USDA Natural Resources Conservation Service

Ecological site F043BP912MT
Limy Cool Woodland Group

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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): 043B–Central Rocky Mountains

The Central Rocky Mountains (MLRA 43B) of Montana occupy some 28,850 square miles and exist primarily in Central and SW portions of the state. The climate is extremely variable with precipitation lows of 9 to 100 inches per year and frost free days of less than 30 to over 110 days. The geology of the region is also highly variable. The combination of variable climate and geology create a complex relationship of plant communities. MLRA 43B elevations typically exist between 6000 and 12,799ft at Granite Peak (the highest point in Montana).

The Continental Divide runs through this MLRA effectively splitting its watershed to contribute to either the Missouri River to the East and the Columbia River to the West.

Ecological site concept

• Site does not receive any additional water
• Dominant Cover: Coniferous Forest
• Soils are
o Not saline or saline-sodic
o Strongly or violently effervescent ($CaCO_3$ >15%) in surface mineral 18cm
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”
• Site Landform: mountain slope, ridges, cirques, escarpments
• Area of rugged mountain, hills, plateaus, and valleys of the Central Rocky Mountains in Southwest Montana.

• Moisture Regime: ustic to udic
• Temperature Regime: cryic to frigid
• Elevation Range: 4800-8850ft
• Slope: 0-60 (typically less than 35%)

Site Development and Testing Plan
This Provisional Ecological Site Description was developed to meet the criteria as defined in Soil Survey National Instruction part 306 (430-306-NI, April 2015) as interpreted by Regional Ecological Site Specialist. Information in this description are first approximations based on broad groupings of soil properties and vegetation characteristics associated with those groupings. Although this description has been through the quality control and quality assurance review process it has not been certified for use in conservation planning.

Associated sites

R043BP804MT	**Limy Grassland Group** The Limy Grassland tends to exist on the same or similar landscape position as the Limy Cool Woodland. The two sites have distinctly different plant communities and ecological processes
R043BP805MT	**Limy Sagebrush Shrubland Group** The Limy Sagebrush Shrubland tends to exist on the same or similar landscape position as the Limy Cool Woodland. The two sites have distinctly different plant communities and ecological processes

Similar sites

F043BP910MT	**Upland Cool Woodland Group** The Upland Cool Woodland and the Limy Cool Woodland have significant species overlap and share similar state and transition models. The amounts of species varies and the Limy Cool Woodland tends to be a slower growing system that produces overall lower amounts of plant biomass.

Table 1. Dominant plant species

Tree	(1) *Pseudotsuga menziesii* (2) *Pinus contorta*
Shrub	(1) *Symphoricarpos albus* (2) *Juniperus communis*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Arnica*

Physiographic features

Site exists on mountain slopes, ridges, and escarpments. Slopes vary from nearly level to 60 percent with dominant slopes rarely exceeding 35 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Hillside or mountainside (2) Mountains > Ridge (3) Mountains > Escarpment (4) Mountains > Cirque
Runoff class	Negligible to low
Flooding frequency	None
Elevation	4,800–8,850 ft
Slope	0–60%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The site is located within frigid, cool to cryic temperature regime in the typic ustic to udic moisture regime. Relative Effective Annual Precipitation is quite variable ranging from 17 to 40 inches. Frost-free days are 30 to 80 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	8-56 days
Freeze-free period (characteristic range)	42-103 days
Precipitation total (characteristic range)	18-26 in
Frost-free period (actual range)	3-78 days
Freeze-free period (actual range)	40-109 days
Precipitation total (actual range)	12-30 in
Frost-free period (average)	50 days
Freeze-free period (average)	90 days
Precipitation total (average)	26 in

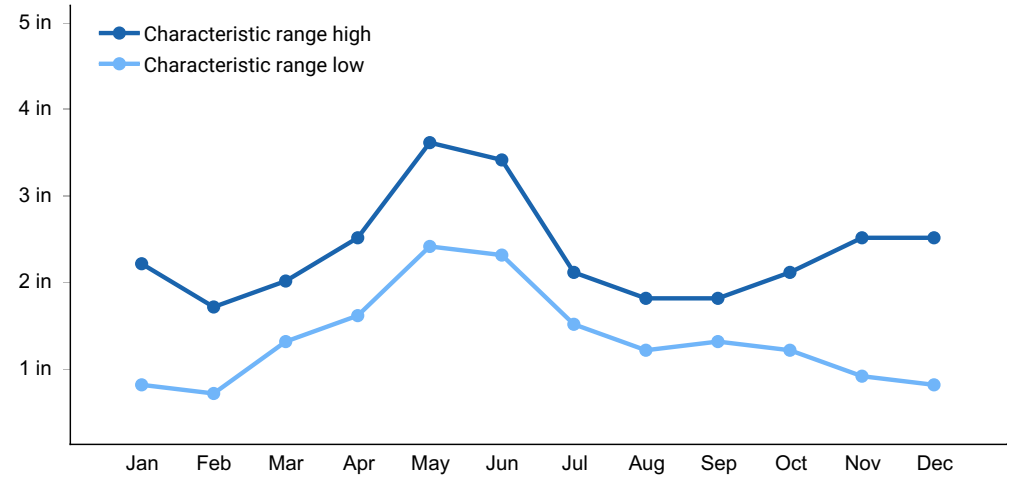


Figure 1. Monthly precipitation range

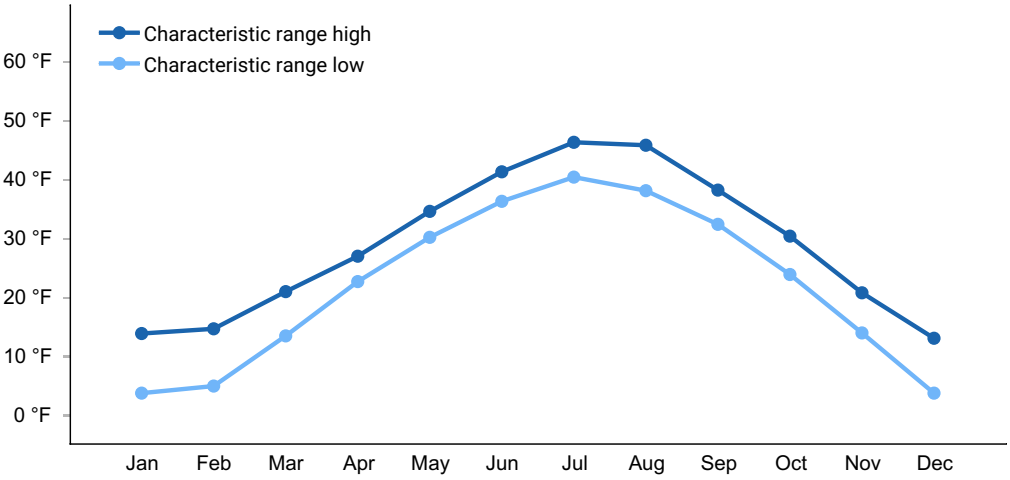


Figure 2. Monthly minimum temperature range

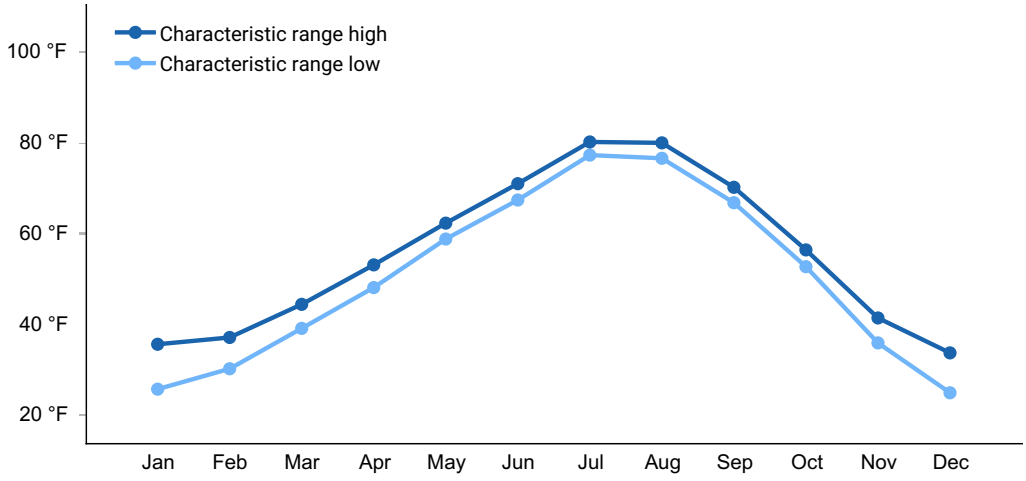


Figure 3. Monthly maximum temperature range

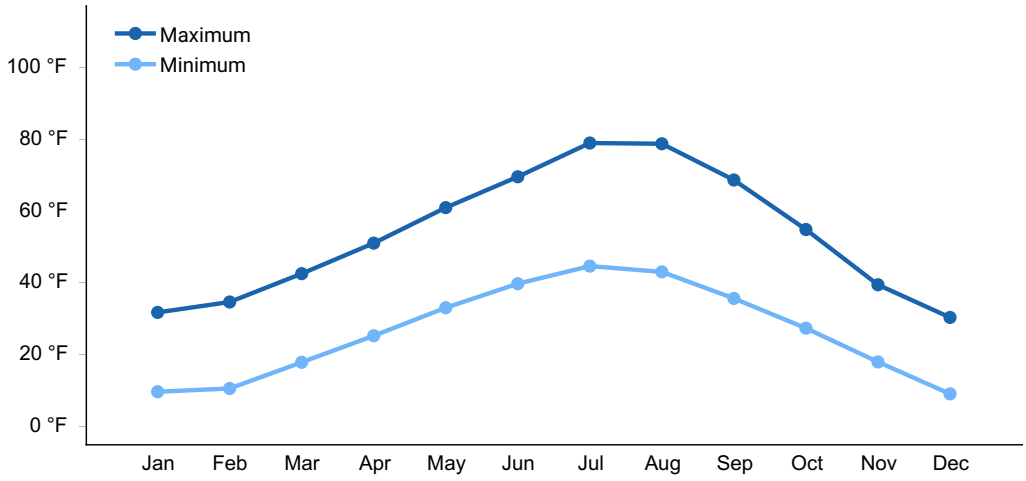


Figure 4. Monthly average minimum and maximum temperature

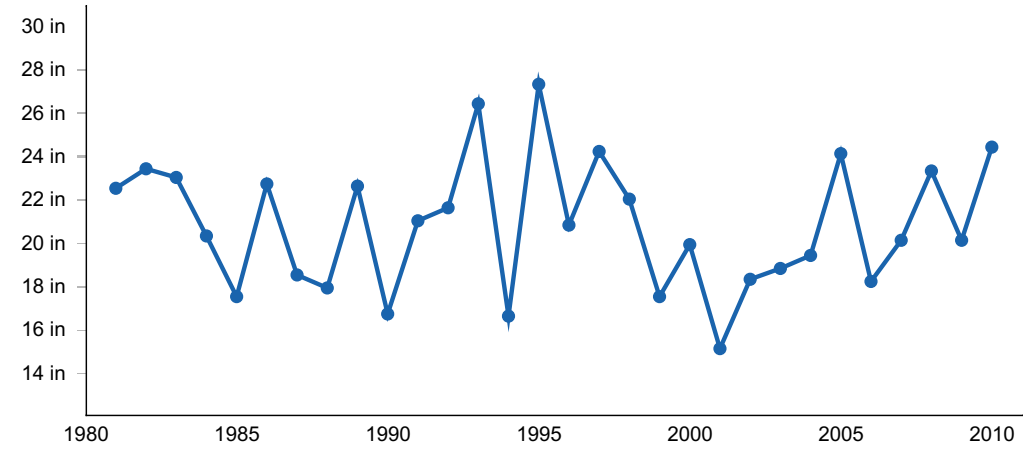


Figure 5. Annual precipitation pattern

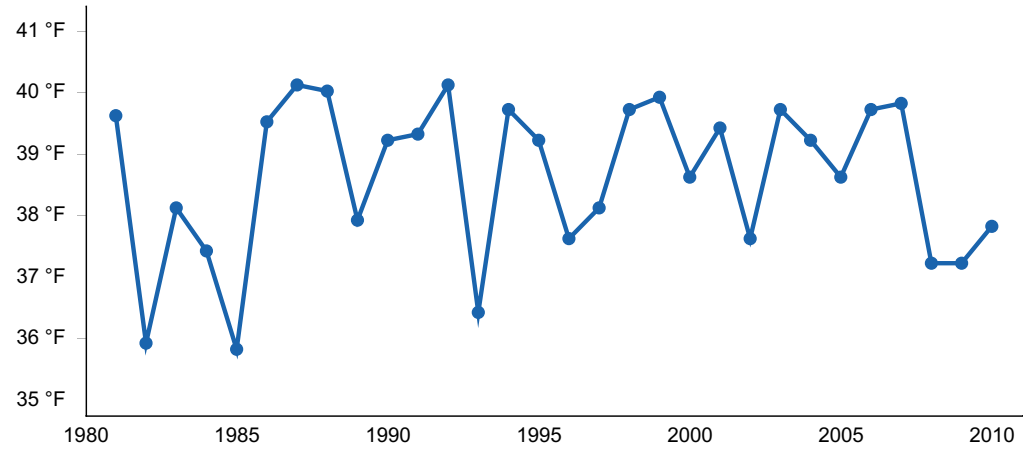


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MILLEGAN 14 SE [USC00245712], White Sulphur Springs, MT
- (2) NEIHART 8 NNW [USC00246008], Monarch, MT
- (3) WILSALL 8 ENE [USC00249023], Wilsall, MT
- (4) BOZEMAN 12 NE [USC00241050], Bozeman, MT

- (5) MYSTIC LAKE [USC00245961], Fishtail, MT
- (6) RED LODGE [USC00246918], Red Lodge, MT
- (7) DIVIDE [USC00242421], Wise River, MT
- (8) WISE RIVER 3 WNW [USC00249082], Wise River, MT
- (9) LAKEVIEW [USC00244820], Lima, MT
- (10) HEBGEN DAM [USC00244038], West Yellowstone, MT
- (11) ISLAND PARK [USC00104598], Island Park, ID
- (12) WEST YELLOWSTONE [USC00248857], West Yellowstone, MT

Influencing water features

Site is not associated with water sources such as streams, springs, and wetlands.

Wetland description

N/A

Soil features

Soils are moderately deep to very deep with less than 15 percent stone and boulder cover. Soils are formed typically from residuum, colluvium over residuum, or colluvium. Geology is calcareous, sedimentary rock (calcium carbonates greater than 15 percent in the soil profile).

Table 4. Representative soil features

Parent material	(1) Colluvium–sedimentary rock (2) Residuum–sedimentary rock
Surface texture	(1) Gravelly, extremely gravelly loam
Drainage class	Well drained
Depth to restrictive layer	20–100 in
Soil depth	20–100 in
Available water capacity (0-40in)	1.9–4.2 in
Calcium carbonate equivalent (0-4in)	15%
Soil reaction (1:1 water) (0-10in)	7.4–8.4
Subsurface fragment volume <=3" (10-20in)	0–45%
Subsurface fragment volume >3" (10-20in)	0–20%

Ecological dynamics

This site is unique compared to other upland woodland sites because the high pH of the soil affects plant production and species presence. For example a site with lower pH may support huckleberry while the high pH of this Limy Cool Woodland will not have and is incapable of supporting huckleberry growth.

1 - Reference State
1.1 Douglas fir dominated forest with understory of shrubs and mixed grasses. Lodgepole pine and Englemann’s spruce throughout the forest but sparsely spaced.

T1A Post-disturbance includes stand replacement fire, insect pestilence, disease, and clear cut

2 - Post-disturbance State
2.1 Post-fire shrub dominated community with saplings of lodgepole pine common. Fireweed dominant forb. Grasses may increase outside of fireweed patches.

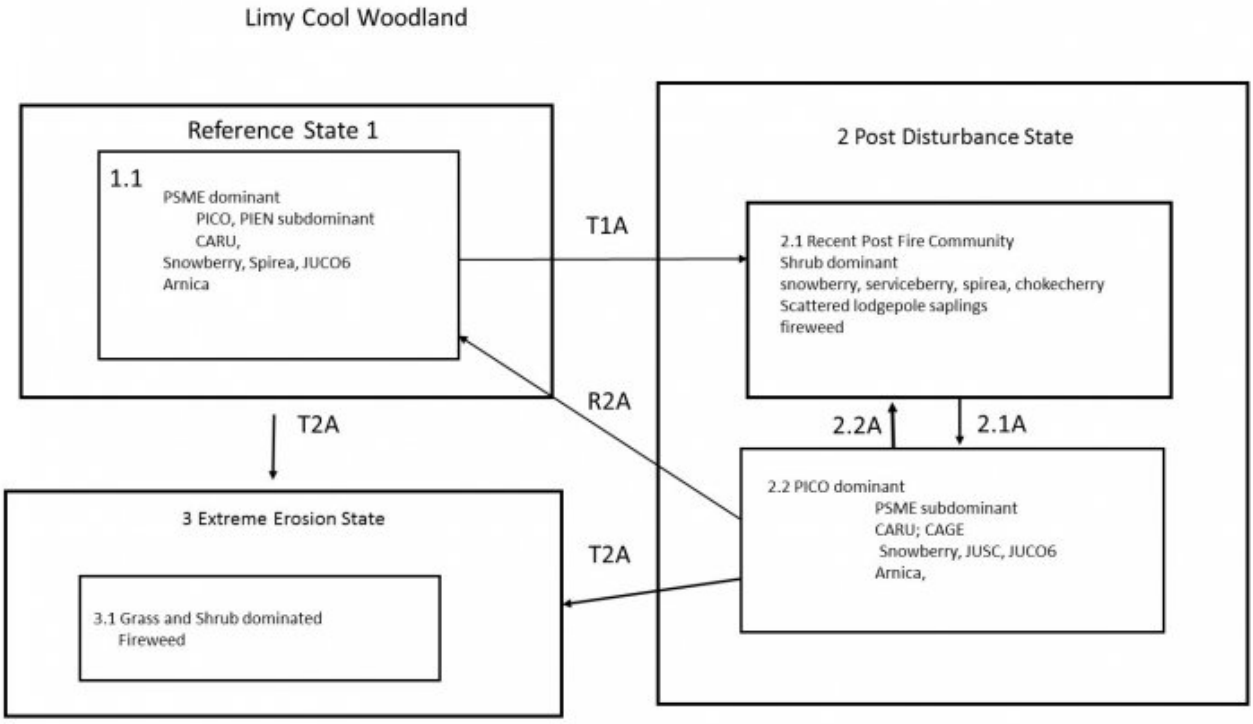
2.1A Over time lodgepole pine saplings increase with some Douglas fir and Englemann's spruce saplings increasing. Forbs and shrubs decrease as tree canopy increases.

2.2 Post-fire forest dominated by lodgepole pine with Douglas fir and Englemann's spruce increasing. Shrubs and grasses returning to pre-fire positions.

2.2A Community Pathway includes stand replacement fire, insect pestilence, disease, and clear cut
T2A: It occurs when intense precipitation events follow extreme stand replacement fires. Due to loss of seed source coupled with extreme surface erosion trees struggle to establish. Grasses and shrubs become dominant.
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 lodgepole pine.

3 - Extreme Erosion State: This State is rare in its extent within the MLRA. It occurs when intense precipitation events follow extreme stand replacement fires
3.1 Grass and shrub dominated, fireweed is the dominant forb.

State and transition model



43B Limy Cool Woodland F043BP912MT
Legend

1.1 Douglas fir dominated forest with understory of shrubs and mixed grasses. Lodgepole pine and Englemann's Spruce throughout the forest but sparsely spaced.
T1A Post Disturbance includes stand replacement fire, insect pestilence, disease, and clear cut

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 Over time PICO saplings increase with some PSME and PIEN saplings increasing. Forbs and shrubs decrease as tree canopy increases.
2.2A Community Pathway includes stand replacement fire, insect pestilence, disease, and clear cut
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. Douglas fir comes back in and shades out lodgepole.

T2A: It occurs when intense precipitation events follow extreme stand replacement fires. Due to loss of seed source coupled with extreme surface erosion trees struggle to establish. Grasses and shrubs become dominant.
3 Extreme Erosion State: This State is rare in its extent within the MLRA. It occurs when intense precipitation events follow extreme stand replacement fires.

Animal community

This ecological site is considered important habitat for large game animals such as deer, elk, and moose as well as upland birds such as ruffed, dusky, and spruce grouse.

Typically this site is considered good for livestock grazing. If the tree canopy is open it will often contain grazeable forage.

Recreational uses

Site frequently used by many outdoor recreationists such as bird watchers, campers, hikers, bikers, and hunters.

Wood products

The dominant forest type is typically suited to forest products of different types. Harvest of this site may prove challenging due to slope and remote location.

Inventory data references

Information presented was derived from NRCS inventory 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).

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Contributors

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Approval

Kirt Walstad, 3/01/2024

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	05/20/2025

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:**

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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:**

17. **Perennial plant reproductive capability:**