USDA Natural Resources Conservation Service

Ecological site F043AP910MT
Upland Cool Moist Woodland Group

Last updated: 9/09/2023
Accessed: 05/11/2025

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

This MLRA is located in Montana (43 percent), Idaho (34 percent), and Washington (23 percent). It makes up about 31,435 square miles (81,460 square kilometers). It has no large cities or towns. It has many national forests, including the Okanogan, Colville, Kootenai, Lolo, Flathead, Coeur d'Alene, St. Joe, Clearwater, and Kaniksu National Forests.

This MLRA is in the Northern Rocky Mountains Province of the Rocky Mountain System. It is characterized by rugged, glaciated mountains; thrust- and block-faulted mountains; and hills and valleys. Steep-gradient rivers have cut deep canyons. Natural and manmade lakes are common.

The major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA are: Kootenai-Pend Oreille-Spokane (1701), 67 percent; Upper Columbia (1702), 18 percent; and Lower Snake (1706), 15 percent. Numerous rivers originate in or flow through this area, including, the Sanpoil, Columbia, Pend Oreille, Kootenai, St. Joe, Thompson, and Flathead Rivers.

This area is underlain primarily by stacked slabs of layered sedimentary or metasedimentary bedrock. The bedrock formations range from Precambrian to Cretaceous in age. The rocks consist of shale, sandstone, siltstone, limestone, argillite, quartzite, gneiss, schist, dolomite, basalt, and granite. The formations have been faulted and stacked into a series of imbricate slabs by regional tectonic activity. Pleistocene glaciers carved a rugged landscape that includes sculpted hills and narrow valleys filled with till and outwash. Continental glaciation over road the landscape in the northern half of the MLRA while glaciation in the southern half was confined to montane settings.

The average annual precipitation is 25 to 60 inches (635 to 1,525 millimeters) in most of this area, but it is as much as 113 inches (2,870 millimeters) in the mountains and is 10 to 15 inches (255 to 380 millimeters) in the western part of the area. Summers are dry. Most of the precipitation during fall, winter, and spring is snow. The average annual temperature is 32 to 51 degrees F (0 to 11 degrees C) in most of the area, decreasing with elevation. In most of the area, the freeze-free period averages 140 days and ranges from 65 to 215 days. It is longest in the low valleys of Washington, and it decreases in length with elevation. Freezing temperatures occur every month of the year on high mountains, and some peaks have a continuous cover of snow and ice.

The dominant soil orders in this MLRA are Andisols, Inceptisols, and Alfisols. Many of the soils are influenced by Mount Mazama ash deposits. The soils in the area have a frigid or cryic soil temperature regime; have an ustic, xeric, or udic soil moisture regime; and dominantly have mixed mineralogy. They are shallow to very deep, are very poorly drained to well drained, and have most of the soil texture classes. The soils at the lower elevations include Udivitrands, Vitrixerands and Haplustalfs. The soils at the higher elevations include Dystrocryepts, Eutrocryepts, Vitricryands , and Haplocryalfs. Cryorthents, Cryepts, and areas of rock outcrop are on ridges and peaks above timberline

This area is in the northern part of the Northern Rocky Mountains. Grand fir, Douglas-fir, western red cedar, western hemlock, western larch, lodgepole pine, subalpine fir, ponderosa pine, whitebark pine, and western white pine are the dominant overstory species, depending on precipitation, temperature, elevation, and landform aspect. The understory vegetation varies, also depending on climatic and landform factors. Some of the major wildlife species in this area are whitetailed deer, mule deer, elk, moose, black bear, grizzly bear, coyote, fox, and grouse. Fish, mostly in the trout and salmon families, are abundant in streams, rivers, and lakes.

More than one-half of this area is federally owned and administered by the U.S. Department of Agriculture, Forest Service. Much of the privately-owned land is controlled by large commercial timber companies. The forested areas are used for wildlife habitat, recreation, watershed, livestock grazing, and timber production. Meadows provide summer grazing for livestock and big game animals. Less than 3 percent of the area is cropland.

Classification relationships

ASSOCIATED HABITAT TYPES:
Major association with:
western hemlock/queencup beadlily

Minor association with:
western redcedar/queencup beadlily
spruce/queencup beadlily
spruce/twinflower
grand fir/twinflower
spruce/queencup beadlily-queencup beadlily phase

Ecological site concept

• Site does not receive additional water
This site does not have the ash layer that the closely related Ashy Cool-Moist Woodland, therefore has less resistance and reliance to disturbance.
• Dominant Cover: Coniferous Forest
Reference vegetation community is an overstory of western cedar and western hemlock with low diversity, generally sparse understory that includes queencup beadlily and moderate cover of moss. Less commonly, the overstory is of Englemann spruce or Grand fir with a more diverse understory. Understory production averages 540 dry pounds per acre (200-900).
• Soils are
o Generally not limy (limited extent)
o Moderately deep, deep, or very deep
o Not ashy or medial textural family
o Typically less than 5% stone and boulder surface cover (<15% max)
• Soil surface texture ashy silt loam or cobbly ashy silt loam or gravelly ashy silt loam in surface mineral 4”
• Parent material is volcanic ash over till or colluvium
• Drainage class is well; no flooding frequency
• Site Landform: stream terraces, outwash terraces, moraines, mountain slopes
• Moisture Regime: udic
• Temperature Regime: frigid
• Elevation Range: 3200-4600 ft
• Slope: 15-30%

Associated sites

F043AP907MT	**Subirrigated Cool Moist Woodland Group** These sites are associated in their site conditions of cool-moist areas including:landforms of stream terraces and outwash terrace, at elevations ranging 3200 to 4600 feet. The F043AP907MT site resides only on very low slopes in contrast to this associated site. They differ in that FO43AP907MT has a reference community of Engelmann spruce and has subirrigated soils, while F043AP902MT has western redcedar and does not have subirrigated soils.

F043AP902MT	**Ashy Cool Moist Woodland Group** These sites are associated with each other in that they both reside in cool and moist site conditions but differ in the presence or absence of ash in the soil. Both site reside on landforms: mountain slopes, glaciated mountain slopes, stream terraces, outwash terraces, moraines; in elevations of 3200-4600 ft and slope ranges of 15-30%.

Similar sites

F043AP907MT	**Subirrigated Cool Moist Woodland Group** These sites are similar in their site conditions of cool-moist areas including:landforms of stream terraces and outwash terrace, at elevations ranging 3200 to 4600 feet. The F043AP907MT site resides only on very low slopes in contrast to this associated site. They differ in that FO43AP907MT has a reference community of Engelmann spruce and has subirrigated soils, while F043AP902MT has western redcedar and does not have subirrigated soils.
F043AP902MT	**Ashy Cool Moist Woodland Group** These sites are similar in that they both have a reference community dominated by western redcedar and western hemlock and reside in cool and moist site conditions but differ in the presence or absence of ash in the soil.

Table 1. Dominant plant species

Tree	(1) *Thuja plicata* (2) *Picea engelmannii*
Shrub	(1) *Vaccinium membranaceum* (2) *Chimaphila umbellata*
Herbaceous	(1) *Clintonia uniflora* (2) *Linnaea borealis*

Physiographic features

• Site Landform: stream terraces, outwash terraces, moraines, mountain slopes
• Elevation Range: 3200-4600 ft
• Slope: 15-30%

Table 2. Representative physiographic features

Landforms	(1) Mountains > Stream terrace (2) Mountains > Outwash terrace (3) Mountains > Moraine (4) Mountains > Mountain slope
Elevation	3,200–4,600 ft
Slope	15–30%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

• Moisture Regime: udic
• Temperature Regime: frigid

• Representative Value (RV) of range of Mean Annual Precipitation: 25-36 inches
• Representative Value (RV) of range of Mean Average Annual Temperature: 38-43 degrees
• Representative Value (RV) of range of Frost Free Days: 70-90 days
SUMMARY TABLES ARE FOR AVAILABLE CLIMATE STATIONS WHICH ARE ALL LOCATED IN VALLEYS.

Table 3. Representative climatic features

Frost-free period (characteristic range)	77-87 days

Freeze-free period (characteristic range)	126-130 days
Precipitation total (characteristic range)	23-31 in
Frost-free period (actual range)	72-88 days
Freeze-free period (actual range)	124-130 days
Precipitation total (actual range)	21-32 in
Frost-free period (average)	81 days
Freeze-free period (average)	128 days
Precipitation total (average)	27 in

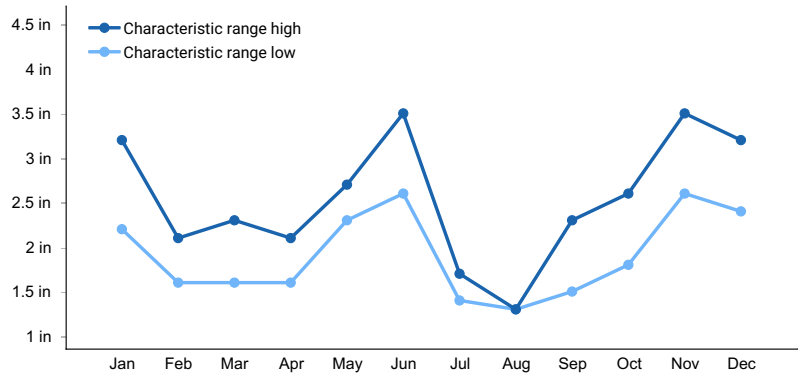


Figure 1. Monthly precipitation range

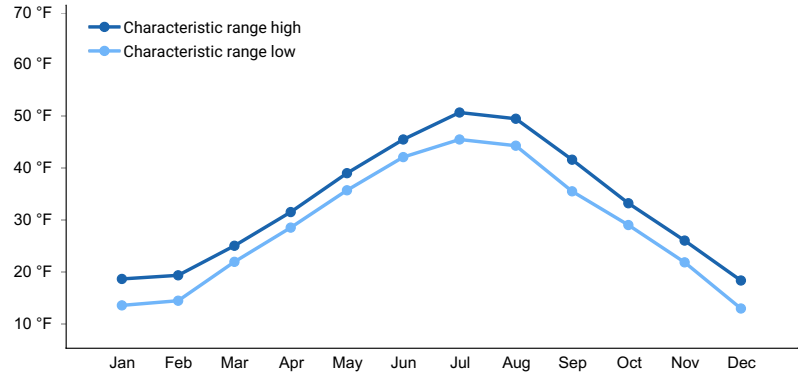


Figure 2. Monthly minimum temperature range

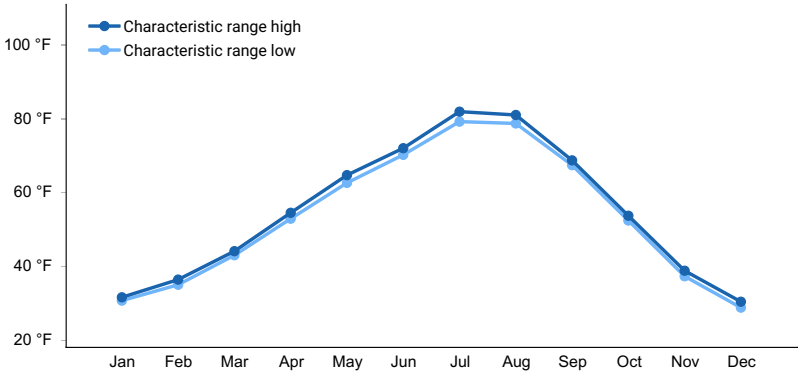


Figure 3. Monthly maximum temperature range

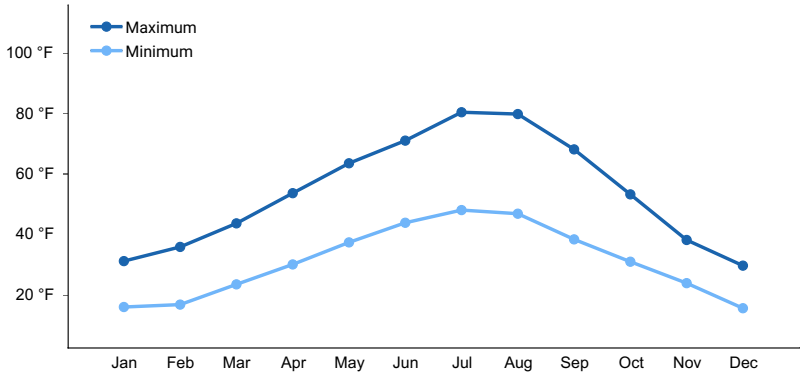


Figure 4. Monthly average minimum and maximum temperature

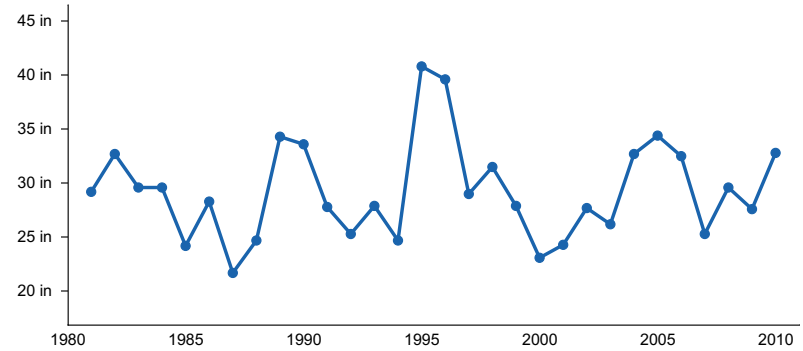


Figure 5. Annual precipitation pattern

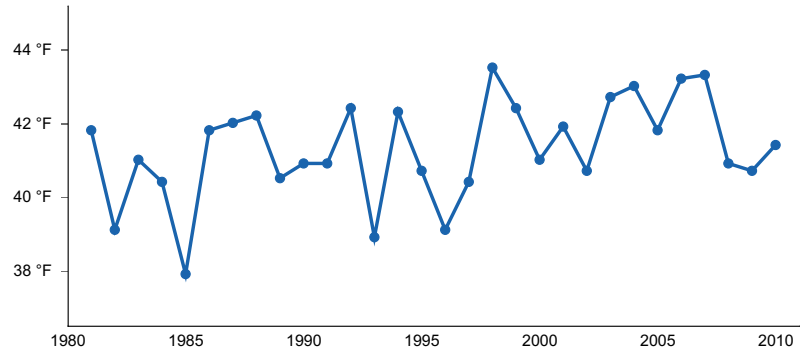


Figure 6. Annual average temperature pattern

Climate stations used

- (1) POLEBRIDGE 1 N [USC00246618], Essex, MT
- (2) WEST GLACIER [USC00248809], Kalispell, MT
- (3) HUNGRY HORSE DAM [USC00244328], Kalispell, MT
- (4) LINDBERGH LAKE [USC00245043], Seeley Lake, MT

Influencing water features

• Site does not receive additional water
NO WATER FEATURES

Wetland description

DOES NOT APPLY

Soil features

• Soils are

o Generally not limy (limited extent)
o Moderately deep, deep, or very deep
o Not ashy or medial textural family
o Typically less than 5% stone and boulder surface cover (<15% max)
• Soil surface texture ashy silt loam or cobbly ashy silt loam or gravelly ashy silt loam in surface mineral 4”
• Parent material is volcanic ash over till or colluvium
• Drainage class is well; no flooding frequency

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Till (3) Colluvium
Surface texture	(1) Ashy silt loam (2) Cobbly, ashy silt loam (3) Ashy, gravelly silt loam
Drainage class	Well drained
Soil depth	20–60 in

Ecological dynamics

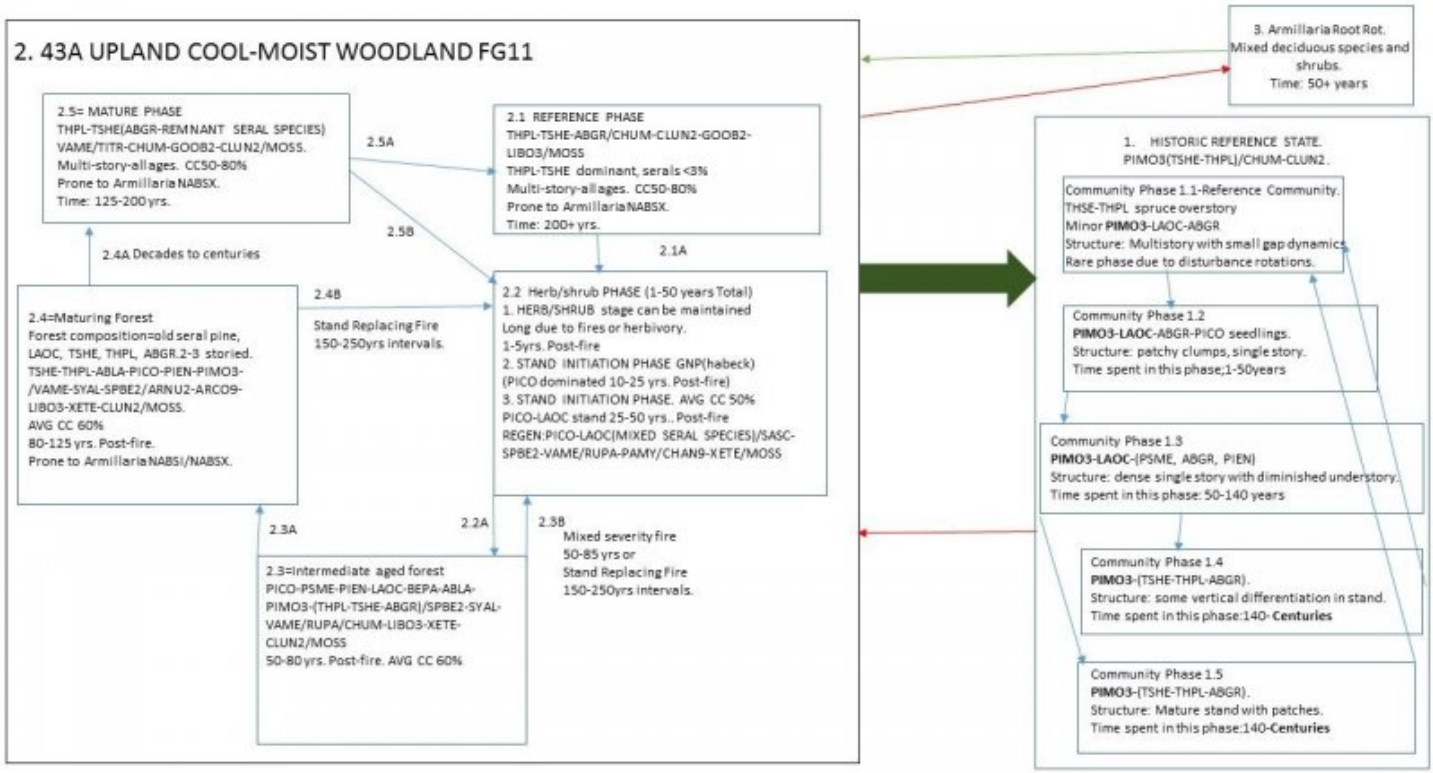
STATE 1: Historic reference state with presence of western white pine as a major seral tree species.
Community Phase 1.1: Reference phase of multi-storied forest canopy dominated by western redcedar and western hemlock.
Community Phase 1.2: Post fire disturbance community of herb and shrub species.
Community Phase 1.3: Intermediate aged forest, dense thick pole sized trees.
Community Phase 1.4: Maturing forest phase of seral tree species and western redcedar and western hemlock.
Community Phase 1.5: Mature forest with some small gap dynamics, remnant seral trees species and western redcedar and western hemlock dominant.

STATE 2: Current reference state with minor or none presence of western white pine as a seral tree species.
Community Phase 1.1: Reference phase of multi-storied forest canopy dominated by western redcedar and western hemlock.
Community Phase 1.2: Post fire disturbance community of herb and shrub species.
Community Phase 1.3: Intermediate aged forest, dense thick pole sized trees.
Community Phase 1.4: Maturing forest phase of seral tree species and western redcedar and western hemlock.
Community Phase 1.5: Mature forest with some small gap dynamics, remnant seral trees species and western redcedar and western hemlock dominant.

STATE 3: Armillaria root rot induced shrubland state.

Transition from State 1 to State 2: Substantial loss of western white pine as a major seral tree species.
Restoration from State 2 to State 1: Western white pine restored as a major seral tree species.
Transition from State 2 to State 3: Significant loss of susceptible tee species at a site due to Armillaria root rot and conversion of the forest to a shrubland.
Restoration from State 3 to State 2: Conversion of the Armillaria root rot induced shrubland to forest, generally of less susceptible seral tree species and eventually to climax tree species.

State and transition model



Animal community

WILDLIFE USES
Early seral phase has high forage potential for deer and elk, but minimal in other phases except for overwintering uses.
Livestock use is very low due to lack of palatable forage.
Areas dominated by Englemann spruce provide winter range for deer, elk and moose though livestock use is low in natural conditions.

Hydrological functions

Streamside zone residence and therefore important for streambank stability and soil stability.

Recreational uses

hunting, fishing, hiking, camping, photography

Wood products

timber products
These stands, especially in the seral stages, have very high timber productivity. Potential for even aged stand management and regenerates readily with adequate seed source.
In areas dominated by Englemann spruce, timber productivity is moderate to high and intensive management can be considered due to vigorous growth potential of trees, easy regeneration and accessibility of sites.

Other references

Hansen, Paul L. Classification and management of Montana's riparian and wetland sites. No. 54. Montana Forest and Conservation Experiment Station, School of Forestry, The University of Montana, 1995.

Pfister, Robert D., et al. "Forest habitat types of Montana." Gen. Tech. Rep. INT-GTR-34. Ogden, UT: US Department of Agriculture, Forest Service, Intermountain Forest & Range Experiment Station. 174 p. 34 (1977).

Contributors

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Approval

Kirt Walstad, 9/09/2023

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	12/18/2020
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):

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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:**
