USDA Natural Resources
Conservation Service

Ecological site F002XN903WA
Western redcedar - Douglas-fir/salal/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.

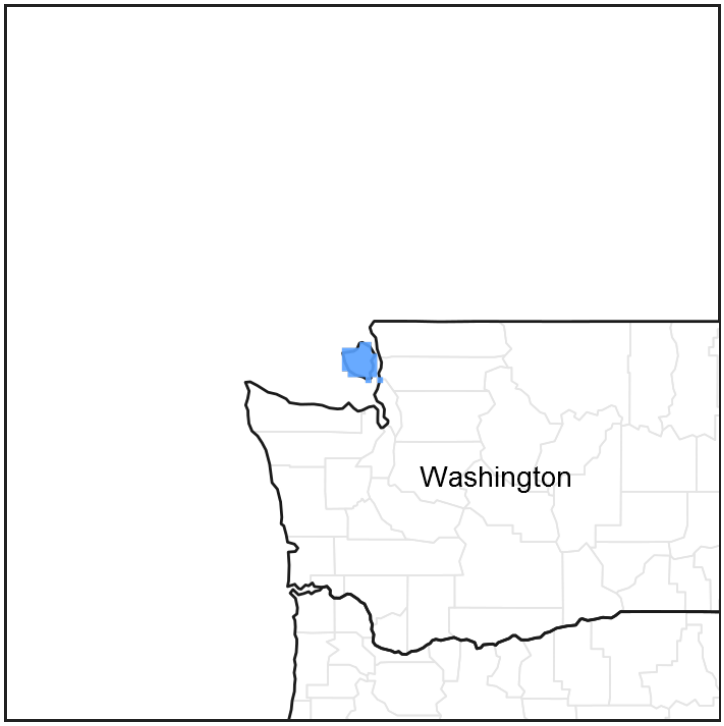


Figure 1. Mapped extent

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.

Classification relationships

Related to plant associations PSME-THPL-(ABGR)/GASH, PSME-THPL/GASH-MANE/POMU, THPL-ABGR/POMU in Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Natural Heritage Rep. 2006-01. Washington Department of Natural Resources, Natural Heritage Program, Olympia , Wash.

[http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

Table 1. Dominant plant species

Tree	(1) *Thuja plicata* (2) *Pseudotsuga menziesii*
Shrub	(1) *Gaultheria shallon*
Herbaceous	(1) *Polystichum munitum*

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain slope (3) Valley
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	3–732 m
Slope	5–75%
Ponding depth	0–15 cm
Water table depth	20 cm
Aspect	N, E, NW

Climatic features

The climate for this site is characterized by warm dry summers and mild moist winters. Precipitation is received mostly in the early fall to late winter.

Table 3. 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 warm, Aquic Dystroxerepts, Coveland, Deadmanbay, Doebay moist, Everett warm, Indianola warm, Mitchellbay, Morancreek, Sholander

Table 4. Representative soil features

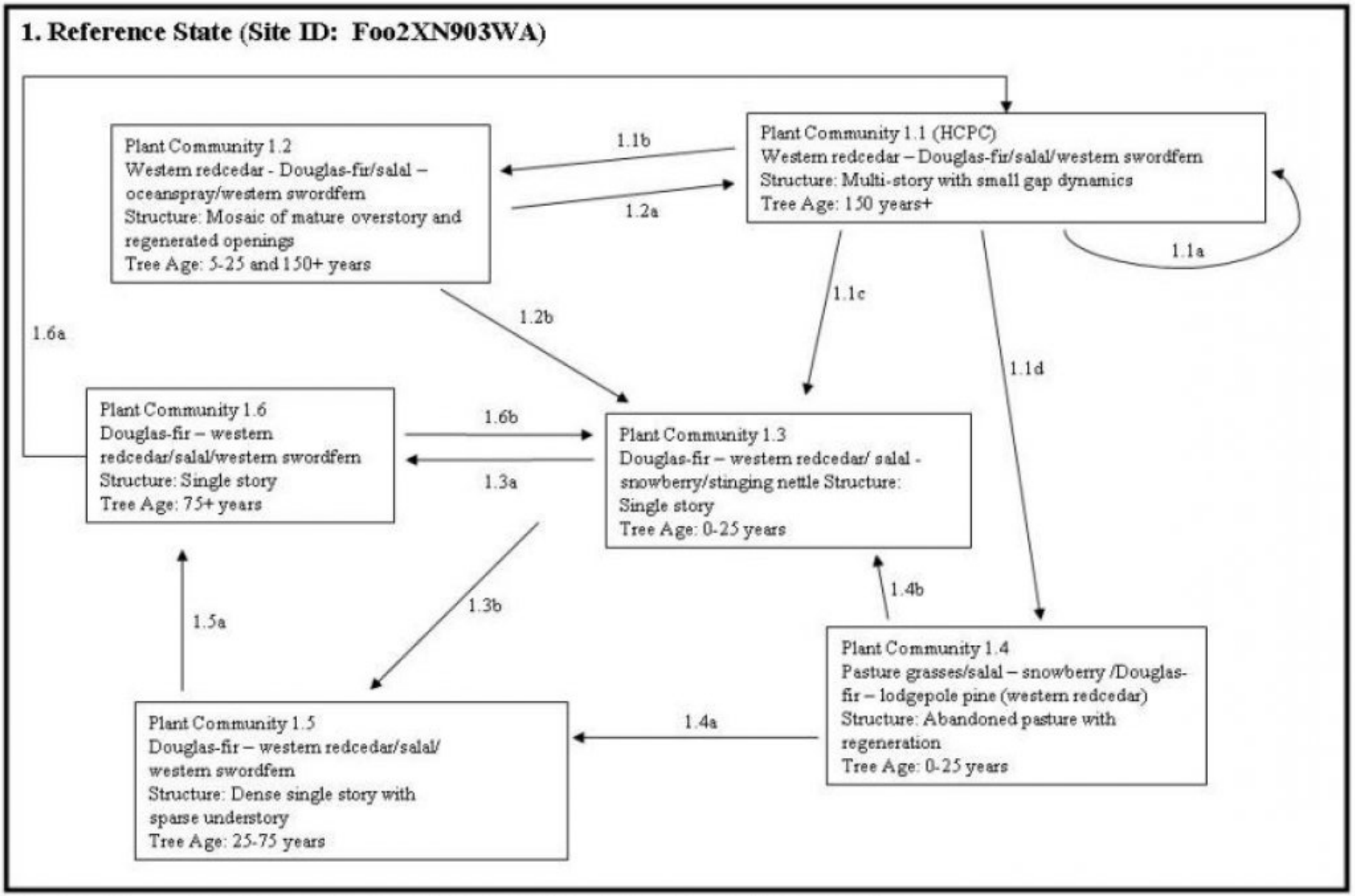
Surface texture	(1) Gravelly sandy loam (2) Loamy sand (3) Silt loam
Drainage class	Somewhat poorly drained to somewhat excessively drained
Permeability class	Very slow to rapid
Soil depth	51 cm
Available water capacity (0-101.6cm)	6.35–18.54 cm
Soil reaction (1:1 water) (0-101.6cm)	4.5–8

Ecological dynamics

These sites are found in the rainshadow of the Olympic Mountains in the Puget Trough, on somewhat moist to moist soils. Western redcedar is the dominant overstory species for these sites, with a varying amount (to 50%) of Douglas-fir. Grand fir, red alder, western hemlock, lodgepole pine and big-leaf maple may be present but only as minority components. 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. The heavy shade of a redcedar forest favors the gradual replacement of Douglas-fir with more shade tolerant redcedar in the absence of a major disturbance. The most common natural disturbances on these sites are small pockets of wind-thrown or diseased overstory trees. 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 is frequently the most common understory species; salal, baldhip rose, snowberry, dull Oregongrape and stinging nettle are also regularly found on these sites. Most of these sites have been harvested for timber since European settlement although all of the various plant communities may have remnant mature trees.

State and transition model

State 1



Thuja plicata – Pseudotsuga menziesii/Gaultheria shallon/Polystichum munitum

Western redcedar – Douglas-fir/salal/western swordfern

→ Community Phase Pathway
HCPC = Historic Climax Plant Community

1.X = Plant Community Phase
1.Xy = Pathway (ecological response to natural and/or management disturbances)

Reference

Community 1.1
Western Redcedar, Douglas-fir, Salal, and Western Swordfern

Structure: multistory with small gap dynamics. Western redcedar is the most common overstory species in community 1.1. Douglas-fir can compose up to 50% of this community with grand fir and western hemlock being much smaller components. The most common natural disturbance on these sites would be the small gap dynamics following the death of one or two trees. Cedar is prone to a few different types of rot, and while these rarely kill a tree, they can cause the stem to break at location of the rot. Due to its shallow root system, western redcedar is susceptible to windthrow on wetter sites and the resulting tip-ups also create small canopy gaps. These limited openings allow some sunlight to reach the forest floor, promoting advanced regeneration and understory species. Although rare, stand-replacing fires have occurred historically in these forests. Cedar is only intermediate in fire resistance, so the majority of trees would be killed by a moderate or intense event. Douglas-firs are much more adapted to fire; consequently, this type of fire would have the ability to significantly alter the historical species distribution.

Community 1.2
Western Redcedar, Douglas-fir, Salal, Oceanspray, 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 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. Redcedar seedlings are highly preferred browse for deer and this, if deer populations are high, can affect the species composition of the regeneration. Most of the understory shrub species will also compete for the increased sunlight and could delay reforestation, especially for the less shade-tolerant species.

Community 1.3
Salal, Snowberry, Douglas-fir, and Western Redcedar

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. Oceanspray, snowberry, salal, 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, even by intense fires. If there is a seed source present, however, western redcedar,

Douglas-fir and red alder will regenerate on the newly exposed mineral soil. The success of seedlings will depend, in part, on the amount of competition from the shrub layer. Site preparation prior to planting seedlings should suffice to control the shrub species. Without active management these sites may be dominated by shrubs for many years.

Community 1.4
Pasture Grasses, Snowberry, Douglas-fir, Lodgepole Pine, and Western Redcedar

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. The environmental conditions favor Douglas-fir and lodgepole pine over western redcedar at this stage and those species (dependent on a seed source) will begin to create an overstory canopy. As the shade intolerant non-native species diminish, the abundance of redcedar and native understory plants such as oceanspray, snowberry and salal will increase.

Community 1.5
Douglas-fir, Western Redcedar, Salal, and Oceanspray

Structure: 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%, leading to a diminished understory. Over time the forest will begin to self-thin due to the elevated competition.

Community 1.6
Douglas-fir, Western Redcedar, Salal, Oceanspray, and Western Swordfern

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 1.3B
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 signifies growth over time with active management, maximizing timber development. Precommercial and/or commercial thinning, combined with understory control, would lower stand density and decrease competition for water and nutrients.

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 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

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.

CMAI data, by species, derived from:

Alnus rubra: Table 11 of Worthington, N.P., F.A. Johnson, G.R. Staebler and W. J. Lloyd. 1960. Normal Yield Tables for Red Alder. USDA For. Ser. Res. Paper 36, 3p., illus. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Pseudotsuga menziesii: Chambers, C. Washington State Department of Natural Resources Technical Report #20.

Table 5. 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
Douglas-fir	*PSME*	75	120	102	175	–	–	–	
red alder	*ALRU2*	85	105	92	127	–	–	–	
western redcedar	*THPL*	55	75	0	0	–	–	–	

Other references

Fire Effects Information System, [Online].
U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
http://www.fs.fed.us/database/feis/

Agee, J.K. Fire ecology of Pacific Northwest forests. Covelo, CA: Island Press; 1993. 493 pages .

Perry, D.A. Forest Ecosystems. Baltimore, MD: The Johns Hopkins University Press; 1994. 649 pages.

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	11/27/2024
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:**

   _____

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

   _____

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):**

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:**

17. **Perennial plant reproductive capability:**