USDA Natural Resources
Conservation Service

Ecological site F002XN906WA
Western hemlock-western redcedar/red huckleberry-salal/western swordfern

Last updated: 11/27/2024
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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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Table 1. Dominant plant species

Tree	(1) *Tsuga heterophylla* (2) *Thuja plicata*
Shrub	(1) *Vaccinium parvifolium* (2) *Gaultheria shallon*
Herbaceous	(1) *Polystichum munitum*

Physiographic features

This site is on slopes of bedrock hills, glacially modified hills, and glacial terraces.

Climatic features

Precipitation data from PRISM Climate Group, Oregon State University. Precipitaion data is monthly average, not monthly maximum. Temperature data from Coupeville, WA climate station.

Table 2. Representative climatic features

Frost-free period (average)	240 days
Freeze-free period (average)	
Precipitation total (average)	1,016 mm

Influencing water features

Soil features

Applicable soil series:
Alderwood taxadjunct, Coveland cool, Elwha, Everett taxadjunct, Indianola, Mitchellbay cool, Morancreek cool, Sholander cool, Uselessbay, Utsalady, Zylstra

Table 3. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Loam (3) Sandy loam
Drainage class	Somewhat poorly drained to somewhat excessively drained
Permeability class	Slow to very rapid
Soil depth	25 cm
Available water capacity (0-101.6cm)	8.89–16.76 cm
Soil reaction (1:1 water) (0-101.6cm)	3.5–7.3

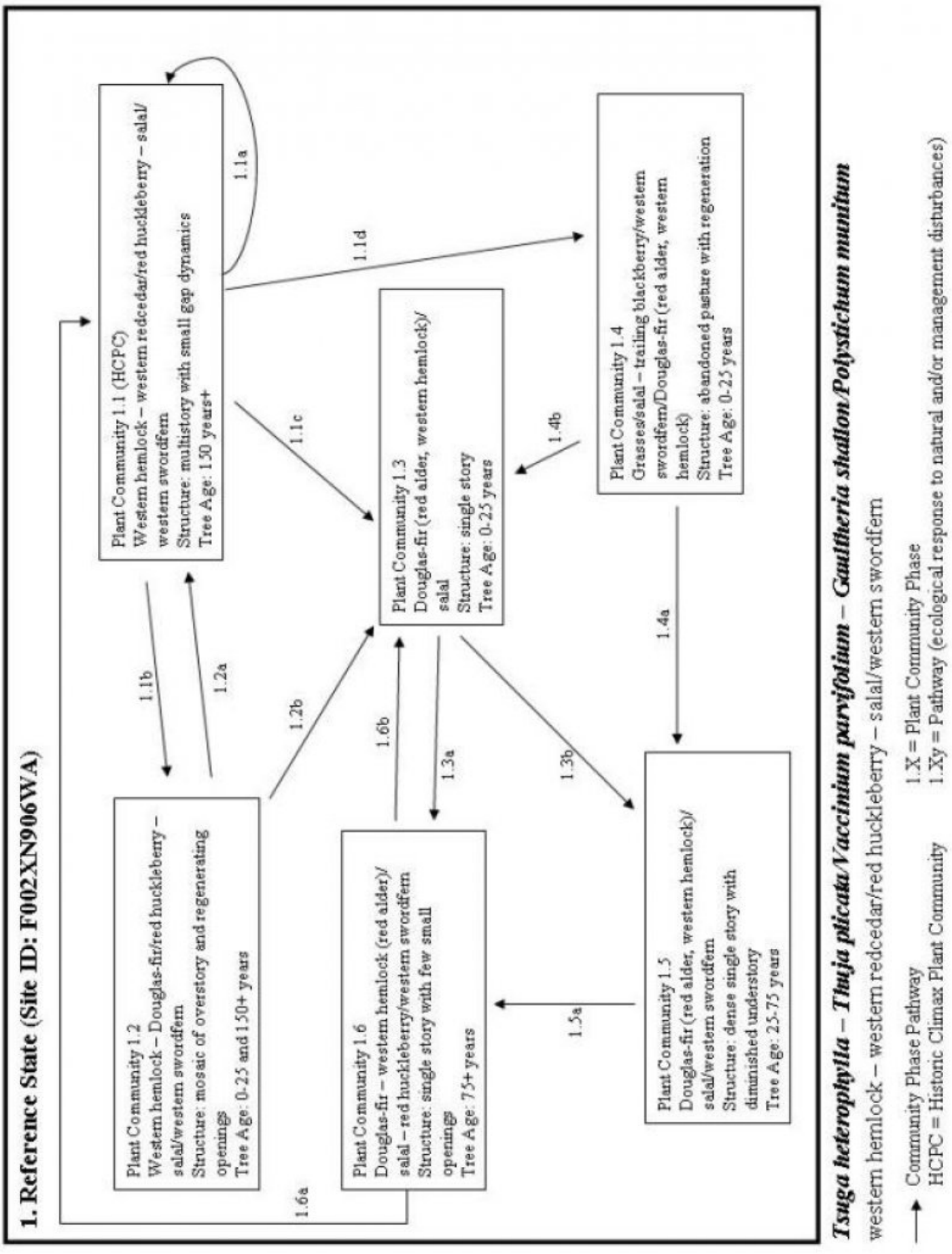
Ecological dynamics

This ecological site is widespread in Island County and is found on soils ranging from somewhat poorly to somewhat excessively drained. Western hemlock is the dominant tree in community 1.1 with lesser amounts of western redcedar and Douglas-fir. Douglas-fir is not shade tolerant, as compared to western hemlock and western redcedar, but because it is such a long-lived species (800+ years) scattered individuals will remain in community 1.1. Grand fir, bigleaf maple and western white pine may also be present, but only as minority components.

Most of these sites have been harvested for timber (and usually burned afterward) since European settlement although all of the various plant communities may have remnant mature trees. The historic fire regime would have been one of low frequency (150-300+ years) and moderate to high intensity. These fires would, in effect, be stand-replacing although individual trees would survive, providing a seed source. Western hemlock, with its thin bark and shallow root system, is not able to tolerate fire while western redcedar is only somewhat more tolerant. Douglas-fir, however, is well adapted to withstand fire, so even a moderate fire would likely change the species composition.

Red alder is a common early-seral, fast growing species in this area and will often seed in on newly cleared land. This will typically result in a nearly pure stand with scattered Douglas-fir, redcedar and hemlock. Red alder is shade intolerant, however, and cannot reproduce under its own canopy. It is also a relatively short-lived species and the stand will start to deteriorate after 70 years or so. This will release the more shade tolerant species that have seeded in under the alder and the stand will progress toward the HCPC until the next disturbance. If there is no red alder seed source available, the initial stand will be a mix of western hemlock, western redcedar and Douglas-fir. The most common natural disturbances on these sites are pockets of wind-thrown or diseased overstory trees; all three of these species are susceptible to various rots which weaken the roots and/or boles causing breakage. The resulting openings in the canopy allow some sunlight to reach the forest floor, which benefits the often sparse understory. This is especially true in mid-successional (75-150 years) stands, which have very little height differentiation. Western swordfern, red huckleberry, salal, trailing blackberry, Cascade Oregongrape and evergreen huckleberry are common understory species in this ecological site.

State and transition model



State 1
Reference

Community 1.1
Western Hemlock, Western Redcedar, Red Huckleberry, Salal, and Western Swordfern

Structure: multistory with small gap dynamics. Western hemlock is the most common overstory species in the historic climax plant community. Western redcedar and Douglas-fir will both be present; grand fir, bigleaf maple and western white pine would be much smaller components. The dense canopy created by multiple age groups of hemlocks blocks most of the sunlight from the forest floor, leading to a sparse understory. Gaps in the canopy which allow sunlight to reach the ground are where the majority of the understory plants would be found. If there is no mid-canopy of regenerating hemlocks the understory will be more continuous. The most common natural disturbance on these sites would be the small gap dynamics following the death of one or two trees.

Community 1.2
Western Hemlock, Douglas-fir, Red Huckleberry, Salal, and Western Swordfern

Structure: mosaic of mature overstory and regenerating openings. Plant community 1.2 retains some areas that resemble the HCPC but also contains moderate sized (2-5 acres) openings. Historically, this spatial pattern would have been caused by low- to moderate-intensity fires or pockets of disease (such as annosum root rot or laminated root rot); uneven-aged management techniques such as group selection or shelterwood with reserves can also create this plant community. Depending on the seed sources present, the patches may contain any of the previously mentioned overstory species. Some of the shrub species found in the ecological site (salal, salmonberry, oceanspray, red elderberry) also respond well to increased sunlight and may delay or even prevent reforestation of the newly formed openings.

Community 1.3
Douglas-fir, Red Alder, Western Hemlock, and Salal

Structure: single story/shrub. community 1.3 is forestland in regeneration; species composition depends on the natural seed sources present and the intensity of management. When resulting from a moderate- to severe fire event, there is a good possibility for shrubs to out-compete tree seedlings. Red huckleberry, salal, oceanspray, snowberry, trailing blackberry, red elderberry and salmonberry (which may have been only moderately abundant previously) all have the capability to rapidly recover and spread when top-killed, slowing successful regeneration. This would be less of an issue with intensive management. Historically, Douglas-fir has been the preferred timber species and so has been favored over red alder or western hemlock on these sites. This has changed over time, so a managed stand at this stage could feature any of the species or be a mixture.

Community 1.4
Grasses, Salal, Trailing Blackberry, Western Swordfern, Douglas-fir, Redcedar, and Western hemlock

Structure: abandoned pasture with regeneration. community 1.4 is abandoned pasture or crop land. This community will be dominated by non-native grasses but may have some native species present. Shrubs and trees will gradually encroach from the surrounding forest. While Douglas-fir and red alder prefer mineral soil, they will germinate in an organic seedbed, which is preferred by hemlock. Depending on the available seed source, any of these species will begin to encroach on an abandoned pasture. As an overstory canopy develops, the cover of shade intolerant grasses will diminish and native understory plants such as salal, red huckleberry and trailing blackberry will increase.

Community 1.5
Douglas-fir, Red Alder, and Western Hemlock

Structure: dense single story with diminished understory. Community 1.5 is a forest in the competitive exclusion stage. Because this community is indicative of no active management, there is increasing competition among individual trees for the available water and nutrients. Canopy closure is almost 100 percent, leading to a diminished understory. Over time the forest will begin to self-thin due to the elevated competition. Species composition

depends on the original seed sources available; the forest could be single or mixed-species.

Community 1.6
Douglas-fir, Western Hemlock, Red Alder, Salal, Red Huckleberry, and Western Swordfern

Structure: single story with few small openings community 1.6 is a maturing forest which is starting to differentiate vertically. Individual trees are dying (whether due to insects, disease, competition or windthrow) allowing some sunlight to reach the forest floor. This allows for an increase in the understory as well as some overstory tree species regeneration. Cycling between community 1.3 and community 1.6, through even-aged management, will generate maximum wood fiber.

Pathway 1.1A
Community 1.1 to 1.2

This pathway represents a larger disturbance – a moderate-intensity fire or wind storm would have historically created this forest structure; uneven-aged management techniques such as group selection or shelterwood with reserves may also lead to this community. Areas of regeneration would range from 2 to 5 acres.

Pathway 1.1B
Community 1.1 to 1.3

This pathway denotes a major disturbance such as a high-intensity fire, large scale wind even or clear-cutting followed by prescribed burning.

Pathway 1.1C
Community 1.1 to 1.4

This pathway signifies the conversion of forestland to either cropland or pasture.

Pathway 1.2A
Community 1.2 to 1.1

This pathway represents growth over time with no further significant disturbance. The areas of regeneration pass through the typical stand phases – competitive exclusion, maturation, understory re-initiation – until they resemble the old-growth structure of the HCPC.

Pathway 1.2B
Community 1.2 to 1.3

This pathway represents either a high-intensity fire or a change to intensive management (block harvest, post-harvest burn). Both situations lead to the stand initiation phase of forest development.

Pathway 1.3C
Community 1.3 to 1.5

This pathway indicates no further management, denoting only growth over time.

Pathway 1.3A
Community 1.3 to 1.6

This pathway represents either a high-intensity fire or a change to intensive management (block harvest, post-harvest burn). Both situations lead to the stand initiation phase of forest development.

Pathway 1.4B
Community 1.4 to 1.3

This pathway indicates active management in order to restore the forest. Site preparation (most likely mechanical

tilling, possibly combined with herbicides) and planting of preferred species bring about the change.

Pathway 1.4A
Community 1.4 to 1.5

This pathway represents the shift from field to forest without any external management. Whatever seed sources are present will provide the basis of the future forest.

Pathway 1.5A
Community 1.5 to 1.6

This pathway represents grow over time, with or without active management. Precommercial (or possibly commercial) thinning can decrease competition by removing a portion of the trees. Without management, intermediate and suppressed trees will begin to die.

Pathway 1.6A
Community 1.6 to 1.1

This pathway is one of no further management. Continued growth over time, as well ongoing mortality, leads to continued vertical diversification. The community begins to resemble the structure of the HCPC, with small pockets of regeneration and a more diversified understory.

Pathway 1.6B
Community 1.6 to 1.3

This pathway represents intensive management focusing on wood products. Clear-cutting, some type of site preparation, planting of preferred species and timely thinnings are the steps to achieve this goal.

Additional community tables

Wood products

Site Index data, by species, derived from:

Alnus rubra: Worthington, Norman P. ,Floyd A. Johnson, George R. Staebler, and William J. Lloyd. 1960. Normal yield tables for red alder. USDA, Forest Service. Pacific Northwest Forest and Range Experiment Station Research Paper No 36. USDA NRCS curve # 100.

Pseudotsuga menziesii: King, James E. 1966. Site index curves for Douglas-fir in the Pacific Northwest . Weyerhaeuser Company, Forestry Research Center. Forestry Paper 8. USDA NRCS curve # 795.

Thuja plicata: Kurucz, J.F. 1978. Preliminary, polymorphic site index curves for western redcedar – Thuja plicata Donn – in coastal British Columbia. MacMillan Bloedel Forest Research Note No. 3. USDA NRCS curve # 970.

Tsuga heterophylla: Wiley, Kenneth N. Site index tables for western hemlock in the Pacific Northwest. Weyerhaeuser Company, Western Forestry Research Center Forestry Paper No. 17. USDA NRCS curve # 995.

Table 4. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
western hemlock	*TSHE*	75	95	188	222	–	–	–	
Douglas-fir	*PSME*	90	120	116	175	–	–	–	
red alder	*ALRU2*	80	120	84	152	–	–	–	
western redcedar	*THPL*	80	100	0	0	–	–	–	

Contributors

Kathryn E. Smith

Approval

Kirt Walstad, 11/27/2024

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	09/26/2024
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:**
