USDA Natural Resources Conservation Service

Ecological site R048AY009NM
Mountain Breaks

Last updated: 2/11/2025
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.

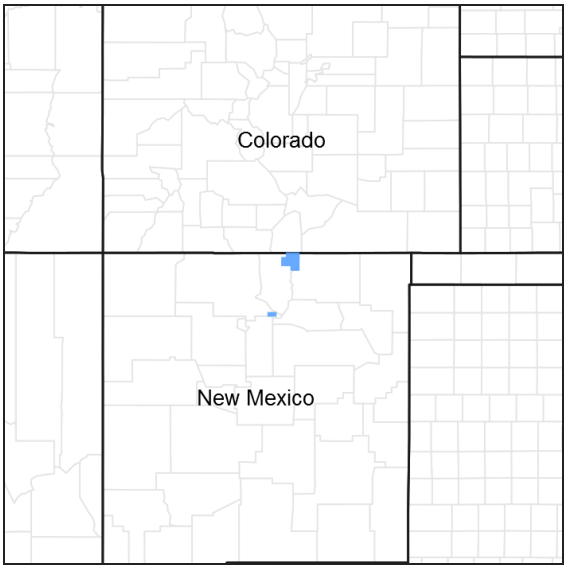


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 048A–Southern Rocky Mountains

This area is in Colorado (76 percent), New Mexico (11 percent), Utah (8 percent), and Wyoming (5 percent). It makes up about 45,920 square miles (119,000 square kilometers). The towns Jemez Springs, Los Alamos, Red River and Eagle Nest, New Mexico, are in this MLRA. This MLRA has numerous national forests, the Carson National Forest and part of the Santa Fe National Forest in New Mexico. The Jemez, Picuris, Santa Clara, and Taos Indian Reservations are in this MLRA. Most of this area is in the Southern Rocky Mountains Province of the Rocky Mountain System. Small parts of the southwest corner and some isolated areas farther west are in the Canyon Lands Section of the same province and division. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. The ranges include the Sangre de Cristo Mountains, Jemez Mountains, and Tusas Mountains. Elevation typically ranges from 6,500 to 13,167 feet (1,980 to 1,039 meters) in this area. The Rio Grande is a National Wild and Scenic River in northern New Mexico, which is in the southern part of this MLRA.

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. The rocks exposed in the mountains are mostly Precambrian igneous and metamorphic rocks, which in many places are flanked by steeply dipping Mesozoic sedimentary rocks. Younger igneous rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area. Representative formations in this area are the Silver Plume and Pikes Peak granites, San Juan Volcanics, and Mancos Shale. Many of the

highest mountain ranges were reshaped by glaciation during the Pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are important sources of sand and gravel.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the area dominantly have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. Mineralogy is typically mixed, smectitic, or paramicaceous. In areas with granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on mountain slopes. Dystrocryepts (Leighcan and Mummy series) formed on mountain slopes and summits at the higher elevations. In areas of andesite and rhyolite bedrock, Dystrocryepts (Endlich and Whitecross series) formed in colluvium on mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on mountain slopes at low elevations and with low precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in colluvium on mountain slopes at high elevations.

LRU notes

This site is part of the RM-2 sub-resource area. This site is found on the west side of Sangre de Cristo mountains, Tusas Mountains (southern San Juan mountains) and Jemez Mountains.

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA AgHandbook 296.

Ecological site concept

This site occurs on mesa and canyon side-slopes and other mountain breaks. The site consists of productive areas interspersed with areas of low production, rock outcrop and badland. Slopes and exposure vary. Slopes range from 9 to 45 percent. Elevation ranges from 9,100 to 10,500 feet above sea level.

Soil depths is deep. Surface texture is generally a gravelly loam. Subsoils range from gravelly clay loam, gravelly sandy clay loam to very gravelly sandy clay loam. The soil profile is generally high in rock fragments. Boulders are scattered about the site. There usually are pockets on the site where run-in of precipitation results in good soil-moisture relationships.

Soils correlated to this site:
Ess and Wellsville.

This ecological site used to have the ID number of R048BY001NM in RM-2 subresource area in 1982.

Associated sites

F048AY908CO	**Mixed Conifer** This site is found mostly commonly on mountain slopes. Soils are moderately deep to very deep (20 to 60+ inches). Soil surface textures are loam, very gravelly sandy loam, very stony sandy loam, stony sandy loam, stony loam, very stony loam, very cobbly loam or gravelly fine sandy loam. Subsurface textures can be loamy-skeletal or sometimes fine-loamy. It is usually ustic udic or typic udic and cryic. It is a Mixed Conifer community with subalpine fir, white fir, and Douglas fir intermixed. The effective precipitation ranges from 20 to 40 inches.

Similar sites

R048AY008NM	**Mountain Brush** This site is located on the sides of basalt-capped mesas and escarpments of sandstone, basalt, shale and limestone. This site is formed on the upland leading away from vertical basalt escarpments and basalt-capped mesas. They are formed from a variety of materials derived from sandstone, basalt, shale and limestone. Rock outcrop is common and may occupy from 15 percent to 50 percent of the area. Slopes range from 5 to 25 percent. The exposure is mainly to the east, south and west. However, this site may occur on the drier north-facing slopes. North and east-facing slopes are generally more productive and tend to grow more woody vegetation. Elevation ranges from 7,500 to 9,000 feet above sea level. The soils on this site are shallow, well drained over sandstone, shale, basalt and limestone. Rock outcrops are common and occupy the nearly vertical basalt escarpments, ridges and benches of exposed sandstone, limestone and shale. Rubbleland occurs at the base of the basalt escarpments. The surface textures is usually clay loam and the subsoils are clay loam and clayey shale. The surface runoff is medium too rapid and the erosion hazard is severe. Effective rooting depth is from 12 to 20 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Festuca arizonica* (2) *Muhlenbergia montana*

Physiographic features

This site occurs on mesa and canyon side-slopes and other mountain breaks. The site consists of productive areas interspersed with areas of low production, rock outcrop and badland. Slopes and exposure vary. Slopes range from 9 to 45 percent. Elevation ranges from 9,100 to 10,500 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Mountain valley
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	2,743–3,200 m
Slope	9–45%

Climatic features

The climate is characterized by cold, wet winters in which more than 50 percent of the total annual precipitation is received during the winter. The balance of the precipitation is received in the summer months, some of it in the form of high intensity thunderstorms. Average annual precipitation is about 22 inches but ranges from 16 to 30 inches and yearly fluctuations are common.

The average frost-free period is about 80 days but ranges from 60 days at the highest elevations to 110 days at the lowest elevations; however, the period lengths vary. The average last killing frost in the spring occurs about June 10th. The average first killing frost in the fall occurs about September 20th. Average annual air temperature is 22.6 degrees F in January and 64.5 degrees F in July with extremes ranging from -40 degrees F to 95 degrees F.

Table 3. Representative climatic features

Frost-free period (characteristic range)	48-124 days
Freeze-free period (characteristic range)	88-152 days
Precipitation total (characteristic range)	406-762 mm
Frost-free period (actual range)	47-125 days
Freeze-free period (actual range)	82-157 days

Precipitation total (actual range)	406-762 mm
Frost-free period (average)	86 days
Freeze-free period (average)	120 days
Precipitation total (average)	584 mm

Climate stations used

- (1) RED RIVER [USC00297323], Questa, NM
- (2) WOLF CANYON [USC00299820], Jemez Springs, NM
- (3) LOS ALAMOS 13 W [USW00003062], Jemez Springs, NM
- (4) LOS ALAMOS [USC00295084], Los Alamos, NM
- (5) JEMEZ SPRINGS [USC00294369], Jemez Springs, NM

Influencing water features

None

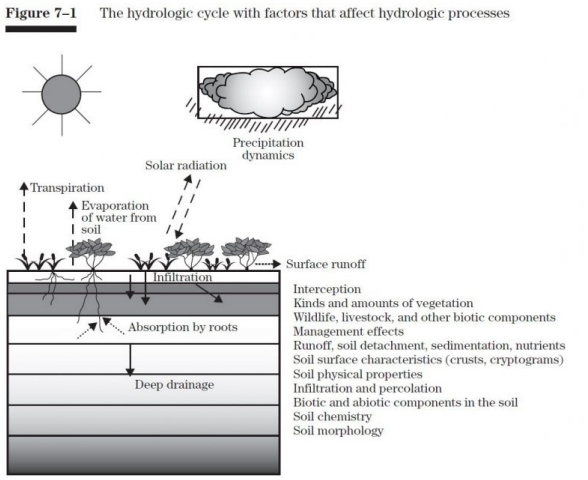


Figure 8.

Soil features

Soil depths is deep. Surface texture is generally a gravelly loam. Subsoils range from gravelly clay loam, gravelly sandy clay loam to very gravelly sandy clay loam. The soil profile is generally high in rock fragments. Boulders are scattered about the site. There usually are pockets on the site where run-in of precipitation results in good soil-moisture relationships.

Soils correlated to this site:
Ess and Wellsville.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous and metamorphic rock (2) Colluvium–igneous and metamorphic rock
Surface texture	(1) Gravelly loam
Family particle size	(1) Loamy-skeletal (2) Fine-loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	152–203 cm

Surface fragment cover <=3"	15–25%
Surface fragment cover >3"	1–10%
Available water capacity (Depth not specified)	6.35–15.24 cm
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–1
Soil reaction (1:1 water) (Depth not specified)	5.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	25–35%
Subsurface fragment volume >3" (Depth not specified)	1–15%

Ecological dynamics

Deterioration of the potential plant community is indicated by a decrease in such species as Arizona fescue, mountain muhly, western wheatgrass, prairie junegrass, winterfat and fourwing saltbush. Species that increase include blue grama, galleta, sleepygrass, big sagebrush, rabbitbrush and other undesirable woody species. A planned grazing system with periodic grazing and rest is best to maintain the natural balance between plant species and to maintain high productivity. This site appears better suited for sheep and goats than cattle due to the terrain and the potential plant community. It is also well suited to deer, elk, small mammals and birds.

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates and intensities of fire, herbicide treatment, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

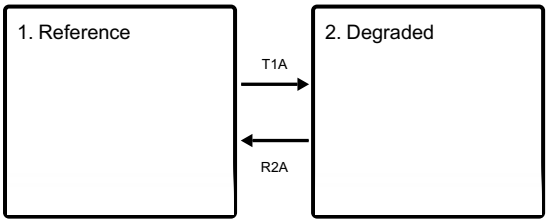
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram.

The plant communities shown in this State and Transition Model may not represent every possibility but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added.

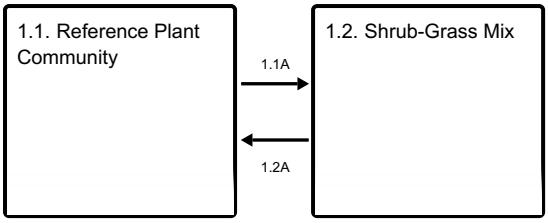
The state and transition model was added to comply with the provisional ecological site instruction. It is a very general model.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference

This state represents the natural range of variability on the site. The plant communities within the reference state were shaped and maintained by disturbances such as grazing, browsing, drought, wet years, and fire. The removal or alteration of these processes can cause a shift to an alternative state. Deterioration of the potential plant community is indicated by a decrease in such species as Arizona fescue, mountain muhly, western wheatgrass, prairie junegrass, winterfat and fourwing saltbush. Species that increase include blue grama, galleta, sleepygrass, big sagebrush, rabbitbrush and other undesirable woody species. A planned grazing system with periodic grazing and rest is best to maintain the natural balance between plant species and to maintain high productivity.

Community 1.1
Reference Plant Community

Vegetation on this site is diverse. Grasses dominate the deeper, more productive soils while less developed soils are dominated by shrubs with a tree overstory. Colonies of scrub Gambel oak are scattered throughout the site. Forbs are most noticeable when in bloom. Woody canopy is generally less than 30 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	437	656	947
Shrub/Vine	168	252	364
Forb	67	101	146
Total	**672**	**1009**	**1457**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	23-27%
Grass/grasslike foliar cover	25-29%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	15-19%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	31-35%

Figure 10. Plant community growth curve (percent production by month). NM3301, R048AY009NM Mountain Breaks HCPC. R048AY009NM Mountain Breaks HCPC Grass with a major component of shrubs and an overstory of trees and a minor component of forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	5	5	10	25	30	15	7	0	0

Community 1.2
Shrub-Grass Mix

Shrubs and trees have increased in canopy cover to be the dominant plants on the site. This has altered the hydrology and energy flow of the plant community. If grazing and browsing of the site persist, palatable species may decrease in be replaced by invasive or less desirable plants.

Pathway 1.1A
Community 1.1 to 1.2

Lack of fire, improper grazing of herbaceous species, lack of insects and disease, and/or drought.

Pathway 1.2A
Community 1.2 to 1.1

Proper grazing, browsing of shrubs, active insects and pathogens are present on the site; fire and/or wet climatic cycles.

State 2
Degraded

This state represents a shift from the reference state. The site has crossed a threshold that will require significant inputs to return to reference conditions, if possible. This has altered the hydrology and energy flow of the plant community.

Transition T1A
State 1 to 2

Removal of periodic fire may result in an increase in woody canopy across the site. Improper grazing will cause desirable species to decrease and less desirable species to increase Long term drought can also have an impact on the shifting structure and composition of the plant community.

Restoration pathway R2A
State 2 to 1

Fire, wetter climatic cycles, and/or proper grazing management can help return the plant community back to grassland. Shrub/tree management may be needed to decrease shrubs and/or trees.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				101–151	
	Arizona fescue	FEAR2	*Festuca arizonica*	101–151	–
2				50–101	
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	50–101	–
	mountain muhly	MUMO	*Muhlenbergia montana*	50–101	–
3				30–101	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	30–101	–

	Indian ricegrass	ACHY	*Achnatherum hymenoides*	30–101	–
	needle and thread	HECO26	*Hesperostipa comata*	30–101	–
4				30–101	
	spike muhly	MUWR	*Muhlenbergia wrightii*	30–101	–
	western wheatgrass	PASM	*Pascopyrum smithii*	30–101	–
5				30–67	
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	30–71	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	30–71	–
	little bluestem	SCSC	*Schizachyrium scoparium*	30–71	–
6				10–50	
	prairie Junegrass	KOMA	*Koeleria macrantha*	10–50	–
	muttongrass	POFE	*Poa fendleriana*	10–50	–
7				30–50	
	blue grama	BOGR2	*Bouteloua gracilis*	30–50	–
	James' galleta	PLJA	*Pleuraphis jamesii*	30–50	–
	Grass, perennial	2GP	*Grass, perennial*	30–50	–
Forb					
8				56–146	
	castilla	CASTI	*Castilla*	30–50	–
	beardtongue	PENST	*Penstemon*	30–50	–
	Forb, native	2FN	*Forb, native*	30–50	–
	fleabane	ERIGE2	*Erigeron*	30–50	–
	buckwheat	ERIOG	*Eriogonum*	30–50	–
	Wright's deervetch	LOWR	*Lotus wrightii*	30–50	–
	pea	LATHY	*Lathyrus*	0–11	–
	lupine	LUPIN	*Lupinus*	0–11	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–11	–
	gilia	GILIA	*Gilia*	0–11	–
Shrub/Vine					
9				28–73	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	30–71	–
	Gambel oak	QUGA	*Quercus gambelii*	30–71	–
10				10–67	
	fourwing saltbush	ATCA2	*Atriplex canescens*	10–67	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–67	–
11				10–67	
	prairie sagewort	ARFR4	*Artemisia frigida*	10–67	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	10–67	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	10–67	–
12				10–50	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	10–50	–
	skunkbush sumac	RHTR	*Rhus trilobata*	10–30	–
	snowberry	SYMPH	*Symphoricarpos*	10–30	–

	currant	RIBES	*Ribes*	10–30	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–11	–
	elderberry	SAMBU	*Sambucus*	0–11	–
Tree					
13				0–29	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–29	–
	twoneedle pinyon	PIED	*Pinus edulis*	0–29	–

Animal community

Grazing:
Approximately 75 percent of the vegetation produced on this site is suitable for grazing or browsing by domestic livestock and wildlife. Grazing distribution is a problem due to the site's association with steep and rocky landscapes. Salting, herding and trail construction helps to improve grazing distribution on this site.

Habitat for Wildlife:
This site provides habitats which support a resident animal community that is characterized by elk, mule deer, mountain lion, bobcat, long-tailed weasel, mountain cottontail, rock squirrel, bush-tailed woodrat, brush mouse, raven, blue grouse, Townsend solitaire and short-honed lizard. If rock faces and cliffs occur, these sites provide nesting for prairie and peregrine falcon and the white-throated swift.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Hydrologic Interpretations
Soil Series---- Hydrologic Group
Ess---------- B
Wellsville----- B

Recreational uses

This site is well suited to hunting, hiking and nature observation. The high-mountain setting nearby enhances the natural beauty of this site.

Wood products

Very little potential for wood products exists on this site.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index--- Ac/AUM
100 - 76---------- 4.4 – 5.7
75 – 51---------- 5.6 – 8.6
50 – 26---------- 8.5 – 17.0
25 – 0---------- 17.0+

Inventory data references

Data collection for this site was done in conjunction with the progressive soil surveys within the State of New Mexico. This site is found in the following soil surveys: Taos, Mora, and Rio Arriba.

These site descriptions were developed as part of a Provisional ESD project using historic soil survey manuscripts,

available range site descriptions.

Other references

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Contributors

Don Sylvester
Elizabeth Wright
John Tunberg

Approval

Kirt Walstad, 2/11/2025

Acknowledgments

Site Development and Testing Plan:

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team..

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	02/11/2025
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:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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):**

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:**