

## Ecological site F003XD805OR Frigid Udic Maritime Mountain Slopes 40-60 PZ

Last updated: 5/10/2024  
Accessed: 05/21/2024

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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.

### MLRA notes

Major Land Resource Area (MLRA): 003X—Olympic and Cascade Mountains

This area includes the west slope and parts of the east slope of the Cascades Mountains in Washington and Oregon. The Olympic Mountains in Washington State are also included. These mountains are part of a volcanic arc located at a convergent plate boundary. Volcanic rocks predominate but metamorphic and sedimentary rocks occur in the North Cascades and Olympic Mountains. Topography is generally dissected and steep, but some areas consist of constructional volcanic platforms and isolated stratovolcanoes. Elevation is usually 500 to 6000 feet but reaches to 14,410 ft at the summit of Mount Rainier. Many areas hosted alpine glaciers or ice sheets during the Pleistocene, and a few remain today.

Climate becomes cooler and moister with increasing elevation and latitude. Low elevations experience a long growing season and mild temperatures. High elevations can accumulate snowpack lasting into summer and frost may occur in any month. Average annual precipitation ranges from 60 to 180 inches in most areas. Most precipitation falls during the fall, winter, and spring during low-intensity frontal storms. Summers are relatively dry. Average annual temperature is 27 to 50 degrees F. The frost-free period is 10 to 180 days.

### Classification relationships

Forested Plant Associations of the Oregon East Cascades (Simpson 2007)

CWF431 – white fir–grand fir/queencup beadlily

Plant association group – White fir / Grand fir, wet

Plant Associations of the Commercial Forest of the Warm Springs Indian Reservation (Marsh 1987)

Grand fir / Snowberry

Grand fir / Oregon Boxleaf

Grand fir / Vine Maple

Landfire biophysical settings model (Landfire 2007)

0710180 East Cascades Mesic Montane Mixed-Conifer Forest and Woodland.

### Ecological site concept

This site encompasses a broad group of forest communities encompassed by the wet, modified maritime influenced, mixed conifer zone at middle elevations on the east slope of the Oregon Cascades. In reference condition, this site supports a forest canopy dominated by Douglas-fir (*Pseudotsuga menziesii*) and grand fir (*Abies grandis*), with western larch (*Larix occidentalis*) and understory reproduction of Douglas-fir and grand fir common. Plant community diversity is high with many wet site indicator species present such as bigleaf huckleberry (*Vaccinium membranaceum*), Oregon boxwood (*Paxistima myrsinites*), vine maple (*Acer circinatum*), vanilla leaf (*Achlys triphylla*), twinflower (*Linnaea borealis*) and beadlilly (*Clintonia uniflora*).

Sites at higher elevations than this site receiving cooler temperatures, higher precipitation, and in many cases more favorable aspects that result in increased effective soil moisture, support codominance of western hemlock (*Tsuga heterophylla*) due to its greater moisture requirements. In comparison to the associated mixed conifer sites receiving less precipitation, the maritime influence of this site results in a udic rather than xeric soil moisture regime with greater available moisture during the summer season. The higher soil moisture conditions of this site, as well as cooler temperatures, result in a less frequent fire rotation in comparison to these drier sites. This site has a fire regime characterized by moderately frequent, low and mixed severity fire (Landfire fire regime group 3).

This is a provisional ecological site that groups characteristics at a broad scale with little to no field verification and is subject to extensive review and revision before final approval. All data herein was developed using existing information and literature and should be considered provisional and contingent upon field validation prior to use in conservation planning.

## Associated sites

F003XD806OR	<b>Frigid Udic Maritime Mountain Slopes 60-90 PZ</b> Occupying landforms upslope or landscape positions with greater precipitation and/or soil moisture accumulation and retention.
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## Similar sites

F003XD806OR	<b>Frigid Udic Maritime Mountain Slopes 60-90 PZ</b> Higher precipitation, dominated by western hemlock
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**Table 1. Dominant plant species**

Tree	(1) <i>Abies grandis</i> (2) <i>Pseudotsuga menziesii</i>
Shrub	Not specified
Herbaceous	(1) <i>Clintonia uniflora</i>

## Physiographic features

This site is largely found occupying middle elevations on the east slope of the Cascades in Oregon. Its range is largely restricted to areas outside of the pumice plateau where deep pumice soils preclude the persistence of Douglas-fir. Within this range the site is primarily found on benches and slopes of mountains and glacial moraines. This site is commonly found occupying elevations between 3,000 – 5,400 ft (900 – 1,650 m). Slopes are most often 6 – 50% but can range from 0 - 65%. This site is found on all aspects. This site does not experience flooding or ponding and no water table is present within the upper two meters of soil.

**Table 2. Representative physiographic features**

Landforms	(1) Mountains > Mountain slope (2) Mountains > Bench (3) Mountains > Moraine
Flooding frequency	None
Ponding frequency	None
Elevation	914–1,646 m
Slope	6–50%
Water table depth	254 cm
Aspect	W, NW, N, NE, E, SE, S, SW

**Table 3. Representative physiographic features (actual ranges)**

Flooding frequency	Not specified
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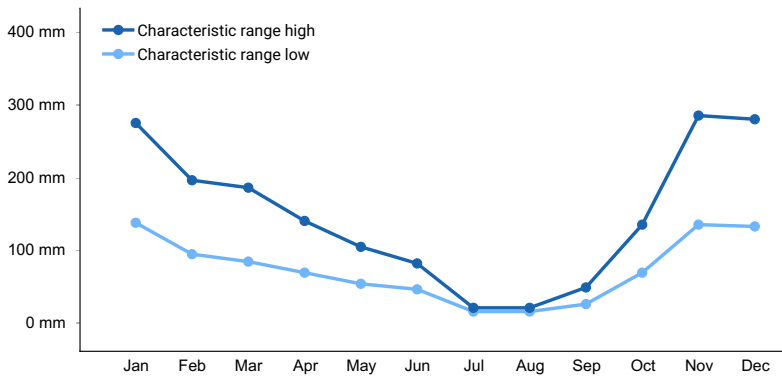
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–65%
Water table depth	Not specified

## Climatic features

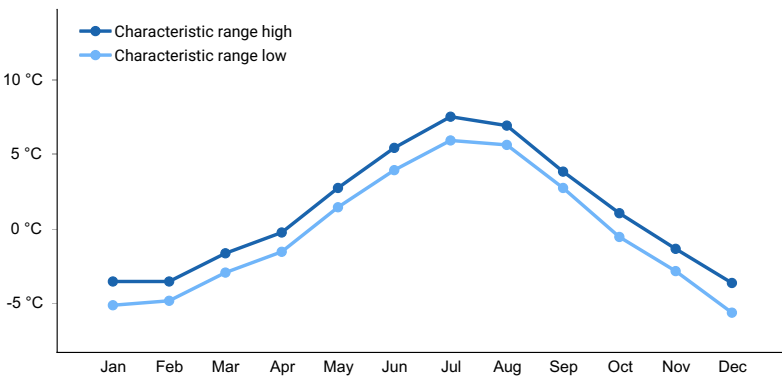
The average annual precipitation ranges from 40 - 60 in (100 – 150 cm) which occurs mainly between the months of November and June, mostly in the form of rain and snow. The average annual air temperature ranges from 39 - 43° F (4 - 6 °C) and the frost-free period ranges from 50 to 80 days. The soil temperature regime is frigid, soil moisture regime is udic. This climate is influenced by maritime weather patterns emerging from the pacific coast which bring greater precipitation and higher winter temperatures. These patterns are somewhat modified by the Cascade crest, which due to orographic uplift, buffers the site from the greater maritime impacts experienced by forests in the Western Cascades. The graphs below are populated from the closest available weather station to representative site locations and are provided to indicate general climate patterns.

**Table 4. Representative climatic features**

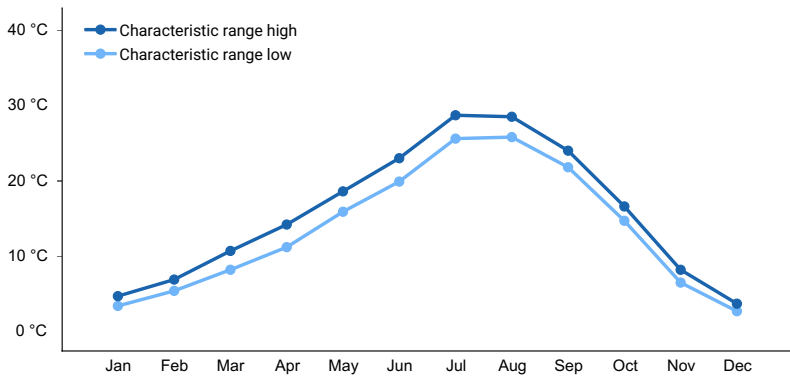
Frost-free period (characteristic range)	50-80 days
Freeze-free period (characteristic range)	90-135 days
Precipitation total (characteristic range)	1,016-1,524 mm
Frost-free period (average)	65 days
Freeze-free period (average)	100 days
Precipitation total (average)	1,270 mm



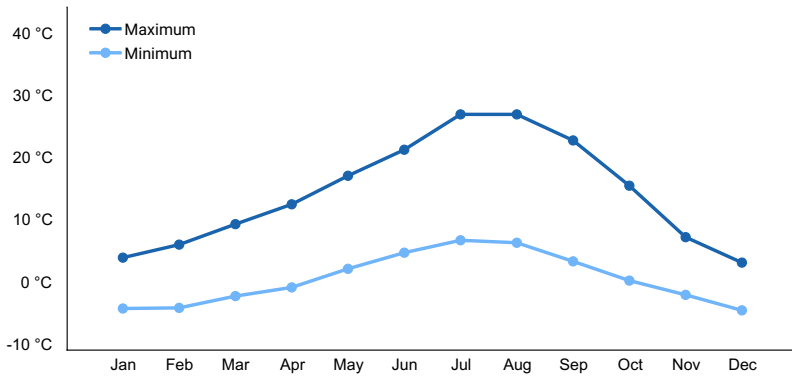
**Figure 1. Monthly precipitation range**



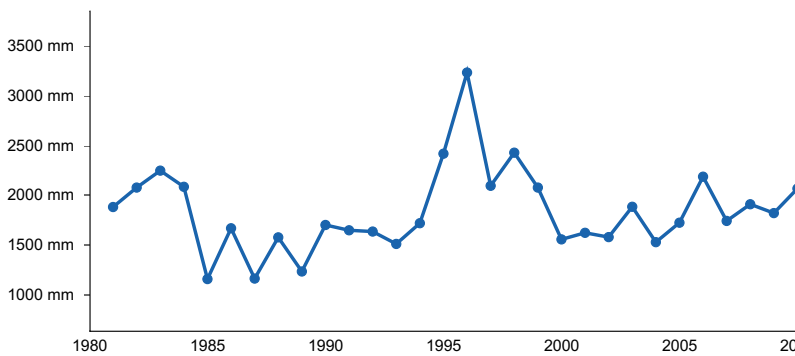
**Figure 2. Monthly minimum temperature range**



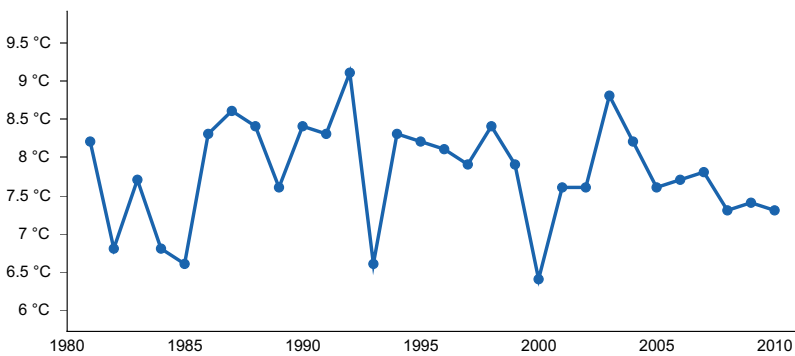
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

### Climate stations used

- (1) MARION FRKS FISH HATCH [USC00355221], Willamette Natl Forest, OR
- (2) SANTIAM JUNCTION [USC00357554], Blue River, OR
- (3) SISTERS [USC00357857], Sisters, OR

## Influencing water features

This site is not influenced by water from a wetland or stream.

## Soil features

The soils that typify this site concept are moderately deep to very deep over paralithic bedrock. Soil parent materials are commonly colluvium and residuum weathered from andesite and glacial till, both of which are either mixed or mantled (topped) with volcanic ash. Soil drainage and available water content are influenced by ash content and rock fragments throughout the profile. These are primarily well drained to somewhat excessively drained soils that often contain substantial subsurface rock fragments. Surface textures commonly range from sandy loams and fine sandy loams to gravelly, very stony and very cobbly sandy loams.

A representative soil complex associated with this site:

Howash very cobbly sandy loam, low precipitation, 12 to 30 percent slopes

**Table 5. Representative soil features**

Parent material	(1) Colluvium–andesite (2) Residuum–andesite (3) Till (4) Volcanic ash–volcanic rock
Surface texture	(1) Sandy loam (2) Gravelly sandy loam (3) Very cobbly sandy loam (4) Very stony sandy loam (5) Fine sandy loam
Family particle size	(1) Ashy-skeletal (2) Ashy
Drainage class	Well drained
Permeability class	Moderate to rapid
Depth to restrictive layer	51–203 cm
Soil depth	51–203 cm
Surface fragment cover ≤3"	0–45%
Surface fragment cover >3"	0–45%
Available water capacity (0-101.6cm)	4.06–16 cm
Soil reaction (1:1 water) (0-101.6cm)	5.1–7.3
Subsurface fragment volume ≤3" (10.2-152.4cm)	5–35%
Subsurface fragment volume >3" (10.2-152.4cm)	5–60%

**Table 6. Representative soil features (actual values)**

Drainage class	Well drained to somewhat excessively drained
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover ≤3"	Not specified
Surface fragment cover >3"	Not specified

Available water capacity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	Not specified
Subsurface fragment volume <=3" (10.2-152.4cm)	Not specified
Subsurface fragment volume >3" (10.2-152.4cm)	Not specified

## Ecological dynamics

As a wet mixed conifer site, this site is often situated above the moist mixed conifer zone and below the wet western hemlock/grand fir and cold mountain hemlock (*Tsuga mertensiana*)/silver fir (*Abies amabilis*) forests. The reference plant community for this site is characterized by a diverse canopy dominated by Douglas-fir and grand fir, with western larch common and incense cedar (*Calocedrus decurrens*), lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), western hemlock (*Tsuga heterophylla*) and western white pine (*Pinus monticola*) often also occurring depending on more localized site conditions. Of the true firs, grand fir is more common on this site north of the Metolius drainage, with hybrids between grand fir and white fir more common to the south (Simpson 2007). Overstory composition in mature forests is largely dominated by shade tolerant species but variability may be dependent on factors such as aspect, with ponderosa and incense cedar increasing on some southern exposures with less effective moisture. Plant community diversity is high across this broad site concept with many species present. Some consistently dominant species include snowbrush (*Ceanothus velutinus*), golden chinkapin (*Chrysolepis chrysophylla*), bigleaf huckleberry (*Vaccinium membranaceum*), Oregon boxwood (*Paxistima myrsinites*), Vine maple (*Acer circinatum*), vanilla leaf (*Achlys triphylla*), twinflower (*Linnaea borealis*) and bride's bonnet (*Clintonia uniflora*).

### Disturbance:

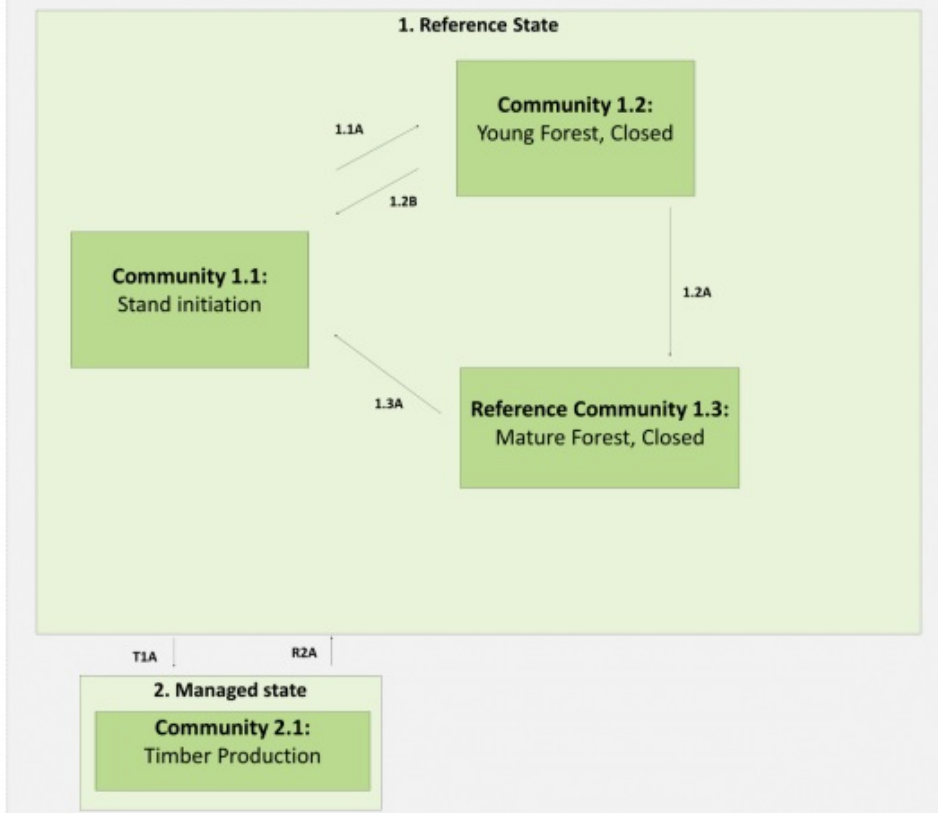
Historically, wet grand fir forests were likely subject to a fire regime characterized mainly by moderately frequent, mixed severity fire (Landfire fire regime group 3) (Simpson 2007, Landfire 2007). This is in contrast to drier grand fir, Douglas-fir and ponderosa forests that were subject to more frequent, low intensity fires (Hessberg et al. 2005). This fire regime combined with high precipitation, favors the development of closed canopy conditions and the infill of shade tolerant true fir species, incense cedar and Douglas-fir in the understory of these forests. While ponderosa pine may be present on these sites, it will be outcompeted overtime by more shade-tolerant species, and is often only present in the canopy of late successional forests as scattered mature individuals (Franklin and Dyrness 1973). Snowbrush, golden chinkapin and vine maple will increase following fire and often form shrubfields on favorable sites following stand replacing fires. These shrubfields may persist for decades and may inhibit the reestablishment of tree species (Franklin and Dyrness 1973).

These sites are often of high productivity and attractive for commercial timber harvesting which will have varying effects on stand structure and composition depending on harvest practices. Dense shrub cover following fire or logging may delay stand regeneration (Marsh et al 1987). Livestock grazing potential is limited on this site due to closed canopy conditions and high shrub cover.

The state and transition model below represents a generalized and simplified version of forest change in response to fire in this ecological site. It does not attempt to model the complex effects of forestry practices or insect outbreaks on ecosystem change. It is largely based on Landfire biophysical settings model: 0710180 East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (Landfire 2007).

## State and transition model

F006XY8050R



Community Pathways	
1.1A	Lack of fire for ~20 years
1.2A	Lack of fire for ~65 years
1.2B	High severity, stand replacing fire occurs
1.3A	High severity, stand replacing fire occurs

Transitions / Restoration Pathways	
T1A	Extensive timber harvest
R2A	Forest restoration, stand replacing fire

## State 1

### Historical Reference State

A wet forest community, this site occurs across the landscape as a mosaic of plant community phases characterized by variation in forest structural stage (tree age, density and cover) and plant community. This mosaic pattern is highly influenced by a mixed fire regime approximated by Landfire fire regime group 3: 35 - 200 Year Fire Return Interval, Low and Mixed Severity. As a highly productive forest community, this site will persist in closed canopy conditions represented by communities 1.2 and 1.3 most often. The mature, closed forest community represented by 1.3 is the reference community. Open stand conditions are possible due to insect outbreak or disease but rarely persist given site productivity. A minor amount of exotic species may be present on this site. However, site productivity and diversity likely bolster resilience to invasion for this site and exotic species are not known to significantly alter plant community dynamics as of writing.

### Dominant plant species

- grand fir (*Abies grandis*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- bride's bonnet (*Clintonia uniflora*), other herbaceous

## Community 1.1

### Shrub community, Stand initiation

Community dominated by shrubs. These shrubfields may persist for decades yet are likely important for providing shade to young conifers, cycling nutrients and providing wildlife forage. Forest reestablishment will depend on seed sources and may require longer intervals if available sources are no longer onsite and must depend on wind or animal transport from adjacent forests. Fire with high enough severity to remove shrub cover will maintain this community. All other communities may transition to this phase after stand replacing fires.

## **Community 1.2**

### **Young Forest, Closed**

Closed canopy forest, densely stocked with young to intermediate aged Douglas-fir, western larch and grand fir. Western hemlock may be locally present in the subcanopy, which is otherwise dominated by shrubs with little herbaceous cover due to lack of light.

## **Community 1.3**

### **Mature Forest, Closed**

The reference community is characterized by a mature, closed canopy forest. It is an uneven aged stand with large grand fir, Douglas-fir and western larch in the overstory. Western hemlock may be present in some areas more locally that receive more moisture. It is densely stocked, with a limited cover of herbaceous species or shrubs, species present will be primarily shade-tolerant species.

## **Pathway P1.1A**

### **Community 1.1 to 1.2**

Lack of fire for ~20 years

## **Pathway P1.2B**

### **Community 1.2 to 1.1**

High severity, stand replacing fire occurs

## **Pathway P1.2A**

### **Community 1.2 to 1.3**

Lack of fire for ~65 years

## **Pathway P1.3A**

### **Community 1.3 to 1.1**

High severity, stand replacing fire occurs

## **State 2**

### **Managed State**

This alternative state represents the many variations of timber harvesting that can occur in this site. This may result in a number of manipulated community types and pathways depending on strategies surrounding harvest, shrub control, weed control and replanting. Following harvest, some sites with adequate moisture and shrub seed source may be dominated by early seral shrubs. These may persist for decades yet are likely important for providing shade to young conifers, cycling nutrients and providing wildlife forage and cover.

### **Dominant plant species**

- Douglas-fir (*Pseudotsuga menziesii*), tree

## **Transition T1A**

### **State 1 to 2**

Extensive timber harvest followed by continual management for timber production that has significantly altered species compositions and resulting disturbance responses.

## **Restoration pathway R2A**

### **State 2 to 1**



Alterations of forest tree species composition, as well as soil compaction and surface disturbances due to large machine usage may hinder passive forest reestablishment. Forest reestablishment may require shrub control and tree replanting if the desired goal is regaining a forest structure within a desired timeframe. Ecological forestry practices may promote a return to reference state. Stand replacing fire may lead to a transition to community 1.1 of the reference state if soil compaction is not severe, species composition has not been significantly altered and tree seed source is available.

## Additional community tables

## References

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## Contributors

Andrew Neary - Concept developed for 2020 PES initiative

## 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:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of**

values):

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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:**

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