Ecological site F046XP908MT
Upland Aspen Woodland Group

Last updated: 9/07/2023
Accessed: 05/04/2024

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): 046X–Northern and Central Rocky Mountain Foothills

The Provisional ESD Initiative was established to expedite the development of ecological site descriptions through the development of provisional ESDs. While Provisional ESDs are not complete, the intent is to produce an ESD complete enough for land managers to use while approved ESDs are being developed.

This project area has mixed ownership falling primarily under private ownership or lands managed by the Blackfeet Nation. This PES project is contained within MLRA 46. Major Land Resource Area (MLRA) 46, Rocky Mountain Foothills, is approximately 11.6 million acres. MLRA 46's extent has changed over recent years and is now primarily located in Montana and Wyoming with limited acres in Utah and Colorado. It spans from the Canadian border south to the Uinta Mountains of Northwest Colorado. MLRA 46 is a transitional MLRA between the plains and mountains of primarily non-forested rangeland. In Montana, 3 LRUs exist based on differences in geology, landscape, soils, water resources, and plant communities. Elevations for this MLRA in Montana vary from a low of 3200 to 6500 feet (975 to 1981 m) however the elevations on the fringes of this MLRA may fall outside of that range in extremely small isolated areas where the boundaries between LRU C and MLRA 43B LRU G are not easily defined. Annual precipitation ranges from 8 inches (254 mm) to, in very isolated areas, 42 inches (1083 mm). In general precipitation rarely exceeds 24 inches (610mm). Frost-free days are variable from 50 days near the Crazy and Beartooth Mountains to 130 days in the foothills south of the Bear's Paw Mtns of Central Montana. The geology of MLRA 46 is generally Cretaceous and Jurassic marine sediments

MLRA 46's plant communities are dominated by cool season bunchgrasses with mixed shrubs. This MLRA is rarely forested however Ponderosa and limber pine do occupy areas. Portions of this MRLA may have a sub dominance of warm season mid-statured bunchgrasses like little bluestem, however the general concept of the MLRA does not have a large component of warm season species. Wyoming big sagebrush, Mountain big sagebrush, silver sagebrush, and shrubby cinquefoil tend to be the dominant shrub component. The kind and presences of shrubs tends to be driven by a combination of soils and climate. Due to the variable nature of the Land Resources Units, Climatic subsets will be necessary to describe the ecological sites and the variation of plant communities for this MLRA.

Ecological site concept

• Site does not receive any additional water
• Dominant Cover: Deciduous Forest
• Soils are
o Generally not saline or saline-sodic (limited extent)
o Moderately deep, deep, or very deep
o Typically less than 5% stone and boulder cover (<15% max)
• Soil surface texture ranges from sandy loam to clay loam in surface mineral 4”
• Parent material is alluvium
• Site landforms: Hillslopes

• Transitional area of foothills separating plains and mountains
• Moisture Regime: ustic
• Temperature Regime: frigid to cryic
• Elevation Range: 3500-5800
• Slope: 5-15%

Associated sites

F046XP911MT	**Upland Warm Woodland Group** The Upland Warm Woodland shares landscape position with the Upland Aspen Woodland

Similar sites

F043BP908MT	**Upland Aspen Woodland Group** The Upland Aspen Woodland sites in 43B are similarly structured however have distinctly different vegetation communities

Table 1. Dominant plant species

Tree	(1) *Populus tremuloides*
Shrub	(1) *Symphoricarpos albus*
Herbaceous	(1) *Elymus glaucus* (2) *Achnatherum nelsonii*

Physiographic features

The Upland Aspen Woodland site exists on nearly level to steep hillslopes on glacial till.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Swale (2) Foothills > Rotational slide (3) Foothills > Hillslope > Slip face
Elevation	3,500–5,800 ft
Slope	5–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is trends toward the highest in the MLRA with an average of 19 inches of annual precipitation. The frost-free days tend to be low with an average of 63; however, portions of this site can receive as many as 110 frost-free days. This combination of high precipitation and cool weather create a highly productive site dominated by cool-season tall grasses.

Table 3. Representative climatic features

Frost-free period (characteristic range)	39-92 days
Freeze-free period (characteristic range)	97-121 days
Precipitation total (characteristic range)	15-24 in
Frost-free period (actual range)	21-104 days
Freeze-free period (actual range)	89-127 days
Precipitation total (actual range)	13-26 in
Frost-free period (average)	63 days
Freeze-free period (average)	109 days

Precipitation total (average)	19 in

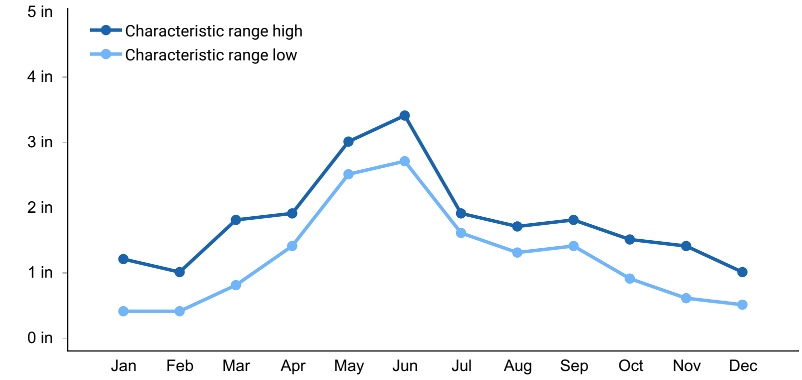


Figure 1. Monthly precipitation range

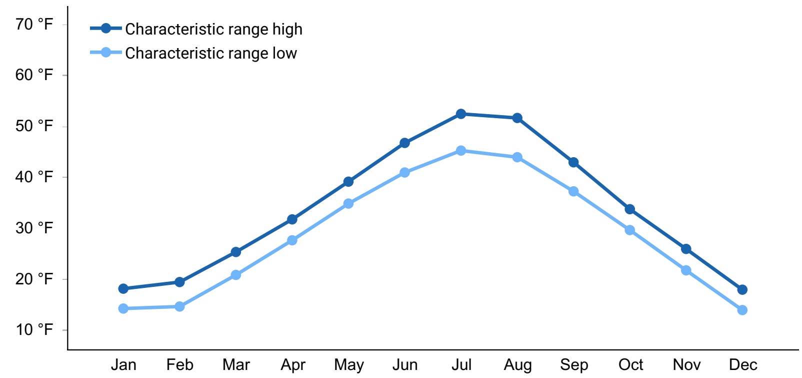


Figure 2. Monthly minimum temperature range

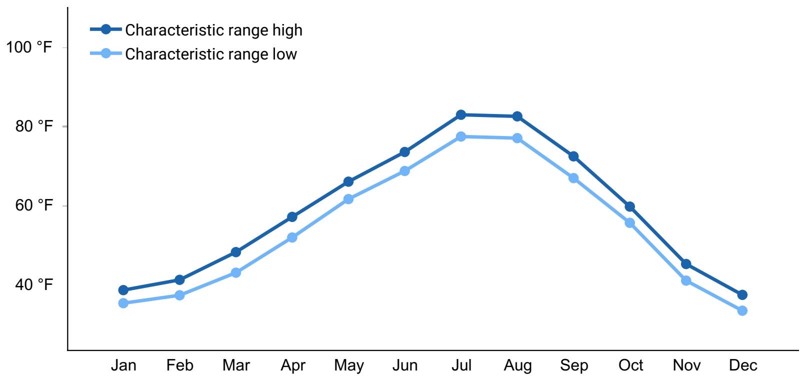


Figure 3. Monthly maximum temperature range

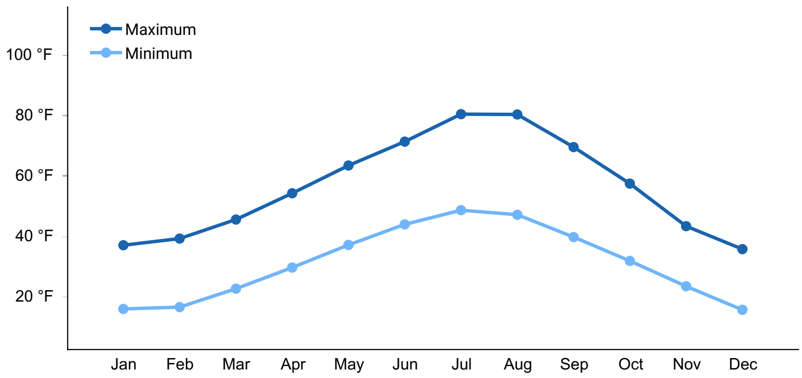


Figure 4. Monthly average minimum and maximum temperature

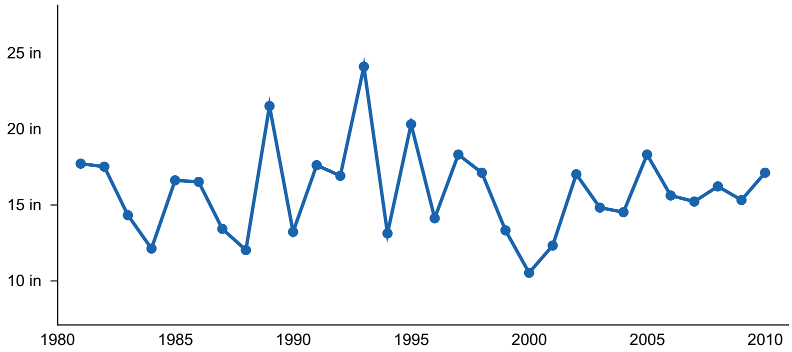


Figure 5. Annual precipitation pattern

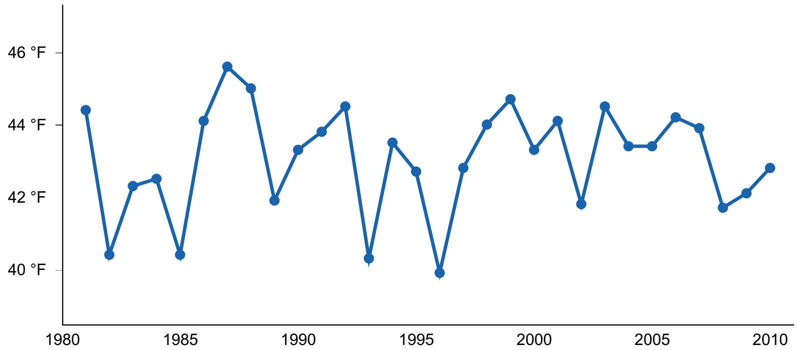


Figure 6. Annual average temperature pattern

Climate stations used

- (1) AUGUSTA [USC00240364], Augusta, MT
- (2) EAST GLACIER [USC00242629], East Glacier Park, MT
- (3) ST. MARY 1 SSW [USW00004130], Babb, MT
- (4) BABB 6 NE [USC00240392], Babb, MT
- (5) CASCADE 20 SSE [USC00241557], Cascade, MT
- (6) SHONKIN 7 S [USC00247540], Highwood, MT
- (7) STANFORD [USC00247864], Stanford, MT
- (8) MARTINSDALE 3 NNW [USC00245387], Martinsdale, MT
- (9) BIG TIMBER [USC00240780], Big Timber, MT
- (10) NYE 2 [USC00246190], Fishtail, MT

Influencing water features

Site does not typically receive extra water. In some situations, particularly those involved in slide areas, small depressions may exist where water may accumulate. Some situations also exist where increase in clay content and/or compaction as a result of glaciation can slow infiltration of water however site will not exhibit classic wetland characteristics.

Soil features

Soils on the Aspen Woodland site are often deep and dark due to their high organic matter content. Soils of this site are often classified as Mollisols. Soil textures are loam to clay loam with varying levels for rock fragments throughout the profile. Clay content typically increase with depth and may influence drainage class though the site is considered well drained.

Table 4. Representative soil features

Parent material	(1) Till–sedimentary rock

Surface texture	(1) Cobbly loam (2) Clay loam (3) Stony loam (4) Gravelly loam
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	20–100 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	4.7–7.9 in
Soil reaction (1:1 water) (0-20in)	5.6–7.8
Subsurface fragment volume <=3" (0-20in)	0–20%
Subsurface fragment volume >3" (0-20in)	0–35%

Ecological dynamics

1.1 Aspen community mature. Shade-tolerant conifers may be present in understory. Herbaceous understory of blue and Canada wildrye, multiple sedges, pinegrass (limited). THOC, arnica, sweet cicely, fleabanes common
1.1a – Insects, disease and/or drought reduce aspen canopy. Herbaceous understory from 1.1 increase. Aspen cloning may occur as a result of increased light accessing understory
1.1b – Stand reducing fire and/or timber harvesting removes most of canopy. Aspen sprouting occurs. Forbs typically respond first to open canopy with grasses following.

1.2 Aspen canopy is reduced significantly due to disease or drought. Herbaceous component increases in productivity. Grasses tend to dominate. Some aspen cloning occurs due to increased light accessing lower canopies.
1.2a Time and proper grazing allow for aspen to increase in size

1.3 Young aspen clones increase dramatically as overstory is mostly gone. Some forbs may “colonize” quickly
1.3a Time and Proper grazing allow for aspen to increase in size. Many of the smaller aspen clones fail with stronger surviving beyond saplings.

1.4 Young aspens increase in size and canopy begins to close in overstory canopy. Herbaceous component reduces slightly
1.4a Time and proper grazing allow for aspen to increase in size

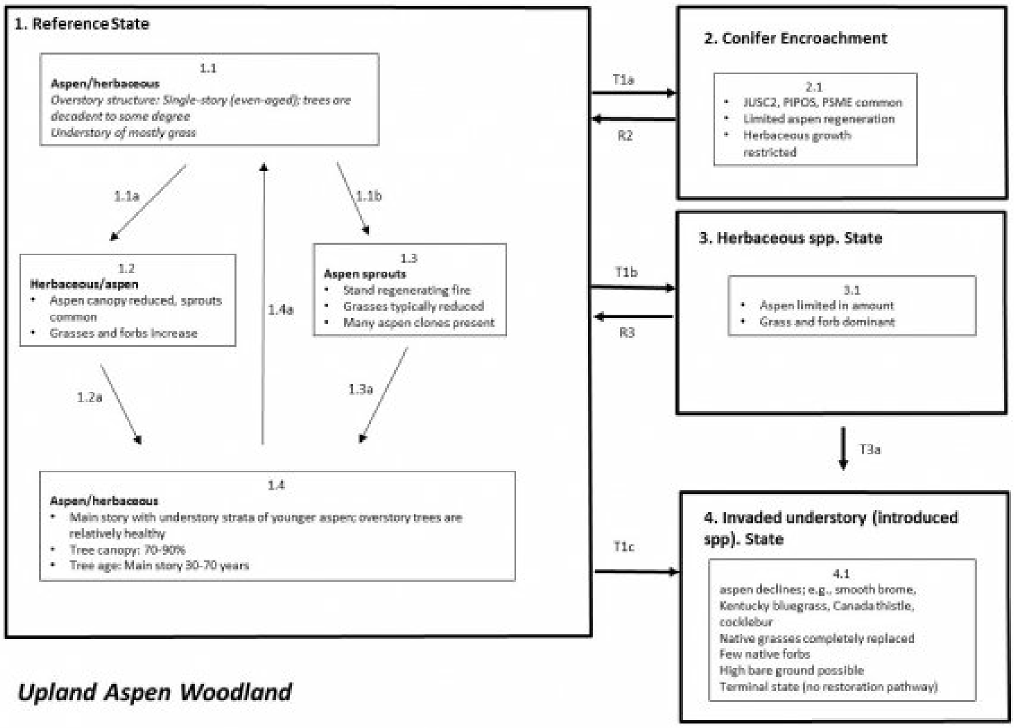
T1a – Fire suppression, improper grazing
2.1 Fire suppression and overgrazing (both wildlife and livestock) promote conifer encroachment. JUSC2, PSME, PIPOS, and limited PIAL present. Herbaceous production reduced. Aspen clones nonexistent.
R2 Grazing management rest suggested. Removal of coniferous trees. Prescribed fire triggers aspen regeneration

T1b Improper grazing management, Fire Suppression
3.1 Long term overgrazing by livestock and wildlife have reduced understory aspen and herbaceous diversity is typically reduced to few species.
R3 Prescribed grazing and time allow for aspen regeneration (temporary exclusion of herbivores may be necessary). Prescribed fire may reduce competitive herbaceous component and allow for aspen regeneration

T1c Improper grazing management, catastrophic fire
T3a Improper grazing management, catastrophic fire
4.1 Long term overgrazing by livestock and wildlife have reduced understory aspen and herbaceous diversity is

typically reduced to few species. Noxious and other invasive weeds take advantage of open spaces in invade. This is a terminal state as control measure normally do not exist. Aspen stand will likely stall in condition and regeneration fails.

State and transition model



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Animal community

Site offers livestock and wildlife forage as well as habitat for multiple wildlife species

Recreational uses

Site offers landscape and viewshed opportunities as well as hunting, hiking, and camping uses.

Wood products

Aspen site offers lumber for furniture and decorations.

Inventory data references

Information presented was derived from NRCS inventory data, National Resources Inventory (NRI) Data, literature, field observations, and personal contacts with range-trained personnel (i.e., used professional opinion of agency specialists, observations of land managers, and outside scientists).

Other references

Barrett, H. 2007. Western Juniper Management: A Field Guide.
Bestelmeyer, B., J.R. Brown, J.E. Herrick, D.A. Trujillo, and K.M. Havstad. 2004. Land Management in the American Southwest: a state-and-transition approach to ecosystem complexity. Environmental Management 34:38–51.
Bestelmeyer, B. and J. Brown. 2005. State-and-Transition Models 101: A Fresh look at vegetation change.
Blaisdell, J.P. 1958. Seasonal development and yield of native plants on the Upper Snake River Plains and their relation to certain climate factors.
Colberg, T.J. and J.T. Romo. 2003. Clubmoss effects on plant water status and standing crop. Journal of Range Management 56:489–495.
DiTomaso, J.M. 2000. Invasive weeds in Rangelands: Species, Impacts, and Management. Weed Science 48:255–265.
Dormaar, J.F., B.W. Adams, and W.D. Willms. 1997. Impacts of rotational grazing on mixed prairie soils and vegetation. Journal of Range Management 50:647–651.
Hobbs, J.R. and S.E. Humphries. 1995. An integrated approach to the ecology and management of plant invasions. Conservation Biology 9:761–770.
Humphrey, L. David. 1984. Patterns and mechanisms of plant succession after fire on Artemisia-grass sites in southeastern Idaho Vegetation. 57: 91-101.
Masters, R. and R. Sheley. 2001. Principles and practices for managing rangeland invasive plants. Journal of Range Management 38:21–26.
McLean, A. and S. Wikeem. 1985. Influence of season and intensity of defoliation on bluebunch wheatgrass survival and vigor in southern British Columbia. Journal of Range Management 38:21–26.
Miller, R.F., T.J. Svejcar, and J.A. Rose. 2000. Impacts of western juniper on plant community composition and structure. Journal of Range Management 53:574–585.
Ross, R.L., E.P. Murray, and J.G. Haigh. July 1973. Soil and Vegetation of Near-pristine sites in Montana.
Smoliak, S., R.L. Ditterlin, J.D. Scheetz, L.K. Holzworth, J.R. Sims, L.E. Wiesner, D.E. Baldridge, and G.L. Tibke. 2006. Montana Interagency Plant Materials Handbook.
Stavi, I. 2012. The potential use of biochar in reclaiming degraded rangelands. Journal of Environmental Planning and Management 55:1–9.
Stringham, T.K., W.C. Kreuger, and P.L. Shaver. 2003. State and Transition Modeling: an ecological process approach. Journal of Range Management 56:106–113.
Stringham, T.K. and W.C. Krueger. 2001. States, Transitions, and Thresholds: Further refinement for rangeland applications.
Tirmenstein, D. 1999. Gutierrezia sarothrae. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). https://www.fs.fed.us/database/feis/plants/shrub/gutsar/all.html [2022, March 30].
Walker, L.R. and S.D. Smith. 1997. Impacts of invasive plants on community and ecosystem properties. Pages 69–86 in Assessment and management of plant invasions. Springer, New York, NY.
Whitford, W.G., E.F. Aldon, D.W. Freckman, Y. Steinberger, and L.W. Parker. 1989. Effects of Organic Amendments on Soil Biota on a Degraded Rangeland. Journal of Range Management 41:56–60.
Wilson, A.M., G.A. Harris, and D.H. Gates. 1966. Cumulative Effects of Clipping on Yield of Bluebunch wheatgrass. Journal of Range Management 19:90–91.

Contributors

Petersen, Grant

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	05/04/2024
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):

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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:**
