USDA Natural Resources Conservation Service

Ecological site F043CY504WA
Warm-Frigid, Xeric, Loamy, Basalt Mountains and Plateaus (Douglas-fir/warm dry shrub)

Last updated: 9/08/2023
Accessed: 04/25/2024

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): 043C–Blue and Seven Devils Mountains

Major land resource area (MLRA): 043C-Blue and Seven Devils

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

Most commonly found in LRU 43C04 (Dissected Basalt Highlands). Also found in adjacent areas of 43C02 (Eastern High Basalt Plateau).

Classification relationships

This ESD fits into the National Vegetation Standard's Douglas-fir Middle Rocky Mountain Mesic-Wet Forest Alliance and Washington State's Natural Heritage Program's Northern Rocky Mt. Dry Mesic Montane Mixed Conifer Forest.

Ecological site concept

This ESD in distinguished by an overstory of ponderosa pine, and Douglas-fir with an understory of shrubs such as common snowberry, mallow ninebark and oceanspray. Common forbs are pinegrass, heartleaf arnica, lupines, western hawkweed and strawberry. It occurs on foothills, mountainsides, and canyon walls. Soils have developed in mixed Mazama tephra (volcanic ash) deposits and loess, over residuum and colluvium from basalt or metavolcanics. The soils are moderately deep to very deep and have adequate available water capacity to a depth of 1 m. The soils are moderately well or well-drained.

Associated sites

F043CY503WA	**Frigid, Moist-Xeric Loamy, Canyons and Mountains (Grand fir/Moist Shrub)** frigid, moist-xeric, ashy surface, basalt/andesite geology.
F043CY508WA	**Frigid, Xeric, Loamy, Mountains and Plateaus, Mixed Ash Surface Grand fir/pinegrass** frigid, xeric, mixed ash surface, basalt/andesite geology
F043CY511WA	**Frigid, Dry-Udic, Loamy, Hills, and Canyons, Basalt, Mixed Ash (grand fir/moist herb)** frigid, dry-udic, mixed ash surface, basalt geology.

Similar sites

F043CY507WA	**Warm-Frigid, Xeric Loamy, Hills and Plateaus, High WT (Douglas-fir/ warm dry shrub)** Site has a perched water table at 18 to 36 inches during Feb-May
F043CY505WA	**Warm-Frigid, Xeric, Loamy Eolian Hills and Plateaus (Douglas-fir/ warm dry shrub)** Predominately eolian deposit geology
F043CY506WA	**Warm-Frigid, Xeric Loamy, Granitic, Mountains (Douglas-fir/ warm dry shrub)** Granitic geology

Table 1. Dominant plant species

Tree	(1) *Pseudotsuga menziesii var. glauca* (2) *Pinus ponderosa*
Shrub	(1) *Physocarpus malvaceus* (2) *Symphoricarpos albus*
Herbaceous	(1) *Calamagrostis rubescens* (2) *Arnica cordifolia*

Physiographic features

Landscapes: Mountains, Plateaus, Canyonlands
Landform: Mountain slopes, Hillslopes, Ridges, Escarpments, Canyon walls

Elevation (m): Total range = 615 to 1845m
(2,015 to 6,050 feet)
Central tendency = 1075 to 1385 m
(3,525 to 4,540 feet)

Slope (percent): Total range = 0 to 100 percent
Central tendency = 25 to 60 percent

Water Table Depth (cm):
15% of components have a perched water table at 18 to 40 inches during Feb-Mar
85% have no water table observed

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Aspect:
Total range: 205-355-160
Central tendency: 275-355-85

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Plateau > Hillslope (3) Canyonlands > Canyon wall (4) Mountains > Ridge (5) Canyonlands > Escarpment
Elevation	3,525–4,540 ft
Slope	25–60%

Water table depth	0 in
Aspect	W, NW, N, NE

Table 3. Representative physiographic features (actual ranges)

Elevation	2,015–6,050 ft
Slope	0–100%
Water table depth	18–0 in

Climatic features

Frost-free period (days): Total range = 50 to 145 days
Central tendency = 80 to 105 days

Mean annual precipitation (cm): Total range = 400 to 1415 mm
(16 to 56 inches)
Central tendency = 635 to 945 mm
(25 to 37 inches)
MAAT (C): Total range = 5.0 to 9.9
(41 to 50 F)
Central tendency = 6.9 to 8.1
(44 to 47 F)
Climate Stations: none

Table 4. Representative climatic features

Frost-free period (characteristic range)	80-105 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	25-37 in
Frost-free period (actual range)	50-145 days
Freeze-free period (actual range)	
Precipitation total (actual range)	16-56 in
Frost-free period (average)	92 days
Freeze-free period (average)	
Precipitation total (average)	31 in

Influencing water features

Water Table Depth (cm):
15% of components have a perched water table at 18 to 40 inches during Feb-Mar
85% have no water table observed

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Soil features

This ecological subsite is associated with several soil series (e.g. Bigelk, Couse, Getaway, Klicker, Klickson, Larabee, Setters, Suloaf, Sweiting, and Tolo). The soil components are: Alfic Vitrixerands, Pachic Ultic Argixerolls, Ultic Palexerolls, Vitrandic Argixerolls, Vitrandic Haploxerolls, and Xeric Argialbolls. These soils have developed in mixed Mazama tephra (volcanic ash) deposits and loess, over residuum and colluvium from basalt or metavolcanics. The soils are moderately deep to very deep and have adequate available water capacity to a depth of 1 m. The soils are moderately well or well-drained.

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

Surface Texture:
(1) Silt loam
(2) Ashy Silt loam
(3) Stony Ashy Silt loam
(4) Ashy Loam

Table 5. Representative soil features

Parent material	(1) Volcanic ash (2) Loess (3) Residuum–basalt (4) Colluvium–basalt (5) Residuum–metavolcanics (6) Colluvium–metavolcanics
Surface texture	(1) Ashy silt loam (2) Ashy loam (3) Silt loam (4) Stony, ashy silt loam
Drainage class	Well drained
Permeability class	Moderately slow
Depth to restrictive layer	30–80 in
Soil depth	30–80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5.7 in
Soil reaction (1:1 water) (0-60in)	6.5
Subsurface fragment volume <=3" (10-60in)	15%
Subsurface fragment volume >3" (10-60in)	10%

Table 6. Representative soil features (actual values)

Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately rapid
Depth to restrictive layer	20–80 in
Soil depth	20–80 in
Surface fragment cover <=3"	0%

Surface fragment cover >3"	0%
Available water capacity (0-40in)	3.1–11.2 in
Soil reaction (1:1 water) (0-60in)	5.1–7.3
Subsurface fragment volume <=3" (10-60in)	0–50%
Subsurface fragment volume >3" (10-60in)	0–40%

Ecological dynamics

This site is comprised of the modal Douglas-fir (Pseutotsuga menziesii)/ninebark (*Physocarpus malvaceus*) plant association (PSME/PHMA). The less abundant Douglas-fir/Common Snowberry (*Symphoricarpos albus*) (PSME/SYAL) and Douglas-fir/birchleaf spirea (Spirea betulifolia) (PSME/SPBE) plant associations are included in this provisional ESD. These plant associations are all part of the broader warm dry upland forest plant association group (PAG), and the dry upland forest potential vegetation group (PVG) .This warm dry Douglas-fir forest type occurs above Ponderosa pine (*Pinus ponderosa*) forest types on a moisture gradient. It is in turn transitional to the mesic mixed (using LANDFIRE terminology; generally, “moderately dry”) conifer types.

This ESD was characterized by a ponderosa pine dominated overstory in the historic, naturally occurring ecological condition. Older stands typically contained large, widely spaced ponderosa pine and Douglas-fir, with understory shrub species such as ninebark, ocean spray (*Holodiscus discolor*), and snowberry.

Other conifers found in this ecologic site include grand fir (to a limited extent) and western larch (*Larix occidentalis*). Larch begins to occur in greater proportions compared to the dryer and warmer grass dominated Douglas-fir plant associations (such as in the pinegrass and elk sedge plant association environments).

Pre-European frequent, low intensity surface fires (also called “under-burns”) maintained long lived stands of fire-resistant late seral conifers in the older, more open stands. Less frequent 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 recruitment and lesser numbers of larch seedlings, occurring with fire adapted understory species such as ceanothus spp., Scouler’s willow (*Salix scouleriana*), ninebark, and grass species including pinegrass and elk sedge.

Young, newly regenerated stands would normally progress to mid-development phases in time, in the absence of major disturbance impacts that would halt progression. Those developing stands were dominated by large pole to small and intermediate sawtimber sized individual conifers . The stands expressed varying degrees of canopy closure depending on the initial seedling and stocking rates, coupled with the impacts of minor, small scale 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 significant surface fire, shade tolerant grand fir will begin to dominate the understory conifer layer (understory infill of mid and late seral conifers is now a common, widespread condition which is a direct result of a policy of total fire suppression. The policy of total forest fire suppression was implemented in the Post-European era of settlement in the western United States and became progressively effective in extinguishing the majority of wildfires across dry western landscapes.

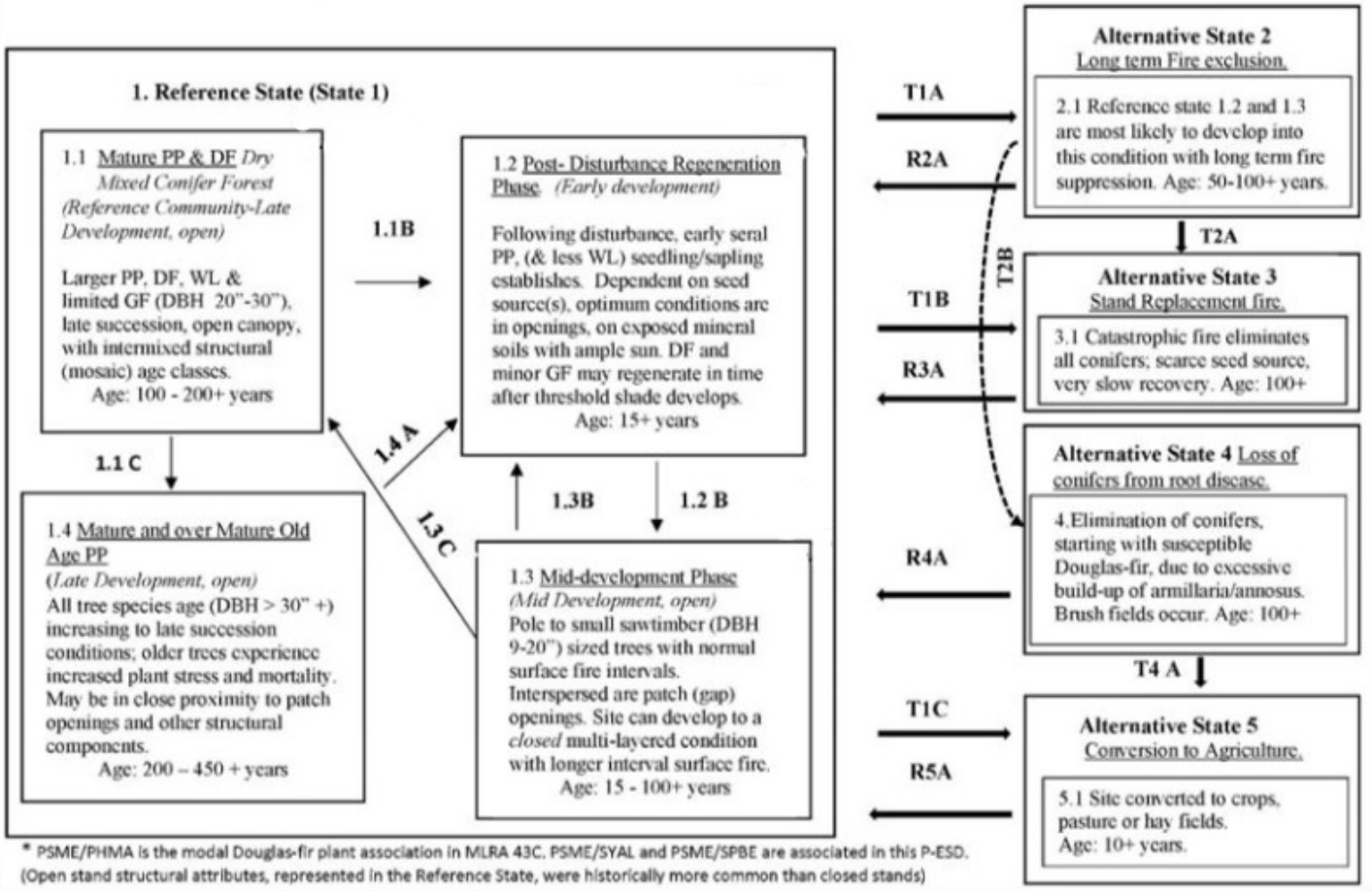
The expressions of the various historical stand(s) in this site contained various ages, sizes and species mixes which were found in a mosaic pattern across the larger landscape. Clumps, gaps and individual trees were the norm. These forests occurred in ecologically defined “spatially heterogeneous patterns”.

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 of the stand.

State and transition model

State and Transition Diagram

State Transition Model - Ecological Site (Provisional)
Frigid Xeric Loamy Mountains
General Plant Association: Douglas-fir Warm Dry Shrub *



* PSME/PHMA is the modal Douglas-fir plant association in MLRA 43C. PSME/SYAL and PSME/SPBE are associated in this P-ESD.
(Open stand structural attributes, represented in the Reference State, were historically more common than closed stands)

Plant Community, Transition(s) and Restoration Pathways

Reference State (State 1):

(Refer to Appendix 1 for tree-size classes)

Low intensity naturally occurring ground fires maintain the dominant large, open and widely spaced mature ponderosa pine (or Douglas-fir) across the landscape. Surface fires occur on a regular basis in the disturbance dependent community, without altering the basic structure of the overall stand, maintaining Community Phase 1.1.

1.1B Less common stand replacement or mixed severity fire shifts the stand to the early development phase. This tends to maintain the mosaic pattern of stand structural and age classes across the larger scale landscape (in 100's to 1,000's of acres in size). Secondary succession is initiated in the various patch sizes resulting from these higher severity fire impacts, provided conifer seed source(s) exists.

1.1C In the long-term absence of a mixed or stand replacement event (or from other catastrophic widespread disturbances such as epidemic bark beetle mortality, etc.), the mature stands grow to very large over-mature size and age. These stands may reach old-growth status. Endemic insect and disease impact the stand and result in smaller openings within the canopy which may fill in with young early or mid-seral conifer regeneration.

Surface fires (including reburns) eliminate many of the newly established seedings and small saplings; this can occur multiple times within a short interval which may eliminate seed sources necessary to establish ponderosa pine or other conifer seedlings. In that case persistent brush fields can develop, especially on larger sized openings. Multiple reburns maintain Community Phase 1.2.

1.2B Seedlings and saplings grow and develop to pole and small sawtimber size (and age) class(s).

Low to moderate intensity fires maintain the open nature of the stand and provide benefits to pole size ponderosa pine by allowing the clumps to thin naturally, maintaining Community Phase 1.3.

1.3B Stand develops with low to moderate intensity fires to the pole or small sawtimber phase.

1.3C Stand continues to develop to the mature/large sawtimber phase (>20" DBH).

1.4A Mixed severity fire, or other types of significant disturbance event (i.e. induced mortality resulting from biotic/abiotic injury), occurs in the mature and over mature overstory canopy; reverts to early seral development stage. The overall larger scale landscape maintains the mosaic attribute structure.

Transitions:

T1A Long term total fire exclusion (50-100+ years) results in Alternative State 2.

T1B A widespread catastrophic (also referred to as "stand replacing") fire event occurs as a natural (but relatively rare) event in any phase within the reference state. Due to the size and intensity of the wildfire, a deficiency of seed source(s) inhibits the re-establishment of the early seral Ponderosa pine and other conifers (resulting in the development of Alternative State 3).

T1C Forested site converted to annual cropland or pasture/hayland (leading to State 5).

T2A Wide spread catastrophic fire occurs, similar to that of T1B, but the intensity and impact of the wildfire event is much greater in scope because of the unnatural buildup of fuels in Alternative State 2 (the transition results in the development of Alternative State 3, but with a larger degree of resource impact to the site than in T1B).

T2B In the absence of a catastrophic wildfire, the long-term site occupancy of mid seral Douglas-fir (and lesser levels of grand fir) results in increased levels of root disease, especially on poor nutritional soils. In time all conifer species are impacted and are eliminated from the site, leading to long term brush dominated occupancy.

T4A Alternative State 4 is converted to annual cropland or pasture/hayland uses.

Restoration Pathways:

R2A Common fuel reduction practices are applied. These practices include low thinning and pruning to reduce ladder fuels. In addition, stands are managed to shift conifer species composition to early seral ponderosa pine.

R3A Reforestation (e.g. the planting of Ponderosa pine with limited Douglas-fir) is applied in the short-term aftermath of a catastrophic, stand replacing wildfire. Native fire adapted understory species rebound naturally.

R4A An extended period of time (up to 100+ years) is needed for the extensive (infested) below ground root mass to decompose. After this time, afforestation can be applied in order to establish viable forest stands.

R5A Afforestation is applied on cropland or pasture/haylands in order to reestablish functional forest stands. Site preparation may be necessary prior to planting conifer seedlings.

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	04/25/2024
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):**

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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:**
