USDA Natural Resources Conservation Service

Ecological site F003XN922WA
Frigid/Udic Active Natural Disturbance

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

Related National Park Service Plant Alliance: Acer circinatum Shrubland Alliance. (Crawford 2009)

This ecological site includes the following USDA Forest Service Plant Association Groups: Mesic GASH-BENE and Mesic POMU (Western Hemlock Series). (Henderson 1992 p.32)

Associated sites

F003XN920WA	**Frigid Riparian Forest**
F003XN921WA	**Frigid/Udic Coniferous**
F003XN923WA	**Cryic/Xeric Coniferous**

Table 1. Dominant plant species

Tree	(1) *Acer circinatum*
Shrub	(1) *Ribes lacustre* (2) *Vaccinium parvifolium*

Herbaceous	(1) *Polystichum munitum* (2) *Pteridium aquilinum*

Physiographic features

This native plant community is of limited extent on mountain slope positions at lower elevations along the west slope of the North Cascades. Typically this site is confined to avalanche paths and runout areas or similar areas with a higher frequency of disturbance such as talus slopes or debris torrent deposits.

This ecological site has only been mapped within the boundary of the North Cascades National Park Complex. This site, where mapped, ranged from 360 to 4600 feet in elevation. The table below refers to the representative elevations of this site.

Table 2. Representative physiographic features

Landforms	(1) Avalanche chute (2) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	396–1,189 m
Slope	20–100%
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 35 to 106 inches and the mean annual temperature ranges from 37 to 49 degrees Fahrenheit. Generally this site occupies areas with warm dry summers and cool 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)	90 days
Freeze-free period (average)	120 days
Precipitation total (average)	2,692 mm

Influencing water features

This ecological site is not influenced by wetland or riparian water features but may be found adjacent to incised streams.

Soil features

Applicable Soils: Ragged and Tricouni, deciduous phases.

The soils that support this native plant community occur in the frigid soil temperature regime (average annual temperature less than 8 degrees C, with a greater than 5 degrees C summer-winter fluctuation) and udic soil moisture regime (the rooting zone is usually moist throughout the winter and the majority of summer). These soils are well drained and very deep. Generally these soils have a mantle of material with significant volcanic ash influence overlying colluvium. The upper mantle is characterized by a low bulk density and high water holding

capacity although an abundance of coarse fragments within the profile may limit the amount of moisture available. Soil profiles under this plant community will typically have a darker color than their coniferous forest counterparts owing to the abundance of deciduous forest litter and herbaceous root matter incorporated into the soil profile.

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 sandy loam (2) Ashy loamy sand
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)	10.49–40.61 cm
Soil reaction (1:1 water) (0-101.6cm)	5–6.5
Subsurface fragment volume <=3" (Depth not specified)	5–50%
Subsurface fragment volume >3" (Depth not specified)	5–30%

Ecological dynamics

This site is found in cool, moist, lower elevation active avalanche chutes. Vine maple (Acer ciricnatum) is the dominant species and grows almost prostrate in response to the snow load and the force of avalanches. Repetitious disturbance by avalanches does not allow for the establishment of a forested overstory, but many seedling of many species, such as Douglas-fir (*Pseudotsuga menziesii*), western redcedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and grand fir (*Abies grandis*) may be found on these sites, often encroaching from the forested edges. The rigid trunks of all of these species do not lend themselves to being repeatedly over-swept with heavy snow however; and over time, the majority of these trees will be snapped off. Common shrub species found on these sites include prickly currant (*Ribes lacustre*), red huckleberry (*Vaccinium parvifolium*), pachistima (*Paxistima myrsinites*), and Cascade Oregongrape (*Mahonia nervosa*); while western swordfern (*Polystichum munitum*) western brackenfern (*Pteridium aquilinum*) and queencup bead lily (*Clintonia uniflora*), fragrant bedstraw (*Galium triflorum*) and fireweed (*Chamerion angustifolium*) are common forbs.

State and transition model

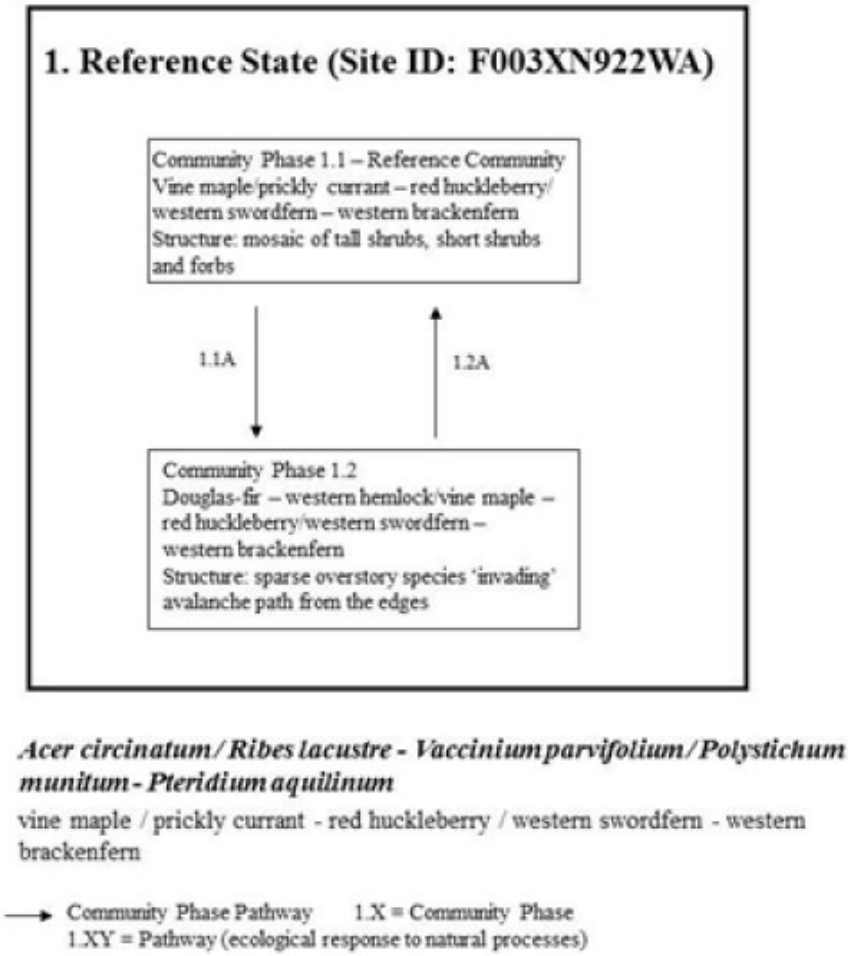

Figure 4. State and Transition Model

State 1
Reference State

Community 1.1
Vine maple/prickly currant – red huckleberry/western swordfern – western brackenfern

Figure 5. Reference Community

Structure: mosaic of tall shrubs, short shrubs and forbs Vine maple will form large areas of continuous canopy cover especially toward the lower end of avalanche chutes where the slope becomes less steep. These areas tend to have less varied shrub composition but higher amounts of forbs and ferns. Where vine maple becomes more

patchy, other tall shrubs such as red elderberry (*Sambucus racemosa*) and redosier dogwood (*Cornus sericea*) and willows (Salix spp.) can be present. These species don't take on a prostrate form, instead they resprout basally, becoming stunted and multi-stemmed. Prickly currant, red huckleberry, thimbleberry (*Rubus parviflorus*), salmonberry (*Rubus spectabilis*) and Cascade Oregongrape will also take advantage of a more open canopy. All of these species (with the possible exception of prickly currant) can readily sprout from the root crown and are therefore able to persist in avalanche chutes. Understory species included in the Canopy Cover Summary table had at least a 50% rate of constancy in 13 inventory plots.

Community 1.2
Douglas-fir – western hemlock/vine maple – red huckleberry/ western swordfern – western brackenfern

Structure: sparse overstory species 'invading' avalanche path from the edges. The forest surrounding avalanche chutes provide a continual seed source for recruitment into the community. Typically these rigid-stemmed species will not survive repeated onslaughts from avalanches when they establish in the main snow path. They can, however, slowly encroach from the forest edges where mature trees offer some buffer against less forceful snow movements. Over time and in the right circumstances (less overall snowfall, more stable snowpack), this can lead to a narrowing of the original chute.

Pathway 1.1A
Community 1.1 to 1.2

This pathway represents an extended time with minimal major avalanche disturbance.

Pathway 1.2A
Community 1.2 to 1.1

This pathway represents a particularly powerful avalanche or series of avalanches which reclaim the original extent of the avalanche chute.

Additional community tables

Table 5. 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	0–10
fireweed	CHANA2	*Chamerion angustifolium ssp. angustifolium*	Native	0.3–0.9	1–10
fragrant bedstraw	GATR3	*Galium triflorum*	Native	0.2–0.3	0–5
Fern/fern ally					
western brackenfern	PTAQ	*Pteridium aquilinum*	Native	0.3–1.2	5–25
western swordfern	POMU	*Polystichum munitum*	Native	0.3–0.9	5–20
Shrub/Subshrub					
vine maple	ACCI	*Acer circinatum*	Native	0.9–4.6	50–90
red elderberry	SARA2	*Sambucus racemosa*	Native	0.3–1.8	5–30
salmonberry	RUSP	*Rubus spectabilis*	Native	0.6–1.8	2–30
Cascade barberry	MANE2	*Mahonia nervosa*	Native	0.3–0.9	1–25
thimbleberry	RUPA	*Rubus parviflorus*	Native	0.6–1.5	1–25
prickly currant	RILA	*Ribes lacustre*	Native	0.6–1.5	1–25
red huckleberry	VAPA	*Vaccinium parvifolium*	Native	0.3–1.8	1–25
redosier dogwood	COSE16	*Cornus sericea*	Native	0.9–3	1–20
Oregon boxleaf	PAMY	*Paxistima myrsinites*	Native	0.3–0.9	1–20

Inventory data references

Type Locality: plot ID#07-CAB-025

Type locality

Location 1: Whatcom County, WA	
Township/Range/Section	T39N R12E S15
UTM zone	N
UTM northing	5413627
UTM easting	629245
Latitude	48° 51′ 44″
Longitude	121° 14′ 16″

Other references

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

Bebi, P., Kulakowski, D. & Rixen, C. 2009. Snow avalanche disturbances in forest ecosystems – State of research and implications for management. Forest Ecology and Management 257: 1883-1892.

Crawford, R. C., C. B. Chappell, C. C. Thompson, and F. J. Rocchio. 2009. Vegetation classification of Mount Rainier, North Cascades, and Olympic National Parks. Natural Resource Technical Report NPS/NCCN/NRTR—2009/211. National Park Service, Fort Collins, Colorado. 58 pages.

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/

Henderson, J., R. Lesher, D. Peter, and D. Shaw. 1992. Field guide to the forested plant associations of the Mt. Baker-Snoqualmie National Forest. Technical paper R6-Ecol-TP-028-91. 196 pages.

Miller, Margaret M.; Miller, Joseph W. 1976. Succession after wildfire in the North Cascades National Park complex. In: Proceedings, annual Tall Timbers fire ecology conference: Pacific Northwest; 1974 October 16-17; Portland, OR. No. 15. Tallahassee, FL: Tall Timbers Research Station: 71-83. [6574]

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

Pojar, J., and A. MacKinnon. 1994. Plants of the Pacific Northwest Coast. Lone Pine,
Vancouver, British Columbia. 528 pages.

Rixen, C., Haag, S., Kulalowski, D. & Bebi, P. 2007. Natural avalanche disturbance shapes plant diversity and species composition in subalpine forest belt. Journal of Vegetation Science 18: 735-742.

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/

Stokes, A., Mine, F., Mao, Z., Brancheriau, L. & Vandvik, V. 2012. Multi-stemming and mechanical traits ensure persistence of subalpine woody plants exposed to a disturbance gradient. Journal of Vegetation Science 23: 325.

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	05/20/2024
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):**

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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:**
