USDA Natural Resources Conservation Service

Ecological site F044AY506WA
Warm-Frigid, Xeric, Loamy, Foothills and Stream Terraces, High Water Table (Douglas-Fir Warm Dry Shrub)

Last updated: 9/07/2023
Accessed: 05/17/2024

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): 044A–Northern Rocky Mountain Valleys

Major Land Resource Area (MLRA): 043A–Northern Rocky Mountains

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 44A02 (Pend Oreille-Kootenai Valleys). Also found in areas of 43A01, and 43A03.

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 outwash, lacustrine deposits and/or alluvium. The soils are very deep and have adequate available water capacity to a depth of 1 m. The soils are poorly to moderately well drained (median = somewhat poorly drained). They have a water table at 4 to 27 inches below the surface during some portion of the year (median = 18 inches)

Associated sites

F043AY518WA	**Warm-Frigid, Xeric, Loamy Slopes, mixed ash surface (Douglas-Fir/Warm Dry Shrub) Pseudotsuga menziesii / Physocarpus malvaceus - Symphoricarpos albus** Found on hill and mountain side slopes as well as loamy terraces. They are very deep and lack a water table at 50-75cm during spring. Overstory species include Pseudotsuga menziesii var. glauca, and Pinus ponderosa. The understory is typified by Physocarpus malvaceus, Symphoricarpos albus, Calamagrostis rubescens, and Bromus vulgaris.
F043AY524WA	**Frigid, Udic, Loamy, Foothills/Mountainsides, ashy surface (Western Hemlock/Moist Forbes) Tsuga heterophylla / Clintonia uniflora , Tsuga heterophylla / Asarum caudatum** Found on mountain side slopes and hill slopes. Cool, moist positions that lack a high water table. Soils are loamy textured with a distinct volcanic ash mantle. Overstory species include Tsuga heterophylla, and Thuja plicata. The understory is typified by subshrubs and forbs including Coptis occidentalis, Linnaea borealis ssp. Longiflora, Clintonia uniflora and Goodyera oblongifolia.
F043AY521WA	**Warm-Frigid, Moist- Xeric Loamy Foothills/Mountainsides, ashy surface (Grand Fir Warm Dry Shrub) Abies grandis - Pseudotsuga menziesii / Physocarpus malvaceus - Symphoricarpos albus** Found on lower Hill slopes, mountain slopes and terraces. Textures are loamy and sites lack a high water table. The soil surface has a distinct layer of volcanic ash material. Overstory species include Abies grandis and Pseudotsuga menziesii var. glauca. The understory is typified by Physocarpus malvaceus,Symphoricarpos albus, Calamagrostis rubescens,and Hieracium albiflorum.

Similar sites

F043AY518WA	**Warm-Frigid, Xeric, Loamy Slopes, mixed ash surface (Douglas-Fir/Warm Dry Shrub) Pseudotsuga menziesii / Physocarpus malvaceus - Symphoricarpos albus** Found on hill and mountain side slopes as well as loamy terraces. Lacks a water table at 20 to 30 inches during spring. Overstory species include Pseudotsuga menziesii var. glauca,and Pinus ponderosa. The understory is typified by Physocarpus malvaceus, Symphoricarpos albus, Calamagrostis rubescens, and Bromus vulgaris.
F044AY503WA	**Warm-Frigid, Moist- Xeric Loamy Foothills/Mountainsides, high water table (Grand Fir Warm Dry Shrub) Abies grandis - Pseudotsuga menziesii / Physocarpus malvaceus - Symphoricarpos albus** Found on floodplains and in drainageways. Water table at depth 20 to 30 inches with loamy surface texture. Site vegetation is typified by Calamagrostis canadensis and Galium trifidum.

Table 1. Dominant plant species

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

Physiographic features

Elevation (m): Total range = 395 to 985 m
(1,290 to 4,900 feet)
Central tendency = 725 to 1035 m
(2,380 to 3,225 feet)

Water Table Depth: 0 to 44 inches during Jan-Jun (median = 18 inches)

Table 2. Representative physiographic features

Landforms	(1) Foothills > Flood plain (2) Mountains > Lake terrace (3) Valley > Stream terrace (4) Basin > Basin floor
Flooding duration	Brief (2 to 7 days)

Flooding frequency	Occasional
Elevation	725–983 m
Slope	0–10%
Water table depth	46 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Flooding duration	Brief (2 to 7 days)
Flooding frequency	Frequent
Elevation	393–1,494 m
Slope	0–30%
Water table depth	0–112 cm

Climatic features

Frost-free period (days): Total range = 100 to 140 days
Central tendency = 115 to 125 days

Mean annual precipitation (cm): Total range = 285 to 860 mm
(11 to 34 inches)
Central tendency = 415 to 600 mm
(16 to 24 inches)

MAAT (C): Total range = 5.7 to 10.5
(42 to 51 F)
Central tendency = 7.5 to 8.7
(46 to 48 F)

Climate Stations: none

Table 4. Representative climatic features

Frost-free period (characteristic range)	115-125 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	406-610 mm
Frost-free period (actual range)	100-140 days
Freeze-free period (actual range)	
Precipitation total (actual range)	279-864 mm

Influencing water features

Water Table Depth: 0 to 44 inches during Jan-Jun (median = 18 inches)

Flooding:
Frequency: None to frequent
Duration: None to brief

Ponding:
Frequency: None
Duration: None

Soil features

This ecological subsite is associated with several soil series (e.g. Blueslide, Coxlake, Cubcreek, Cusick, Hadencreek, Hodgson, Inchelium, Jimcreek, Kegel, Ret, Sacheen variant, Sclome, and Xerofluvents). The soil components are Aquic Haploxeralfs, Aquic Xeropsamments, Cumulic Haploxerolls, Fluvaquentic Haplaquolls, Fluvaquentic Haploxerolls, Typic Argiaquolls, Vitrandic Haploxerolls, and Vitrandic Palexeralfs. These soils have developed in mixed Mazama tephra, and loess over outwash, lacustrine deposits and/or alluvium. The soils are very deep and have adequate available water capacity to a depth of 1 m. The soils are poorly to moderately well drained (median = somewhat poorly drained). They have a water table at 4 to 27 inches below the surface during some portion of the year (median = 18 inches)

Table 5. Representative soil features

Parent material	(1) Volcanic ash (2) Loess (3) Outwash (4) Lacustrine deposits (5) Alluvium (6) Mudflow deposits
Surface texture	(1) Ashy silt loam (2) Silty clay loam (3) Sandy loam
Drainage class	Somewhat poorly drained
Permeability class	Moderate
Depth to restrictive layer	0 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	18.54 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)	3%
Subsurface fragment volume >3" (25.4-152.4cm)	0%

Table 6. Representative soil features (actual values)

Drainage class	Poorly drained to moderately well drained
Permeability class	Slow to moderately rapid
Depth to restrictive layer	0 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.11–22.61 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)	5.6–7.3
Subsurface fragment volume <=3" (25.4-152.4cm)	0–16%
Subsurface fragment volume >3" (25.4-152.4cm)	0%

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.

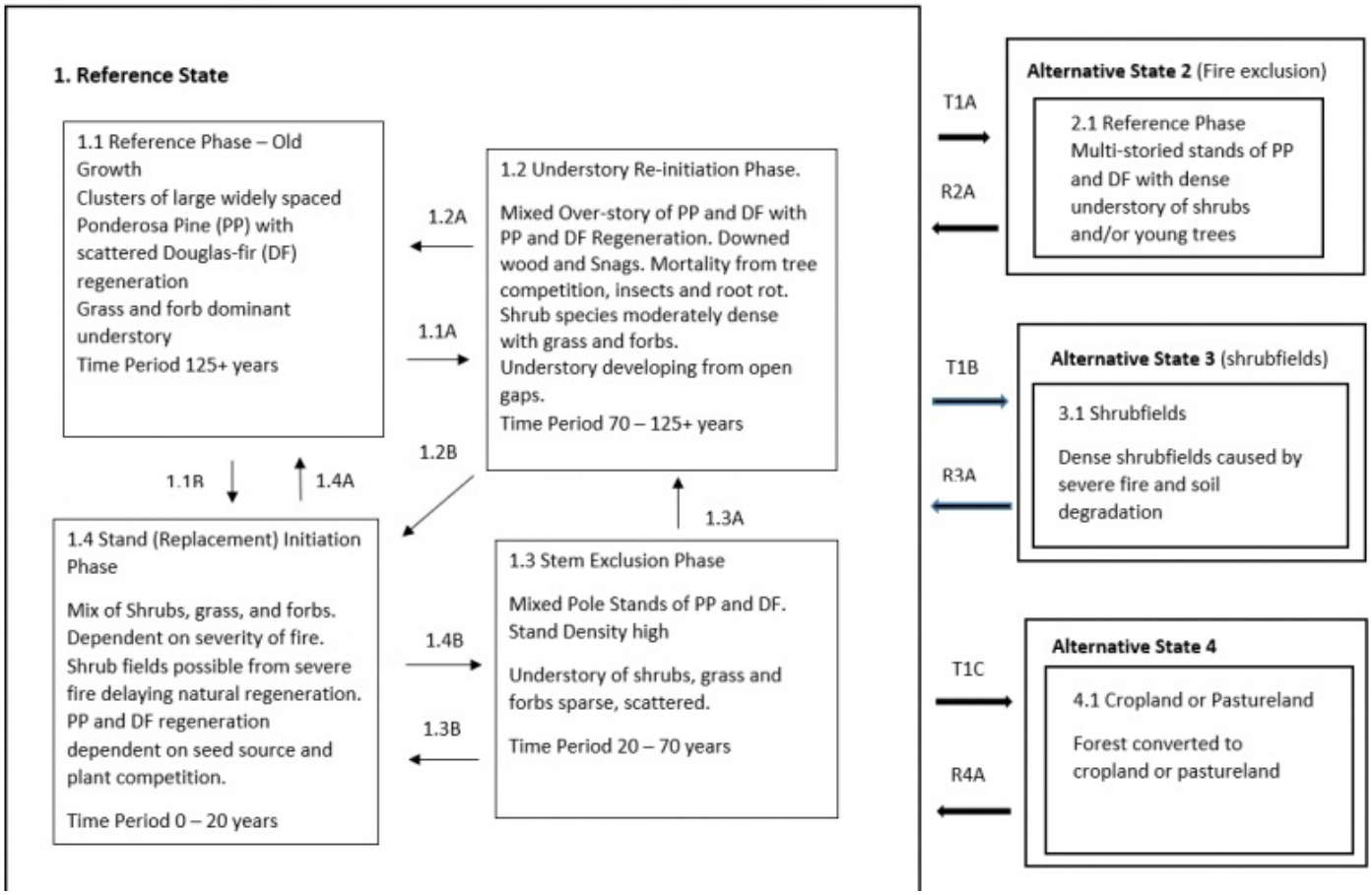
In Alternative State 3 severe fire has damaged soil nutrient capacity with shrub fields of ceanothus species dominating the site for 50+ years. This condition more commonly occurring on south and west facing slopes. Restoration activities must be scrutinized on a site by site basis.

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

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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..

Contributors

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Approval

Kirt Walstad, 9/07/2023

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	05/17/2024
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):**

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):**

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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:**
