150-400 years and may experience stand replacing catastrophic wildfires (US Department of Agriculture, 2012).

Associated sites

AX001X04X410	**Mesic Udic Forest** Mesic Udic Forest is located within the same elevation range as Mesic Udic Moist Forest. Mesic Udic Moist Forest is found on depressions or concave landscape positions that retain moisture for longer periods of time.

Table 1. Dominant plant species

Tree	(1) *Tsuga heterophylla* (2) *Pseudotsuga menziesii*
Shrub	(1) *Gaultheria shallon* (2) *Mahonia nervosa*
Herbaceous	(1) *Polystichum munitum* (2) *Oxalis oregana*

Legacy ID

F001XD411OR

Physiographic features

This ecological site is located on footslopes, toeslopes, and backslopes. Elevations are typically between 50 and 4,000 feet with slopes ranging from 0 to 75 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	15–1,219 m
Slope	0–75%
Water table depth	53–152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The climate has hot, moist summers and warm, wet winters. Mean annual precipitation ranges from 60 to 130 inches. Average annual temperatures range from 45 to 54 degrees F. The mild temperatures, abundant precipitation, and a long growing season result in highly productive forestlands.

Table 3. Representative climatic features

Frost-free period (characteristic range)	110-200 days
Freeze-free period (characteristic range)	269-341 days
Precipitation total (characteristic range)	1,524-3,302 mm

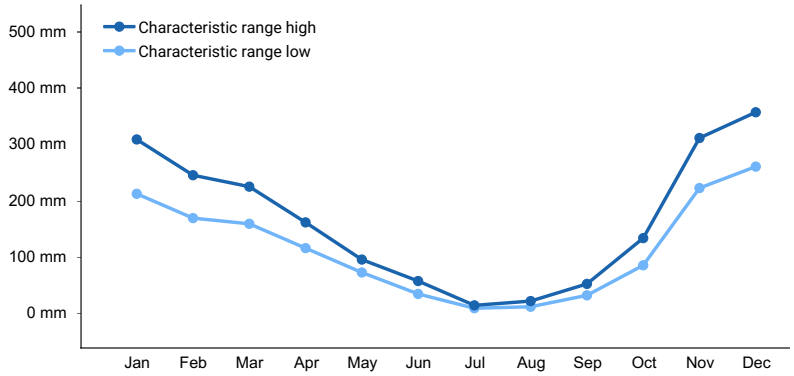


Figure 1. Monthly precipitation range

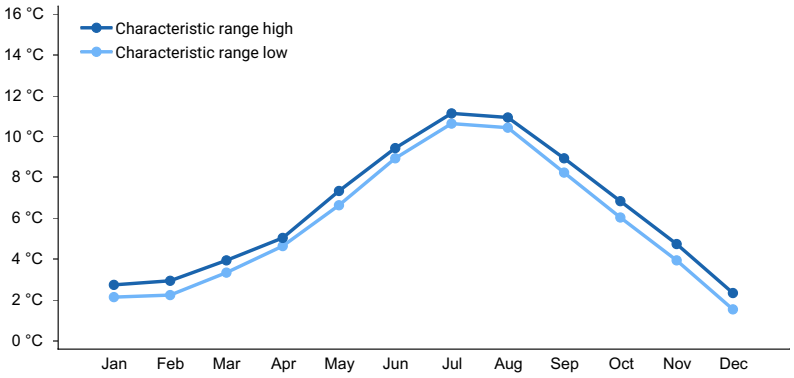


Figure 2. Monthly minimum temperature range

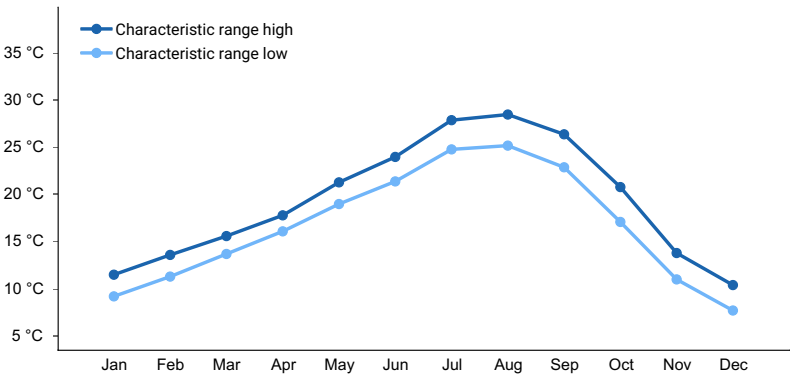


Figure 3. Monthly maximum temperature range

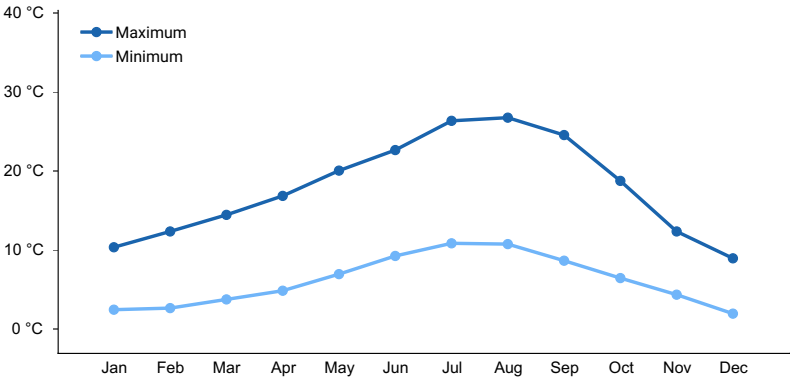


Figure 4. Monthly average minimum and maximum temperature

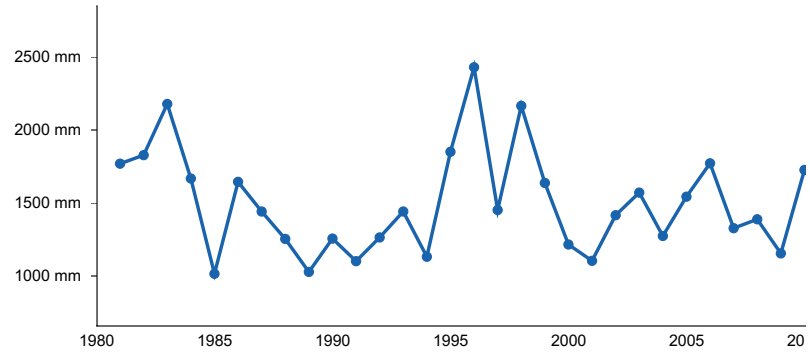


Figure 5. Annual precipitation pattern

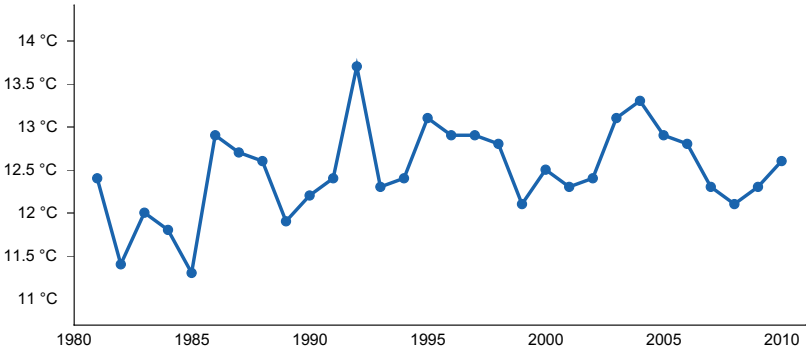


Figure 6. Annual average temperature pattern

Climate stations used

- (1) POWERS [USC00356820], Powers, OR
- (2) ELKTON 3 SW [USC00352633], Elkton, OR
- (3) ALSEA FH (FALL CREEK) [USC00350145], Alsea, OR

Influencing water features

In general, this ecological site is not influenced by wetland or riparian water features but may be found on stream terraces or adjacent to wetland and riparian areas. The soils have a high water table from March through June.

Soil features

Soils that support this ecological site occur in the mesic soil temperature regime and the udic soil moisture regime. The soil is usually moist during the growing season.

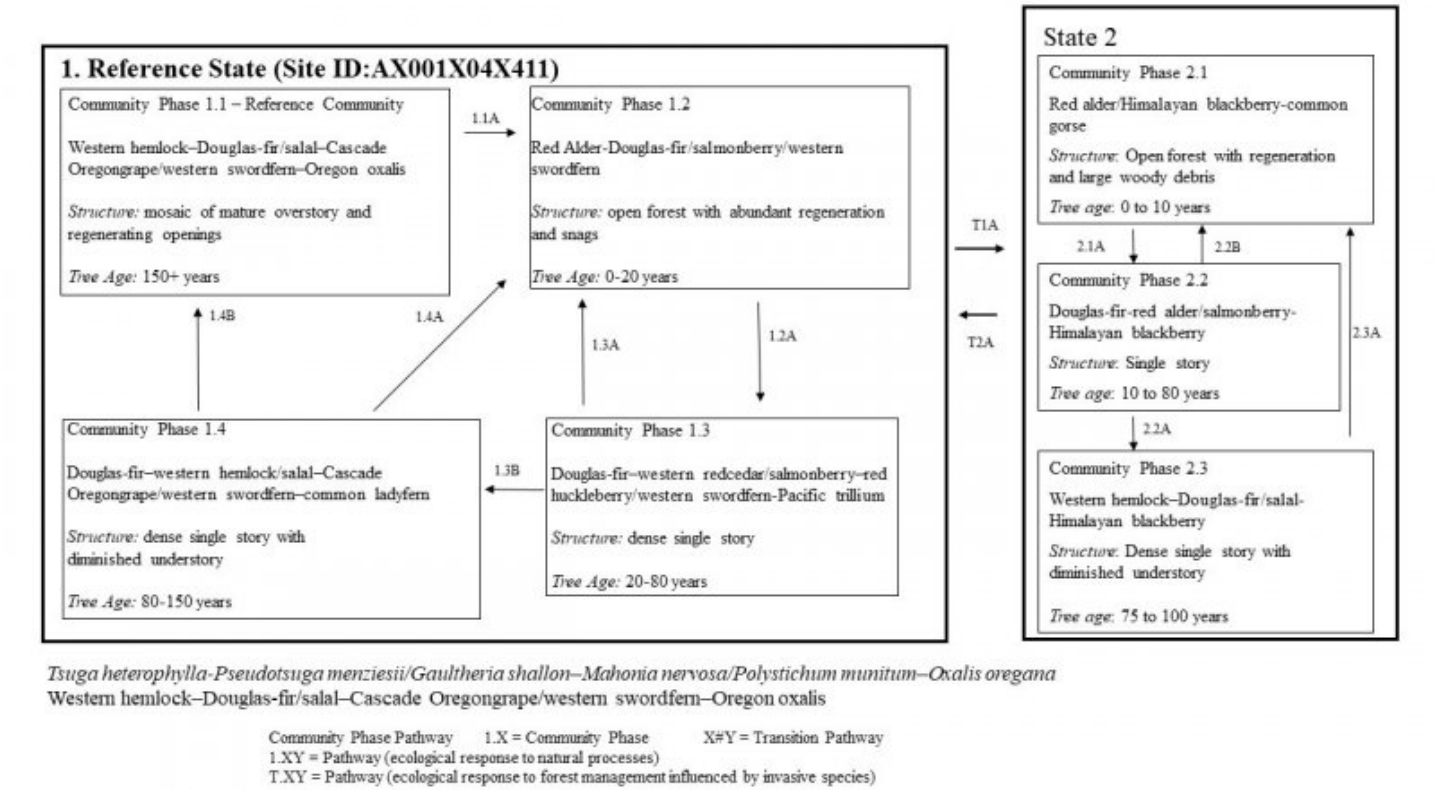
Table 4. Representative soil features

Parent material	(1) Colluvium–igneous and sedimentary rock (2) Residuum–igneous and sedimentary rock
Surface texture	(1) Silt loam (2) Silty clay loam (3) Loam (4) Gravelly loam (5) Very gravelly loam
Drainage class	Moderately well drained to well drained
Depth to restrictive layer	51–152 cm
Surface fragment cover <=3"	0–22%
Surface fragment cover >3"	0–4%

Clay content (2.5-17.8cm)	15–34%
Subsurface fragment volume <=3" (2.5-152.4cm)	0–49%
Subsurface fragment volume >3" (2.5-152.4cm)	0–27%

Ecological dynamics

State and transition model



Tsuga heterophylla-Pseudotsuga menziesii/Gaultheria shallon–Mahonia nervosa/Polystichum munitum–Oxalis oregana
Western hemlock–Douglas-fir/salal–Cascade Oregongrape/western swordfern–Oregon oxalis

Community Phase Pathway 1.X = Community Phase X#Y = Transition Pathway
1.XY = Pathway (ecological response to natural processes)
T.XY = Pathway (ecological response to forest management influenced by invasive species)

State 1
Reference State

Community 1.1
Western hemlock – Douglas-fir / salal – Cascade Oregongrape/ western swordfern – Oregon oxalis

Western hemlock – Douglas-fir / salal – Cascade Oregongrape/ western swordfern – Oregon oxalis Structure: mosaic of mature overstory and regenerating openings Western hemlock, Douglas-fir, and western redcedar are the most common overstory species in the Reference Community which lack of major disturbance for at least 100 years. Western hemlock is the most shade tolerant species in this forest and regenerates successfully in the understory. Douglas-fir and western redcedar may be codominant in the overstory, but regeneration is limited to gaps in the canopy. Gaps in the mid-canopy and overstory allow sunlight to reach the ground and are where the majority of the understory plants establish. In addition, these gaps provide opportunities for deciduous tree species such as red alder to regenerate throughout this reference community. Common understory shrub species include salal, red huckleberry (*Vaccinium parvifolium*), vine maple, salmonberry, Cascade oregongrape, Devils club (*Oplopanax horridus*), common ladyfern (*Athyrium filix-femina*), western swordfern, and Oregon oxalis.

Dominant plant species

- western hemlock (*Tsuga heterophylla*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- western redcedar (*Thuja plicata*), tree
- salal (*Gaultheria shallon*), shrub
- Cascade barberry (*Mahonia nervosa*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- vine maple (*Acer circinatum*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- western swordfern (*Polystichum munitum*), other herbaceous
- redwood-sorrel (*Oxalis oregana*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous

Community 1.2
Red alder – Douglas-fir / salmonberry / western swordfern

Red alder – Douglas-fir / salmonberry / western swordfern Structure: open forest with abundant regeneration and snags Community phase 1.2 is an early seral plant community that has been impacted by a stand-replacing disturbance such as a wildfire, large scale wind event, mass movement, or major insect pest or disease. Nearly all trees are absent, but some fire-resistant trees may survive in the overstory. Snags are prevalent and remain standing and decaying. Large woody debris may be present on the surface and serve as nurse sites. The understory is predominately early seral tree, shrub, and forb species such as red alder, red huckleberry, and salmonberry. Red alder has several competitive advantages and can establish quickly, relative to conifers. Red alder can sprout and establish in full sunlight and fixes nitrogen providing an early competitive advantage (Villarin, 2009). In addition, the seeds of deciduous species are light and can be transported long distances by wind and water, allowing for rapid recolonization. Red alder seedlings and saplings will typically establish 3 to10 years following disturbance, depending on severity. Douglas-fir is relatively fire resistant and can survive moderately intense fires, due to its thick corky bark. Depending on fire severity and cambium damage, a mature Douglas-fir component may remain as a dominant overstory species, while western red cedar and western hemlock may be at full stand replacement post fire (Tesky, 1992). When resulting from a moderate to severe fire event, there is a good probability for shrubs to out-compete tree seedlings. Vine maple, red huckleberry, salal, and Cascade Oregongrape (which may have been only moderately abundant previously) all have the capacity to rapidly recover and spread when top-killed, slowing successful overstory regeneration. Seed sources for tree species would be from the surrounding, undisturbed forest and any of the survivors of the disturbance and would result in a mixed stand which could include Douglas-fir, western hemlock, red alder, bigleaf maple, western redcedar, and grand fir.

Dominant plant species

- red alder (*Alnus rubra*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- western redcedar (*Thuja plicata*), tree
- bigleaf maple (*Acer macrophyllum*), tree
- salmonberry (*Rubus spectabilis*), shrub
- vine maple (*Acer circinatum*), shrub
- salal (*Gaultheria shallon*), shrub

- Cascade barberry (*Mahonia nervosa*), shrub
- western swordfern (*Polystichum munitum*), other herbaceous

Community 1.3
Douglas-fir – western redcedar / salmonberry – red huckleberry / western swordfern – Pacific trillium

Douglas-fir – western redcedar / salmonberry – red huckleberry / western swordfern – Pacific trillium Structure: dense single story Community phase 1.3 is an early seral forest in regeneration, possibly with scattered remnant mature trees. Species composition depends on the natural seed sources present and the intensity of disturbance. When resulting from a moderate to severe fire event, it is probable that shrubs will out-compete tree seedlings. Red alder, red huckleberry, evergreen huckleberry, western swordfern, and salmonberry may be abundant in the understory depending on sunlight availability (Bailey, 1968). Red alder will begin to die between 40 to 70 years following disturbance and allow more light to penetrate the newly nitrogen rich soil (Naiman, 2009). As a result, conifer regeneration becomes more prevalent in this community phase. Douglas-fir and western redcedar will begin to regenerate rapidly and increase in dominance, creating thick patches of regenerating saplings. Species composition depends on the natural seed sources present and the intensity of disturbance.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- western redcedar (*Thuja plicata*), tree
- red alder (*Alnus rubra*), tree
- bigleaf maple (*Acer macrophyllum*), tree
- salmonberry (*Rubus spectabilis*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- California huckleberry (*Vaccinium ovatum*), shrub
- western swordfern (*Polystichum munitum*), other herbaceous
- Pacific trillium (*Trillium ovatum*), other herbaceous

Community 1.4
Douglas-fir - western hemlock / salal – Cascade Oregongrape / western swordfern – common ladyfern

Douglas-fir - western hemlock / salal – Cascade Oregongrape / western swordfern – common ladyfern Structure: dense single story with diminished understory Community phase 1.4 is a forest in the competitive exclusion stage, possibly with scattered remnant mature trees. There is increasing competition among individual trees for available water and nutrients. Douglas-fir and western redcedar, will dominate the overstory canopy, however red alder may be present in pockets of canopy openings. In addition, western hemlock is very shade tolerant and will begin to establish in the shade of mature Douglas-fir and western redcedar. Canopy closure is almost 100 percent leading to diminished shrub and forb layers. Some understory species better adapted to at least partial shade will begin to increase. Over time, the forest will begin to self-thin due to the elevated competition.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- western hemlock (*Tsuga heterophylla*), tree
- western redcedar (*Thuja plicata*), tree
- salal (*Gaultheria shallon*), shrub
- Cascade barberry (*Mahonia nervosa*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- western swordfern (*Polystichum munitum*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- Pacific trillium (*Trillium ovatum*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, large scale wind event, major insect pest infestation, timber management, or large mass movement event leading to the stand initiation phase of forest development.

Pathway 1.2A
Community 1.2 to 1.3

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

Pathway 1.3A
Community 1.3 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, large scale wind event, major insect pest or disease infestation, timber management, or large mass movement leading to the stand initiation phase of forest development.

Pathway 1.3B
Community 1.3 to 1.4

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

Pathway 1.4B
Community 1.4 to 1.1

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

Pathway 1.4A
Community 1.4 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, timber management, large scale wind event, major insect pest or disease infestation, or large mass movement leading to the stand initiation phase of forest development.

State 2
Disturbed State

Community 2.1
Red alder/Himalayan blackberry-common gorse

Red alder/Himalayan blackberry-common gorse Structure: Open forest with regeneration and large woody debris Community Phase 2.1 represents a recently disturbed forest that is naturally regenerating. Large woody debris is often prolific following large-scale disturbances which inhibits vegetation to establish under natural conditions. Areas that are not replanted immediately (1 to 3 years) following a timber harvest or large-scale disturbance may become vulnerable to invasive species infestation. Typically, commercially managed forests will be replanted following

disturbance and species preference depends on site conditions and long-term economic market decisions. Overall, species biodiversity in forests managed for short rotation timber is diminished. Natural reforestation depends on available seed sources following disturbance. Early seral species such as red alder tend to regenerate quickly with abundant sunlight. Plant community composition is typically homogenous and even-aged. Following disturbance, these sites are often dominated by common gorse (*Ulex europaeus*), Himalayan blackberry (*Rubus armeniacus*), and Scotch broom (*Cytisus scoparius*) which tend to outcompete native species establishment. Invasive species management is most critical during this phase.

Dominant plant species

- red alder (*Alnus rubra*), tree
- Himalayan blackberry (*Rubus armeniacus*), shrub
- Scotch broom (*Cytisus scoparius*), shrub
- common gorse (*Ulex europaeus*), shrub

Community 2.2
Douglas-fir-red alder/salmonberry-Himalayan blackberry

Douglas-fir-red alder/salmonberry-Himalayan blackberry Structure: Single story Community phase 2.2 represents an even-aged, regenerating forest. Douglas-fir can regenerate quickly on nurse logs or in recently disturbed soils. Shade-intolerant red alder remains a large component in the overstory until it reaches maturity (Fonda, 1974). The vegetation in areas that have been replanted commonly is dense and even aged, and the understory species are sparse in areas that have a high percentage of canopy cover. Salmonberry is a common understory species, but invasive species increase in prominence. Scotch broom, common gorse, and Himalayan blackberry can greatly impact the shrubby understory and outcompete native species. Scotch broom and common gorse are shade-intolerant and will diminish as the canopy cover increases. Management techniques such as pre-commercial thinning and mitigation of invasive species will accelerate the maturation and improve the health of the forest.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- red alder (*Alnus rubra*), tree
- salmonberry (*Rubus spectabilis*), shrub
- Himalayan blackberry (*Rubus armeniacus*), shrub
- Scotch broom (*Cytisus scoparius*), shrub
- common gorse (*Ulex europaeus*), shrub

Community 2.3
Douglas-fir-western hemlock/salal-Himalayan blackberry

Douglas-fir-western hemlock/salal-Himalayan blackberry Structure: Dense single story with diminished understory Community phase 2.3 represents a maturing forest that has increased plant diversity. Western hemlock can regenerate under dense, shrubby canopies. It will begin to establish in the overstory canopy along with Douglas-fir. Invasive species will inhibit the overall health and structure of the forest, creating an ecosystem which is susceptible to devastation from insects and disease. The dense, shrubby understory is susceptible to wildfires. Commercial logging operations commonly take place during this phase as trees reach economical maturity in size and volume. It is presumed that without timber management during this phase, an old-growth western hemlock stand will develop.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- western hemlock (*Tsuga heterophylla*), tree
- salal (*Gaultheria shallon*), shrub
- Himalayan blackberry (*Rubus armeniacus*), shrub

Pathway 2.1A
Community 2.1 to 2.2

This pathway represents growth over time with no further major disturbance or active forest management.

Pathway 2.2B
Community 2.2 to 2.1

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, a large-scale wind event, a major insect or disease infestation, large mass movement, or timber harvest activities that lead to the stand initiation phase of forest development.

Pathway 2.2A
Community 2.2 to 2.3

This pathway represents growth over time with no further major disturbance or active forest management.

Pathway 2.3A
Community 2.3 to 2.1

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, a large-scale wind event, a major insect or disease infestation, large mass movement, or timber harvest activities that lead to the stand initiation phase of forest development.

Transition T1A
State 1 to 2

This pathway represents an area of major disturbance that removes most of the overstory. Large-scale disturbances such as this, have the potential to increase the vulnerability of invasive species infestation when the seed source is either nearby or introduced to the site. This type of disturbance will impact the ecological site and the natural feedbacks that maintained the reference state.

Transition T2A
State 2 to 1

This pathway represents intensive management to restore the historic plant community.

Additional community tables

Inventory data references

Other Established Classifications for Ecological Site

National Vegetation Classification: A3377 Tsuga heterophylla – Pseudotsuga menziesii / Rubus spectabilis Mesic Forest Alliance

USDA Forest Service Plant Associations of Southwestern Oregon: western hemlock / salal / western swordfern

USDA Forest Service Plant Association and Management Guide of the Northern Oregon Coast Range: western hemlock/dwarf Oregon grape/swordfern -Northwest Oregon Coast

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Contributors

Erin Kreutz
Erik Dahlke
David Rand
Carri Gaines

Approval

Kirt Walstad, 5/07/2024

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	12/20/2021
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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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:**
