

Ecological site F003XN924WA

Low Cryic/Udic West Coniferous

Last updated: 1/30/2025

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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.



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 National Park Service Plant Alliances:
Abies amabilis - *Abies lasiocarpa* Forest and Woodland Alliance, *Abies amabilis* - *Tsuga heterophylla* - (*Pseudotsuga menziesii*) / (*Rhododendron albiflorum*) Cold Forest Alliance (Crawford 2009).

This ecological site is related to the United States Forest Service Plant Association Groups: Mesic VAME and Moist VAAL 12 (Silver Fir Series). (Henderson 1992 p.83)

Associated sites

F003XN921WA	Frigid/Udic Coniferous
F003XN925WA	High Cryic/Udic Coniferous
F003XN926WA	Cryic/Udic Active Natural Disturbance

Table 1. Dominant plant species

Tree	(1) <i>Abies amabilis</i> (2) <i>Tsuga heterophylla</i>
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Shrub	(1) <i>Vaccinium membranaceum</i> (2) <i>Menziesia ferruginea</i>
Herbaceous	(1) <i>Gymnocarpium dryopteris</i> (2) <i>Clintonia uniflora</i>

Physiographic features

This native plant community occurs across many landscape positions at middle elevations of the North Cascades. This site occupies the low cryic/udic soil temperature/moisture regime and extends across glacial valleys to mountain slopes and in some locations to the ridge lines above.

This ecological site has only been mapped within the boundary of the North Cascades National Park Complex. This site, where mapped, ranged from 1700 to 5200 feet in elevation. The table below refers to the representative elevations of this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Valley side (3) Stream terrace
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	671–1,402 m
Slope	5–100%
Water table depth	51 cm
Aspect	Aspect is not a significant factor

Climatic features

This ecological site receives most of its annual precipitation from October to April in the form of snow that will commonly persist into late spring and early summer. The mean annual precipitation ranges from 50 to 115 inches and the mean annual temperature ranges from 33 to 47 degrees Fahrenheit. Generally this site occupies areas with cool dry summers and cold wet winters.

Precipitation and temperature data in the tables below was extracted from: PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>, created February 2004. Information from the Ross Dam weather station, was used by the PRISM Climate Group to generate climate data for the North Cascades region.

Table 3. Representative climatic features

Frost-free period (average)	60 days
Freeze-free period (average)	90 days
Precipitation total (average)	2,921 mm

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. Occasionally and for brief amounts of time, the site may be flooded by adjacent rivers and streams but overall this has an insignificant influence on the plant community. Typically the Kimtah or Terror soil series are present in the areas subject to flooding.

Soil features

Applicable soils: Chilliwack, warm, Forbidden, Kimtah, Perfect, Spickard, Tepeh, moist, Terror and Yawning.

The soils that support this native plant community occur in the low cryic west soil temperature regime and udic soil moisture regime (the rooting zone is usually moist throughout the winter and the majority of summer). For the purposes of the soil inventory, the cryic zone (average annual temperature less than 8 degrees C, with less than 5 degrees C difference from winter to summer) was divided into several zones to distinguish soil and/or climatic differences between the lower elevation west side zone (low cryic/udic west), the higher elevation crest zone (high cryic/udic), and lower elevation east side zone (low cryic/udic east). These soils are moderately well to well drained and soil depth ranges from deep to very deep. Generally these soils have a mantle of material with significant volcanic ash influence overlying glacial till or colluvium. The upper mantle is characterized by a low bulk density and high water holding capacity. Soil moisture is not a limiting factor to forest growth on these soils owing to abundance of precipitation and the inherent water holding properties of soils influenced by volcanic ash. Typically under a coniferous overstory, as the amount of precipitation increases the degree of pedogenic weathering increases. In soils with significant volcanic ash influence and landscape stability (i.e. geologic time), pedogenic weathering produces Spodosols such as the Chilliwack, Kimtah, and Yawning soil series. Some soil properties of these Spodosols are similar to the other soils found under this native plant community, but morphologically Spodosols are visually distinct because of the typically bright albic and spodic horizon sequence in the upper soil profile. Weak expression of this morphology may be visible in the Andisols and Inceptisols of this grouping but generally these soils exhibit an ochric epipedon and cambic subsurface diagnostic horizon.

A blank entry under soil depth column indicates no depth restriction within the soil profile.

For more information on soils and their terminology, please refer to Soil taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys (Soil Survey Staff, 1999; <http://soils.usda.gov/technical/classification/taxonomy/>).

Table 4. Representative soil features

Surface texture	(1) Ashy fine sandy loam (2) Ashy sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to very rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	10.67–40.61 cm
Soil reaction (1:1 water) (0-101.6cm)	4–7
Subsurface fragment volume <=3" (Depth not specified)	5–80%
Subsurface fragment volume >3" (Depth not specified)	5–50%

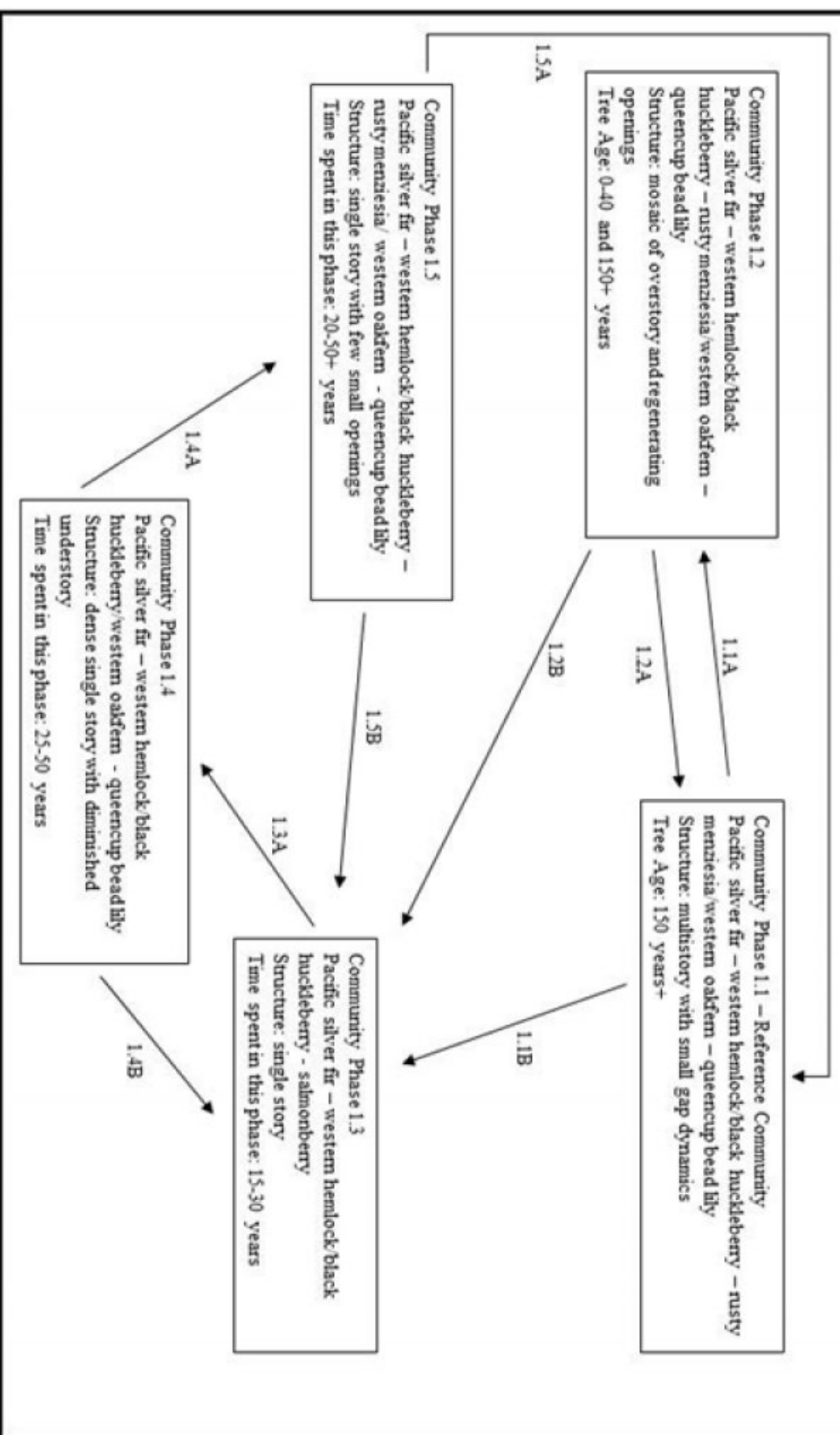
Ecological dynamics

This site is found in the cold, moist, mid-elevations on the west side of the Cascade Crest. Pacific silver fir (*Abies amabilis*) and western hemlock (*Tsuga heterophylla*) are the dominant species with western redcedar (*Thuja plicata*) and Douglas-fir (*Pseudotsuga menziesii*) occasionally present. The most common disturbance for this site is windthrow to which both Pacific silver fir and western hemlock are susceptible. The resulting canopy openings allow more sunlight to reach the forest floor. The historic fire regime is one of low frequency (300+ years) and high

intensity and results in a stand replacing event. Common understory shrubs include black huckleberry (*Vaccinium membranaceum*), rusty menziesia (*Menziesia ferruginea*), devilsclub (*Oplopanax horridus*), five-leaved bramble (*Rubus pedatus*), Cascade azalea (*Rhododendron albiflorum*) and vine maple (*Acer circinatum*). Common forbs include western oakfern (*Gymnocarpium dryopteris*), queencup bead lily (*Clintonia uniflora*), fringe cup (*Tellima grandiflora*), common ladyfern (*Athyrium filix-femina*) and starry false lily of the valley (*Maianthemum stellatum*).

State and transition model

1. Reference State (Site ID: F003XN924WA)



Abies amabilis – *Tsuga heterophylla*/*Vaccinium membranaceum* – *Menzies ferruginea*/*Gymnocarpium dryopteris* – *Clintonia uniflora*

Pacific silver fir – western hemlock/black huckleberry – rusty menziesia/western oakfern – queencup bead lily

→ Community Phase Pathway

1.X = Community Phase

1.XY = Pathway (ecological response to natural disturbances)

Figure 4. State and Transition Model

Reference

Community 1.1

Multistory Pacific Silver Fir, Western Hemlock, Black Huckleberry, Rusty Menziesia, and Western Oakfern



Figure 5. Reference Community

Structure: multistory with small gap dynamics. Pacific silver fir and western hemlock are the dominant overstory species in Community Phase 1.1 - Reference Community. Western redcedar is also common along with small amounts of Douglas-fir. Western hemlock regeneration often creates a dense mid-canopy which stops much of the sunlight from reaching the forest floor. In these areas the understory will be very sparse. If there is no mid-canopy 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 overstory trees, allowing for the release of advanced regeneration and/or an increase in the understory shrub community.

Community 1.2

Mosaic, Pacific Silver Fir, Western Hemlock, Black Huckleberry, Rusty Menziesia, and Western Oakfern

Structure: mosaic of mature overstory and regenerating openings. CP 1.2 retains some areas that resemble CP 1.1 but also contains moderate sized (2-5 acres) openings. Historically, this spatial pattern would have been caused by pockets of disease (such as annosum root rot, *Heterobasidion annosum*, or laminated root rot, *Phellinus weirii*, to which both Pacific silver fir and western hemlock are susceptible), minor insect infestations or possibly low- to moderate-intensity fires. Western redcedar is more resistant to these rot-causing organisms and so could reforest infected areas. Many of the shrub species found in this ecological site (including black huckleberry, rusty menziesia, vine maple and salmonberry) also respond well to increased sunlight and may delay reforestation of the newly formed openings.

Community 1.3

Pacific Silver Fir, Western Hemlock, Black Huckleberry, and Salmonberry

Structure: single story/shrub CP 1.3 is forestland in regeneration, possibly with scattered remnant mature trees; species composition depends on the natural seed sources present and the intensity of disturbance but would still be dominated by Pacific silver fir and western hemlock. Many of the shrub species present on this site (*Vaccinium* spp., *Rubus* spp.) have the ability to resprout from buds found below the soil (adventitious buds on root crowns and/or rhizomes) and this can cause competition for newly sprouted tree seedlings. This can result in areas that remain non-forested for many years.

Community 1.4

Pacific Silver Fir, Western Hemlock, Black Huckleberry, and Western Oakfern

Structure: single story CP 1.4 is a forest in the competitive exclusion stage, possibly with scattered remnant mature trees; there is increasing competition among individual trees for the available water and nutrients. Canopy closure is

almost 100% in areas that have successfully reforested, leading to a diminished shrub understory. The increased shade does benefit some understory species (such as queencup bead lily, western oakfern and fringe cup). Toward the end of this community phase the forest will begin to self-thin due to the overstory competition.

Community 1.5

Pacific Silver Fir, Western Hemlock, Black Huckleberry, Rusty Menziesia, and Western Oakfern

Structure: single story with few small openings CP 1.5 is a maturing forest which is starting to differentiate vertically. The taller overstory canopy allows for more sunlight to reach the forest floor, as does the death of individual trees (whether due to insects, disease, competition or windthrow). This allows for an increase in the understory as well as for some pockets of overstory tree species regeneration.

Pathway 1.1A

Community 1.1 to 1.2

This pathway represents a larger disturbance – an insect infestation, wind storm or rot pocket would create this forest structure. Areas of regeneration would range from approximately 2 to 5 acres.

Pathway 1.1B

Community 1.1 to 1.3

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, large scale wind event or major insect infestation.

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 reinitiation – until they resemble the old-growth structure of the reference community.

Pathway 1.2B

Community 1.2 to 1.3

This pathway represents a major stand-replacing disturbance leading to the stand initiation phase of forest development.

Pathway 1.3A

Community 1.3 to 1.4

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

Pathway 1.4B

Community 1.4 to 1.3

This pathway represents a major stand-replacing disturbance leading to the stand initiation phase of forest development.

Pathway 1.4A

Community 1.4 to 1.5

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

Pathway 1.5A

Community 1.5 to 1.1

This pathway represents no further major disturbance. Continued growth over time, as well as ongoing mortality, leads to continued vertical diversification. The community begins to resemble the structure of the reference community, with pockets of regeneration and a continued increase in understory diversity.

Pathway 1.5B

Community 1.5 to 1.3

This pathway represents a major stand-replacing disturbance leading to the stand initiation phase of forest development.

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
Pacific silver fir	ABAM	<i>Abies amabilis</i>	Native	–	–	–	–
western hemlock	TSHE	<i>Tsuga heterophylla</i>	Native	–	–	–	–
western redcedar	THPL	<i>Thuja plicata</i>	Native	–	–	–	–
Douglas-fir	PSME	<i>Pseudotsuga menziesii</i>	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Forb/Herb					
bride's bonnet	CLUN2	<i>Clintonia uniflora</i>	Native	0.2–0.3	1–40
bigflower tellima	TEGR2	<i>Tellima grandiflora</i>	Native	0.2–0.3	1–25
starry false lily of the valley	MAST4	<i>Maianthemum stellatum</i>	Native	0.3–0.6	0–20
Fern/fern ally					
western oakfern	GYDR	<i>Gymnocarpium dryopteris</i>	Native	0.2–0.3	1–25
common ladyfern	ATFI	<i>Athyrium filix-femina</i>	Native	0.3–0.9	0–20
Shrub/Subshrub					
thinleaf huckleberry	VAME	<i>Vaccinium membranaceum</i>	Native	0.3–1.2	5–50
vine maple	ACCI	<i>Acer circinatum</i>	Native	0.6–4.6	1–40
rusty menziesia	MEFE	<i>Menziesia ferruginea</i>	Native	0.6–1.5	5–30
devilsclub	OPHO	<i>Oplopanax horridus</i>	Native	0.3–1.8	5–30
Cascade azalea	RHAL2	<i>Rhododendron albiflorum</i>	Native	0.6–1.8	5–30
salmonberry	RUSP	<i>Rubus spectabilis</i>	Native	0.6–1.8	0–20
strawberryleaf raspberry	RUPE	<i>Rubus pedatus</i>	Native	0.1–0.2	0–15
red huckleberry	VAPA	<i>Vaccinium parvifolium</i>	Native	0.3–1.8	0–10

Table 7. 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	<i>TSHE</i>	80	110	197	250	90	—	—	
Pacific silver fir	<i>ABAM</i>	75	115	0	0	0	—	—	

Inventory data references

Type Locality Plot ID: 09-PHR-055

Type locality

Location 1: Whatcom County, WA	
Township/Range/Section	T40N R11E S5
UTM zone	N
UTM northing	5427362
UTM easting	616983
Latitude	48° 59' 17"
Longitude	121° 24' 3"

Other references

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

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Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436. <http://soils.usda.gov/technical/classification/taxonomy/>

Contributors

Kathryn Smith

Approval

Kirt Walstad, 1/30/2025

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	01/30/2025
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):**

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

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

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

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:

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

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

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:**
