

## **Ecological site F046XP902MT Shallow Cold Woodland Group**

Last updated: 9/07/2023  
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### **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, three 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 feet to 6500 feet (975 to 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 MLRA 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 43B 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 and 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 inches (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 Mtn Front Foothills receives 10 inches (247mm) to 42 inches (1083mm) 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

- Dominant Cover: Coniferous Forest
- Site does not receive any additional water
- Soils are
  - o Not saline or saline-sodic
  - o Not strongly or violently effervescent within surface mineral 4"
  - o Soil is shallow (less than 20in (50cm) to bedrock, lithic, or paralithic root restriction)
  - o Soil is not ashy or medial textural family
  - o Stones and/or boulders cover <15% surface area or fragmental textural class
- Soil surface texture variable
- Site Landform: hillslope, escarpment, butte
- Transitional area of foothills separating plains and mountains
- Parent material is residuum and/or colluvium
- Moisture Regime: ustic
- Temperature Regime: cryic
- Elevation Range: 4800-5800
- Slope: 0-60% (typically less than 25%)

Associated sites

F046XP909MT	<b>Upland Cold Woodland Group</b> The Upland Cool Woodland is often a neighboring site sharing the same general location on the landscape
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Similar sites

F046XP909MT	<b>Upland Cold Woodland Group</b> The Upland Cool Woodland expresses a similar forest however generally produces more amounts of trees and understory growth.
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Table 1. Dominant plant species

Tree	(1) <i>Pseudotsuga menziesii</i> (2) <i>Pinus contorta</i>
Shrub	(1) <i>Symphoricarpos albus</i> (2) <i>Spiraea betulifolia</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Festuca campestris</i>

Physiographic features

The Shallow 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**

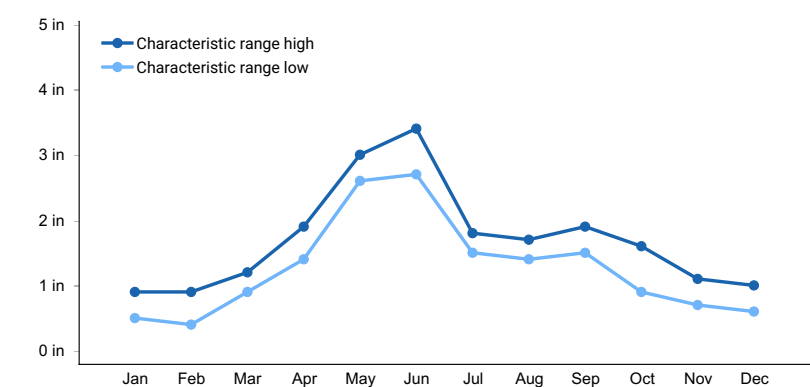
Hillslope profile	(1) Shoulder (2) Summit
Landforms	(1) Foothills > Butte (2) Foothills > Escarpment (3) Foothills > Hill
Elevation	4,800–5,800 ft
Slope	0–60%
Aspect	NW, N, NE, E

## 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**

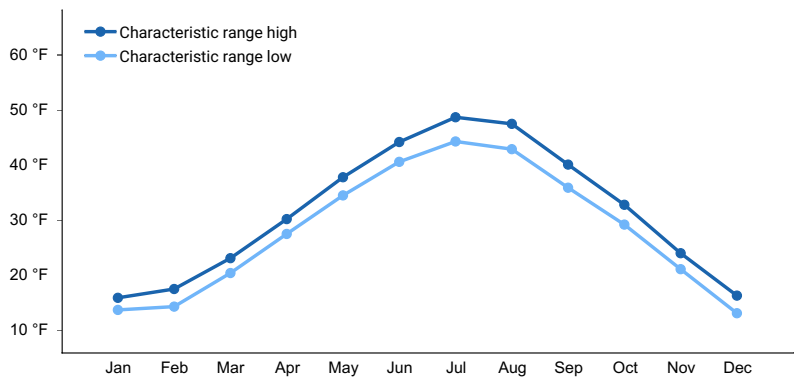


Figure 2. Monthly minimum temperature range

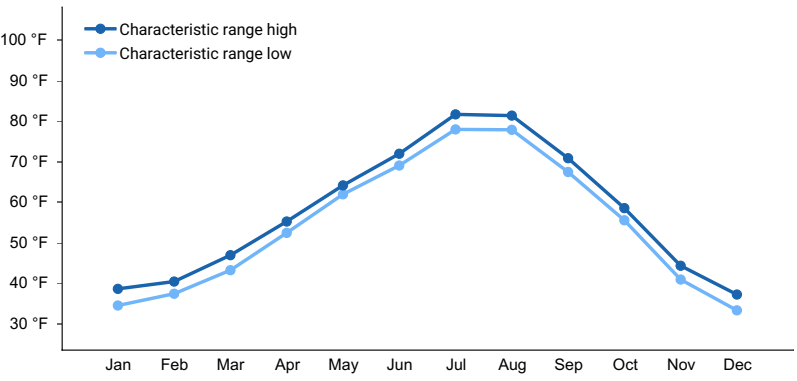


Figure 3. Monthly maximum temperature range

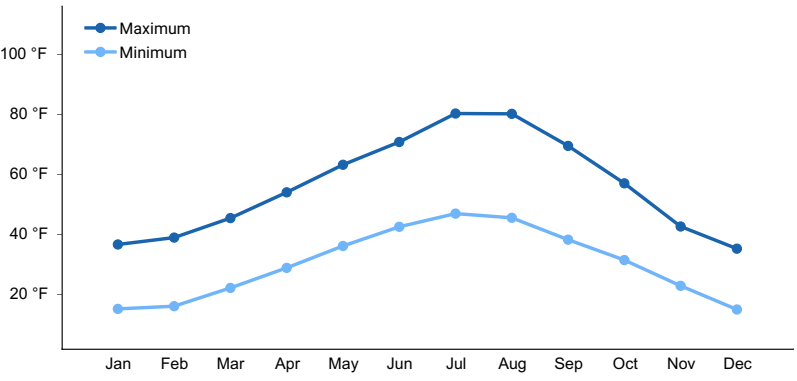


Figure 4. Monthly average minimum and maximum temperature

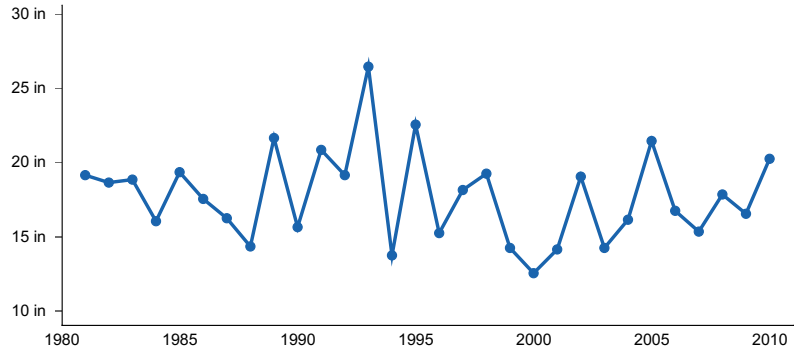


Figure 5. Annual precipitation pattern

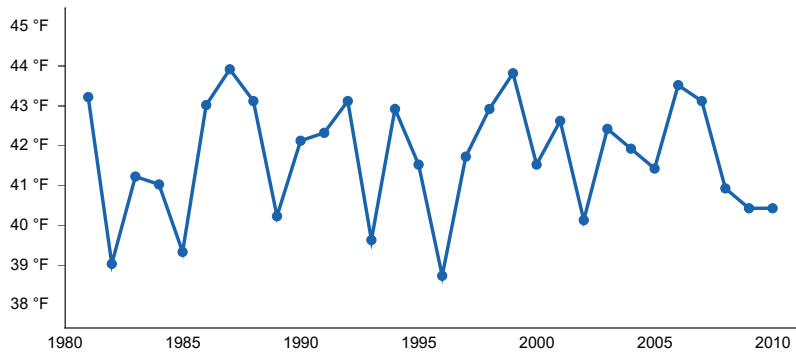


Figure 6. Annual average temperature pattern

### 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

Site not influenced by water features

### Soil features

Soils of the Shallow Cold Woodland are 10 to 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 Cheadel, Melville, and Whitlash.

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	10–20 in
Soil depth	10–20 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-20in)	0.8–2.1 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 dominated forest with minor components of Lodgepole (and extremely limited Ponderosa). Grasses and sedges tend to be limited. Forbs and shrubs dominate understory canopy.

T1A Post Disturbance includes stand replacement fire, insect pestilence and disease. Fire frequency is long but fire is intense.

2.1 Shrub dominant condition post disturbance. Saplings of multiple trees present. Forbs increase in composition particularly colonizing species like fireweed

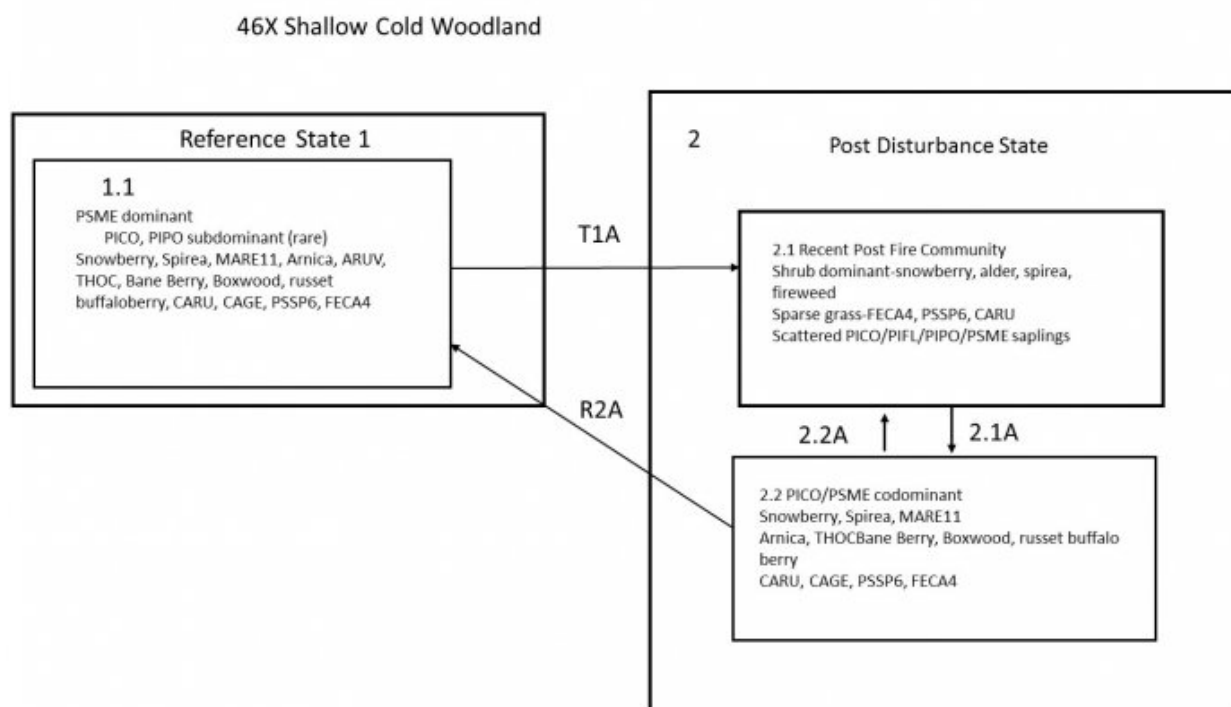
2.1A Time where trees start to re-establish

2.2 Lodgepole dominant community with saplings of Douglas fir and extremely minor Ponderosa component

2.2A Community phase shift is due to fire, insect pestilence and disease. Fire frequency is long but fire is intense.

R2A Restoration pathway where the site, over time, without fire, insect pestilence, or disease moves back to the reference state. Douglas fir comes back in and shades out the other tree species. This process can take many years.

## State and transition model



1.1 Douglas Fir dominated forest with minor components of Lodgepole (and extremely limited Ponderosa). Grasses and sedges tend to be limited. Forbs and shrubs dominate understory canopy.

T1A Post Disturbance includes stand replacement fire, insect pestilence and disease. Fire frequency is long but fire is intense.

2.1 Shrub dominant condition post disturbance. Saplings of multiple trees present. Forbs increase in composition particularly colonizing species like fireweed

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## **Animal community**

Site is marginal to good forage for livestock. Site offers good to excellent forage and habitat for wildlife.

## **Recreational uses**

Multiple recreation opportunities available including hunting, hiking, landscape/viewshed, and photography.

## **Wood products**

Lumber, post-and-pole, and firewood operation options available.

## **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. Baldrige, 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	05/11/2025
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):

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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:**
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17. **Perennial plant reproductive capability:**
-