USDA Natural Resources Conservation Service

Ecological site F046XP909MT
Upland Cold Woodland Group

Last updated: 9/07/2023
Accessed: 05/10/2025

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): 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' (975-1981m) 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 (254mm) to, in very isolated areas, 42 inches (1083mm). 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 Mountains 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.
The Rocky Mountain Front Foothills LRU is the northernmost LRU of MLRA 46. The boundaries are the Canadian border to the north, the Rocky Mountain Front LRU of MLRA 433 (proposed) and the western extent of Continental Glaciation (MLRA 52).
The Rocky Mountain Front Foothills LRU's geology is generally sedimentary in nature. Primary geological units include Two Medicine Limestone & Sandstone, Colorado Shale, Glacial Drift (alluvium), Terrace deposits (alluvium) and St Mary River formation (mudstone). Landforms include outwash terraces, escarpments, fan remnants, valleys, hillslopes, and drainage ways. Elevations of this landscape is from 3221 feet (982m) to 6954 feet (2120m).
Well drained soils are dominate in this LRU. Most areas have 0 to 15 percent slope, while some are 15 to 30 percent mostly on the 43B boundary. Soils are Slight to Moderate Alkaline, except for small area next to mountains. Mean clay percentages are mostly above 23 percent. Primarily very deep soils 70 percent, moderately-deep and deep soils 30 percent.
The climate of this LRU is the most variable of MLRA 46's LRUs however the average of 16.9" (429mm) follows the typical MLRA concept. The major difference between this LRU and the others of MLRA 46 is the Chinook wind. These winds create massive temperature swings in the winter which can melt snow cover and initiate bud growth on

shrubs. These changes may dry soil affecting plant production and species composition. The Rocky Mountain Front Foothills receives 10 inches (247 mm) to 42 inches (1083 mm) annually. The average air temperature ranges from 36 degrees F (2.39 degrees C) to 46 degrees F (8.02 degrees C). The soil temperature regime is frigid with a soil moisture regime dominated by Ustic with areas of Udic. Frost free days is from 70 to 100 days.
The vegetation potential for the Rocky Mountain Front Foothills LRU can be variable but is dominated by rangeland. Forested extents are typically minimal and consist primarily of limber pine, Ponderosa pine, and Rocky Mountain juniper with mixed grassland. The rangeland of this LRU follows the general concept of the MLRA. The dryer sites are dominated by bluebunch wheatgrass and as the precipitation increases and temperatures decrease rough fescue increase. In areas that receive the highest precipitation, Richardson's needlegrass may exist. Shrub cover is limited in this area and is generally silver sagebrush and shrubby cinquefoil with areas of chokecherry and buffaloberry (both Russet and silver). The glacial drift areas will often have wetland associated vegetation as well as large areas of quaking aspen.

Ecological site concept

• Site does not receive any additional water
• Dominant Cover: Coniferous 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"
• Transitional area of foothills separating plains and mountains
• Site Landform: Hillslope, escarpments
• Moisture Regime: ustic
• Temperature Regime: cryic
• Elevation Range: 4800-5800
• Slope: 0-60% (typically less than 25%)

Associated sites

F046XP902MT	**Shallow Cold Woodland Group** The Shallow Cold Woodland is typically located nearby and often slightly higher on the landscape on the shoulder of the landform.

Similar sites

F046XP902MT	**Shallow Cold Woodland Group** The Shallow Cold Woodland is typically located nearby and often slightly higher on the landscape on the shoulder of the landform. The Shallow Cold site exhibits a similar plant community with a similar STM

Table 1. Dominant plant species

Tree	(1) *Pseudotsuga menziesii* (2) *Pinus contorta*
Shrub	(1) *Symphoricarpos albus* (2) *Shepherdia canadensis*
Herbaceous	(1) *Calamagrostis rubescens* (2) *Elymus glaucus*

Physiographic features

The Upland Cold Woodland is an upland site that occupies steeper buttes and escarpments on igneous or sedimentary parent materials. Slopes are variable from nearly level to over 45 percent. The site is less than 20 inches deep to lithic or paralithic root restriction. Sites are generally located on the shoulder or summit of buttes, escarpments, and hills.

Table 2. Representative physiographic features

Hillslope profile	(1) Shoulder (2) Summit
Landforms	(1) Foothills > Butte (2) Foothills > Escarpment (3) Foothills > Hill
Elevation	4,800–5,800 ft
Slope	0–60%
Aspect	NW, N, NE, E

Climatic features

The climate in the cold woodland designation averages 19 inches of precipitation with approximately 50 frost-free days. These averages are amongst the coldest and wettest within this MLRA.

Table 3. Representative climatic features

Frost-free period (characteristic range)	28-70 days
Freeze-free period (characteristic range)	95-112 days
Precipitation total (characteristic range)	16-20 in
Frost-free period (actual range)	17-76 days
Freeze-free period (actual range)	88-120 days
Precipitation total (actual range)	15-24 in
Frost-free period (average)	50 days
Freeze-free period (average)	105 days
Precipitation total (average)	19 in

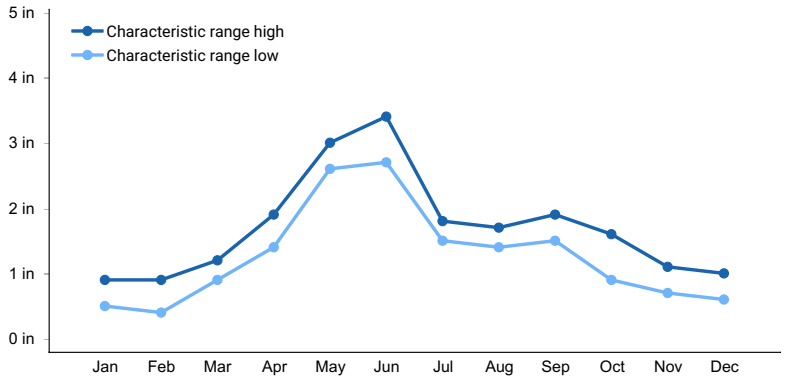


Figure 1. Monthly precipitation range

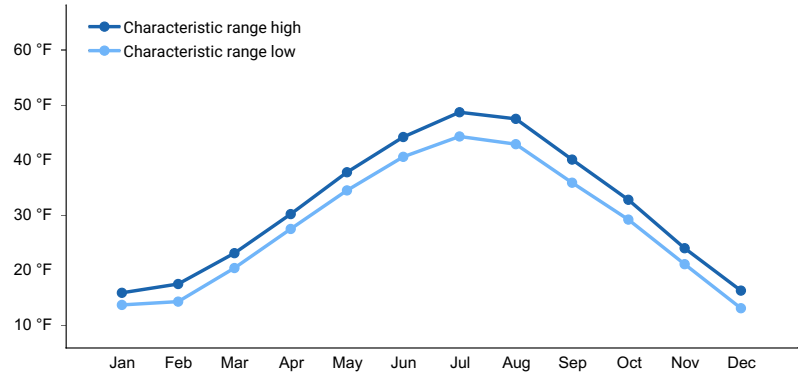


Figure 2. Monthly minimum temperature range

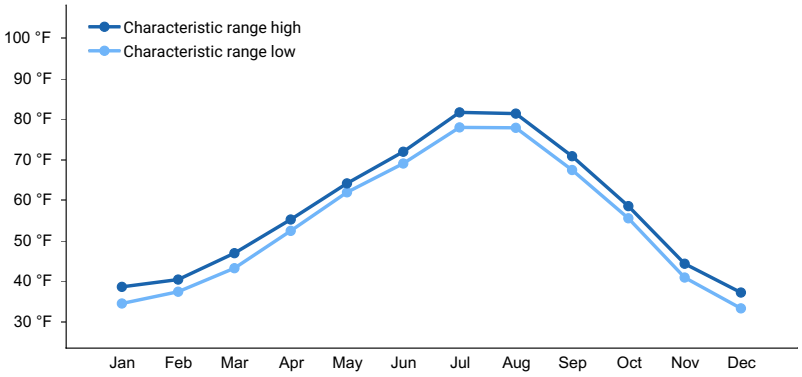


Figure 3. Monthly maximum temperature range

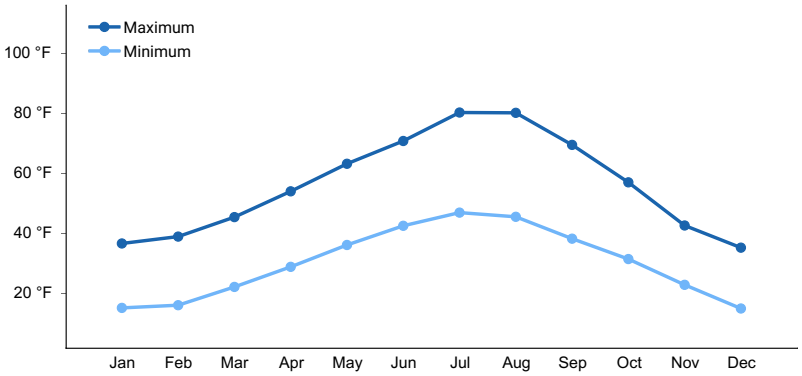


Figure 4. Monthly average minimum and maximum temperature

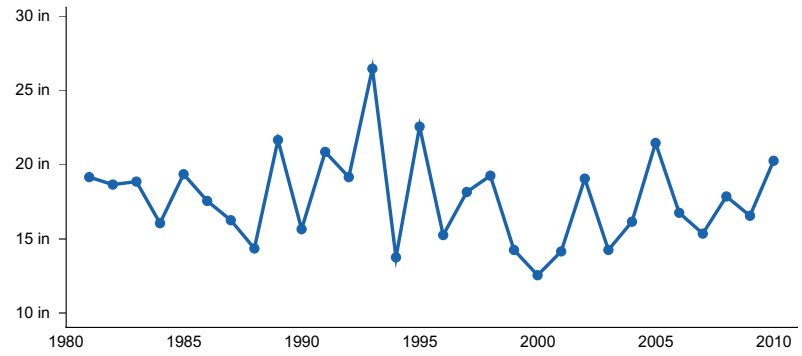


Figure 5. Annual precipitation pattern

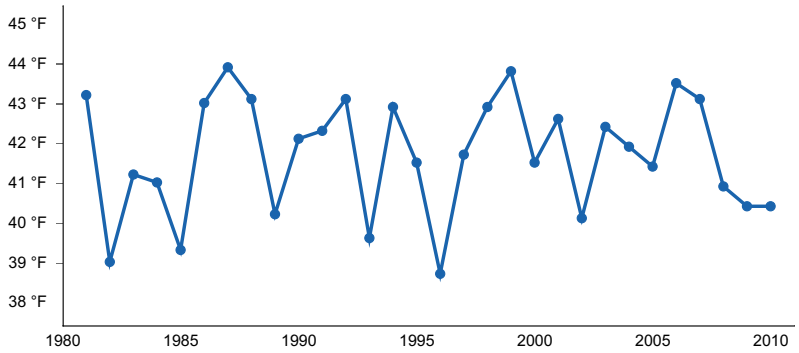


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ST MARY [USC00247292], Babb, MT
- (2) BABB 6 NE [USC00240392], Babb, MT
- (3) CASCADE 20 SSE [USC00241557], Cascade, MT
- (4) NYE 2 [USC00246190], Fishtail, MT
- (5) ROGERS PASS 9 NNE [USC00247159], Wolf Creek, MT

Influencing water features

n/a

Wetland description

n/a

Soil features

Soils of the Upland Cold Woodland are moderately deep to deep with a minimum of 20 inches deep to lithic or paralithic root restrictive layer. Soils will often have high amounts of rock fragments throughout the profile, generally increasing with depth. Soils are well drained with often less than 20 percent clay in the surface 4 inches.

Common soil series include Babb, Elve, and Whitore

Table 4. Representative soil features

Parent material	(1) Residuum–volcanic and sedimentary rock
Surface texture	(1) Cobbly loam (2) Gravelly loam (3) Stony loam
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Depth to restrictive layer	20–100 in
Soil depth	20–100 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	3.1–6.5 in
Soil reaction (1:1 water) (0-10in)	6.1–7.3

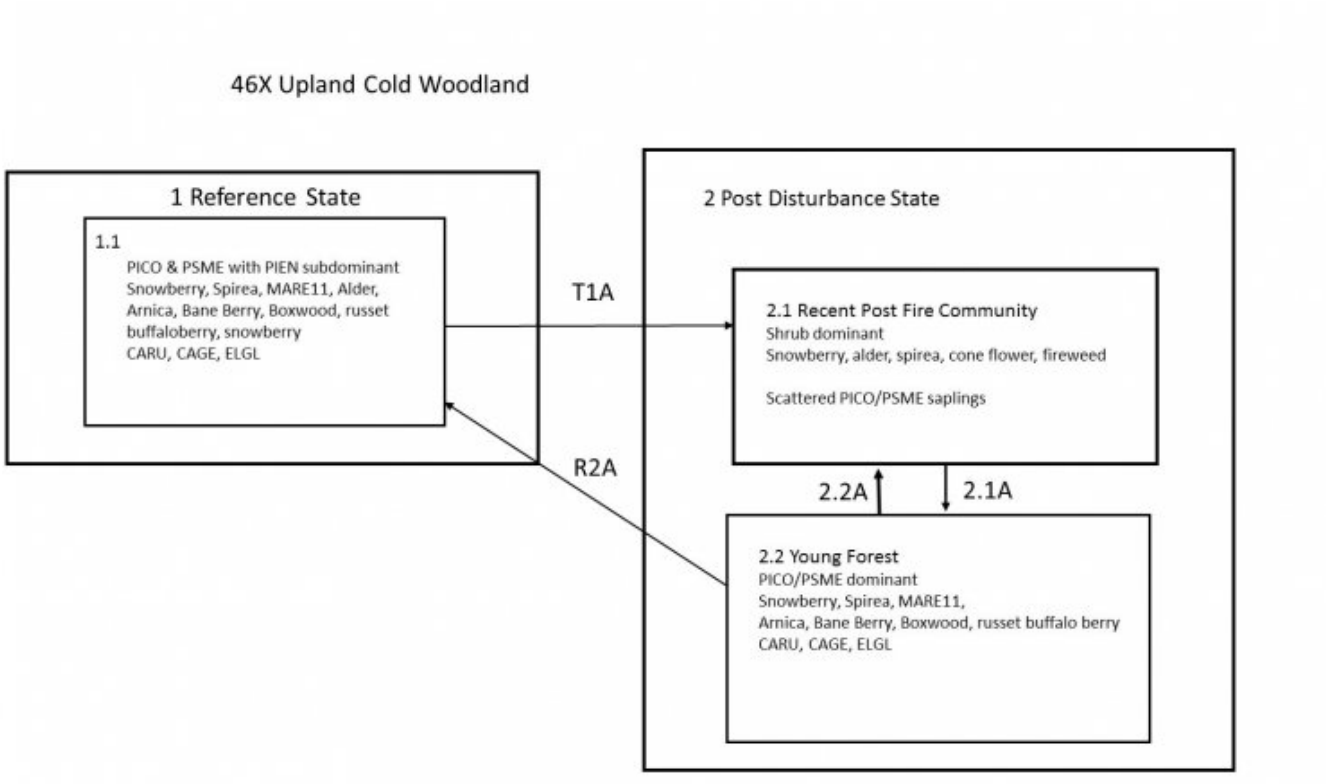
Subsurface fragment volume <=3" (0-20in)	0–65%
Subsurface fragment volume >3" (0-20in)	0–15%

Ecological dynamics

1.1 Douglas fir and lodgepole pine with understory of primarily forbs, shrubs and limited grasses. Community relatively resilient.
T1A Post disturbance includes stand replacement fire, insect pestilence and disease. Fire frequency is long but fire is intense.
2.1 Post fire shrub dominant community with saplings of lodgepole being common. Fireweed dominant forb. Grasses may increase outside of fireweed patches
2.1A Time where trees start to re-establish
2.2A Community phase shift is due to fire, insect pestilence and disease. Fire frequency is long but fire is intense.
2.2 Post Fire forest dominated by lodgepole pine with Douglas fire and Englemann spruce increasing. Shrubs and grasses returning to pre-fire positions.

R2A Restoration pathway where the site, over time, without fire, insect pestilence, or disease moves back to the reference state. Subalpine fir comes back in and shades out the other tree species.

State and transition model



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Animal community

Site poor for livestock suitability. Site provides multiple opportunities for wildlife species.

Recreational uses

Site suitable for multiple recreational uses including hunting, hiking, camping, landscape viewing, and photography.

Wood products

Site provides offers suitable timber harvest, post-and-pole operations, and firewood gathering.

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

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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	05/10/2025
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):**

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:**

17. **Perennial plant reproductive capability:**