Ecological site group EX043AESG01
Warm Mesic Xeric Loamy Slopes (Ponderosa Pine/Shrub) Pinus Ponderosa /Symphoricarpos albus, Pinus Ponderosa / Physocarpus malvaceus

Last updated: 03/27/2019
Accessed: 05/10/2025

Key Characteristics

None specified

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.

Physiography

Major Land Resource Area: 43A Northern Rocky Mountains and Foothills

Modal LRU – 43A03 – Columbia-Colville Valleys

This LRU is composed predominantly of low elevation valley floors and the slopes of foothills or low mountains adjacent to the Columbia and Colville rivers. The soils tend to be loamy mollisols and inceptisols with mixed or thin ash surfaces. Till and outwash are the dominant parent materials. Soil climate is a mesic or frigid temperature regime and xeric moisture regime with average annual precipitation around 495 mm (19 inches).

Others where occurring – 43A01 - Okanogan Plateau
43A02 - Western Selkirk Highlands

Ecological Site Concept:

The data below describes the physiographic, climatic and other parameters for the ponderosa pine/shrub ES group as a whole. This vegetation alliance is widespread so a Core Concept for each parameter is also described. See Appendix A for a finer division of the alliance based on selected soil features.

This ESD in distinguished by an overstory of ponderosa pine understory shrub component of ninebark, oceanspray, and snowberry. It occurs on foothills, mountainsides, and flat terraces. This ESD fits into the National Vegetation Standard's Central Rocky Mt. *Pinus ponderosa* / Shrub Understory alliance.

Physiographic Features

This ecological site group occurs mainly on low to mid elevation slopes of glaciated foothills and outwash valleys. It is found predominantly on side slopes, foot slope, and flats. The parent material is volcanic ash or mixed volcanic ash and loess over till, loamy outwash or residuum and colluvium from mainly granitic and metasedimentary rock.

Landscapes: Mountains, Foothills, Valleys, Plateaus, Scablands

Landform: Hill slopes, Outwash Terraces, Outwash Plains

Elevation:

Total range = 390 to 980 m
(1,280 to 3,215 feet)
Core Concept = 590 to 745 m
(1,935 to 2,445 feet)

Slope (percent):
Total range = 0 to 45 percent
Core Concept = 3 to 20 percentT

Water Table Depth:
56cm to >200 cm (>85% have no water table present)
(22 to >80 inches)

Climate

Climatic Features

During the spring and summer, a circulation of air around a high-pressure center brings a prevailing westerly and northwesterly flow of comparatively dry, cool and stable air into the region. As the air moves inland, it becomes warmer and drier which results in a dry season beginning in the late spring and reaching a peak in mid-summer. In the fall and winter, a circulation of air around two pressure centers over the ocean brings a prevailing southwesterly and westerly flow of air into the Pacific Northwest. This air from over the ocean is moist and near the temperature of the water. Condensation occurs as the air moves inland over the cooler land and rises along the windward slopes of the mountains or highlands. This results in a wet season beginning in October, reaching a peak in winter, then gradually decreasing in the spring.

The elevation within the LRU varies from approximately 1,000 feet in the lower river valleys to 3,400 feet over the higher terrain. The annual precipitation increases from 18 inches in the valley to 24 inches over the higher foothills. Winter season snowfall varies from 30 to 50 inches. Both rainfall and snowfall increase in the higher elevations. Snow can be expected after the first of November and to remain on the ground from the first of December until March or April.

In January, the average maximum temperature is near 31° F and the minimum temperature is 18° F. Minimum temperatures from -10° to -20°F are recorded almost every winter and temperatures ranging to -30° F have been recorded. In July, the average maximum temperature is 85° to 90° and the minimum temperature 45° to 50° F. Maximum temperatures reach 100° F on a few afternoons each summer and temperatures between 105° to 110° F have been recorded. Temperatures in the mountains decrease three to five degrees Fahrenheit with each 1,000 feet increase in elevation. The average date of the last freezing temperatures can be expected by mid-May and before mid-October in the warmer areas.
(Compiled from WRCC: Climate of Washington and available station data)

Frost-free period (days):
Total range = 105 to 140 days
Core Concept = 120 to 130 days

Mean annual precipitation (cm):
Total range = 240 to 640 mm
(9 to 25 inches)
Core Concept = 390 to 490 mm
(15 to 19 inches)

MAAT (C)
Total range = 6.9 to 10.2
(44 to 50 F)
Core Concept = 8.1 to 8.9
(47 to 48 F)

Climate Stations: none

Soil features

Representative Soil Features

This ecological site group is associated with several soil components. The soil components can be grouped into four soil subgroups: Typic Vitrixerands, Vitrandic Haploxerepts, Vitrandic Dystroxerepts, Vitrandic Haploxerolls, and Andic Haploxerepts. Most of these soils have developed in Mazama tephra deposits over till, outwash and residuum and colluvium from granitic and metasedimentary rock. These tephra layers are important for forest productivity in that they retain large amounts of water compared to other parent materials, have high cation exchange capacity and high availability of organically bound plant nutrients. Minor amounts of soil are formed in lacustrine deposits. The soils range from shallow (lithic bedrock) to very deep. Many of these soils have dense till layers at a depth of 20 to 40 inches and have a low available water holding capacity and slow to very slow permeability in the till layers. The soils are mostly moderately well drained to well-drained. Surface textures include ashy fine sandy loam, gravelly ashy sandy loam, stony and/or very stony ashy sandy loam.

See appendix A for a discussion of different sub-divisions of the ponderosa pine/shrub alliance based on differences in soils features.

Appendix A

Examination of map unit components assigned to the Ponderosa Pine/ Shrub alliance showed four possible subdivisions of the larger ecological group.

These are:
1) Warm Mesic Xeric Loamy Foothills, Terraces, High Water Table (Ponderosa Pine/Shrub)
2) Warm Mesic Xeric Loamy Foothills, Terraces, mixed ash surface (Ponderosa Pine/Shrub)
3) Warm Mesic Xeric Loamy Foothills, Terraces, low AWC subsoils (Ponderosa Pine/Shrub)
4) Warm Mesic Xeric Sandy Hill slopes and Outwash terraces (Ponderosa Pine/Shrub)

A.1 Warm Mesic Xeric Loamy Foothills, Terraces, High Water Table (Ponderosa Pine/Shrub)

Most commonly found in LRU 43A03 (Columbia-Colville Valleys). Also found in LRU 44A01 (Spokane-Rathdrum Outwash Plains). 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: Foothills, Valleys
Landform: sideslopes, foot slopes, toe slopes

Elevation (m): Total range = 390 to 925 m
(1,280 to 3,035 feet)
Core Concept = 665 to 705 m
(2,180 to 2,310 feet)

Slope (percent): Total range = 0 to 30 percent
Core Concept = 3 to 15 percent

Water Table Depth (cm):
15 – 58 cm (median = 56 cm)
(6 – 23 inches; median = 22 inches)

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Aspect: all
Core Concept: none

Climatic Features
Frost-free period (days): Total range = 110 to 140 days
Core Concept = 115 to 125 days

Mean annual precipitation (cm): Total range = 270 to 670 mm
(11 to 26 inches)
Core Concept = 400 to 510 mm
(16 to 20 inches)

MAAT (C): Total range = 7.3 to 10.0
(45 to 50 F)
Core Concept = 8.3 to 9.0
(47 to 48 F)

Climate Stations: none

Representative Soil Features

This ecological subsite is associated with several soil series (e.g. Dearyton, Hardesty, Lakespring, Omak). The soils are Vitrandic Haploxeralfs, Vitrandic Palexeralfs, Vitrandic Haploxerolls, Vitrandic Durixerolls, and Aquic Xerofluvents. These soils have developed in mixed Mazama tephra deposits over till, glaciolacustrine material, outwash and alluvium from granitic and other mixed rock. The soils range are very deep and have a water table within 75cm of the surface during some part of the year. The soils are mostly moderately well drained.

Parent Materials:
Kind: Tephra (volcanic ash)
Origin: mixed
Kind: till, outwash, alluvium, glaciolacustrine
Origin: granitic, quartzite, other unspecified

Surface Texture:
(1)Ashy Loam
(2)Ashy Silt Loam

Fragment content of surface (hard fragments): 0 to 9 percent (median = 7%)

Subsurface Texture Group: Loamy
Fragment content of subsurface (25 to 100cm): 0 to 34 percent (median = 5%)
Most components lack surface fragments
Drainage Class: Moderately Well drained
Saturated Hydraulic conductivity: High
Soil Depth: >200 cm
Calcium Carbonate Equivalent (percent): 0
Soil Reaction (1:1 Water): 5.0 to 7.8
Available Water Capacity (total in 100cm): 11.38-21.09cm (median = 16.16cm)

A.2 Warm Mesic Xeric Loamy Foothills, Terraces, mixed ash surface (Ponderosa Pine/Shrub)

Most commonly found in 43A01 (Okanogan Plateau). Significant areas also found in LRU 44A01 (Spokane-

Rathdrum Outwash Plains). 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: Foothills, Valleys
Landform: sideslopes, foot slopes, toe slopes

Elevation (m): Total range = 395 to 1065 m
(1,295 to 3,495 feet)
Core Concept = 610 to 790 m
(2,000 to 2,590 feet)

Slope (percent): Total range = 0 to 45 percent
Core Concept = 2 to 20 percent

Water Table Depth (cm):
94 – >200 cm (median = >200 cm)
(37 – 80 inches; median = >80 inches)

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Aspect: 110-235-340
Core Concept: 145-235-305

Climatic Features
Frost-free period (days): Total range = 105 to 140 days
Core Concept = 115 to 125 days

Mean annual precipitation (cm): Total range = 280 to 670 mm
(11 to 26 inches)
Core Concept = 385 to 500 mm
(15 to 20 inches)

MAAT (C): Total range = 6.6 to 10.1 C
(44 to 50 F)
Core Concept = 7.9 to 8.8 C
(46 to 48 F)

Climate Stations: none

Representative Soil Features

This ecological subsite is associated with several soil series (e.g.). The soils are Bong, Cedonia, Clayton, Donavan, Fourmound, Garrison, Gibbs, Glenrose, Goldlake, Hagen, Hudnut, Kramerhill, Narcisse, Phoebe, Seaboldt, Speigle, Stutler. These soils have developed in mixed Mazama tephra deposits over till, glaciolacustrine material, outwash, colluvium, residuum, loess and alluvium from granitic, quartzite, basalt and other mixed rock. The soils range are very deep and have a no water table within 75cm of the surface during any part of the year. The soils are mostly well drained.

Parent Materials:
Kind: Tephra (volcanic ash)
Origin: mixed

Kind: till, outwash, alluvium, glaciolacustrine, colluvium, residuum, loess
Origin: granitic, quartzite, basalt, other unspecified

Surface Texture:
(1) Ashy Loam
(2) Ashy Sandy Loam
(3) Ashy Silt Loam

Fragment content of surface (hard fragments): 0 to 43 percent (median = 6%)

Subsurface Texture Group: Loamy
Fragment content of subsurface (25 to 100cm): 0 to 90 percent (median = 13%)
Most components lack surface fragments
Drainage Class: Well drained (small number of Moderately Well and Somewhat Excessively drained)
Saturated Hydraulic conductivity: Moderately High to Very High (above restriction) (median = Moderately High)
Soil Depth: 53 to >200 cm (median = >200cm)
Lithic contact – 71-119 cm
Paralithic contact – 117 cm
Densic material – 53-102 cm

Calcium Carbonate Equivalent (percent): 0-6
Soil Reaction (1:1 Water): 5.6 to 8.5
Available Water Capacity (total in 100cm): 4.50-11.30cm (median = 11.11cm)

A.3 Warm Mesic Xeric Loamy Foothills, Terraces, low AWC subsoils (Ponderosa Pine/Shrub)

Found in LRU 44A01 (Spokane-Rathdrum Outwash Plain). 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: Foothills, Valleys
Landform: sideslopes, foot slopes summits

Elevation (m): Total range = 490 to 880 m
(1,610 to 2,885 feet)
Core Concept = 635 to 730 m
(2,085 to 2,395 feet)

Slope (percent): Total range = 0 to 55 percent
Core Concept = 8 to 25 percent

Water Table Depth (cm): none present

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Aspect: 60-165-345
Core Concept: 100-165-260

Climatic Features
Frost-free period (days): Total range = 105 to 135 days
Core Concept = 120 to 125 days

Mean annual precipitation (cm): Total range = 380 to 665 mm
(15 to 26 inches)
Core Concept = 425 to 520 mm
(17 to 20 inches)

MAAT (C): Total range = 7.3 to 9.6 C
(45 to 49 F)
Core Concept = 8.2 to 8.8 C
(47 to 48 F)

Climate Stations: none

Representative Soil Features

This ecological subsite is associated with several soil series (e.g.). The soils are Bobbitt, Lenz, McGuire, Northstar, Skalan, Spokane. The soil components can be grouped into four soil subgroups: Typic Xerochrepts, Ultic Haploxeralfs, Vitrandic Argixerolls, Vitrandic Haploxerolls. These soils have developed in Mazama tephra deposits and loess mixed with outwash, colluvium, and residuum, from granitic, basalt, metamorphic and other mixed rock. The soils are predominantly moderately deep and have a no water table within 75cm of the surface during any part of the year. The soils are mostly well drained.

Parent Materials:
Kind: Tephra (volcanic ash)
Origin: mixed
Kind: outwash, colluvium, residuum, loess
Origin: granitic, basalt, metamorphic, other unspecified

Surface Texture:
(1) Ashy Loam
(2) Ashy Sandy Loam

Fragment content of surface (hard fragments): 0 to 29 percent (median = 0%)

Subsurface Texture Group: Loamy
Fragment content of subsurface (25 to 100cm): 0 to 80 percent (median = 55%)
Most components lack surface fragments
Drainage Class: Well drained (small number Somewhat Excessively drained)
Saturated Hydraulic conductivity: Moderately High to Very High (above restriction) (median = High)
Soil Depth: 66 to >200 cm (median = 81cm)
Lithic contact – 66-97 cm
Paralithic contact – 66 cm
Calcium Carbonate Equivalent (percent): 0
Soil Reaction (1:1 Water): 5.0 to 7.0
Available Water Capacity (total in 100cm): 4.24-6.68cm (median = 5.69cm)

A.4 Warm Mesic Xeric Sandy Hill slopes and Outwash terraces (Ponderosa Pine/Shrub)

Found in LRU 44A01 (Spokane-Rathdrum Outwash Plain). Also present in 43A03 (Columbia-Colville Valleys). 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: Foothills, Valleys
Landform: sideslopes, foot slopes, toe slopes, summits and flats

Elevation (m): Total range = 490 to 880 m

(1,610 to 2,885 feet)
Core Concept = 635 to 730 m
(2,085 to 2,395 feet)

Slope (percent): Total range = 0 to 55 percent
Core Concept = 8 to 25 percent

Water Table Depth (cm): none present

Flooding:
Frequency: None
Duration: None

Ponding:
Frequency: None
Duration: None

Aspect: 60-165-345
Core Concept: 100-165-260

Climatic Features
Frost-free period (days): Total range = 105 to 135 days
Core Concept = 120 to 125 days

Mean annual precipitation (cm): Total range = 380 to 665 mm
(15 to 26 inches)
Core Concept = 425 to 520 mm
(17 to 20 inches)

MAAT (C): Total range = 7.3 to 9.6 C
(45 to 49 F)
Core Concept = 8.2 to 8.8 C
(47 to 48 F)

Climate Stations: none

Representative Soil Features

This ecological subsite is associated with several soil series (e.g.). The soils are Hallcreek, Spokane, Springdale. The soil components can be grouped into two soil subgroups: Andic Haploxerepts, and Vitrandic Haploxerepts. These soils have developed in Mazama tephra deposits and loess mixed with outwash, colluvium, and residuum, from granitic, basalt, metamorphic and other mixed rock. The soils are predominantly moderately deep and have a no water table within 75cm of the surface during any part of the year. The soils are mostly well drained.

Parent Materials:
Kind: Tephra (volcanic ash)
Origin: mixed
Kind: outwash, loess
Origin: mixed unspecified

Surface Texture:
(1) Ashy Coarse Sandy Loam
(2) Ashy Sandy Loam

Fragment content of surface (hard fragments): 0 to 27 percent (median = 24%)

Subsurface Texture Group: Loamy
Fragment content of subsurface (25 to 100cm): 23 to 77 percent (median = 41%)

Most components lack surface fragments
Drainage Class: Somewhat Excessively drained
Saturated Hydraulic conductivity: High to Very High (median = High)
Soil Depth: >200 cm
Calcium Carbonate Equivalent (percent): 0
Soil Reaction (1:1 Water): 5.0 to 6.7
Available Water Capacity (total in 100cm): 4.17-7.10cm (median = 4.35cm)

Vegetation dynamics

This site is located level terrain, foot slopes and side slopes. It is on sites with more moisture than the pine/dry shrub or pine/dry grass sites. Most of this site occurs under 2500' of elevation. Reference state is characteristic of mature pine stands over snowberry, serviceberry, spirea, chokecherry, woods rose, nutka rose, cascara and ninebark. Redstem ceanothus may be present as evidence of past fires. Fire disturbance is sporadic and currently in the mixed severity or stand replacing regimes. It would not be considered in the pine/savanna category due to lack of frequent ground fires. Overstory canopy cover of these mature pine stands will range from 40 – 60%. These mature pine stands will be subject to bark beetle kill, windfall, and fire. The understory shrubs will resprout quickly and pine regeneration will be dependent on pine seed placement and shrub competition.
The pine/snowberry plant association will be located on the drier topographic locations and the pine/ninebark plant association will be located on northern aspects. These sites have been subject to overgazing, introduced grass seeding and land conversion. Kentucky bluegrass and Canada bluegrass have invaded many of these sites dominating the understory. Sites on level terrain have been converted to crops, pasture, or urban land.

Relationship to Other Established Classifications:

United States National Vegetation Classification (2008) – A3446 Ponderosa 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 Mountain Ponderosa Pine Woodland and Savanna

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 - 15r Okanogan – Colville Xeric Valleys & Foothills and 15s Spokane Valley Outwash Plains

This ecological site includes the following USDA Forest Service Plant Associations: PIPO/SYAL, PIPO/PHMA, and PIPO/SYOR. (Williams et. al. 1995)

Major Land Resource Area

MLRA 043A
Northern Rocky Mountains

Subclasses

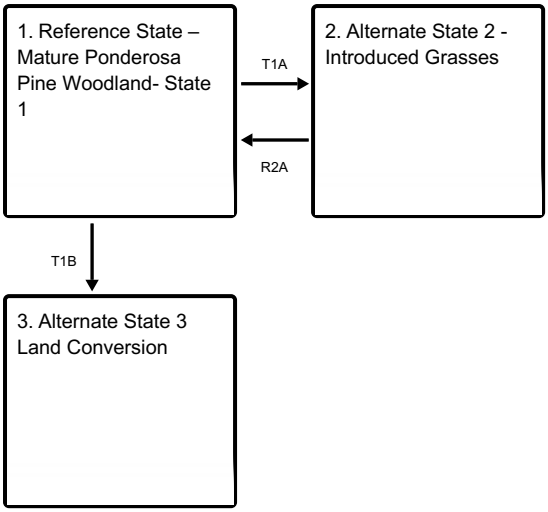
- F043AY501WA–Warm Mesic Xeric Loamy Foothills, Terraces, High Water Table (Ponderosa Pine/Shrub) Pinus Ponderosa /Symphoricarpos albus, Pinus Ponderosa / Physocarpus malvaceus
- F043AY502WA–Warm Mesic Xeric Loamy Foothills, Terraces, mixed ash surface (Ponderosa Pine/Shrub) Pinus Ponderosa /Symphoricarpos albus, Pinus Ponderosa / Physocarpus malvaceus

Stage

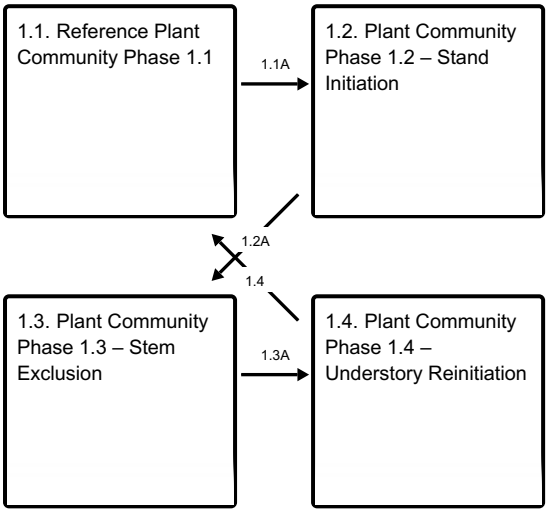
Provisional

State and transition model

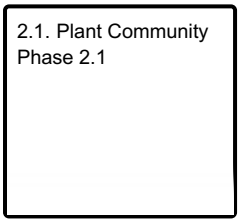
Ecosystem states



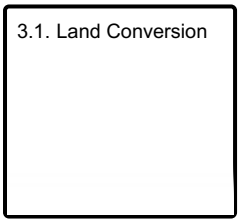
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State – Mature Ponderosa Pine Woodland- State 1

Reference State – Mature Ponderosa Pine Woodland- State 1 This state is relatively stable with long fire intervals maintaining a mature stand of ponderosa pine over a host of shrubs. Pine regeneration after any type of disturbance creating understory gaps will be variable due to shrub competition. Western pine beetle kill and windfall will create snags and down wood. Forest productivity is measured using site index (SI) and culmination of annual increment (CMAI). This ecological site is the most productive of the pure pine sites. Ponderosa pine is the only tree species and site indexes ranges greatly depending on local site characteristics. NRCS forest site index plots taken

throughout MLRA 430 shows this variability. Site index ranges from 70 - 130. Average site index for this ecological site will be 95 - 105 feet using Meyers 100year total age table. Using the average SI CMAI would be 102 cubic feet/acre/year at 40 years of age in a fully stocked stand.

Community 1.1
Reference Plant Community Phase 1.1

Mature pine stand with canopy coverage from 40 – 60% allowing dense understory coverage of shrubs with snowberry the most abundant and ninebark on moister sites. Little or no pine regeneration present due to shrub competition. Fire return intervals could be 100+ years. With minimal disturbance this phase maintained for long periods.

Community 1.2
Plant Community Phase 1.2 – Stand Initiation

Stand replacing fire. Shrubs reestablish quickly. Pine regeneration dependent on seed year, moisture, and exposed mineral soil. A pine-shrub mosaic may develop dependent on pine – shrub competition dynamics.

Community 1.3
Plant Community Phase 1.3 – Stem Exclusion

Dense pole stage pine stand mortality from stand competition. Shrub dominated areas may exist interspersed within the pine stand.

Community 1.4
Plant Community Phase 1.4 – Understory Reinitiation

Shrub understory reestablishes from openings created with pine stand mortality from stand competition, beetle kill, root rot, or windfall. Snags and downed wood occur on site. Little or no pine regeneration due to shrub competition.

Pathway 1.1A
Community 1.1 to 1.2

Little or no fire disturbance over long period maintains mature pine stand over snowberry

Pathway 1.2A
Community 1.2 to 1.3

Dense pine stands develop in areas of good pine regeneration after fire.

Pathway 1.3A
Community 1.3 to 1.4

Dense pine stands thin out due to stand competition allowing shrubs to reestablish.

Pathway 1.4
Community 1.4 to 1.1

Time. With minimal disturbance mature pine stand maintained.

State 2
Alternate State 2 - Introduced Grasses

This state developed from past overgrazing or other disturbance and where Kentucky bluegrass and/or Canada bluegrass invaded from adjacent areas. Shrub coverage is low. A mature stand of pine usually exists.

Community 2.1
Plant Community Phase 2.1

This would be considered the reference plant community for this state. A mature overstory of ponderosa pine with bluegrass dominating the understory. This condition will be maintained for a long period. Little or no pine regeneration exists due to bluegrass cover. Shrub cover will be spotty.

State 3
Alternate State 3 Land Conversion

Much of this Ecological Site is located at lower elevations where humans (Native and European) settled. These areas were converted to homesteads, pastures, and cropland. In recent times urban expansion has converted these sites to housing developments, shopping malls, and/or business centers.

Community 3.1
Land Conversion

Figure . hill slopes converted to cropland

Transition T1A
State 1 to 2

Introduced grasses invaded site and changed understory composition. Overgazing further reduced native vegetation.

Transition T1B
State 1 to 3

Sites converted to other land uses.

Restoration pathway R2A
State 2 to 1

Intense site preparation to kill cool season introduced grasses. Native shrub and grass seeding needed if native vegetation is sparse.

Citations

. 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.

Daubenmire, R. and J. Daubenmire. 1968. Forest Vegetation of Eastern Washington and Northern Idaho.

Smith and Fischer. 1997. Fire Ecology of the Forest Habitat Types of Northern Idaho.

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..