USDA Natural Resources Conservation Service

Ecological site F003XN952WA
Southern Washington Cascades High Cryic Deciduous Forest

Last updated: 2/03/2025
Accessed: 05/13/2025

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): 003X–Olympic and Cascade Mountains

Steep mountains and narrow to broad, gently sloping valleys characterize this MLRA. A triple junction of two oceanic plates and one continental plate is directly offshore from Puget Sound. Subduction of the oceanic plates under the westerly and northwesterly moving continental plate contributes to volcanic activity in the Cascade Mountains. Movement among these plates has resulted in major earthquakes and the formation of large stratovolcanoes. The Cascade Mountains consist primarily of volcanic crystalline rock and some associated metasedimentary rock. The mean annual precipitation is dominantly 60 to 100 inches, but it is 30 to 60 inches on the east side of the Cascade Mountains.
The soil orders in this MLRA are dominantly Andisols, Spodosols, and Inceptisols and minor areas of Entisols and Histosols. The soils are dominantly in the frigid or cryic temperature regime and the udic moisture regime. The soils generally are shallow to very deep, well drained, ashy to medial, and loamy or sandy. They are on mountain slopes and ridges.

Ecological site concept

This ecological site is in cold, moist areas at an elevation of more than 3,600 feet. It is in active avalanche chutes on debris cones of glacial-valley walls. The most common disturbances are avalanches, rockfalls, and debris flows. Wildfires are less common, but the steep slopes facilitate the rapid movement of fire to upslope areas.
The soils that support this site are in the cryic soil temperature regime and the udic soil moisture regime. They formed in mixed colluvium and volcanic ash. They are well drained and very deep. The soils are not subject to flooding or ponding. Soil moisture is not a limiting factor to forest growth because of the abundance of precipitation and the inherent water-holding properties of soils influenced by volcanic ash. A thin organic horizon that consists of decomposing twigs, needles, and litter is on the soil surface. This horizon helps to protect the soil from wind and water erosion.
As a result of the frequent disturbances, this site primarily supports early seral species such as Sitka alder (*Alnus viridis* ssp. sinuata) and vine maple (*Acer circinatum*). Common understory shrubs include Sitka mountain ash (*Sorbus sitchensis* var. sitchensis) and devilsclub (*Oplopanax horridus*).
Repeated avalanches do not allow for the establishment of a coniferous overstory. Seedlings of tree species such as Pacific silver fir (*Abies amabilis*), subalpine fir (*Abies lasiocarpa*), noble fir (*Abies procera*), Alaska cedar (*Callitropsis nootkatensis*), and mountain hemlock (*Tsuga mertensiana*) may encroach from the forested edges. Over time, the majority of these rigid-trunked trees will be snapped off by avalanches.

Associated sites

F003XN948WA	**Southern Washington Cascades Low Cryic Deciduous Forest** Ecological site F003XN948WA, Southern Washington Cascades Low Cryic Deciduous Forest, is located at lower elevations compared to site F003XN952WA, Southern Washington Cascades High Cryic Deciduous Forest. Both sites are in active avalanche chutes. Ecological site F003XN948WA dominantly supports tree species such as Pacific silver fir and western hemlock. Site F003XN952WA dominantly supports species such as subalpine fir, mountain hemlock, and Alaska cedar.

Similar sites

F003XN948WA	**Southern Washington Cascades Low Cryic Deciduous Forest** Ecological site F003XN948WA, Southern Washington Cascades Low Cryic Deciduous Forest, is located at lower elevations compared to site F003XN952WA, Southern Washington Cascades High Cryic Deciduous Forest. Both sites are in active avalanche chutes. Ecological site F003XN948WA dominantly supports tree species such as Pacific silver fir and western hemlock. Site F003XN952WA dominantly supports species such as subalpine fir, mountain hemlock, and Alaska cedar.

Table 1. Dominant plant species

Tree	(1) *Alnus viridis ssp. sinuata* (2) *Acer circinatum*
Shrub	(1) *Sorbus sitchensis*
Herbaceous	(1) *Veratrum viride*

Physiographic features

This ecological site is dominantly on debris cones at middle to high elevations (above 3,600 feet) in Mount Rainier National Park. Typically, the site is confined to avalanche paths and runout areas, but it may be in other areas that are disturbed frequently, such as talus slopes or areas of debris torrent deposits. The site is on all slopes, but it is dominantly on slopes of 15 to 65 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Avalanche chute
Flooding frequency	None
Ponding frequency	None
Elevation	1,097–2,103 m
Slope	15–100%
Water table depth	178 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Most of the annual precipitation is received as snow in October through March. The snow commonly persists until late in spring or early in summer. The mean annual precipitation is 63 to 110 inches, and the mean annual air temperature is 36 to 45 degrees F. Generally, the summers are cool and dry and the winters are cold and wet.

Table 3. Representative climatic features

Frost-free period (characteristic range)	30-90 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	1,600-2,794 mm

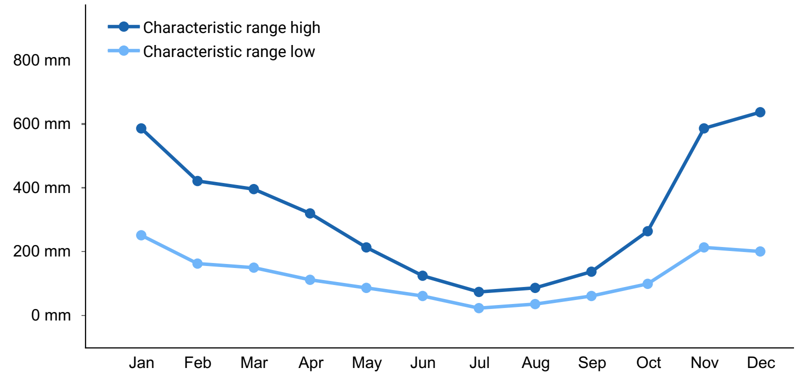


Figure 1. Monthly precipitation range

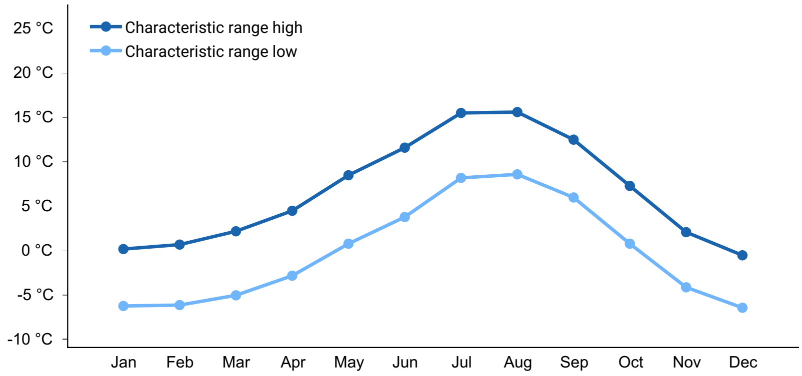


Figure 2. Monthly minimum temperature range

Influencing water features

This site is at middle to high elevations in Mount Rainier National Park and is dominantly on debris cones. The site receives runoff from upslope areas. It is not directly influenced by wetland or riparian features.

Soil features

Applicable soils: Summerland, cold

Applicable soil map units: 8230, 9201, 9993

The soils that support this native plant community are in the cryic soil temperature regime and the udic soil moisture regime. They are well drained and very deep. They are on dominantly on debris cones of glacial-valley walls. These soils formed in mixed colluvium and volcanic ash. They are not subject to flooding or ponding. They have more than 35 percent rock fragments in the particle-size control section. The fine-earth fraction is coarse textured. The soils are dominantly ashy loamy sand or ashy sandy loam. Podsolization in not evident in the profile because of the active landscape positions, frequent avalanches, and potential for rockfalls. The soils have an umbric epipedon and a cambic horizon.

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Colluvium
Surface texture	(1) Extremely stony, ashy sandy loam (2) Very gravelly, ashy sandy loam (3) Very cobbly, ashy loamy sand
Drainage class	Well drained
Soil depth	152 cm
Surface fragment cover <=3"	20–65%

Surface fragment cover >3"	5–65%
Available water capacity (Depth not specified)	2.54–17.78 cm
Soil reaction (1:1 water) (Depth not specified)	3.5–6
Subsurface fragment volume <=3" (Depth not specified)	20–65%
Subsurface fragment volume >3" (Depth not specified)	5–65%

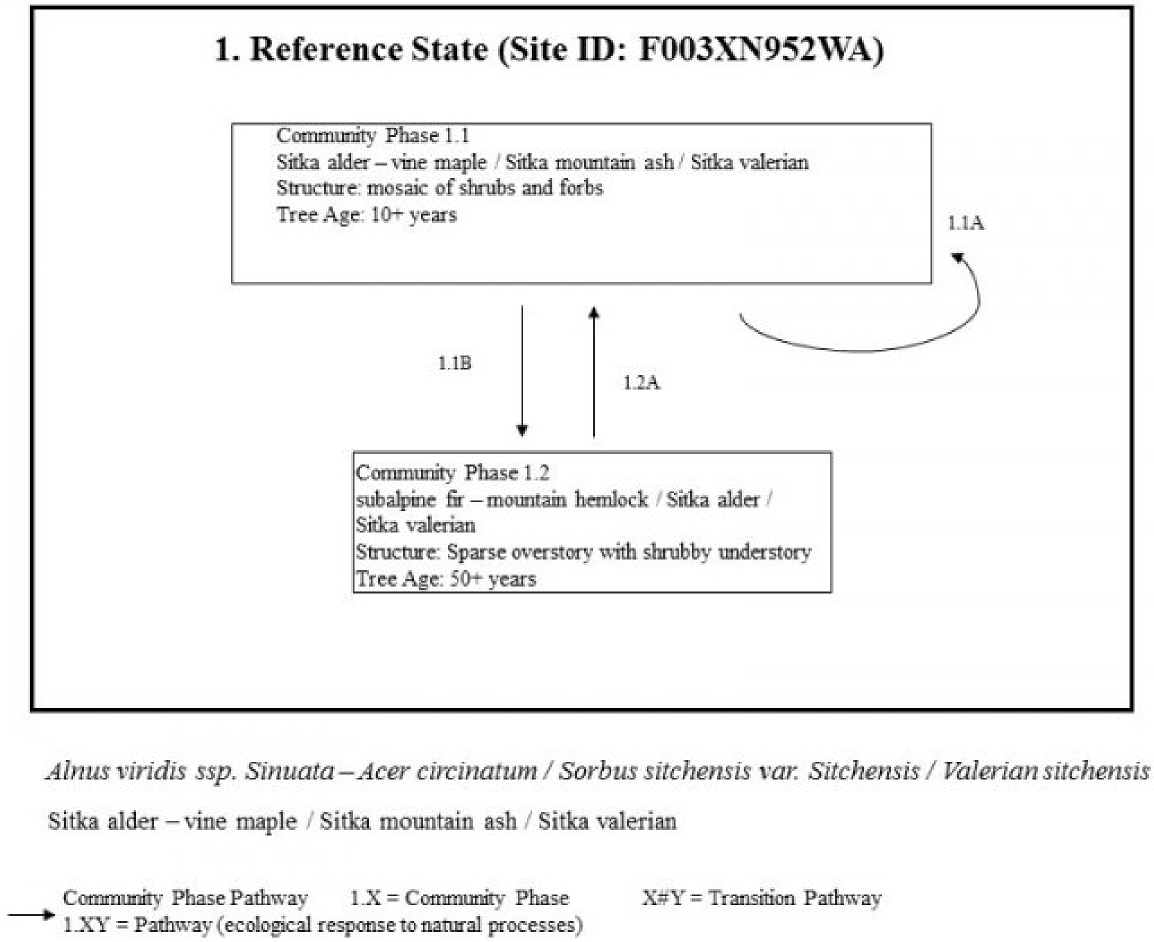
Ecological dynamics

This ecological site is in cold, moist areas at the middle to high elevations (above 3,600 feet) on active avalanche chutes. As a result of the frequent disturbances, this site primarily supports early seral species such as Sitka alder (*Alnus viridis* ssp. sinuata) and vine maple (*Acer circinatum*). Both species are adapted to colonizing talus slopes and avalanche chutes. These species have resilient wood and grow nearly prostrate in response to the snow load and recurring avalanches. The seeds of Sitka alder are particularly adapted to soils exposed by avalanches (Uchytil, 1989).

Repeated avalanches do not allow for the establishment of a coniferous overstory. Seedlings of tree species such as Pacific silver fir (*Abies amabilis*), subalpine fir (*Abies lasiocarpa*), noble fir (*Abies procera*), Alaska cedar (*Callitropsis nootkatensis*), and mountain hemlock (*Tsuga mertensiana*) may encroach from the forested edges. Over time, the majority of these rigid-trunked trees will be snapped off by avalanches. Common understory shrubs include Sitka mountain ash (*Sorbus sitchensis* var. sitchensis) and devilsclub (*Oplopanax horridus*). Common forbs include Sitka valerian (*Valeriana sitchensis*), fireweed (*Chamerion angustifolium*), false hellebore (*Veratrum viride*), and common beargrass (*Xerophyllum tenax*).

Wildfires may occur on this site. The damage commonly is not severe because of the rapid movement of fire on the steep slopes; therefore, recovery is relatively quick. Early seral species such as Sitka alder and vine maple regenerate post fire. Sitka alder is resistant to damage from wildfires because of its nonflammable bark and non-resinous leaves. Vine maple is able to resprout from the roots very quickly after a fire (Uchytil, 1989).

State and transition model



State 1
Reference

Community 1.1
Sitka Alder, Vine Maple, Sitka Mountain Ash, and Sitka Valerian

Structure: Mosaic of shrubs and forbs The reference community represents a lack of major disturbance for at least 10 years. Large areas of continuous canopy cover of Sitka alder develops, especially in the less sloping areas at the lower end of avalanche chutes. These areas generally have less diverse shrubs, but they have more forbs and ferns, such as fireweed, ladyfern, arctic lupine, thimbleberry, and Sitka valerian. Tall shrubs, such as black huckleberry and Sitka mountain ash, are in areas where the Sitka alder canopy is patchy. All of these species readily sprout from the root crown; therefore, they persist in avalanche chutes. Community phase pathway 1.1A This pathway represents an extended time with minimal disturbance by avalanches.

Forest overstory. Pacific silver fir, mountain hemlock, Alaska cedar, Douglas-fir, and subalpine fir are along the outer edges of the reference community. The canopy cover is 2 to 5 percent, and the canopy height is 30 to 100 feet.

Forest understory. The composition of the understory varies depending on the extent of the disturbance and the competition for moisture. Overall cover of shrubs such as Sitka alder, Sitka mountain ash, and rusty menziesia is as high as 40 percent in the reference community. Overall cover of thimbleberry and common ladyfern can be as high as 65 percent.

Dominant plant species

- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- vine maple (*Acer circinatum*), shrub
- thimbleberry (*Rubus parviflorus*), shrub
- Sitka mountain ash (*Sorbus sitchensis var. sitchensis*), shrub
- Sitka valerian (*Valeriana sitchensis*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- arctic lupine (*Lupinus arcticus*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous

Community 1.2
Subalpine Fir, Mountain Hemlock, Sitka Alder, and Sitka Valerian

Structure: Sparse overstory species encroaching avalanche path from edges and shrubby understory Community phase 1.2 represents the forest encroaching on the avalanche chutes. The forest surrounding the avalanche chutes provides a seed source for the plant community. Typically, the rigid-stemmed species in the main snow path do not survive repeated avalanches. They may slowly encroach from the forested edges in areas where mature trees provide some protection against snow movement. Over time and under certain conditions, this can lead to a narrowing of the original chute.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- mountain hemlock (*Tsuga mertensiana*), tree
- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- Sitka valerian (*Valeriana sitchensis*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

Sitka Alder, Vine Maple, Sitka Mountain Ash, and Sitka Valerian

Subalpine Fir, Mountain Hemlock, Sitka Alder, and Sitka Valerian

This pathway represents an extended time with no disturbance from avalanches, which allows trees to become established.

Pathway 1.2A
Community 1.2 to 1.1

Subalpine Fir, Mountain Hemlock, Sitka Alder, and Sitka Valerian

Sitka Alder, Vine Maple, Sitka Mountain Ash, and Sitka Valerian

This pathway represents disturbance by a major avalanche or series of avalanches that reclaims the original extent of the avalanche chute.

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							
subalpine fir	ABLA	*Abies lasiocarpa*	Native	–	–	–	–
Douglas-fir	PSME	*Pseudotsuga menziesii*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Forb/Herb					
arctic lupine	LUAR2	*Lupinus arcticus*	Native	0.3–7.3	0–20
Sitka valerian	VASI	*Valeriana sitchensis*	Native	1.8–3.7	0–15
green false hellebore	VEVI	*Veratrum viride*	Native	1.8–3.7	0–1
Fern/fern ally					
common ladyfern	ATFI	*Athyrium filix-femina*	Native	3.7–14.6	0–65
Shrub/Subshrub					
thimbleberry	RUPA	*Rubus parviflorus*	Native	3.7–18.3	0–60
Sitka mountain ash	SOSIS2	*Sorbus sitchensis var. sitchensis*	Native	7.3–36.6	0–40
rusty menziesia	MEFE	*Menziesia ferruginea*	Native	3.7–14.6	0–40
pink mountainheath	PHEM	*Phyllodoce empetriformis*	Native	0–3.7	0–30
Sitka alder	ALVIS	*Alnus viridis ssp. sinuata*	Native	7.3–43.9	0–20
thinleaf huckleberry	VAME	*Vaccinium membranaceum*	Native	3.7–18.3	0–15

Inventory data references

Other Established Classifications

National vegetation classification: Vancouverian Subalpine Forest North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group

U.S. Department of the Interior, National Park Service, plant association:
•CUPNOO/OPLHOR-(ALNVIR)
•ALNVIR
•ALNVIR-ACECIR

Type locality

Location 1: Pierce County, WA	
Township/Range/Section	T15N R8E S15
Latitude	46° 47′ 21″
Longitude	121° 46′ 54″

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Contributors

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Approval

Kirt Walstad, 2/03/2025

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	05/10/2024
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):**

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:

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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:**
