USDA Natural Resources Conservation Service

Ecological site F043AY589WA
Cryic, Aquic, Loamy, Flood Plains (Engelmann spruce/ladyfern) (PIEN/COSE/ATFI)

Last updated: 10/23/2020
Accessed: 05/20/2024

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

Major land resource area (MLRA): 043A-Northern Rocky Mountains
Modal LRU – 43A01 - Okanogan Plateau

This LRU is composed predominantly of glaciated mountains and foothills. The soils tend to be loamy to sandy andisols, inceptisols, and mollisols with mixed or distinct ash surfaces. Recent alluvium, till, outwash and residuum from granitic or metamorphic rock are the dominant parent materials. Soil climate is a frigid or cryic temperature regime and xeric moisture regime with average annual precipitation around 450 mm (18 inches).

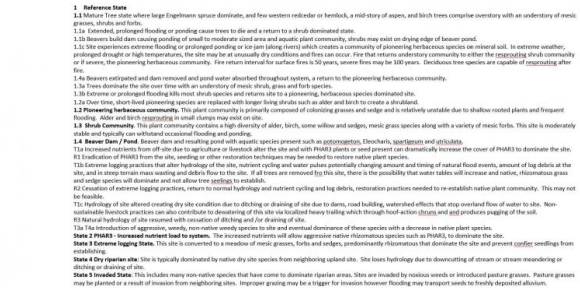
Classification relationships

This ES fits into the National Vegetation Standard’s Rocky Mountain & Great Basin Montane Riparian Forest Group and is most closely related to Washington State’s Natural Heritage Program’s Rocky Mountain Subalpine-Montane Riparian Woodland.

Ecological site concept

Ecological Site Concept:

This ES is found on poorly to somewhat poorly drained valley floors and drainageways. The sites are often affected by cold air drainage from the surrounding mountains. A water table is between the surface and 30 inches depth for much of the Mar-Jul period. They have cryic temperatures and a plant community dominated by subalpine fir, Engelmann spruce, ladyfern, horsetail, firethread sedge, and other forbs and shrubs. They have surface horizons developed from volcanic ash.



1 Reference State
1.1 Mature Tree state where large Engelmann spruce dominate, and few western redcedar or hemlock, a mid-story of aspen, and birch trees comprise overstory with an understory of mesic grasses, shrubs and forbs.
1.1a Extended, prolonged flooding or ponding cause trees to die and a return to a shrub dominated state.
1.1b Beavers build dam causing ponding of small to moderate sized area and aquatic plant community, shrubs may exist on drying edge of beaver pond.
1.1c Site experiences extreme flooding or prolonged ponding or ice jam (along rivers) which creates a community of pioneering herbaceous species on mineral soil. In extreme weather, prolonged drought or high temperatures, the site may be at unusually dry conditions and fires can occur. Fire that returns understory community to either the resprouting shrub community or if severe, the pioneering herbaceous community. Fire return interval for surface fires is 50 years, severe fires may be 100 years. Deciduous tree species are capable of resprouting after fire.
1.4a Beavers extirpated and dam removed and pond water absorbed throughout system, a return to the pioneering herbaceous community.
1.3a Trees dominate the site over time with an understory of mesic shrub, grass and forb species.
1.3b Extreme or prolonged flooding kills most shrub species and returns site to a pioneering, herbaceous species dominated site.
1.2a Over time, short-lived pioneering species are replaced with longer living shrubs such as alder and birch to create a shrubland.
1.2 Pioneering herbaceous community. This plant community is primarily composed of colonizing grasses and sedge and is relatively unstable due to shallow rooted plants and frequent flooding. Alder and birch resprouting in small clumps may exist on site.
1.3 Shrub Community. This plant community contains a high diversity of alder, birch, some willow and sedges, mesic grass species along with a variety of mesic forbs. This site is moderately stable and typically can withstand occasional flooding and ponding.
1.4 Beaver Dam / Pond. Beaver dam and resulting pond with aquatic species present such as potomogeton, Eleocharis, sparganum and utriculata.
T1a Increased nutrients from off-site due to agriculture or livestock alter the site and with PHAR3 plants or seed present can dramatically increase the cover of PHAR3 to dominate the site.
R1 Eradication of PHAR3 from the site, seeding or other restoration techniques may be needed to restore native plant species.
T1b Extreme logging practices that alter hydrology of the site, nutrient cycling and water pulses potentially changing amount and timing of natural flood events, amount of log debris at the site, and in steep terrain mass wasting and debris flow to the site. If all trees are removed fro this site, there is the possibility that water tables will increase and native, rhizomatous grass and sedge species will dominate and not allow tree seedings to establish.
R2 Cessation of extreme logging practices, return to normal hydrology and nutrient cycling and log debris, restoration practices needed to re-establish native plant community. This may not be feasible.
T1c Hydrology of site altered creating dry site condition due to ditching or draining of site due to dams, road building, watershed effects that stop overland flow of water to site. Non-sustainable livestock practices can also contribute to dewatering of this site via localized heavy trailing which through hoof-action chruns and and produces pugging of the soil.
R1 Natural hydrology of site resumed with cessation of ditching and /or draining of site.
T3a T4a Introduction of aggressive, weedy, non-native weedy species to site and eventual dominance of these species with a decrease in native plant species.
State 2 PHAR3 - Increased nutrient load to system. The increased nutrients will allow aggressive native rhizomatous species such as PHAR3, to dominate the site.
State 3 Extreme logging State. This site is converted to a meadow of mesic grasses, forbs and sedges, predominantly rhizomatous that dominate the site and prevent conifer seedlings from establishing.
State 4 Dry riparian site: Site is typically dominated by native dry site species from neighboring upland site. Site loses hydrology due to downcutting of stream or stream meandering or ditching or draining of site.
State 5 Invaded State: This includes many non-native species that have come to dominate riparian areas. Sites are invaded by noxious weeds or introduced pasture grasses. Pasture grasses may be planted or a result of invasion from neighboring sites. Improper grazing may be a trigger for invasion however flooding may transport seeds to freshly deposited alluvium.

Figure 1.

Table 1. Dominant plant species

Tree	(1) *Picea engelmannii* (2) *Abies lasiocarpa*
Shrub	(1) *Cornus sericea ssp. sericea* (2) *Alnus viridis*
Herbaceous	(1) *Athyrium filix-femina* (2) *Senecio triangularis*

Physiographic features

Physiographic Features
This ecological site occurs mainly on valley floors in mountains. Parent materials are volcanic ash over mixed alluvium or till.

Landscapes: Mountains
Landforms: mountain valleys, valley floors, drainageways, depressions

Elevation:
Total range = 680 to 1555 m
(2,235 to 5,095 feet)
Central tendency = 860 to 1160 m
(2,815 to 3,800 feet)

Slope (percent):
Total range = 0 to 15 percent
Central tendency = 2 to 5 percent

Water Table Depth:
0 to 75 cm; median = 45 cm
(0 to 30 inches; median = 18 inches)

Flooding:
Frequency: none to occasional
Duration: none to brief

Ponding:
Frequency: none to rare
Duration: none to brief

Aspect: NA

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Mountains > Valley (3) Mountains > Drainageway
Flooding duration	Not specified
Flooding frequency	Not specified
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	858–1,158 m
Slope	2–5%
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	None to occasional
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to rare
Elevation	681–1,553 m
Slope	0–15%
Water table depth	0–76 cm

Climatic features

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 about 4,900 feet on low mountains and foothills. The annual precipitation increases from 9 inches in the valleys to over 38 inches in the higher terrain. Winter season snowfall averages about 43 inches. Both rainfall and snowfall increase with elevation. 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 29° F and the minimum temperature is 14° F. Minimum temperatures from -5° to -20°F are recorded almost every winter and temperatures ranging to -25° F have been recorded. In July, the average maximum temperature is 81° and the minimum temperature 47° F. Maximum temperatures reach 100° F on a few afternoons each summer and temperatures as high as 108° F have been recorded. The average date of the last freezing temperatures can be expected by early-June and after early-September in the warmer areas.
(Compiled from WRCC: Climate of Washington and available station data)

Frost-free period (days):

Total range = 85 to 115 days
Central tendency = 100 to 110 days

Mean annual precipitation (cm):
Total range = 440to 750 mm
(17 to 29 inches)
Central tendency = 500 to 625 mm
(20 to 25 inches)

MAAT (C)
Total range = 4.0 to 7.1
(39 to 45 F)
Central tendency = 5.2 to 6.3
(41 to 43 F)

Climate stations: none

Influencing water features

Water Table Depth:
0 to 75 cm; median = 45 cm
(0 to 30 inches; median = 18 inches)

Soil features

Representative Soil Features
This ecological site is associated with Aquandic Cryaquepts, Aquandic Dystrocryepts, Aquic Dystrocryepts, Cryaquolls, and Cryofluvents components. These soils have developed in volcanic ash over mixed alluvium or till.

Parent Materials:
Kind: volcanic ash
Origin:
Kind: alluvium, till
Origin: mixed

Surface Texture: (<2mm fraction)
(1) Ashy-Fine sandy loam
(2) Loam

Surface Fragments

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Alluvium (3) Till
Surface texture	(1) Ashy fine sandy loam (2) Loam
Drainage class	Somewhat poorly drained to poorly drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	152–0 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	10.92 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)	16%
Subsurface fragment volume >3" (25.4-152.4cm)	2%

Table 5. Representative soil features (actual values)

Drainage class	Somewhat poorly drained to poorly drained
Permeability class	Very slow to moderately rapid
Depth to restrictive layer	20–0 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	8.89–12.7 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)	5.6–7.3
Subsurface fragment volume <=3" (25.4-152.4cm)	9–41%
Subsurface fragment volume >3" (25.4-152.4cm)	0–8%

Ecological dynamics

State and transition model

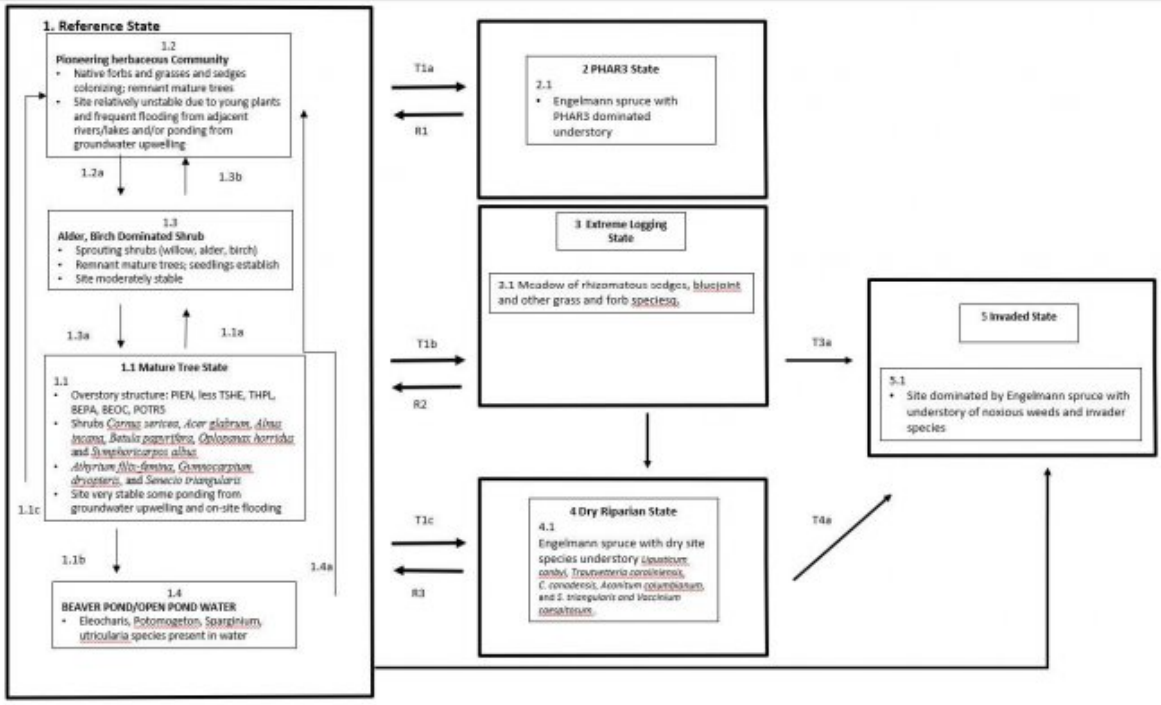

1. Reference State
1.2
Pioneering herbaceous Community
Native forbs and grasses and sedges colonizing; remnant mature trees
Site relatively unstable due to young plants and frequent flooding from adjacent rivers/lakes and/or ponding from groundwater upwelling
1.2a
1.3b
1.3
Alder, Birch Dominated Shrub
Sprouting shrubs (willow, alder, birch)
Remnant mature trees; seedlings establish
Site moderately stable
1.3a
1.1a
1.1 Mature Tree State
1.1
Overstory structure: PIEN, less TSHE, THPL, BEPA, BEOC, POTR5
Shrubs Cornus sericea, Acer glabrum, Alnus incana, Betula papyrifera, Oplopanax horridus and Symphoricarpos albus
Athyrium filix-femina, Gymnocarpium dryopteris, and Senecio triangularis
Site very stable some ponding from groundwater upwelling and on-site flooding
1.1c
1.1b
1.4a
1.4
BEAVER POND/OPEN POND WATER
Eleocharis, Potomogeton, Sparginium, utricularia species present in water
T1a
R1
2 PHAR3 State
2.1
Engelmann spruce with PHAR3 dominated understory
3 Extreme Logging State
3.1 Meadow of rhizomatous sedges, bluejoint and other grass and forb speciesq.
T1b
R2
T3a
5 Invaded State
5-1
Site dominated by Engelmann spruce with understory of noxious weeds and invader species
T1c
R3
4 Dry Riparian State
4.1
Engelmann spruce with dry site species understory Lupaticum condyi, Trautvetteria caroliniensis, C. canadensis, Aconitum columbianum, and S. triangularis and Vaccinium caespitosum.
T4a

Figure 2. STM

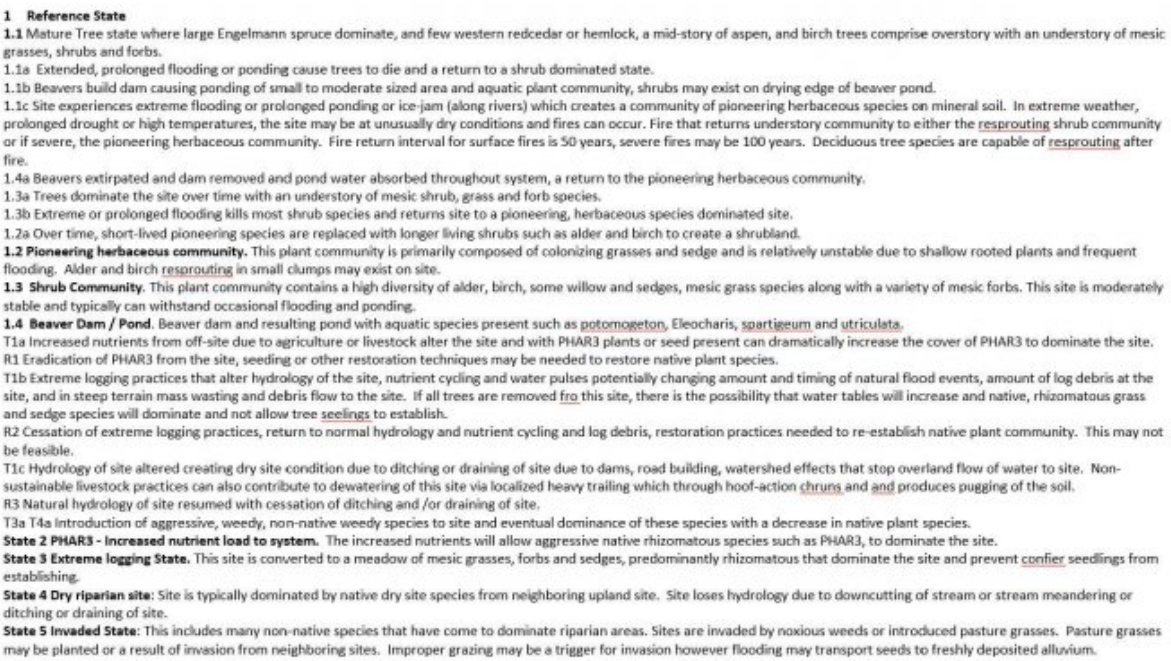


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Figure 3. Narrative

References

. USNVC [United States National Vegetation Classification]. 2019. United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC.. USNVC: http://usnvc.org/.

Rocchio, J.F. and R.C. Crawford. 2015. Ecological systems of Washington State. A guide to identification. Washington Department of Natural Resources.. Natural Heritage Report.. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA. 1–397.

Contributors

Stephanie Shoemaker
Brian Gardner

Approval

Curtis Talbot, 10/23/2020

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	05/20/2024
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):**

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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:**
