USDA Natural Resources Conservation Service

Ecological site F006XB003WA
Frigid Xeric Mountain Slopes (Grand fir Warm Moderately Dry Low Shrub/Herb)

Last updated: 9/11/2023
Accessed: 05/11/2025

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): 006X–Cascade Mountains, Eastern Slope

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Stretching from northern Washington to southern Oregon, MLRA 6 encompasses the mountain slopes, foothills, elevated plateaus and valleys on the eastern slopes of the Cascade mountains. This MLRA is a transitional area between the Cascade Mountains to the west and the lower lying Columbia Basalt Plateau to the east. Situated in the rain shadow of the Cascade Crest, this MLRA receives less precipitation than portions of the cascades further west and greater precipitation than the basalt plateaus to the east. Geologically, the majority of the MLRA is dominated by Miocene volcanic rocks, while the northern portion is dominated by Pre-Cretaceous metamorphic rocks and the southern portion is blanketed with a thick mantle of ash and pumice from Mount Mazama. The soils in the MLRA dominantly have a mesic, frigid, or cryic soil temperature regime, a xeric soil moisture regime, and mixed or glassy mineralogy. They generally are moderately deep to very deep, well drained, and loamy or ashy. Biologically, the MLRA is dominated by coniferous forest, large expanses of which are dominated by ponderosa pine, Douglas-fir or lodgepole pine. Areas experiencing cooler and moister conditions include grand fir, white fir, and western larch while the highest elevations include pacific silver fir, subalpine fir and whitebark pine. Economically, timber harvest and recreation are important land uses in these forests. Historically, many of these forests would have experienced relatively frequent, low and mixed severity fire favoring the development of mature forests dominated by ponderosa pine or Douglas-fir. In the southern pumice plateau forests, less frequent, higher severity fire was common and promoted the growth of large expanses of lodgepole pine forests.

LRU notes

Common Resource Area (CRA) 6.5 - Chiwaukum Hills and Lowlands

This LRU occurs predominantly on mountains and plateaus. The soils are dominantly in the Alfisols and Andisols taxonomic order, with some Inceptisols . Soil parent materials are dominantly colluvium and residuum from igneous, sedimentary, and metamorphic rock, glacial outwash, and glacial till, with a mantle or mixture of volcanic ash in the upper part. Taxonomic soil climate is primarily a frigid temperature regime and xeric moisture regime with average annual precipitation of about 33 inches.

Other LRU'S where the site occurs:
CRA 6.6 - Yakima Plateau and Slopes
CRA 6.7 - Grand Fir Mixed Forest
CRA 6.4 - Chelan Tephra Hills

Classification relationships

CWS337 - Grand fir/Mountain Snowberry (ABGR/SYOR) (WEN)
CWS338 - Grand fir/Pinemat Manzanita (ABGR/ARNE) (WEN) Yakima Nation 16 - Grand fir/Creeping Snowberry (ABGR/SYMO)

Ecological site concept

This site is designated Grand fir Warm Moderately Dry Low Shrub/Herb. It occurs on ridgetops and upper-middle slopes ranging from 2 to 50 percent. Elevation range 1500 to 4500 feet. Average precipitation ranges from 25 to 40 inches. Main tree species are Douglas-fir and ponderosa pine. Lodgepole pine and western larch can be present in cooler moist areas. In natural processes frequent fire created open stands of ponderosa pine and Douglas-fir. Understory consisted of low shrubs like pinemat manzanita, bearberry, creeping snowberry, mountain snowberry, and dwarf huckleberry. Main herbs consist of pinegrass, elk sedge, western fescue, lupines, and yarrow. Oregon white oak will be present on the ABRGR/SYMO sites in the southern area of MLRA 6.

The following USFS plant associations are included in this ecological site:
Grand fir/Mountain Snowberry (ABGR/SYOR)
Grand fir/Pinemat Manzanita (ABGR/ARNE

Grand fir/Creeping Snowberry (ABGR/SYMO) – Included from Yakima Indian Reservation

The most prominent plant associations respectively are: ABGR/SYMO, ABGR/ARNE, and ABGR/SYOR. All three of these plant associations occur on rocky gravelly soils and the overstory trees can appear ragged or wolfy.

Associated sites

F006XD002WA	**Cool Frigid Xeric Ashy Slopes (Grand fir Cool Dry Grass)** On cooler and slightly moister sites Associated Chelan through Yakima along with NW corner of Klickitat.
F006XC003WA	**Cool Frigid Moist Xeric Mountain Slopes (Grand fir Cool Moist Shrub/Herb)** On cooler and moister sites. Associated Chelan through Yakima along with NW corner of Klickitat.
F006XB001WA	**Frigid Xeric Mountain Slopes (Douglas-fir Moderately Dry Shrub/Herb)** Little drier.

Similar sites

F006XD005WA	**Frigid Xeric Mountain Slopes and Plateaus (Grand fir Warm Moderately Dry Shrub)** Has western hazel in the understory.

Table 1. Dominant plant species

Tree	(1) *Pseudotsuga menziesii* (2) *Pinus ponderosa*
Shrub	(1) *Symphoricarpos*
Herbaceous	Not specified

Physiographic features

This ecological site is on mountain slopes, plateaus, structural benches, and buttes. It is typically found between 1500 and 4500 feet in elevation on all aspects. Slope gradients typically range from 2 to 65 percent, but can be as steep as 90 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Plateau > Plateau (3) Structural bench (4) Butte

Flooding frequency	None
Ponding frequency	None
Elevation	1,500–4,500 ft
Slope	2–65%
Water table depth	20–60 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	None
Ponding frequency	None
Elevation	700–6,200 ft
Slope	0–90%
Water table depth	60 in

Climatic features

Mean Annual precipitation
Total Range: 18 - 65 inches
Central tendency: 25 - 45 inches

Mean Annual Air Temperature
Total Range: 42 - 50 F
Central tendency: 43 - 46 F

Frost-free period (days)
Total range: 70 - 145
Central tendency: 85 -120

Representative Climate Station: USC00453184 - Glenwood Number 2; latitude 46.0089 N, longitude -121.2634 west; elevation 1903 feet

Table 4. Representative climatic features

Frost-free period (characteristic range)	43-46 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	25-45 in
Frost-free period (actual range)	42-50 days
Freeze-free period (actual range)	
Precipitation total (actual range)	18-65 in

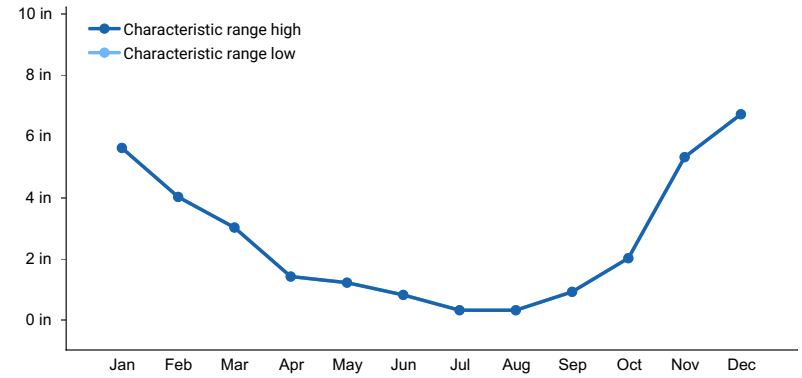

Figure 1. Monthly precipitation range

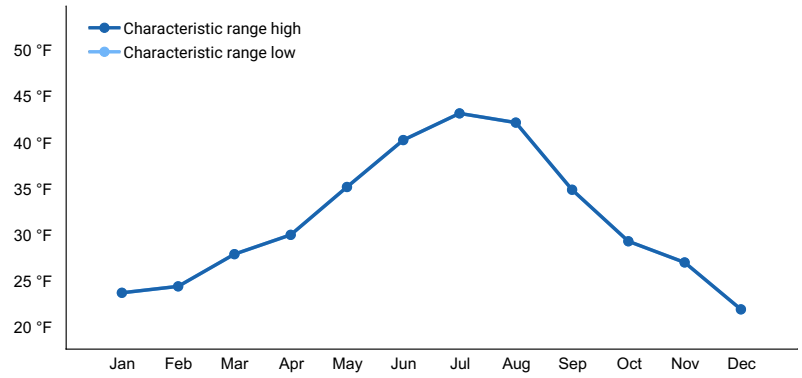

Figure 2. Monthly minimum temperature range

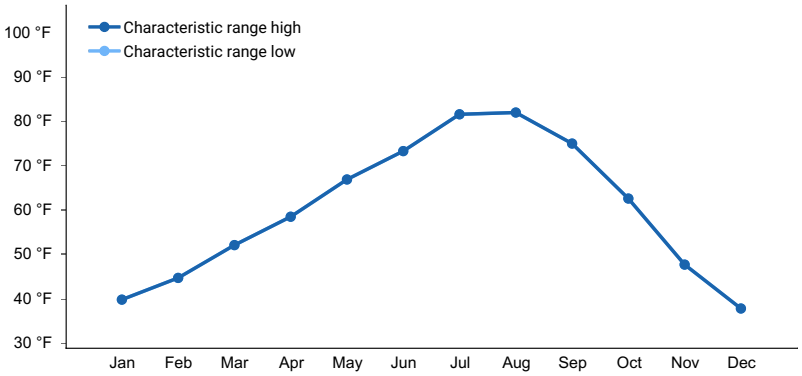

Figure 3. Monthly maximum temperature range

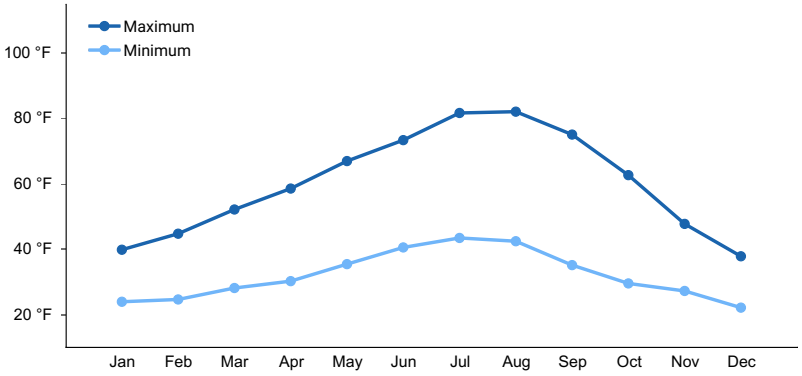

Figure 4. Monthly average minimum and maximum temperature

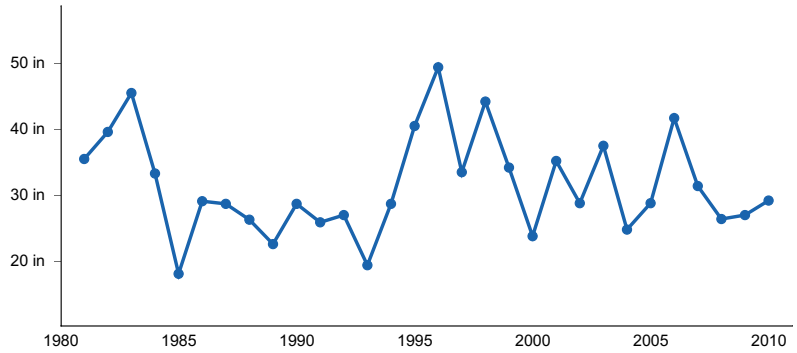

Figure 5. Annual precipitation pattern

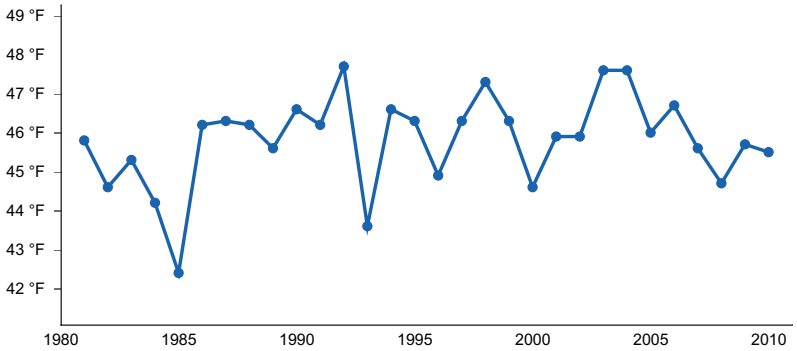

Figure 6. Annual average temperature pattern

Climate stations used

- (1) GLENWOOD #2 [USC00453184], Glenwood, WA

Influencing water features

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

Wetland description

N/A

Soil features

This ecological site is associated with several soil map unit components. The components are dominantly Vitrandic Haploxeralfs in the Alfisols taxonomic order Alfic Vitrixerands in the Andisols order and Andic Dystroxerepts in the Inceptisols order. Soils are dominantly moderately deep to very deep and have average available water capacity of about 4.8 inches (10.9 cm) in the 0 to 40-inches (0 to 100 cm) depth range. Soil parent material is dominantly volcanic ash and loess over colluvium, residuum, and alluvium from granitic, volcanic, metamorphic, and sedimentary rock.
Dominant Soil Series: Deroux, Loneridge, Nard, Singh, Trelk, Yahne, Yedlick

Parent Materials:
Kind – colluvium, residuum, alluvium, block and ash flows, loess, volcanic ash
Origin – sandstone, rhyolite, basalt, andesite, granitic rock, mixed sources

Table 5. Representative soil features

Surface texture	(1) Ashy loam (2) Ashy sandy loam (3) Ashy fine sandy loam

Family particle size	(1) Fine-loamy (2) Ashy over loamy-skeletal (3) Clayey-skeletal (4) Loamy-skeletal
Drainage class	Well drained
Depth to restrictive layer	20–60 in
Surface fragment cover <=3"	0–27%
Surface fragment cover >3"	0–24%
Available water capacity (0-40in)	0.8–7.7 in
Soil reaction (1:1 water) (0-40in)	5.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–37%
Subsurface fragment volume >3" (Depth not specified)	0–43%

Ecological dynamics

This site is designated Grand fir Warm Moderately Dry Low Shrub/Herb. It occurs on ridgetops and upper-middle slopes ranging from 2 to 50 percent. Elevation range 1500 to 4500 feet. Average precipitation ranges from 25 to 40 inches. Main tree species are Douglas-fir and ponderosa pine. Due to fire exclusion grand fir has become more prominent in the overstory and regeneration. Lodgepole pine and western larch can be present in cooler moist areas. In natural processes frequent fire created open stands of ponderosa pine and Douglas-fir. Understory consisted of low shrubs like pinemat manzanita, bearberry, creeping snowberry, mountain snowberry, and dwarf huckleberry. Main herbs consist of pinegrass, elk sedge, western fescue, lupines, and yarrow. Oregon white oak will be present on the ABRGR/SYMO sites in the southern area of MLRA 6.

The following USFS plant associations are included in this ecological site:
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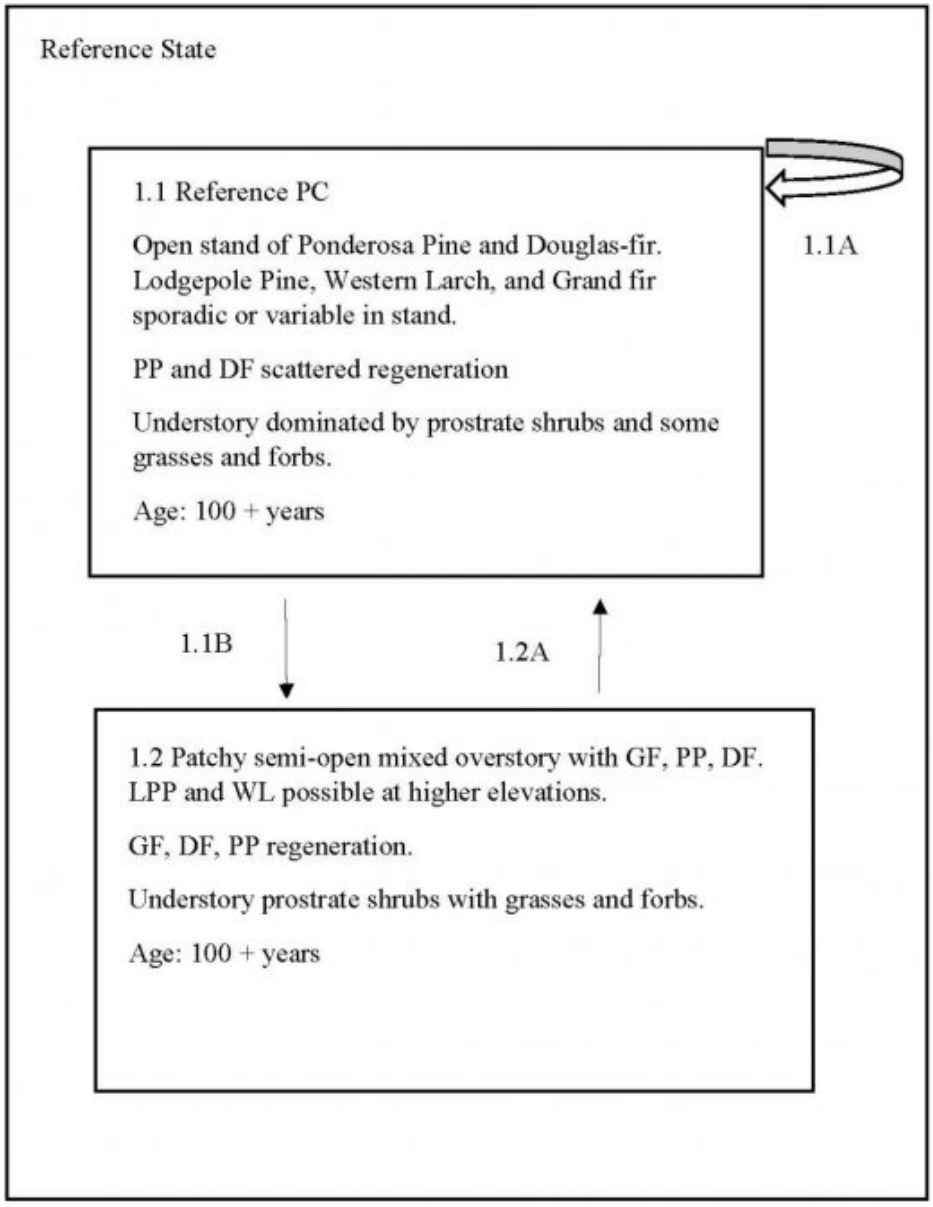
Grand fir/Pinemat Manzanita (ABGR/ARNE

Grand fir/Creeping Snowberry (ABGR/SYMO) – Included from Yakima Indian Reservation

The most prominent plant associations respectively are: ABGR/SYMO, ABGR/ARNE, and ABGR/SYOR.

All three of these plant associations occur on rocky gravelly soils and the overstory trees can appear ragged or wolfy. Dwarf mistletoe, bark beetles and laminated root rot can be problem in Douglas-fir. Root rots can also be present in ponderosa pine. If grand fir becomes prominent on the site Armillaria root rot, bark beetles, and budworm defoliators can be problem. Wind damage and winter desiccation can occur on overstory trees on exposed areas like ridge tops.

State and transition model



State 1
Reference State

Community 1.1
Reference PC

Figure 7. GF/ARNE on ridgetop in Blewett Pass area. Plant Community 1.2. Patchy GF, DF, LPP. Pinemat manzanita and dwarf huckleberry main low shrubs in opening.

Open stand of ponderosa pine and Douglas-fir. Lodgepole pine, western larch, and grand fir sporadic or variable in stand. PP and DF scattered regeneration Understory dominated by prostrate shrubs and some grasses and forbs. Age: 100 + years

Resilience management. 1.1A – Frequent low severity ground fires maintain Reference Plant Community by keeping grand fir, ponderosa pine, and Douglas-fir regeneration from establishing. Maintains shrub understory and open tree overstory.

Dominant plant species

- grand fir (*Abies grandis*), tree
- ponderosa pine (*Pinus ponderosa*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- lodgepole pine (*Pinus contorta*), tree
- western larch (*Larix occidentalis*), tree
- pinemat manzanita (*Arctostaphylos nevadensis*), shrub
- creeping snowberry (*Symphoricarpos mollis*), shrub
- mountain snowberry (*Symphoricarpos oreophilus*), shrub
- dwarf huckleberry (*Gaylussacia dumosa*), shrub
- elk sedge (*Carex garberi*), grass
- pinegrass (*Calamagrostis rubescens*), grass
- western fescue (*Festuca occidentalis*), grass
- lupine (*Lupinus*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous

Community 1.2
Patchy semi-open mixed overstory

Figure 8. GF/ARNE Blewett Pass. Plant community 1.2. GF, LPP, WL, DF, WWP overstory in patchy cover. Lack of frequent fire.

Patchy semi-open mixed overstory with grand fir, ponderosa pine, Douglas-fir. Lodgepole pine and western larch possible at higher elevations. GF, DF, PP regeneration. Understory prostrate shrubs with grasses and forbs. Age: 100 + years

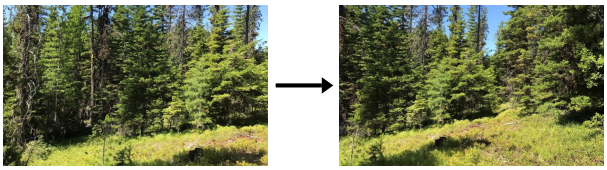
Pathway 1.1B
Community 1.1 to 1.2

Reference PC

Patchy semi-open mixed overstory

Lack of frequent ground fires allows regeneration to establish and create a mixed species patchy overstory. Stand is still semi-open with open areas of prostrate shrubs.

Pathway 1.2A
Community 1.2 to 1.1



Patchy semi-open mixed overstory

Reference PC

Mixed severity fire opens up stand.

Additional community tables

Other information

Site productivity is highly variable to due site location e.g. exposed ridges, gravelly soils. Some site locations which are not exposed or on moister sites will have better growth and higher site index values.

Douglas-fir site index range is 60 – 110 (Cochran 1979b (765) 50 BHA). Grand fir site index range is 70 – 120. (Cochran 1979b (031) 50 BHA). Ponderosa pine site index range is 60 – 100 (Meyer 1961 (600) 100 TA). Lodgepole pine site index range is 70 – 90 (Alexander 1966 (520) 100 TA)

Table 6. 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
Douglas-fir	*PSME*	60	110	–	–	–	–	–	
grand fir	*ABGR*	70	120	–	–	–	–	–	
ponderosa pine	*PIPO*	60	100	–	–	–	–	–	
lodgepole pine	*PICO*	70	90	–	–	–	–	–	

Inventory data references

Forest Service Plant Associations:
CWS337 - Grand fir/Mountain Snowberry (ABGR/SYOR)
CWS338 - Grand fir/Pinemat Manzanita (ABGR/ARNE)

Yakima Nation Habitat Type:
16 - Grand fir/Creeping Snowberry (ABGR/SYMO)

Other references

Field Guide for Forest Plant Associations of the Wenatchee National Forest. Lillybridge et al. PNW-GTR-359. October 1995

Forest Plant Associations of the Yakima Indian Reservation. John, Tart, Clausnitzer. May 1988

Washington Natural Heritage Program. Ecosystems of Washington State, A Guide to Identification, Rocchio and Crawford, 2015 - Northern Rocky Mt. Dry-Mesic Montane Mixed Conifer Forest (D. Fir – Pine)
USDA, NRCS Forest-Soil Eco classifications.

Field reconnaissance by Gary Kuhn, ACES Forester and Steve Campbell NRCS Soil Scientist. July 2019

Contributors

Gary Kuhn
Carri Gaines
Steve Campbell

Approval

Kirt Walstad, 9/11/2023

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	05/11/2025
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:**
