USDA Natural Resources Conservation Service

Ecological site F006XA803OR
Frigid Xeric Maritime North Slopes 35-55 PZ

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

Stretching from northern Washington to southern Oregon, MLRA6 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

Located at the eastern edge of the Columbia river gorge, this unit is restricted to areas influenced by the modified maritime climate of this unique passageway through the Cascades. This setting allows for the persistence of Oregon White Oak woodlands east of the Cascade crest. These woodlands often include ponderosa pine, and on sites with greater soil moisture, Douglas-fir.
Botanical diversity is high, with a mixture of West Cascade and East Cascade plant species commonly co-occurring. Physiographically, this unit is characterized by dissected foothills, valleys and ridges draining Mount Hood in Oregon and Mount Adams in Washington. Geologically, the unit is characterized by late tertiary pyroclastic and volcanoclastic deposits and basalt flows.
The climate of this unit is generally warm and dry with a predominately xeric soil moisture regime and mesic soil temperature regime. Historically, the drier extent of these forests have been influenced by a fire regime whereby frequent low and mixed severity fires would have favored the development of open canopied forests. Higher elevations and more westerly locations receiving more moisture within this unit would have been influenced by moderately frequent, low and mixed severity fires favoring a mosaic of forest stages with closed canopy conditions common.

Classification relationships

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

Plant association group - Abies concolor/Abies grandis, Wet

Landfire Biophysical Setting (Landfire 2007)
0710180 East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

Ecological site concept

This site represents a broad group of cool, moist grand fir forest communities on north and east slopes of the foothills surrounding Mount Hood. Occupying areas adjacent to and within the Columbia river valley, the climate of this site is influenced by a modified maritime climate as well as the rain shadow effect of Mount Hood, which alter plant community composition and productivity. The near sea level conduit of the Columbia river brings increased precipitation and low elevation cloud cover in winter that increases winter temperatures, relative to nearby areas outside of this influence.
The forest canopy of this site is dominated by Douglas-fir, grand fir, with ponderosa pine (Pinus ponderosa) sometimes common, and Douglas-fir (Pseudotsuga menziesii) and grand fir (Abies grandis) reproduction common in the understory. The plant community includes shrubs such as vine maple (Acer circinatum), serviceberry (Amelanchier alnifolia), oceanspray (Holodiscus discolor) and California hazel (Corylus cornuta); and herbaceous species such as vanilla leaf (Achlys triphylla), starflower (Trientalis borealis), pinegrass (Calamagrostis rubescens) and western fescue (Festuca occidentalis).
Nearby sites receiving less precipitation, or experiencing higher temperatures, are subject to decreased moisture availability in summer and therefore may support a reference community dominated by ponderosa pine and Douglas-fir, with few grand fir. Cooler and wetter sites upslope from this site support western hemlock (*Tsuga heterophylla*) and are subject to longer fire return due to higher fuel moisture later into the season.

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

F006XA804OR	**Mesic Xeric Maritime Foothills 30-50 PZ** Mesic soil temperature regime, occurs on adjacent aspects with greater solar radiation, PIPO-PSME dominated
R006XA302OR	**Steep South Slopes 20-40 PZ** Mesic soil temperature regime, occurs on adjacent south slopes
R006XA304OR	**Loamy 20-40 PZ** Mesic soil temperature regime, occurs on adjacent aspects with greater solar radiation
R006XA204OR	**South Slopes 20-40 PZ** Mesic soil temperature regime, occurs on adjacent south slopes

Similar sites

F006XA804OR	**Mesic Xeric Maritime Foothills 30-50 PZ** Mesic soil temperature regime,, occurs on all aspects, PIPO-PSME dominated
R006XA302OR	**Steep South Slopes 20-40 PZ** Occurs on south slopes, white oak dominated
R006XA304OR	**Loamy 20-40 PZ** Mesic soil temperature regime, lower precipitation and production, occurs on all aspects, PIPO-PSME dominated
R006XA204OR	**South Slopes 20-40 PZ** Shallow soils, occurs on south slopes, grass dominated

Table 1. Dominant plant species

Tree	(1) *Abies grandis* (2) *Pseudotsuga menziesii*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site is typically found occupying middle elevations of the valleys to the north and east of Mount Hood in Oregon. The site is primarily found on hillslopes, benches and mountain slopes. This site commonly occupies elevations between 1,750 to 3,500 feet (525 to 650 meters) but may be occur from 1,100 to 4,000 feet (330 to 1,200 meters). Slopes are most often 16 to 50 percent but can range from 0 to 70 percent. This site typically occupies north and east aspects. This site is not subject to ponding or flooding and no water table is present within 100 inches of the soil surface.

Table 2. Representative physiographic features

Landforms	(1) Valley > Bench (2) Valley > Hillslope (3) Mountain valleys or canyons > Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,750–3,500 ft
Slope	6–50%
Ponding depth	0 in
Water table depth	100 in
Aspect	N, NE, E

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	1,100–4,000 ft
Slope	1–70%
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

The average annual precipitation ranges from 35 to 55 inches (900 to 1,400 mm) which occurs mainly between the months of November and June, mostly in the form of rain. The average annual air temperature ranges from 42 to 45 degrees Fahrenheit (5.5 to 7 °C) and the frost-free period ranges from 100 to 130 days. This climate is modified by the influence of the Columbia River Gorge which acts as a conduit for maritime air masses to move through the Cascade mountains. The soil temperature regime is frigid, soil moisture regime is xeric. 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)	100-130 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	35-55 in

Frost-free period (average)	115 days
Freeze-free period (average)	
Precipitation total (average)	40 in

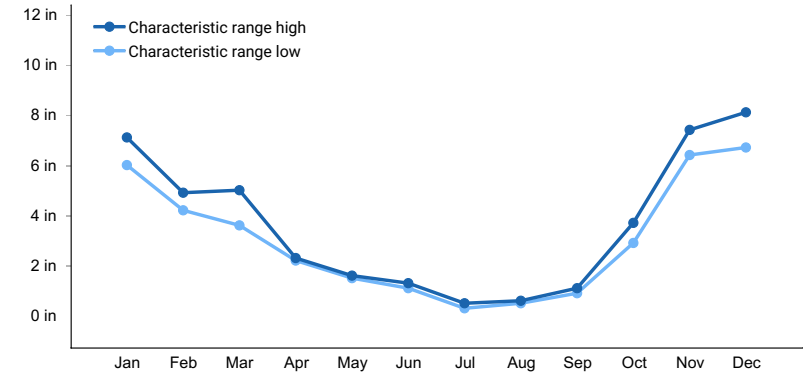


Figure 1. Monthly precipitation range

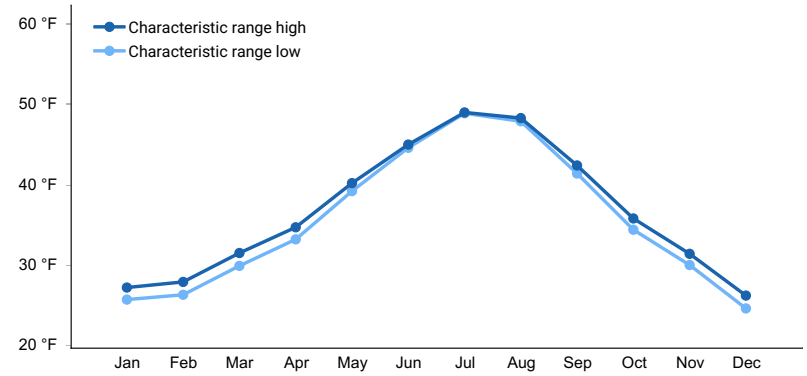


Figure 2. Monthly minimum temperature range

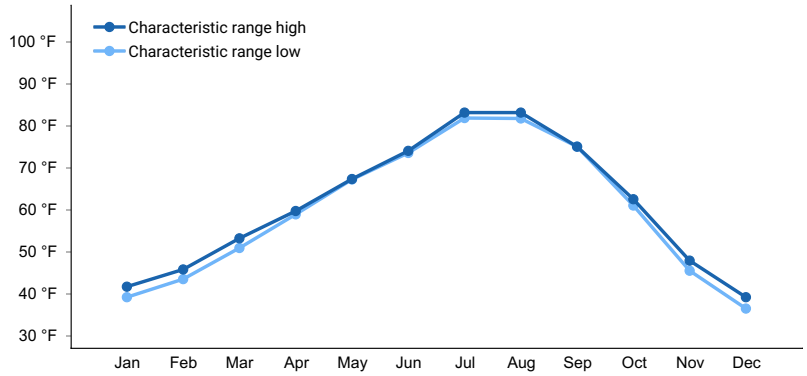


Figure 3. Monthly maximum temperature range

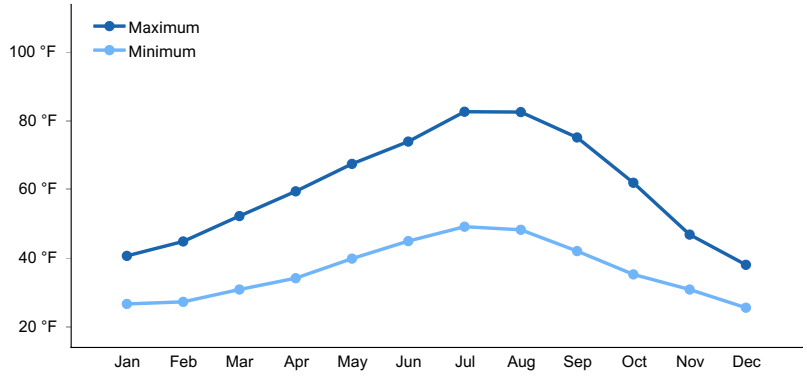


Figure 4. Monthly average minimum and maximum temperature

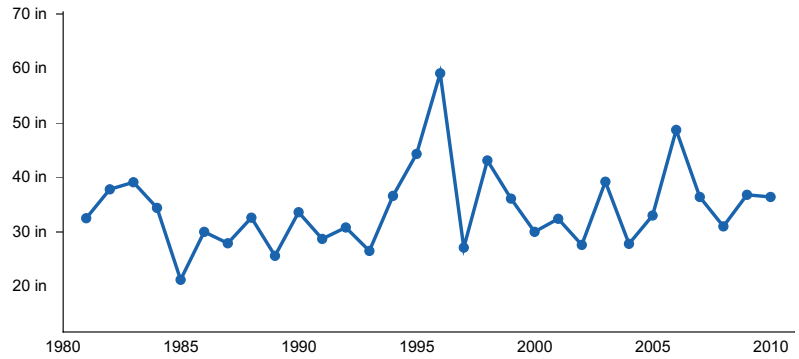


Figure 5. Annual precipitation pattern

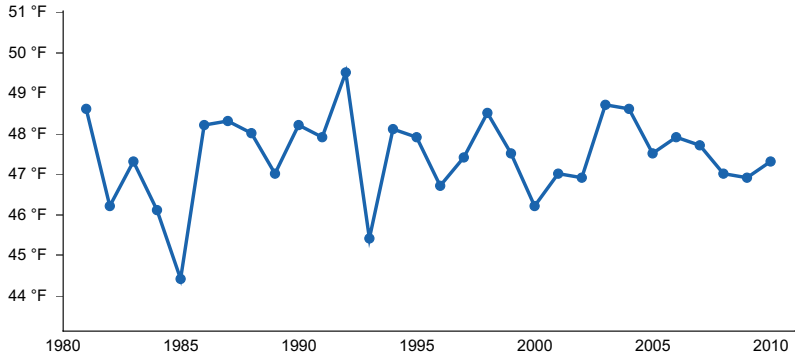


Figure 6. Annual average temperature pattern

Climate stations used

- (1) PARKDALE 1 NNE [USC00356466], Mount Hood Parkdale, OR
- (2) MT ADAMS RS [USC00455659], Trout Lake, WA

Influencing water features

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

Wetland description

N/A

Soil features

The soils are typically moderately deep to very deep and well drained. Soil parent materials are commonly volcanic ash and loess over colluvium derived from basalt and andesite. Surface textures are typically gravelly loams but can range to coarser sandy loams and very stony sandy loams.

Table 5. Representative soil features

Parent material	(1) Volcanic ash (2) Loess (3) Colluvium–andesite (4) Colluvium–basalt
Surface texture	(1) Gravelly loam (2) Sandy loam (3) Very stony sandy loam
Family particle size	(1) Fine-loamy (2) Loamy-skeletal
Drainage class	Well drained

Permeability class	Rapid to very rapid
Depth to restrictive layer	21–80 in
Soil depth	21–80 in
Surface fragment cover <=3"	0–45%
Surface fragment cover >3"	0–45%
Available water capacity (0-40in)	2.4–7.1 in
Soil reaction (1:1 water) (0-40in)	5.6–6.5
Subsurface fragment volume <=3" (4-60in)	10–25%
Subsurface fragment volume >3" (4-60in)	5–20%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
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 (0-40in)	1.9–7.5 in
Soil reaction (1:1 water) (0-40in)	5.1–7.3
Subsurface fragment volume <=3" (4-60in)	0–30%
Subsurface fragment volume >3" (4-60in)	0–25%

Ecological dynamics

Reference Plant community:

As a cool, moist grand fir site, this site is often situated above the moist Douglas-fir zone and below the wet grand fir and cool mountain hemlock (*Tsuga mertensiana*)/silver fir (*Abies amabilis*) forests. The reference plant community for this site is that of a canopy dominated by Douglas-fir and grand fir with a diverse shrub understory. Ponderosa pine is also common and Western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*) and western larch (*Larix occidentalis*) may occur in the stand in minor amounts. Understory shrubs are diverse and may include vine maple, serviceberry, oceanspray and California hazel. Herbaceous cover is highly variable depending on shrub cover and canopy closure, a diverse community may be present but common members are vanilla leaf, starflower, pinegrass and western fescue.

Disturbance:

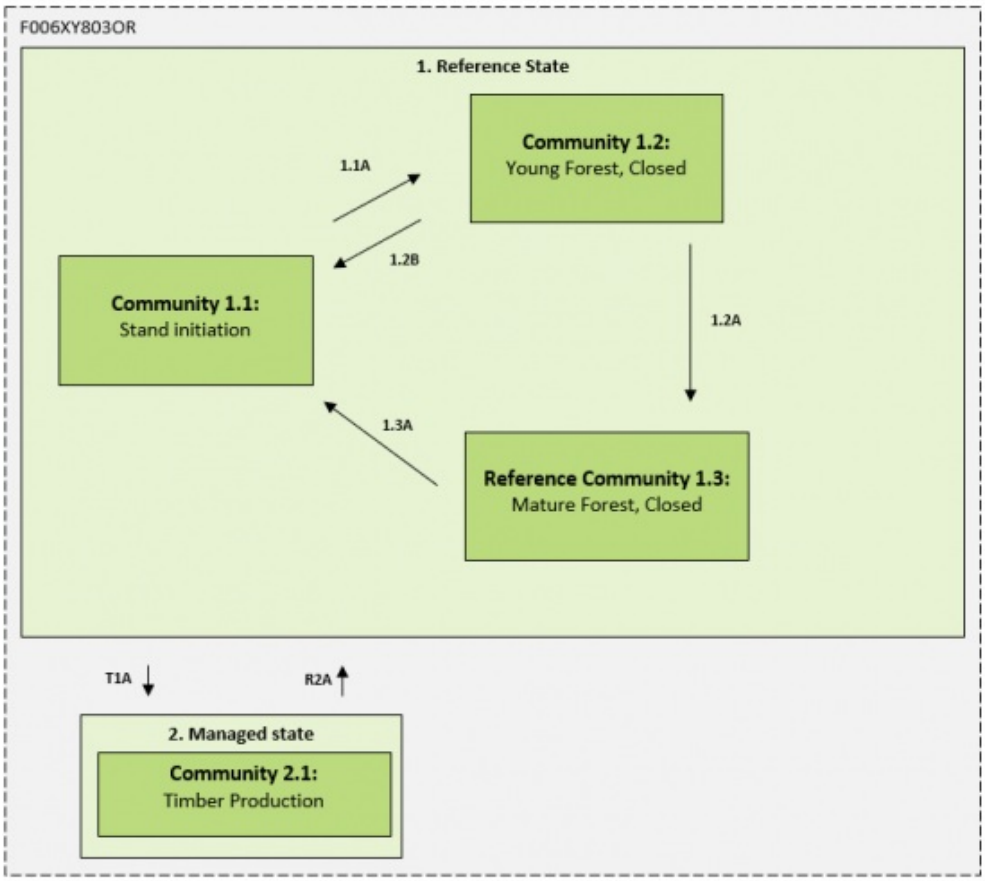
Historically, cool, moist mixed conifer forests were likely subject to a fire regime characterized mainly by moderately frequent, low and mixed severity fire (Landfire fire regime group 3) (Simpson 2007, landfire 2007). This is in contrast to dry grand fir, Douglas-fir and ponderosa forests that were historically 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 and Douglas-fir in the understory of these forests. While Ponderosa pine is still present on these sites, it will be outcompeted overtime by more shade tolerant species and

in the canopy of late successional forests is often only present as scattered mature individuals (Franklin and Dyrness 1973). Shrub species may 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). Prolonged anthropogenic fire suppression may lead to cycles of overstocking and larger, more high severity fires.

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). Selective logging of large shade-intolerant trees may advance succession and favor the development of stands dominated by more shade tree species overtime (Hessberg et al. 2005). 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, insect outbreaks or climate change on ecosystem function or process. Emerging evidence is suggesting that climate change is leading to hotter and drier conditions in western forests that will increase fire frequency and extent and lengthen fire seasons (Halofsky et al. 2020). When combined with the interacting impacts of fire suppression, drought, and insect outbreaks, it is possible that this ecological system will experience unpredictable ecosystem shifts and additional alternative states. The reference state of the current model is largely based on Landfire biophysical settings model 0710180 East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (Landfire 2007).

State and transition model



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 cool, moist 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 composition. This mosaic pattern is highly influenced by a mixed fire regime likely approximating 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 under a historical disturbance regime given site productivity.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- grand fir (*Abies grandis*), tree

Community 1.1
Shrub community, stand Initiation

Community dominated by shrubs with some trees regenerating. Severe fire will maintain this community. All other communities may transition to this phase after stand replacing fires.

Community 1.2
Young Forest, Closed

Closed canopy, densely stocked with young to intermediate aged Douglas fir and grand fir. Other minor trees present in understory which is otherwise dominated by shrubs with little herbaceous cover due to lack of light.

Community 1.3
Reference Plant Community: Mature Forest, Closed

The Reference Community 1.3, is the Mature closed canopy stand. Uneven aged stand with large grand fir and Douglas fir codominant, occasionally large ponderosa pine. Minor tree species including western red cedar, western hemlock and western larch may be found depending on site conditions. This community phase is densely stocked, with low herbaceous or shrub cover, except for shade-tolerant species.

Pathway 1.1A
Community 1.1 to 1.2

Lack of fire for ~20 years

Pathway 1.2B
Community 1.2 to 1.1

High severity, stand replacing fire occurs

Pathway 1.2A
Community 1.2 to 1.3

Lack of fire for ~65 years

Pathway 1.3A
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

Ecological forestry practices may promote a return to reference state. Forest reestablishment may require shrub control and tree replanting if the desired goal is regaining a forest structure within a desired timeframe. 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.

Context dependence. Alterations of forest tree species composition, as well as soil compaction and surface disturbances due to large machine usage may hinder passive forest reestablishment.

Additional community tables

Inventory data references

Information presented here has been derived from NRCS data. Field observations from range trained personnel were also used. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

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Contributors

Andrew Neary - Original PES site concept

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:**

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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):**

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:**