USDA Natural Resources Conservation Service

Ecological site F043CY509WA
Frigid, Xeric, Loamy Mountains and Plateaus, Ashy Surface Grand fir/pinegrass

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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): 043C–Blue and Seven Devils Mountains

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Description of MLRAs can be found in: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook

LRU notes

Modal LRU – 43C04 Dissected Basalt Highlands

This LRU is composed predominantly of low elevation canyons and mid elevation foothills, mountain slopes, ridges and valley walls The soils of the LRU tend to be loamy Vitrixerands, Argixerolls and Haploxerolls with thick or mixed ash surfaces. Alluvium, loess and colluvium and residuum from basalt are the dominant parent materials. Soil climate is mesic or frigid temperature regime and xeric or udic moisture regime with average annual precipitation around 905 mm (36 inches).

Others where occurring – 43C01 - Cold, Moist Volcanic Highlands

Classification relationships

This ecological site is aligned to the following classification systems:

• NVCS Central Rocky Mountain Grand fir - Douglas-fir Forest & Woodland Alliance (A- 3362).
• U.S. National Vegetation Classification Standard (NVCS) Central Rocky Mountain Grand fir-Douglas-fir-Western larch Forest Group (G211).
• Washington Natural Heritage Program code CEG000275.
• USDA Forest Service Ecological Sub-region M332 “Blue Mountains”.
• LANDFIRE BpS model 10450: Northern Rocky Mountain Dry-Mesic Montane Mixed- Conifer Forest (primary model). Note: BpS model 10500 can be used for the lodgepole pine early seral sites.
• Ecoclass Seral Stage Code CWG113 (Blue-Ochoco PA, 1991).

Ecological site concept

This ESD is distinguished by an overstory of ponderosa pine, grand fir and Douglas-fir with an understory of pinegrass and elk sedge. Shrubs such as common snowberry and Oregon grape may occur but have low coverage. Common forbs are heartleaf arnica, lupines, western hawkweed and strawberry. It occurs on foothills, mountainsides, and canyon walls This ESG fits into the National Vegetation Standard's Central Rocky Mountain Grand Fir - Douglas-fir Forest & Woodland and Washington State's Natural Heritage Program's Northern Rocky Mt. Dry Mesic Montane Mixed Conifer Forest.

Associated sites

F043CY508WA	**Frigid, Xeric, Loamy, Mountains and Plateaus, Mixed Ash Surface Grand fir/pinegrass** frigid, xeric, mixed ash surface, basalt/andesite geology

Similar sites

F043CY508WA	**Frigid, Xeric, Loamy, Mountains and Plateaus, Mixed Ash Surface Grand fir/pinegrass** Mixed ash surface
F043CY503WA	**Frigid, Moist-Xeric Loamy, Canyons and Mountains (Grand fir/Moist Shrub)** Moist-xeric soil moisture regime
F043CY502WA	**Cool-Frigid, Dry-Xeric, Loamy Mountains (Douglas-fir Cool Dry Grass)** Cool-frigid soil temperature regime, dry-xeric soil moisture regime

Table 1. Dominant plant species

Tree	(1) *Abies grandis* (2) *Pseudotsuga menziesii var. glauca*
Shrub	(1) *Chimaphila umbellata* (2) *Mahonia repens*
Herbaceous	(1) *Calamagrostis rubescens* (2) *Carex geyeri*

Physiographic features

Most commonly found in LRU 43C01 (Cold, Moist Volcanic Highlands). Also found in adjacent areas of 43C04 (Dissected Basalt Highlands). Climate parameters were obtained from PRISM and other models for the area. Landscape descriptors are derived from USGS DEM products and their derivatives.

Physiographic Features
Landscapes: Mountains, Plateaus
Landform: Mountain slopes, Plateaus

Elevation (m): Total range = 1070 to 1865 m
(3,510 to 6,115 feet)
Central tendency = 1375 to 1575 m
(4,510 to 5,165 feet)

Slope (percent): Total range = 0 to 80 percent
Central tendency = 20 to 45 percent

Water Table Depth (cm):
>200 cm (median = >200cm)
>80 inches; (median = >80 inches)

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Aspect:
Total range: 285-40-165
Central tendency: 340-40-110

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Plateau > Plateau
Flooding frequency	None
Ponding frequency	None
Elevation	1,375–1,574 m
Slope	20–45%
Water table depth	0 cm
Aspect	NW, N, NE, E

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	1,070–1,864 m
Slope	0–80%
Water table depth	0 cm

Climatic features

Climatic Features

Frost-free period (days): Total range = 65 to 95 days
Central tendency = 65 to 80 days

Mean annual precipitation (cm): Total range = 540 to 1495 mm
(21 to 59 inches)
Central tendency = 715 to 1030 mm
(28 to 41 inches)

MAAT (C): Total range = 4.6 to 8.2
(40 to 47 F)
Central tendency = 6 to 7
(43 to 45 F)

Climate Stations: none

Table 4. Representative climatic features

Frost-free period (characteristic range)	65-80 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	711-1,041 mm
Frost-free period (actual range)	65-95 days

Freeze-free period (actual range)	
Precipitation total (actual range)	533-1,499 mm
Frost-free period (average)	75 days
Freeze-free period (average)	
Precipitation total (average)	889 mm

Influencing water features

Water Table Depth (cm):
>200 cm (median = >200cm)
>80 inches; (median = >80 inches)

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Soil features

This ecological site has been mapped with the Limberjim series. This soil developed in thick Mazama tephra (volcanic ash) deposits and loess, over residuum and colluvium from basalt or andesite. The soils are moderately deep and have adequate available water capacity to a depth of 1 m. The soils are well-drained.

Parent Materials:
Kind: Tephra (volcanic ash), loess
Origin: mixed
Kind: residuum and colluvium,
Origin: basalt or andesite

Surface Texture:
(1) Ashy Silt loam

Table 5. Representative soil features

Parent material	(1) Volcanic ash (2) Loess (3) Residuum–basalt (4) Colluvium–basalt (5) Residuum–andesite (6) Colluvium–andesite
Surface texture	(1) Ashy silt loam
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	107 cm
Soil depth	51–102 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	16.26 cm

Soil reaction (1:1 water) (0-152.4cm)	Not specified
Subsurface fragment volume <=3" (25.4-152.4cm)	20%
Subsurface fragment volume >3" (25.4-152.4cm)	25%

Table 6. Representative soil features (actual values)

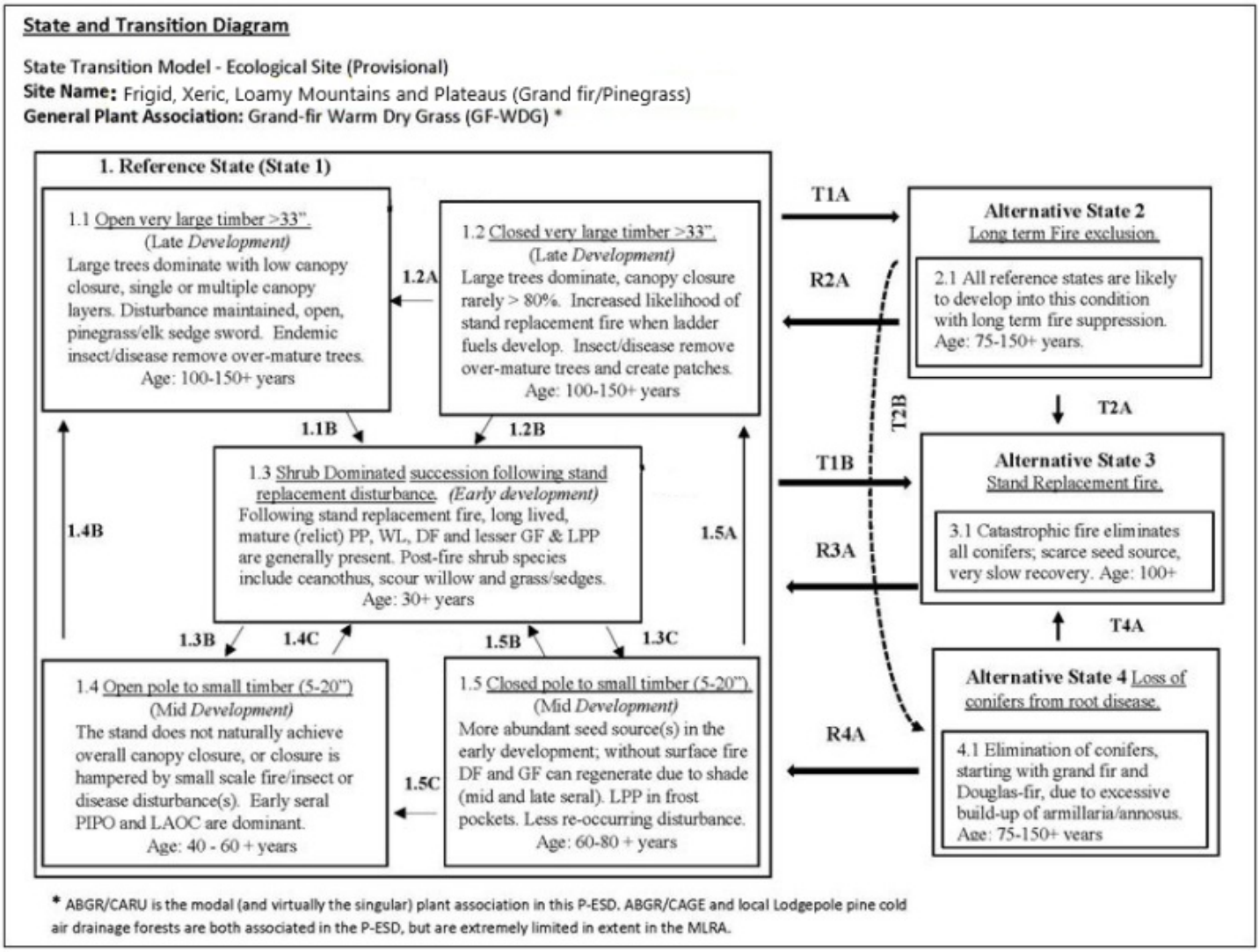
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	102–152 cm
Soil depth	51–102 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	16.26–17.27 cm
Soil reaction (1:1 water) (0-152.4cm)	5.6–7.3
Subsurface fragment volume <=3" (25.4-152.4cm)	10–40%
Subsurface fragment volume >3" (25.4-152.4cm)	0–35%

Ecological dynamics

ECOLOGICAL DYNAMICS OF THE SITE
This site is almost exclusively made up of the grand fir (*Abies grandis*)/pinegrass (*Calamagrostis rubescens*) plant association (ABGR/CARU). Very minor occurrences of the grand fir/elk sedge (*Carex geyeri*) (ABGR/CAGE) plant association, and cold pocket lodgepole pine (*Pinus contorta*) may be found together with with the major plant association. ABGR/CARU is a part of the broader warm dry upland forest plant association group (PAG), and the dry upland forest potential vegetation group (PVG) 1.
This dry grand fir forest type occurs above Ponderosa pine (*Pinus ponderosa*) forest types on a moisture gradient. It is in turn transitional to the mesic mixed (in LANDFIRE2 terminology) conifer types. In the historic, naturally occurring ecological condition, Ponderosa pine is usually the long-lived dominant species in a fire-maintained stand. Other conifers found in this ecologic site include grand fir, Douglas-fir (Pesudotsuga menziesii) and western larch (*Larix occidentalis*). Western larch is commonly limited in diameter growth due to the late season temperature/moisture limitations which occur within this seasonally dry ecological site.
Frequent, low intensity surface fires (also called “under-burns”) maintained widely spaced stands of fire-resistant conifers in older, more open stands. Less frequently occurring mixed-severity and stand replacement fires resulted in mosaics of older and larger trees, intermingled with younger patches of regenerating forests. The early development (i.e. regeneration) phase of this ecological site was dominated by Ponderosa pine and larch seedlings, mixed with fire tolerant grasses, sedges and shrub species such as ceanothus spp., scouler willow (*Salix scouleriana*) and Bromus spp.
Young, newly regenerated stands would usually progress to mid-development phases in time. The stands were dominated by large pole to small and intermediate sawtimber sized individual conifers. Individual stands expressed varying degrees of canopy closure(s) depending on initial seedling and stocking rates, coupled with the impacts of disturbance events that occurred over the course of development. Mid-development stands could in turn progress to mature stands with the passing of additional time and under favorable conditions. In the absence of surface fire, shade tolerant grand fir will begin to dominate the understory conifer layer (this is now a common and wide spread condition, the direct result of a policy of total fire suppression which was implemented in the Post-European era of settlement in the western United States).
Although fire was the major disturbance factor in the historic context in this ecological site, insects (such as bark beetles and defoliators) and root diseases also impacted the forest at any given time. Less frequent wind events

and lighting also occurred, locally altering stand structural and functional attributes.

State and transition model



Plant Community, Transition(s) and Restoration Pathways

Reference State:

(Refer again to Appendix 1 for tree-size classes)

Frequent low intensity surface fires maintained the open, very large timber (i.e. mature) community phase 1.1 over a relatively long period of time.

1.1 B Stand replacement fire shifts the stand to the early development phase. Secondary succession is initiated.

1.2 A Mixed fire events or endemic insect/disease impacts shift the stand structure to the mature, late development *open*, very large timber structural phase.

1.2 B Stand replacement fire changes the stand to the early development phase; Secondary succession is again initiated.
Reburn(s) occur in early development phase, potentially eliminating young conifer recruitment and/or mature conifer seed tree sources in Community 1.3.

1.3B Young stands in community phase 1.3 progress to *open* mid-development stands over time.

1.3 C Young stands in community phase 1.3 develop in time to *closed*, mid-development stands over time.
Frequent low intensity ground fires maintain the mid development (open) expression of the community phase 1.4 through time

1.4B – Canopy closure does not occur in the young stand. Succession to large/very large timber (open) state occurs with time ~ 50 years.
Note: As the stand matures, canopy closure *could also occur* in the absence of the conditions necessary to maintain the open nature of state 1.4. This will result in the development of community phase 1.2. (this specific pathway, which is uncommon, is not shown in the S&T diagram).

1.4 C – Large scale stand replacement fire changes the stand back to the early development phase (the likelihood of this event is relatively low). Secondary succession is initiated.

1.5 A - With an absence of replacement or mixed fire, or other significant disturbance, the stand develops to the closed, late development phase.

1.5B Large scale stand replacement fire shifts the stand back to early development again.

1.5C Mixed fire events or endemic insect/disease impacts shift the stand structure to the mid development *open*, pole to small timber structural phase.

Transitions:

T1A Long term fire exclusion (50-100+) years, beginning in mid-late development stands; this is more common in closed canopy (shaded) conditions (results in Alternative State 2).

T1B A wide spread stand replacing fire event occurs as a *natural event* in any community phase of the reference state. A vast majority of the cone producing conifers are eliminated, but site quality values remains relatively intact.

T2A Fuel build-up in Alternative State 2 results in a catastrophic wildfire, similar to that of T1B, but the likelihood of replacement fire and the intensity and detrimental impact(s) exceed historic norms.

T2B In the absence of catastrophic fire, the long-term site occupancy of mid to late seral Douglas-fir and grand-fir leads to increased levels of root disease, especially on poor quality sites, eventually excluding all conifer species from the site over time.

T4A Widespread catastrophic fire occurs similar to that of T2A, with varying levels of live and dead conifer individuals, along with abnormal levels of native brush species.

Restoration Pathways:

R2A Treatment practices commonly used to rehabilitate forest lands and reduce fuels is applied (e.g. thinning, pruning, installing fuel breaks, species shift to early seral).

R3A Reforestation is applied in the aftermath of a catastrophic wildfire. Native understory species rebound naturally unless the fire damage to the soil resource was excessive.

R4A Afforestation, after the underground root infestation has receded to threshold levels, is applied. Site preparation may be necessary to control competition from brush and grass species

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References

Powell, D.C., C.G. Johnson, E.A. Crowe, A. Wells, and D.K. Swanson. 2007. Potential vegetation hierarchy for the Blue Mountains section of northeastern Oregon, southeastern Washington, and west-central Idaho. Gen. Tech. Rep. PNW-GTR-709.. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station., Portland, OR.

Other references

USNVC [United States National Vegetation Classification]. 2020. United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. USNVC: http://usnvc.org/

Contributors

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Approval

Kirt Walstad, 9/08/2023

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	05/19/2024
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:**

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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:**
