Ecological site R003XN512WA
Subalpine Parkland - Active Natural Soil Disturbance

Accessed: 04/20/2024

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 may be related to the National Park Service Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow Group and the National Park Service Plant Alliance *Phyllodoce empetriformis*-*Cassiope mertensiana*-(*Vaccinium deliciosum*)-Dwarf Shrubland Alliance.

Associated sites

F003XN925WA	**High Cryic/Udic Coniferous** Can be found adjacent to this ecological site.
F003XN926WA	**Cryic/Udic Active Natural Disturbance** This ecological site occurs below R003XN512WA.
R003XN502WA	**Subalpine Parkland - Minor Natural Soil Disturbance** This ecological site occurs as a complex with R003XN512WA.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This native plant community occurs across many landscape positions at higher elevations of the North Cascades. This site occupies the high cryic/udic soil temperature/moisture regime and occurs on the more active subalpine landscape positions of ridges, cirques, and valley walls and are subject to more frequent and higher intensity natural soil disturbances.

This ecological site has only been mapped within the boundary of the North Cascades National Park Complex.

Table 2. Representative physiographic features

Landforms	(1) Cirque (2) Valley side (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	3,800–6,000 ft
Slope	35–100%
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 early summer. The mean annual precipitation ranges from 60 to 115 inches (1524 to 2921 mm) and the mean annual temperature ranges from 31 to 47 degrees Fahrenheit (-0.6 to 8.3 degrees C). 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)	115 in

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

Applicable Soils: Harlequin, Stetattle, Treen, and Triumph

The soils that support this native plant community occur in the high cryic soil temperature regime and udic soil moisture regime. For the purposes of the soil inventory, the cryic zone 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 well drained and soil depth ranges from shallow to very deep. Generally these soils have a mantle of material with variable volcanic ash influence overlying colluvium. The upper mantle is characterized by a low bulk density and high water holding capacity. Soil moisture is not a limiting factor to plant growth on these soils owing to abundance of precipitation and the inherent water holding properties of soils influenced by volcanic ash. Repeated soil disturbance and cold soil temperatures however, may be a limiting factor to plant establishment and growth.

Additionally, under this rangeland ecological site, landscape stability (i.e. geologic time), pedogenic weathering produces well developed Andisols with thick umbric horizons and bright subsurface colors that can qualify as spodic horizon materials. Weak expression of albic soil horizons can sometimes be seen in soils of this zone. In many instances, the soils of this ecological site will display buried soil horizons as the strata from repeated volcanic ash deposits are not disturbed by tree tip activity.

Table 4. Representative soil features

Surface texture	(1) Ashy sandy loam (2) Medial loam (3) Medial sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to very rapid
Soil depth	10 in
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–25%
Available water capacity (0-40in)	1.25–7.5 in
Soil reaction (1:1 water) (0-40in)	4–6
Subsurface fragment volume <=3" (Depth not specified)	5–80%
Subsurface fragment volume >3" (Depth not specified)	5–80%

Ecological dynamics

These sites occur in the non-forested areas of the mid- and high elevation vegetated zones of the Cascade Mountains. The soils on which this ecosite occurs are generally coarse-textured and deep. They occur on debris aprons, valley walls, and debris cones, often on south or west slopes and in drainageways subject to avalanches. These sites are subject to frequent soil disturbances through processes such as mixing caused by burrowing animals, root growth, tree tipping (bioturbation) or freeze-thaw cycles (cryoturbation), earthquakes, or movement of soils caused by water, either through saturation or movement of snow and ice. Burning can also alter plant communities and would have been important in maintaining this site as a meadow community. It was probably more frequent in the past. These sites tend to be on slopes which don't collect drifted snow, resulting in quicker snow melt and soil warming in the summer. The composition of plant species is determined by both the frequency and scale of disturbances and the time elapsed since the last major disturbance. The Reference Community vegetation is characterized by a predominance of forbs and grasses and grasslike plants. If sufficient time occurs between disturbances, and enough leaf litter builds up to provide a sheltered soil surface in the summer, shrubs may become established. If a very long interval occurs without disturbance, soil surface conditions can become protected enough to allow the establishment of conifers such as subalpine fir (*Abies lasiocarpa*) and mountain hemlock (*Tsuga mertensiana*). Disturbances will tend to reverse this progression, with the severity of disturbance dictating the effect on the species composition of the resulting community. Unless the disturbance is widespread, the plant communities will occur in a complex pattern that is related to variations in substrate, soil moisture conditions, duration of snowpack, and location and severity of disturbance. While the Reference Community may be the most common community, it is likely that all Community Phases will occur intermingled in relatively close proximity on the site at any given time, and that over time the locations of each Phase will change depending on the disturbance pattern, recurrence and intensity. Common plants present on the site include subalpine lupine (*Lupinus arcticus* ssp. subalpinus), false hellebore (*Veratrum viride*), Sitka valerian(*Valeriana sitchensis*), showy sedge (*Carex spectabilis*), American bistort (*Polygonum bistortoides*), partridgefoot (*Luetkea pectinata*), white avalanche lily (*Erythronium montanum*), woolly pussytoes (*Antennaria lanata*), Sitka mountain-ash (*Sorbus sitchensis*), black huckleberry(*Vaccinium membranaceum*), pink mountainheather (*Phyllodoce empetriformis*), white mountain-heather (*Cassiope mertensiana*), and Cascade huckleberry (*Vaccinium deliciosum*). Species will typically occur in more than one of the plant communities present on the site and will be present in varying amounts depending on the

Community Phase and degree of recent disturbance.

State and transition model

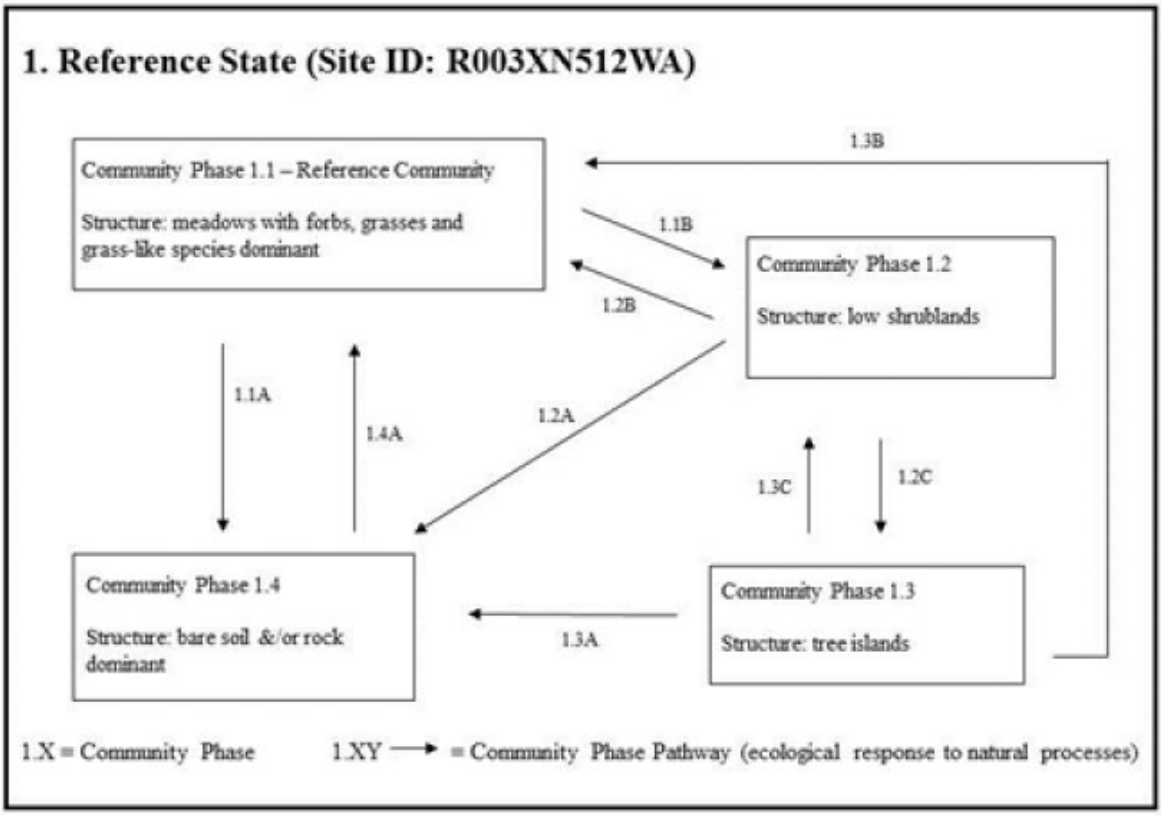

Figure 4. State and Transition Model

State 1
Reference State

Community 1.1
Reference Community

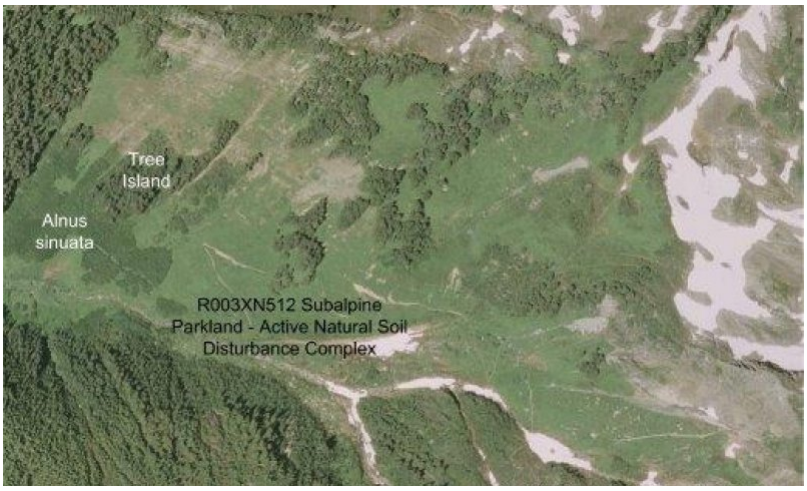

Figure 5. Interplay between R003XN502WA and R003XN512WA.

Vegetation is characterized by a predominance of forbs, grasses and grass-like plants. Common species present on the site include blue wildrye (*Elymus glaucus*), greenleaf fescue (*Festuca viridula*), smooth woodrush (*Luzula glabrata*), subalpine lupine (*Lupinus arcticus* ssp. subalpinus), false hellebore (*Veratrum viride*), Sitka valerian(*Valeriana sitchensis*), showy sedge (*Carex spectabilis*), American bistort (*Polygonum bistortoides*), partridgefoot (*Luetkea pectinata*), avalanche lily (*Erythronium montanum*), woolly pussytoes (*Antennaria lanata*), and Sitka mountain-ash (*Sorbus sitchensis* var. sitchensis).

Table 5. Ground cover

Tree foliar cover	0-1%
Shrub/vine/liana foliar cover	1-15%
Grass/grasslike foliar cover	10-60%
Forb foliar cover	20-100%
Non-vascular plants	0-15%
Biological crusts	0%
Litter	5-50%
Surface fragments >0.25" and <=3"	0-25%
Surface fragments >3"	0-25%
Bedrock	0-10%
Water	0%
Bare ground	5-30%

Community 1.2
Low Shrublands

If sufficient time occurs between disturbances and enough leaf litter builds up to provide a sheltered soil surface in the summer, shrubs may become established. In addition to those found in the Reference Community, common plants present on the site include black huckleberry(*Vaccinium membranaceum*), pink mountainheather (*Phyllodoce empetriformis*), white mountainheather (*Cassiope mertensiana*), and Cascade huckleberry (*Vaccinium deliciosum*).

Community 1.3
Tree Islands

If a very long interval occurs without disturbance, soil surface conditions can become protected enough to allow the establishment of conifers such as subalpine fir (*Abies lasiocarpa*), mountain hemlock (*Tsuga mertensiana*) and whitebark pine (*Pinus albicaulis*). Understory plants commonly found in this phase include black huckleberry(*Vaccinium membranaceum*), pink mountainheather (*Phyllodoce empetriformis*), white mountainheather (*Cassiope mertensiana*), and Cascade huckleberry (*Vaccinium deliciosum*) as well as those found in the Reference Community.

Community 1.4
Bare Soil and/or Rock

In Community Phase 1.4, the majority of vegetation has been removed through an intense disturbance, such as an avalanche, a mass wasting episode or a wildfire, and the site is effectively bare of vegetation. As the site recovers over time, the Reference Community will redevelop.

Pathway 1.1B
Community 1.1 to 1.2

Little or no disturbance so that soil surface/ plant interface conditions will favor establishment of increasingly woody vegetation over time.

Pathway 1.1A
Community 1.1 to 1.4

Extreme disturbance such as an avalanche or mass wasting episode removes the majority of vegetation from the site.

Pathway 1.2B
Community 1.2 to 1.1

Disturbance such as a wildfire occurs which is significant enough to destroy shrubby vegetation.

Pathway 1.2C
Community 1.2 to 1.3

Little or no disturbance so that soil surface/ plant interface conditions will favor establishment of increasingly woody vegetation over time. Continued lack of disturbance allows for the survival and growth of conifers.

Pathway 1.2A
Community 1.2 to 1.4

Extreme disturbance such as an avalanche or mass wasting episode removes the majority of vegetation from the site.

Pathway 1.3B
Community 1.3 to 1.1

Disturbance such as a wildfire occurs which is significant enough to destroy shrubby vegetation.

Pathway 1.3C
Community 1.3 to 1.2

Disturbance such as an avalanche occurs which is significant enough to destroy trees, but not flexible, low-growing shrubs.

Pathway 1.3A
Community 1.3 to 1.4

Extreme disturbance such as an avalanche or mass wasting episode removes the majority of vegetation from the site.

Pathway 1.4A
Community 1.4 to 1.1

Growth over time with no further disturbance.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				0	
	black alpine sedge	CANI2	*Carex nigricans*	0	0
	showy sedge	CASP5	*Carex spectabilis*	0	0
	blue wildrye	ELGL	*Elymus glaucus*	0	0
	greenleaf fescue	FEVI	*Festuca viridula*	0	0
	Parry's rush	JUPA	*Juncus parryi*	0	0
	smooth woodrush	LUGL2	*Luzula glabrata*	0	0
	Alaska oniongrass	MESU	*Melica subulata*	0	0
Forb					
2				0	
	subalpine fleabane	ERPE3	*Erigeron peregrinus*	0	0
	Cascade aster	EULE14	*Eucephalus ledophyllus*	0	0
	common cowparsnip	HEMA80	*Heracleum maximum*	0	0
	Fendler's waterleaf	HYFE	*Hydrophyllum fendleri*	0	0
	Sierra pea	LANE3	*Lathyrus nevadensis*	0	0
	Gray's licorice-root	LIGR	*Ligusticum grayi*	0	0
	subalpine lupine	LUARS2	*Lupinus arcticus ssp. subalpinus*	0	0
	partridgefoot	LUPE	*Luetkea pectinata*	0	0
	spreading phlox	PHDI3	*Phlox diffusa*	0	0
	silverleaf phacelia	PHHA	*Phacelia hastata*	0	0
	American bistort	POBI6	*Polygonum bistortoides*	0	0
	high mountain cinquefoil	POFL3	*Potentilla flabellifolia*	0	0
	white pasqueflower	PUOC	*Pulsatilla occidentalis*	0	0
	arrowleaf ragwort	SETR	*Senecio triangularis*	0	0
	western meadow-rue	THOC	*Thalictrum occidentale*	0	0
	Sitka valerian	VASI	*Valeriana sitchensis*	0	0
	Cusick's speedwell	VECU	*Veronica cusickii*	0	0
	green false hellebore	VEVI	*Veratrum viride*	0	0
Shrub/Vine					
3				0	
	western moss heather	CAME7	*Cassiope mertensiana*	0	0
	pink mountainheath	PHEM	*Phyllodoce empetriformis*	0	0
	Cascade bilberry	VADE	*Vaccinium deliciosum*	0	0
	thinleaf huckleberry	VAME	*Vaccinium membranaceum*	0	0

Inventory data references

Type Locality Plot ID: 07-TMR-060

Type locality

Location 1: Whatcom County, WA	
Township/Range/Section	T40N R14E S32

UTM zone	N
UTM northing	5419139.91
UTM easting	645334.411
Latitude	48° 54′ 29″
Longitude	121° 1′ 0″

Other references

Billings, W.D. 1973. Arctic and Alpine Vegetations: Similarities, Differences, and Susceptibility to Disturbance. BioScience, Vol. 23, No. 12 (Dec., 1973), pp. 697-704.

Billings, W.D. 1987. Constraints to Plant Growth, Reproduction, and Establishment in Arctic Environments. Arctic and Alpine Research, Vol. 19, No. 4, Restoration and Vegetation Succession in Circumpolar Lands: Seventh Conference of the Comité Arctique International (Nov., 1987), pp.357-365

Billings, W.D. and Bliss L.C. 1959. An Alpine Snowbank Environment and Its Effects on Vegetation, Plant Development, and Productivity. Ecology, Vol. 40, No. 3 (Jul., 1959), pp. 388-397.

Canaday, B.B. and Fonda, R.W. 1974. The Influence of Subalpine Snowbanks on Vegetation Pattern, Production, and Phenology. Bulletin of the Torrey Botanical Club, Vol. 101, No. 6 (Nov. - Dec., 1974), pp. 340-350

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.

Douglas, G.W. and Bliss L.C. 1977. Alpine and High Subalpine Plant Communities of the North Cascades Range, Washington and British Columbia. Ecological Monographs, Vol. 47, No. 2 (Spring, 1977), pp. 113-150.

Kuramoto, R.T. and Bliss L.C. 1970. Ecology of Subalpine Meadows in the Olympic Mountains, Washington. Ecological Monographs, Vol. 40, No. 3 (Summer, 1970), pp. 317-347.

Contributors

Martha Chaney
Marty Chaney

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	
Approved by	
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:**
