USDA Natural Resources Conservation Service

Ecological site F043AY585WA
Warm-Frigid, Xeric, Sandy, Outwash Terraces (Douglas-fir Warm Dry Shrub)

Last updated: 10/14/2020
Accessed: 05/05/2024

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): 043A–Northern Rocky 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.

LRU notes

Most commonly found in LRU 43A01 (Okanogan Plateau). Also found in adjacent areas of 43A02, 44A01 and 44A02.

Classification relationships

Relationship to Other Established Classifications:
United States National Vegetation Classification (2008) - A3392 Douglas fir- P. Pine / Shrub Understory Central Rocky Mt. Forest & Woodland Alliance
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)
Description of Ecoregions of the United States, USFS PN # 1391, 1995 - M333 Northern Rocky Mt. Forest-Steppe-Coniferous Forest-Alpine Meadow Province
Level III and IV Ecoregions of WA, US EPA, June 2010 - 15x Okanogan Highland Dry Forest. 15w Western Selkirk Maritime Forest. 15r Okanogan – Colville Xeric Valleys & Foothills.
This ecological site includes the following USDA Forest Service Plant Associations: PSME/PHMA, PSME/PHMA-LIBOL and PSME/SYAL (Douglas-fir Series). (Williams et. al. 1995)

Ecological site concept

These soils have developed in mixed Mazama tephra, and loess over sandy outwash. The soils are very deep and have low available water capacity to a depth of 1 m. The soils are mostly somewhat excessively drained. They do not have a water table within 30 inches of the surface during Apr-Oct.

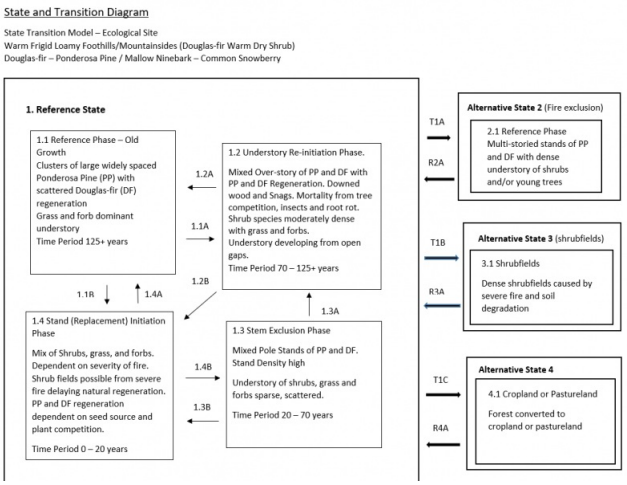


Figure 1.

Figure 2.

Table 1. Dominant plant species

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

Physiographic features

Landscapes: Valleys, Mountains, Sand plains
Landform: outwash terraces, dunes, kames, kame terraces, escarpments

Elevation (m): Total range = 395 to 1540 m
(1,290 to 5,045 feet)
Central tendency = 640 to 1000 m
(2,095 to 3,280 feet)

Slope (percent): Total range = 0 to 70 percent
Central tendency = 7 to 35 percent

Water Table Depth (cm): >200 cm

Flooding:
Frequency: None

Duration: None

Ponding:
Frequency: None
Duration: None

Aspect: NA

Table 2. Representative physiographic features

Landforms	(1) Valley > Outwash terrace (2) Mountains > Kame (3) Sand plain > Dune (4) Valley > Kame terrace
Elevation	639–1,000 m
Slope	7–35%
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Elevation	393–1,538 m
Slope	0–70%
Water table depth	0 cm

Climatic features

Frost-free period (days): Total range = 95 to 145 days
Central tendency = 105 to 120 days

Mean annual precipitation (cm): Total range = 280 to 980 mm
(11 to 39 inches)
Central tendency = 470 to 675 mm
(19 to 27 inches)

MAAT (C): Total range = 4.2 to 10.3
(40 to 50 F)
Central tendency = 6.2 to 8.0
(43 to 46 F)

Climate Stations: none

Influencing water features

Water Table Depth (cm): >80 inches

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Soil features

This ecological subsite is associated with several soil series (e.g. Elmira, Granflat, Nanamkin, Sacheen, Spens, Typic Xerorthents, and Wapal). The soil components can be grouped into: Lamellic Xeropsamments, Typic Xeropsamments, Typic Xerorthents, Vitrandic Haploxerepts, and Vitrandic Haploxerolls. These soils have developed in mixed Mazama tephra, and loess over sandy outwash. The soils are very deep and have low available water capacity to a depth of 1 m. The soils are mostly somewhat excessively drained.

Parent Materials:
Kind: Tephra (volcanic ash) mixed with loess
Origin: mixed
Kind: outwash, sandy glaciolacustrine
Origin: mixed

Surface Texture:
(1) Gravelly Ashy Sandy loam
(2) Loamy Fine Sand
(3) Very Gravelly Loamy Coarse Sand
(4) Loamy Sand

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Loess (3) Outwash (4) Lacustrine deposits
Surface texture	(1) Gravelly, ashy sandy loam (2) Loamy fine sand (3) Very gravelly loamy coarse sand (4) Loamy sand
Drainage class	Somewhat excessively drained
Permeability class	Moderately rapid
Depth to restrictive layer	0 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	6.6 cm
Calcium carbonate equivalent (0-152.4cm)	0%
Electrical conductivity (0-152.4cm)	0 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0
Soil reaction (1:1 water) (0-152.4cm)	6.7
Subsurface fragment volume <=3" (25.4-152.4cm)	31%
Subsurface fragment volume >3" (25.4-152.4cm)	7%

Table 5. Representative soil features (actual values)

Drainage class	Well drained to excessively drained
Permeability class	Moderate to very rapid

Depth to restrictive layer	0 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.29–12.7 cm
Calcium carbonate equivalent (0-152.4cm)	0%
Electrical conductivity (0-152.4cm)	0 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0
Soil reaction (1:1 water) (0-152.4cm)	6.1–7.8
Subsurface fragment volume <=3" (25.4-152.4cm)	0–75%
Subsurface fragment volume >3" (25.4-152.4cm)	0–70%

Ecological dynamics

The reference state occurred before European settlement when frequent low intensity fires created open stands of large ponderosa pine with a grass dominated understory of pinegrass. Patches of Douglas-fir regeneration will be present. On the lower foothills this ecological site occurs on north and east slopes. On upper mountainous terrain it will occur on southern and western aspects. The model soil characteristics will be loamy over till or mixed colluvium. Sites escaping frequent fire will have a patchy mosaic of older large trees with patches of regeneration, pole stands of ponderosa pine and Douglas-fir, and a mixture of shrubs, grasses and forbs. Bark beetle and root disease mortality will create snags and woody debris. Severe stand replacing fires can result in ceanothus shrub fields dominating for several years until natural regeneration of pine and Douglas-fir reclaim the site. In other less severe burned areas, grass and sedge species will dominate along with sprouting shrubs like ninebark, oceanspray, and snowberry. This ecological site is similar to the Douglas-fir – Ponderosa pine – Western Larch / pinegrass ecological site (Douglas-fir Cool Dry Grass), however the presence of western larch is rare on the model site. This site being warmer and not adequate for larch growth. The Douglas-fir Cool Dry Grass ecological site climate is cooler located at higher elevations allowing western larch to become a prominent stand component in mature stands.

Lack of fire or fire exclusion crosses a threshold and the site goes to another state. State 2 results in homogenous multi-storied stands of ponderosa pine and Douglas-fir with dense understories of regeneration and/or shrubs. Snags and wood debris are lacking. These stands are highly susceptible to stand replacing fires. Much of the acreage of this ecological site is in this condition. Timber stand improvement and fuel removal treatments along with prescribed fire can restore this site to a more open patchy landscape more resistant to severe fire.

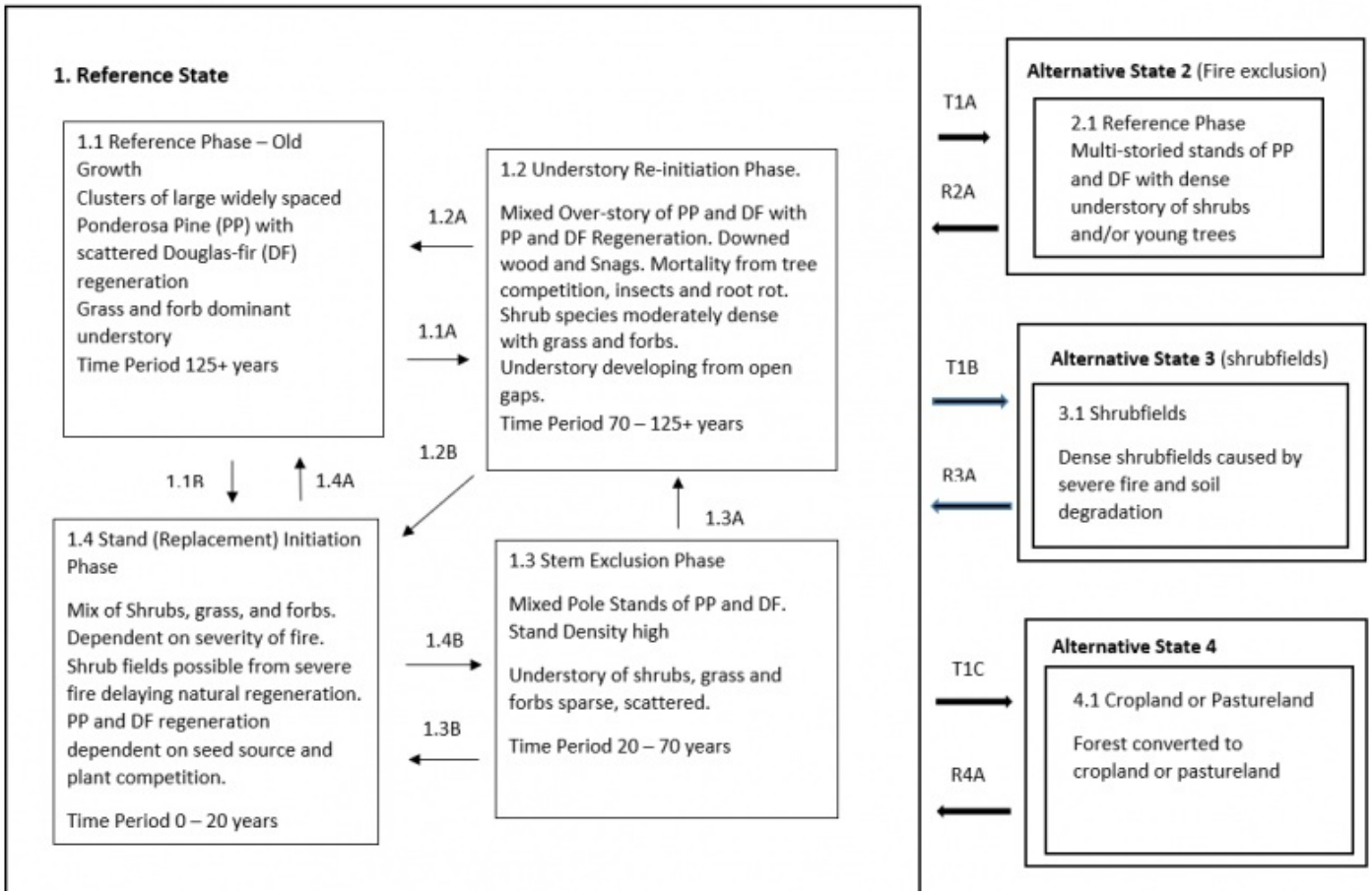
In Alternative State 3 severe fire has damaged soil nutrient capacity with shrub fields of ceanothus species dominating the site for 50+ years. This condition more commonly occurring on south and west facing slopes. Restoration activities must be scrutinized on a site by site basis.

In Alternative State 4 some of the lower landscape portions of this ecological site have been converted to introduced grass pastures or annual cropland. Restoring this site to the reference state takes major inputs in site preparation, tree planting, vegetation control, fuels management and other silvicultural treatments.

State and transition model

State and Transition Diagram

State Transition Model – Ecological Site
Warm Frigid Loamy Foothills/Mountainsides (Douglas-fir Warm Dry Shrub)
Douglas-fir – Ponderosa Pine / Mallow Ninebark – Common Snowberry



Plant Community, Transition and Restoration Pathways

Reference State

1.1A – Fire return interval extended allowing regeneration to grow and mature. Stand mortality start to occur.

1.1B – Stand replacement disturbance. Severe Fire or insect mortality killing large pine/fir.

1.2A – Frequent mixed and low severity ground fires kill regeneration some large trees creating patchy open stands

1.2B – Stand replacement disturbance. Severe Fire or insect mortality killing large pine/fir.

1.3A – Time and localized disturbance. Stand competition mortality and insect/disease mortality creating gaps for understory development and tree regeneration

1.3B – Stand replacement disturbance. Severe fire back to grass/shrub stage with periodic natural tree regeneration

1.4A – Time. Low severity ground fires every 10-20 years to create patchy open grown ponderosa pine and Douglas-fir with grass dominant understory

1.4B – Time with fire return interval extended to allow natural tree regeneration to grow into dense pole stands

T1A - Fire exclusion over long periods allowing stands to grow into homogenous multi-storied stands

T1B – Shrubfields caused by severe fire and soil degradation

T1C – Forest stands converted to cropland or pastureland

R2A – Forest stands restored by overstory thinning, ground and ladder fuels reduction, prescribed fire and seeding of native grasses and forbs.

R 3A – Careful selection of sites to determine if tree planting success is warranted.

R4A – Afforestation through planting of native trees /shrubs and seeding of native grasses and forbs, treatment of invasive plants and Time.

References

. 1998. NRCS National Forestry Manual.

. 2017. NRCS Soil and Site Index data for NE WA and N. Idaho.

Cooper, S.V., K.E. Neiman, R. Steele, and D.W. Roberts. 1991. Forest Habitat types of Northern Idaho, A Second Approximation.

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Williams, C.K., B.F. Kelley, B.G. Smith, and T.R. Lillybridge. October, 1995. Forested Plant Associations of the Colville National Forest.

Zack, A. 1997. Biophysical Classification- Habitat Groups and Description of Northern Idaho and Northwestern Montana, Lower Clarkfork and Adjacent Areas..

Approval

Curtis Talbot, 10/14/2020

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	05/05/2024
Approved by	Curtis Talbot
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:

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:**

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17. **Perennial plant reproductive capability:**
