USDA Natural Resources
Conservation Service

Ecological site F003XN923WA
Cryic/Xeric Coniferous

Last updated: 5/10/2024
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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

This ecological site falls within the National Vegetation Classification Group Northern Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group. (Crawford 2009)

This ecological site includes the following USDA Forest Service Plant Association Groups: Dry VAME (Mountain Hemlock Series) and Mesic Herb (Subalpine Fir Series). (Henderson 1992 p.148 and p.186) It is also related to the Cool Mesic Shrub/Herb (ABLA2/VAME) to the Cold Moist Shrub/Herb (ABLA2/RULA) groupings found in Lillybridge et al. 1995.

Associated sites

F003XN927WA	**Frigid/Xeric Coniferous**
F003XN928WA	**Frigid/Xeric Active Natural Disturbance**
F003XN929WA	**Low Cryic/Udic East Coniferous**

Table 1. Dominant plant species

Tree	(1) *Abies lasiocarpa* (2) *Picea engelmannii*

Shrub	(1) *Rubus parviflorus* (2) *Paxistima myrsinites*
Herbaceous	(1) *Clintonia uniflora*

Physiographic features

This native plant community occurs across many landscape positions generally at mid elevations along the east slope of the North Cascades. Although of limited extent, this site extends across glacial valleys and 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 6500 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 frequency	None
Ponding frequency	None
Elevation	823–1,524 m
Slope	15–65%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

This ecological site receives most of its annual precipitation from October to April. The mean annual precipitation ranges from 30 to 75 inches and the mean annual temperature ranges from 33 to 47 degrees Fahrenheit. Generally this site occupies areas with warm 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)	75 days
Freeze-free period (average)	100 days
Precipitation total (average)	1,905 mm

Influencing water features

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.

Soil features

Applicable soils: Primus, Stehekin.

The soils that support this native plant community occur in the cryic soil temperature regime (average annual temperature less than 8 degrees C, with less than 5 degrees C difference from winter to summer) and xeric soil

moisture regime (the rooting zone is usually moist throughout the winter with prominent summer drought). These soils are well drained and very deep. Generally these soils have a significant percentage of rock fragments from colluvium or glacial till below a mantle of material with volcanic ash influence. The upper mantle is characterized by a low bulk density and relatively high water holding capacity. The Primus series is classified as an Andisol and may have a thin E or A horizon in some profiles due to more strongly expressed pedogenic processes. The Stehekin series is classified as an Inceptisol and may have a weakly expressed E horizon in some locations. The soil profile is more typically mixed volcanic ash and till or colluvium. Typically, both series 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/).

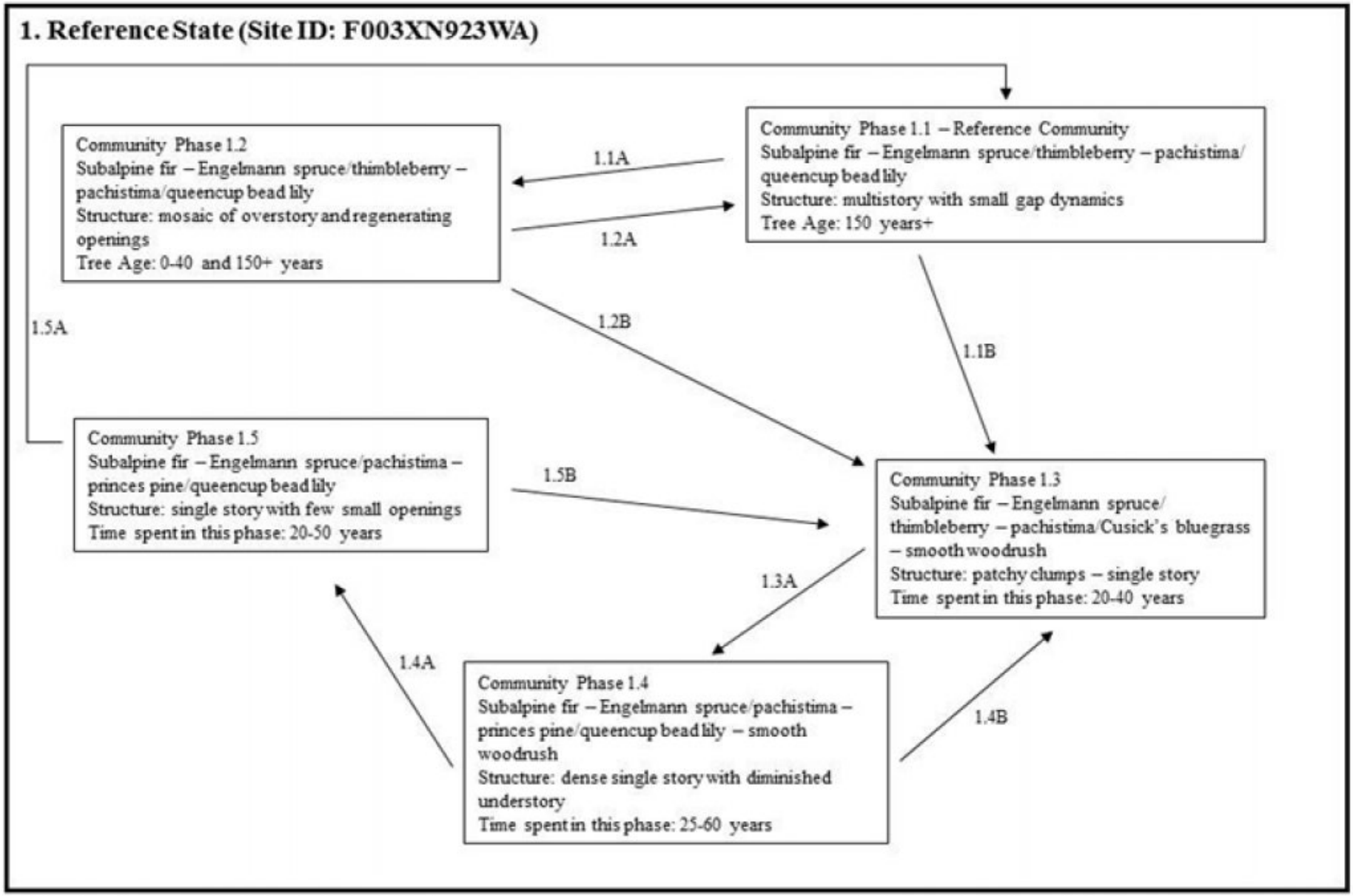
Table 4. Representative soil features

Surface texture	(1) Ashy fine sandy loam (2) Ashy sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid 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)	13.41–40.61 cm
Soil reaction (1:1 water) (0-101.6cm)	5–6.5
Subsurface fragment volume <=3" (Depth not specified)	0–70%
Subsurface fragment volume >3" (Depth not specified)	0–60%

Ecological dynamics

This site is found in cold, dry, mid-elevations east of the Cascade Crest. Subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) are the dominant overstory species with Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*) and whitebark pine (*Pinus albicaulis*) present in lesser amounts. Both subalpine fir and Engelmann spruce are susceptible to windthrow, and this most common disturbance will result in small openings scattered throughout the forest. Both species are also favored hosts of the western spruce budworm (Choristoneura occidentalis), which can cause major mortality during an outbreak. The historic fire regime of these forests is one of low frequency (~200+ years) and high intensity and would be a stand replacing event when it does occur. The main understory species are thimbleberry (*Rubus parviflorus*), pachistima (*Paxistima myrsinites*), black huckleberry (*Vaccinium membranaceum*), dwarf bramble (*Rubus lasiococcus*) queencup bead lily (*Clintonia uniflora*) western pearly everlasting (*Anaphalis margaritacea*) and sweetcicely (*Osmorhiza berteroi*).

State and transition model



Abies lasiocarpa – Picea engelmannii/Rubus parviflorus – Paxistima myrsinites/Clintonia uniflora

subalpine fir – Engelmann spruce/thimbleberry - pachistima/queencup bead lily

→ Community Phase Pathway 1.X = Community Phase

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

Figure 4. State and Transition Model

State 1

Reference State

Community 1.1
Subalpine fir – Engelmann spruce/thimbleberry – pachistima/queencup bead lily

Figure 5. Reference Community (in background)

Structure: multistory with small gap dynamics. Community Phase 1.1 - Reference Community. Both subalpine fir and Engelmann spruce are slow growing species at these elevations. When small natural disturbances occur (the death of one or two trees) infill by seedlings will take several decades, sustaining the multistory structure of the Reference Community. Subalpine fir and Engelmann spruce are susceptible to different rot-causing organisms (e.g. Gloeocystidiellum radiosum for Engelmann spruce and Gloeocystidiellum citrinum for subalpine fir). The presence of one of these organisms can shift the composition of the forest away from its host species. Clumps of thimbleberry and Sitka mountain-ash will be the main taller shrubs while the rest of the shrub species are low-growing species such as pachistima, princes pine and dwarf bramble.

Community 1.2
Subalpine fir – Engelmann spruce/thimbleberry – pachistima/queencup bead lily

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. Subalpine fir and Engelmann spruce are both host to organisms causing root rot (Coniophora puteana) and heart rot (Haematostereum sanguinolentum and Amylostereum chailletii), as well as windthrow, which can cause large pockets of overstory mortality. These areas may take decades to become reforested, resulting in either patches of shrubs or less-common overstory species (lodgepole pine, whitebark pine) which are not susceptible to these specific organisms. As the organisms slowly die off due to a lack of host trees, subalpine fir and Engelmann spruce will re-colonize these areas.

Community 1.3
Subalpine fir – Engelmann spruce/ thimbleberry – pachistima/grasses

Structure: patchy clumps of regeneration – single story. CP 1.3 is a forest in the stand initiation stage, possibly with scattered remnant mature trees; the composition of the seedlings depends on the natural seed sources available. Due to the harsh climate, however, regeneration would be patchy across the landscape with some areas dominated by shrubs and others by a variety of graminoids, such as Cusick's bluegrass (*Poa cusickii*), smooth woodrush (*Luzula glabrata*), blue wildrye (*Elymus glaucus*), and pinegrass (*Calamagrostis rubescens*) and forbs; it could take several decades for tree seedlings to become fully established.

Community 1.4
Subalpine fir – Engelmann spruce/pachistima – princes pine/queencup bead lily

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% within the areas successfully reforested, leading to a diminished graminoid community within these clumps but also providing protection for those species which do well in the shade such as princes pine and

queencup bead lily.

Community 1.5
Subalpine fir – Engelmann spruce/pachistima – princes pine/queencup bead lily

Structure: single story with few small openings. CP 1.5 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 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, such as a major insect outbreak or, less commonly, and major fire event, which leads to the stand initiation phase of forest development.

Pathway 1.3A
Community 1.3 to 1.4

This pathway represents continued 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, such as a major insect outbreak or, less commonly, and major fire event, which leads 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 small pockets of regeneration and a more diversified understory.

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							
subalpine fir	ABLA	*Abies lasiocarpa*	Native	–	–	–	–
Engelmann spruce	PIEN	*Picea engelmannii*	Native	–	–	–	–
Douglas-fir	PSME	*Pseudotsuga menziesii*	Native	–	–	–	–
lodgepole pine	PICO	*Pinus contorta*	Native	–	–	–	–
whitebark pine	PIAL	*Pinus albicaulis*	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	*Clintonia uniflora*	Native	0.2–0.3	0–25
western pearly everlasting	ANMA	*Anaphalis margaritacea*	Native	0.3–0.6	0–15
sweetcicely	OSBE	*Osmorhiza berteroi*	Native	0.2–0.3	0–10
Shrub/Subshrub					
thimbleberry	RUPA	*Rubus parviflorus*	Native	0.6–1.2	10–30
thinleaf huckleberry	VAME	*Vaccinium membranaceum*	Native	0.3–0.9	1–30
Oregon boxleaf	PAMY	*Paxistima myrsinites*	Native	0.3–0.6	5–25
Sitka mountain ash	SOSIS2	*Sorbus sitchensis var. sitchensis*	Native	0.6–1.5	1–20
roughfruit berry	RULA2	*Rubus lasiococcus*	Native	0.1–0.2	0–10
pipsissewa	CHUM	*Chimaphila umbellata*	Native	0.2–0.3	1–10

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
Engelmann spruce	*PIEN*	50	65	39	56	120	–	–	

Inventory data references

Type Locality Plot ID: 09-PHR-094

Type locality

Location 1: Chelan County, WA	
Township/Range/Section	T34N R17E S17
UTM zone	N

UTM northing	5368610
UTM easting	665772
Latitude	48° 26′ 56″
Longitude	120° 45′ 36″

Other references

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Contributors

Kathryn Smith

Approval

Kirt Walstad, 5/10/2024

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	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:**
