Ecological site F006XD001WA
Frigid Moist Xeric Ashy Slopes (Grand fir Warm Moist Shrub/Herb)

Last updated: 9/11/2023
Accessed: 10/12/2024

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.

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) 6.8 - Oak-Conifer Eastern Cascades - Columbia Foothills

This LRU occurs predominantly on slopes of hills and mountains. 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 45 inches.

Other LRU'S where the site occurs:
CRA 6.5 - Chiwaukum Hills and Lowlands
CRA 6.6 - Yakima Plateau and Slopes
CRA 6.7 - Grand Fir Mixed Forest

Classification relationships

CWS551 (WEN): 7 (YAK IND) – Grand fir/vine maple (ABGR/ACCI)
CWS552 (WEN) – Grand fir/vine maple-princes pine (ABGR/ACCI-CHUM)

Associated sites

F006XD002WA	**Cool Frigid Xeric Ashy Slopes (Grand fir Cool Dry Grass)** On slightly drier sites.
F006XB001WA	**Frigid Xeric Mountain Slopes (Douglas-fir Moderately Dry Shrub/Herb)** On drier sites.

Similar sites

F006XC003WA	**Cool Frigid Moist Xeric Mountain Slopes (Grand fir Cool Moist Shrub/Herb)** Cooler and in drainages and northerly slopes.

Table 1. Dominant plant species

Tree	(1) *Abies grandis*
Shrub	(1) *Acer circinatum*
Herbaceous	Not specified

Physiographic features

This ecological site occurs mainly on plateaus, and back slopes, shoulders and foot slopes of hills and mountains. It is found between 100 feet and 6,300 feet in elevation, It occurs on all aspects but is dominantly on northwest to east-facing slopes. Slope gradients generally range from 5 to 55 percent but can be found on slopes up to 90 percent.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Plateau (2) Mountains > Mountain slope (3) Foothills > Hillslope (4) Structural bench
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	500–4,500 ft
Slope	5–55%
Water table depth	20–80 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding duration	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	100–6,300 ft
Slope	0–90%
Water table depth	Not specified

Climatic features

Mean Annual Air Temperature

Total Range: 3.3 to 10.0 degrees Celsius (38 to 50 degrees F)
Central tendency: 5.0 to 7.8 degrees Celsius (41 to 46 degrees F)

Table 4. Representative climatic features

Frost-free period (characteristic range)	85-120 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	35-55 in
Frost-free period (actual range)	65-145 days
Freeze-free period (actual range)	
Precipitation total (actual range)	25-65 in

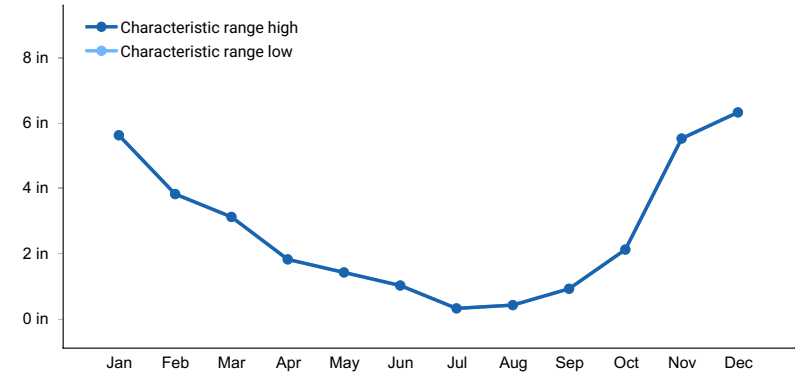


Figure 1. Monthly precipitation range

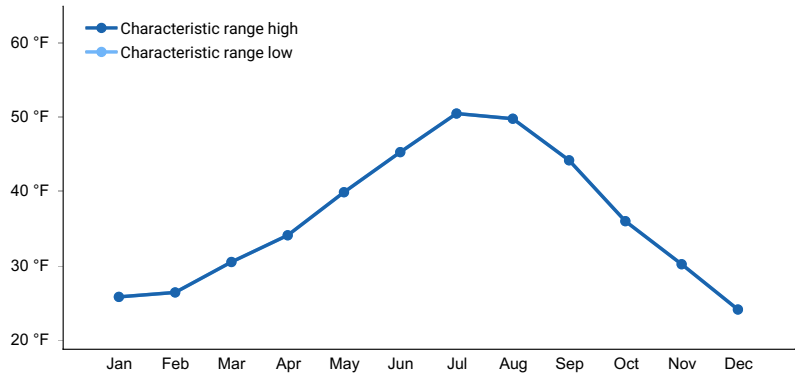


Figure 2. Monthly minimum temperature range

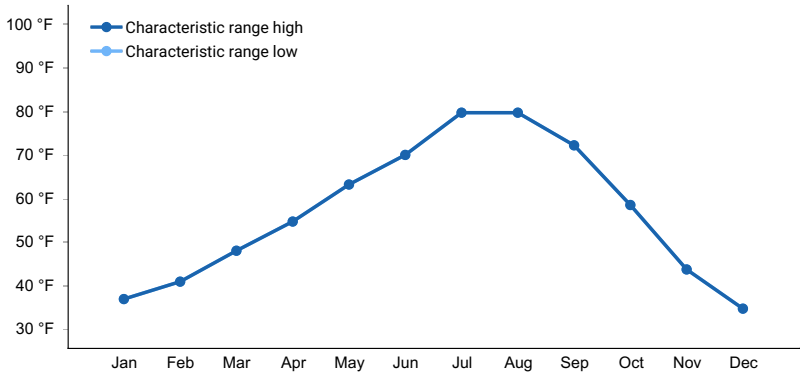


Figure 3. Monthly maximum temperature range

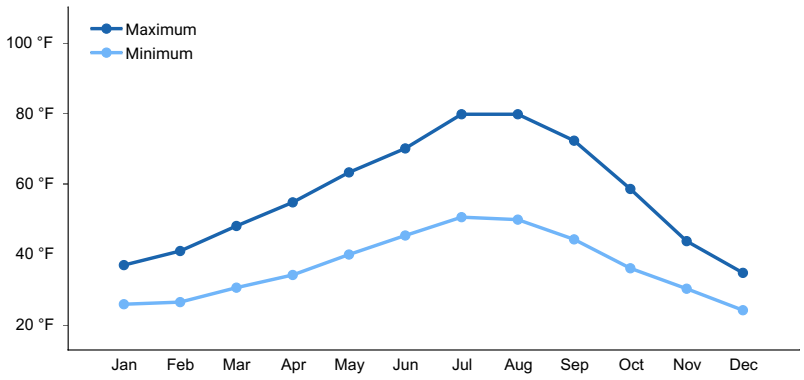


Figure 4. Monthly average minimum and maximum temperature

Climate stations used

- (1) APPLETON [USC00450217], Appleton, 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 and Andic Dystroxerepts in the Inceptisols order. Vitrixerands in the Andisols order are also extensive. Soils are dominantly moderately deep to very deep and have average available water capacity of about 5.6 inches (14.2 cm) in the 0 to 40-inches (0-100 cm) depth range. Soil parent material is dominantly volcanic ash deposits over glacial till, glacial outwash, and colluvium and residuum from granitic, volcanic, metamorphic, and sedimentary rock.
Dominant Soil Series: Jumpmore, Kingtain, McGowan, Nard, Natkim, Panak, Roxer, Timberhead, Underwood

Parent Materials:
Kind – volcanic ash, glacial till, glacial outwash, colluvium, residuum
Origin – granitic, volcanic, metamorphic, and sedimentary rock

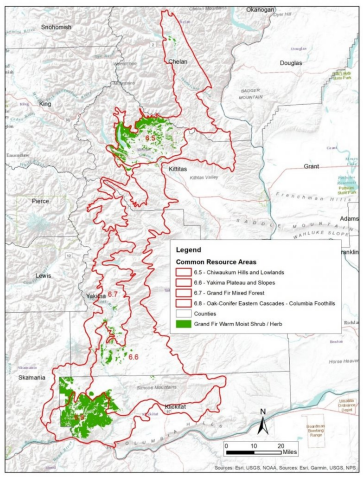


Figure 5. Map of soil mapunits with a major component linked to the Grand Fir Warm Moist Shrub/Herb (Grand Fir - Vine Maple) Ecological Site

Table 5. Representative soil features

Parent material	(1) Volcanic ash
Surface texture	(1) Ashy loam (2) Ashy sandy loam
Family particle size	(1) Fine-loamy (2) Ashy (3) Ashy-skeletal (4) Loamy-skeletal
Drainage class	Moderately well drained to well drained
Depth to restrictive layer	20–60 in
Surface fragment cover <=3"	0–30%
Surface fragment cover >3"	0–13%
Available water capacity (0-40in)	1.2–9.1 in
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (0-40in)	5.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–45%
Subsurface fragment volume >3" (Depth not specified)	0–43%

Ecological dynamics

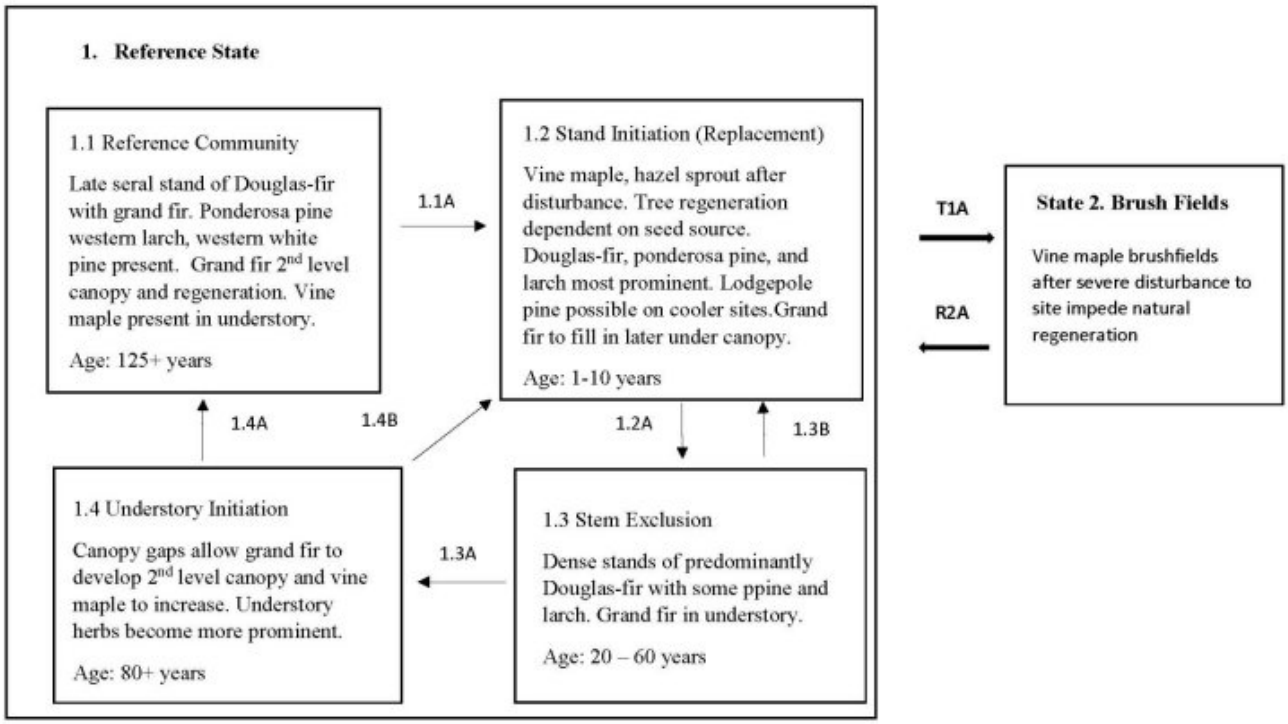
This ecological site occurs in both the Central and Southern Zones of MLRA 6. It includes the Grand fir/vine maple (GF/ACCI), Grand fir/vine maple/prince's pine (GF/ACCI/CHUM), and Grand fir/vine maple/queencup beadlily (GF/ACCI/CLUN) plant associations. In the Wenatchee area it occurs in a large area of the western portion CRA 6.8 and the far northern portion around the Fish Lake region. Mean elevation is 2600 feet occurring on mostly southernly aspects and level terrain. Slopes range from 8 to 68 percent. In the Yakima area south it occurs on the northern edge of the southern portion of CRA 6.5. Mean elevation is 3000 feet, slope range 2 to 40 percent, occurring on southernly aspects.

This is a highly productive site dominated by a mid to late seral overstory of Douglas-fir with a second canopy level of grand fir. Some grand fir, ponderosa pine, and western larch can also be in the overstory. Western white pine remnants may be found in the overstory. White pine would be more prominent if not for the white pine blister rust causing major mortality. Lodgepole pine can be present on cooler GF/ACCI/CHUM sites.

Understory regeneration would be dominated by grand fir and some Douglas-fir. An occasional western redcedar and western hemlock can be in the understory. These plant associations would grade into Western hemlock plant associations as the sites get moister and cooler and grade into Grand fir/pinegrass as the site gets drier.

The understory vegetation is dominated by vine maple, western hazel and sometimes bigleaf maple, along with a host of forbs. This site can support high level of tree stocking. Multiple fires would be mostly in the mixed severity fire regime every 50 to 100 years and stand replacement fires 150 to 500 years. Vine maple and western hazel sprout readily after intense fire so tree regeneration could be hampered by the shrub competition.

State and transition model



State 1
Reference Community

The state is dominated with productive stands of Douglas-fir and grand fir. Ponderosa pine attains its highest productivity on these grand fir/vine maple sites, but cannot dominate the late seral stages and occurs as large scattered individuals. Western larch and western white pine also can occur as scattered individuals. Grand fir is the dominant understory tree in the second level canopy and regeneration. An occasional western redcedar and western hemlock can be found in the regeneration, but grand fir dominates. The moister western prince's pine and queencup beadlily sites may have a few Engelmann spruce in the stand. Vine maple is the dominant understory shrub in all of the Plant Community Phases 1.1 to 1.4 and can sprout quickly after fire or release strongly after canopy gaps in mature stands. Shelterwood systems work best to keep some shade on ground to reduce vine maple dominance and allow tree regeneration to occur, otherwise vine maple shrub fields can occur impeding natural regeneration. Fire regimes would be in the stand replacing or mix severity realm occurring 50 to 150 year range. Major insects that can cause mortality are the fir engraver and Douglas-fir beetle. Overstocked late seral stands with increased grand fir developing from prolonged fire intervals enhance beetle attacks. Dwarf mistletoe is a major concern in western larch causing major growth loss and mortality. White blister rust in white pine has reduced its prevalence in mature stands. Other diseases include Annosum, laminated, and Armillaria root rots. Armillaria can be present in close to 80 percent of the sites with grand fir. Indian paint fungus can be found on sites with increased grand fir stocking. These root rot diseases are enhanced through soil compaction and root damage though selective logging and road building. The root rot diseases are less of a concern in productive grand fir sites and worse in drier sites.

Dominant plant species

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

- grand fir (*Abies grandis*), tree
- ponderosa pine (*Pinus ponderosa*), tree
- western larch (*Larix occidentalis*), tree
- lodgepole pine (*Pinus contorta*), tree
- bigleaf maple (*Acer macrophyllum*), tree
- vine maple (*Acer circinatum*), shrub
- beaked hazelnut (*Corylus cornuta*), shrub
- Douglas maple (*Acer glabrum var. douglasii*), shrub
- Oregon boxleaf (*Paxistima myrsinites*), shrub
- common snowberry (*Symphoricarpos albus*), shrub
- white spirea (*Spiraea betulifolia*), shrub
- rose (*Rosa*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub
- oceanspray (*Holodiscus discolor*), shrub
- Cascade barberry (*Mahonia nervosa*), shrub
- hollyleaved barberry (*Mahonia aquifolium*), shrub
- Sitka mountain ash (*Sorbus sitchensis var. sitchensis*), shrub
- pipsissewa (*Chimaphila umbellata*), shrub
- little prince's pine (*Chimaphila menziesii*), shrub
- bitter cherry (*Prunus emarginata*), shrub
- thinleaf huckleberry (*Vaccinium membranaceum*), shrub
- thimbleberry (*Rubus parviflorus*), shrub
- pinegrass (*Calamagrostis rubescens*), grass
- western rattlesnake plantain (*Goodyera oblongifolia*), other herbaceous
- bride's bonnet (*Clintonia uniflora*), other herbaceous
- American trailplant (*Adenocaulon bicolor*), other herbaceous
- sweetroot (*Osmorhiza*), other herbaceous
- western brackenfern (*Pteridium aquilinum*), other herbaceous
- British Columbia wildginger (*Asarum caudatum*), other herbaceous

Community 1.1
Reference Community

Figure 6. Late seral DF-GF stand with remnant large Ppine and GF regeneration

Mature stands of Douglas-fir and grand fir dominate the overstory. Scattered large ponderosa pine can be found. Western larch and western white pine (not dead due to blister rust) may also be present. Stands not unduly affected by insect or disease mortality and very productive. Vine maple dominate understory shrubs with a diversity of forbs.

Community 1.2
Stand Initiation (Replacement)

Figure 7. Clearcut with vine maple and western hazel sprouts. Douglas-fir planted

Shrub stage with sprouting of vine maple and western hazel. Natural regeneration dependent on tree species seed source. Most likely Douglas-fir, ponderosa pine, and western larch. Grand fir would fill in regeneration later when canopy develops. Lodgepole pine can be present on the cooler ABGR/ACCI/CHUM sites.

Community 1.3
Stem Exclusion

Figure 8. Dense stand of Douglas-fir with vine maple understory

Dense stands of Douglas-fir with some grand fir, ponderosa pine, and larch. Site capable of high stand densities due to moister climate and soils.

Community 1.4
Understory Initiation

Stands of Douglas-fir and grand fir grow and canopy gaps occur with tree to tree competition allowing vine maple, other shrubs, tree regeneration, and forbs to increase. This ecological site is less susceptible to root rots in Douglas-fir and grand fir due to site productivity.

Pathway 1.1A
Community 1.1 to 1.2

Reference Community

Stand Initiation (Replacement)

Stand replacing fire bringing plant community back to shrub stage with regeneration, depending on vine maple competition.

Pathway 1.2A
Community 1.2 to 1.3

Stand Initiation (Replacement)

Stem Exclusion

Tree regeneration, most likely Douglas-fir grows into dense stands. Some grand fir present in the overtory and understory. Scattered ponderosa pine or western larch could be present.

Pathway 1.3B
Community 1.3 to 1.2

Stem Exclusion

Stand Initiation (Replacement)

Stand replacing fire in dense pole stands revert back to shrub plant community phase.

Pathway 1.3A
Community 1.3 to 1.4

Stem Exclusion

Understory Initiation

Pole stands of Douglas-fir and grand fir grow and canopy gaps occur allowing shrubs, herbs and tree regeneration to grow. Vine maple takes advantage of these gaps and can dominate. Most of the tree regeneration is grand fir, with some Douglas-fir, western white pine, and larch.

Pathway 1.4A
Community 1.4 to 1.1

Understory Initiation

Reference Community

Old growth dynamics start occurring in stand with large Douglas-fir and grand fir dominating the overstory. Second level canopy dominated by grand fir. Scattered large old ponderosa pine, western larch, or western white pine can be present.

Pathway 1.4B
Community 1.4 to 1.2

Understory Initiation

Stand Initiation (Replacement)

Stand replacing fire or mixed severity fires create large openings for vine maple and other shrubs to dominate.

State 2
Brush Fields

Vine maple brush fields after severe disturbance to site impede natural regeneration

Community 2.1
Vine Maple Brush Fields

Figure 9. Vine maple competition after harvest disturbance.

Severe fires to site can cause vine maple and other shrubs to dominate site impeding or preventing natural regeneration.

Transition T1A
State 1 to 2

Severe fires kill all standing trees and damage site allowing shrubs to sprout and dominate

Restoration pathway R2A
State 2 to 1

Control of shrub competition and replanting Douglas-fir, ponderosa pine (drier sites), and western larch. Inspection of site qualities important before replanting e.g. soil organic matter and ash layer.

Additional community tables

Other information

Site index /Culmination Mean Annual Increment (CMAI)

Overall this site is highly productive for Douglas-fir, ponderosa pine, and grand fir. Douglas-fir and ponderosa pine being the preferred species for management. Site indexes are measured on 50 year and 100 year tables based on Breast Height Age (BA) or Total Age (TA). CMAI indicates the sites ability to produce wood at a certain age of a stand's maximum annual growth measured in cubic feet per acre.

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
ponderosa pine	*PIPO*	85	137	72	181	40	–	–	
grand fir	*ABGR*	85	116	129	179	91	–	–	
Douglas-fir	*PSME*	84	114	94	162	113	–	–	
lodgepole pine	*PICO*	85	110	98	126	100	–	–	
western larch	*LAOC*	55	80	72	120	–	–	–	

Inventory data references

Forest Service Plant Associations:
CWS551 (WEN): 7 (YAK IND) – Grand fir/vine maple (ABGR/ACCI)
CWS552 (WEN) – Grand fir/vine maple-princes pine (ABGR/ACCI-CHUM)
CWS553 (WEN) – Grand fir/vine maple/queencup beadlily (ABGR/ACCI/CLUN)

Other references

Washington Natural Heritage Program. Ecosystems of Washington State, A Guide to Identification, Rocchio and Crawford, 2015 –
East Cascades Mesic Montane Mixed Conifer Forest and Woodland.
Forest Plant Associations of the Wenatchee National Forest. PNW-GTR-359, October 1995. Lillybridge et.al.
Forest Plant Associations of the Yakima Indian Reservation, May 1988. Thomas, Hart, and Clausnitzer
NRCS MLRA 6 Soil-Forest Productivity data base
NRCS Conservation Resource Area Maps (CRAs)
NRCS MLRA 6 Soil-Forest Plant Association data base
On site field reviews of Central and South CRAs. June and July 2019. Kuhn, Campbell

Contributors

Gary Kuhn
Steve Campbell
Carri Gaines

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	10/12/2024
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):**

_____

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):**

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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:**