

Ecological site R048AY001NM

Subalpine Grassland

Last updated: 4/02/2025
Accessed: 10/05/2026

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): 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, Glossocryolls (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 Haplocryolls (Needleton series) formed in colluvium on mountain slopes at high elevations.

LRU notes

This site is part of the RM-1 sub-resource area. This site is found on the east side of Sangre de Cristo 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 takes in mountain parks and other open grasslands generally within the spruce-fir zone. In some places it is interspersed with aspen groves. This site is located near timberline extending down to the ponderosa pine zone. Topography is mostly rolling to moderate slopes, but some areas are steep. Slopes are between 2 to 20 percent, but can range up to 40 percent. Elevation ranges from 9,000 feet to near timberline, which is approximately 11,400 feet above sea level. The soils are well drained, deep to very deep. The surface texture is loam, cobbly loam or gravelly loam. There may be large numbers of rock fragments throughout the profile as this soil has multiple soil family particle sizes correlated to it. The soils have moderate to moderately slow permeability. Runoff is moderate. Available water-holding capacity is low to medium. The effective rooting depth is 20 inches or more. On the soil Hillery which is correlated to this site, it

occurs on lava flows, mesas and plains. Hillery is also above 40 inches of precipitation which is higher than the concept of this site. Surface soil textures are silt loam, and stony loam.

Associated sites

R048AY002NM	Mountain Grassland This site is found on the north and northeast-facing slopes at lower elevations and can be found on all exposures at the higher elevations. The site is located on open benchlands, outwash fans or exposed ridges between parks and valleys and higher mountain slopes. High mountain rims and mountain valleys are included in this site. The Mountain Grassland often occurs on benches or depressed areas within the steeper surrounding slopes of the ponderosa pine. The slopes ranges from 0 to 15 percent. Elevation ranges from 7,000 to 9,000 feet above sea level. These soils are well drained, deep to very deep. The surface layer is loam, silt loam or sandy loam. Gravel or stones are often present on the soil surface and throughout the profile but is not skeletal. These soils have a moderate permeability. Available water-holding capacity is moderate to high. Effective rooting depth is 40 inches to more than 60 inches.
R048AY005NM	Mountain Malpais This site is characterized by flat to moderately steep topography. It is frequently found as mesa, mountains slopes and ridges where the basalt caps are present. The site's terrain may be interrupted by extrusions of the basalt, leaving a rough or choppy appearance to the topography. The basaltic stone cover typically exists over a portion of the site where igneous extrusions occur. Boulders on the surface are common. The dominant slope range is from 3 to 30 percent, but it some site range up to 55 percent. The exposure varies but has little significance on plant production. Elevation ranges from 6,800 to 9,000 feet above sea level. These soils are well drained, very shallow to shallow, and formed in debris from basalt and other volcanic rock or metamorphic rock. The surface texture is cobbly, very cobbly silt loam; stony, very stony, very cobbly loam; stony, very stony silt loam; and cobbly sandy loam. The texture of the subsoil layers ranges from very stony silt loam, very cobbly loam to extremely stony clay. The effective rooting depth is 6 to 20 inches.
R048AY003NM	Mountain Valley This site is in mountain valleys in the ponderosa pine zone. It has gentle to moderate slopes and receives occasional light overflow from the stream course or adjacent side slopes. The alluvial slopes immediately adjacent to the stream are also included in this site. Slopes are 0-5%. Along valley bottoms where drainage is poor, it may blend with the Mountain Meadow ecological site. This site differs from the Mountain Meadow ecological site in the lack of high-water table. Elevation ranges from 7,000 to 9,000 feet above sea level. Soils on this site are well drained and deep to very deep. The surface layer is loam, sandy loam or fine sandy loam with subsoil of loam, clay loam, or sandy clay loam. These soils have moderate to moderately high permeability. Runoff is medium. Available water-holding capacity is high. Effective rooting depth is 20 inches to more than 60 inches. Severe gullying can carry off most of the water, and a loss of topsoil greatly reduces water intake. Gullies that carry off extra water will drastically alter the moisture-plant relationship in many areas.

Similar sites

R048AY011NM	Subalpine Grassland Dry This site occurs on high mountain tops above and extending down into parks within the spruce-fir zone. Aspen groves and colonies of Gambel oak may be scattered throughout the site. The landscape ranges from rolling to steep with side slopes ranging from 5 to 45 percent. Elevation ranges from 9,000 to 12,000 feet above sea level. The soils are deep but may be high in surface cobbles and stones and give the impression of being shallow. Surface textures range from cobbly and/or gravelly loams and very cobbly sandy loam. Subsoils textures range from loam, clay loam and silt loams are are filled with rock fragments. Family particle size class is loamy-skeletal. This ecological site used to have the ID number of R048BY003NM in RM-2 subresource area in 1982.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Ribes</i> (2) <i>Symphoricarpos</i>
Herbaceous	(1) <i>Bromus marginatus</i> (2) <i>Festuca thurberi</i>

Physiographic features

This site takes in mountain parks and other open grasslands generally within the spruce-fir zone. In some places it is interspersed with aspen groves. This site is located near timberline extending down to the ponderosa pine zone. Topography is mostly rolling to moderate slopes, but some areas are steep. Slopes are between 2 to 20 percent, but can range up to 40 percent. Elevation ranges from 9,000 feet to near timberline, which is approximately 11,400 feet above sea level.

On the soil Hillery which is correlated to this site, it occurs on lava flows, mesas and plains. Hillery is also above 40 inches of precipitation which is higher than the concept of this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Valley side (3) Stream terrace
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	2,740 – 3,480 m
Slope	0 – 20 %
Aspect	N, S

Climatic features

Average annual precipitation for this site varies from 20 to 30 inches. The annual amount received may fluctuate widely from year to year. Winter snowfall is an important feature of the climate of this site. During some winters, starting ordinarily in December and lasting through March, winter storms may cause accumulations up to 10 feet or more on higher portions of this site. Such accumulations lying at the headwaters of drainages represent the moisture reservoir for lower lying valleys for the ensuing summer season. Winter precipitation furnishes approximately 50 percent of the total annual amount received. June is a dry month on much of the site, but in near normal year, soil moisture from snowmelt carries over until summer rains begin. Summer precipitation occurs with the advent of cumulonimbus cloud formations during July and August. Convection currents cause this cloud formation during mid-day and by late afternoon, violent torrential thunderstorms may occur. These storms may be brief and have varied intensity. Frequency of the currents may largely influence the production of range forage on this site.

The mean air temperature of this site ranges from well below zero to approximately 55 degrees F. The frost-free period extends from 70 to 90 days. The last killing frost occurs approximately June 15th. The date of the first killing frost is September 15th.

Evaporation is relatively low on this site, and winds may be of high velocity. The ground is well covered by snow during the coldest weather, and snowmelt is relatively late. The typical plant community seems to be associated with depth and duration of snowpack. Forage plants must withstand grazing pressure and provide for storage of carbohydrates during the period of June 15th through September 15th. The advantage of the high precipitation amounts is offset on this site by the extreme short growing season.

Table 3 Representative climatic features

Frost-free period (characteristic range)	50-70 days
Freeze-free period (characteristic range)	90-100 days
Precipitation total (characteristic range)	510-760 mm
Frost-free period (actual range)	40-80 days
Freeze-free period (actual range)	90-110 days
Precipitation total (actual range)	510-760 mm
Frost-free period (average)	60 days
Freeze-free period (average)	100 days
Precipitation total (average)	640 mm

- (1) ANGEL FIRE 1S [USC00290407], Cimarron, NM
- (2) GASCON [USC00293488], Mora, NM

Influencing water features

None

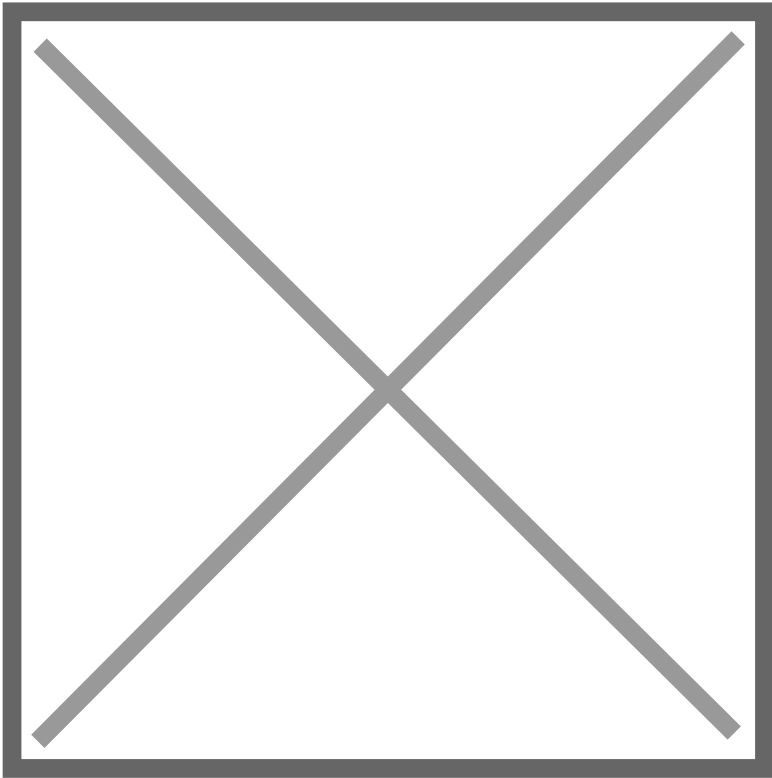


Figure 7.

Soil features

The soils are well drained, deep to very deep. The surface texture is loam, cobbly loam or gravelly loam. There may be large numbers of rock fragments throughout the profile as this soil has multiple soil family particle sizes correlated to it. The soils have moderate to moderately slow permeability. Runoff is moderate. Available water-holding capacity is low to medium. The effective rooting depth is 20 inches or more.

Included soils are (differences listed from modal site concept):

Fine-Loamy Soils:
Croftshaw

Wellsville (This soil has parent materials that are alluvium derived from mixed and/or colluvium derived from mixed and/or residuum weathered from mixed.)

Loamy-Skeletal Soils:
Ess
Quazar

Fine Soils (not typical of the site):

Hillery (All soil components are above 40 inches of precipitation with parent materials from residuum weathered from basalt. Surface soil textures are silt loam, and stony loam.)

Table 4. Representative soil features

Parent material	(1) Colluvium – igneous rock (2) Slope alluvium – igneous rock
Surface texture	(1) Gravelly, cobbly loam (2) Loam

Family particle size	(1) Fine-loamy (2) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	150 – 250 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	0 – 20 %
Available water capacity (Depth not specified)	8.89 – 20.32 cm
Calcium carbonate equivalent (Depth not specified)	Not specified
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	5.6 – 7.8
Subsurface fragment volume <=3" (Depth not specified)	10 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

Continuous grazing during the entire season will cause mountain brome, Thurber fescue, mountain muhly, Arizona fescue and tufted hairgrass will decline and eventually disappear. Species most likely to invade this site or increase from trace amounts as the plant community deteriorates are Kentucky bluegrass, dandelions, rabbitbrush, cinquefoil and annual forbs. In some places aspen may invade. There may be a substantial increase in species such as lupine, yarrow, fringed sagewort or snowberry. In some places big or silver sagebrush may become dominant. Kentucky bluegrass, Letterman needlegrass or sheep fescue usually become the main grasses as deterioration continues. Under sheep use, Thurber fescue may hold its own or increase for a time while many forbs decrease.

To maintain or improve on a healthy well-balanced plant community, grazing of domestic livestock should be delayed until soils are firm from the winter snows and when the desirable plants have had the opportunity to make good growth. Rapid growth of plants in the spring may temporarily deplete food reserves. Deferring grazing until the plants have had an opportunity to restore this food supply is advisable. This, coupled with a system of deferred grazing, which varies the time of grazing in a pasture during successive years, will allow for maximum forage production.

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 tree harvest, grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, and kinds and times of timber harvest, 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. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

The state and transition model was added to fill the provisional ecological site (PES) instruction. It is a very general model.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				242-269	
	mountain brome	BRMA4	<i>Bromus marginatus</i>	242-269	–
2				161-202	
	Thurber's fescue	FETH	<i>Festuca thurberi</i>	161-202	–
3				161-202	
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	161-202	–
4				94-135	
	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	94-135	–
5				94-135	
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	94-135	–
6				94-135	
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	94-135	–
	Columbia needlegrass	ACNEN2	<i>Achnatherum nelsonii ssp. nelsonii</i>	94-135	–
7				40-67	
	sedge	CAREX	<i>Carex</i>	40-67	–
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	40-67	–
8				40-67	

	slender wheatgrass	ELTRT	<i>Elymus trachycaulus ssp. trachycaulus</i>	40-67	–
	oatgrass	DANTH	<i>Danthonia</i>	40-67	–
	pine dropseed	BLTR	<i>Blepharoneuron tricholepis</i>	40-67	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	40-67	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	40-67	–
	muttongrass	POFE	<i>Poa fendleriana</i>	40-67	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-11	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-11	–
	meadow barley	HOBR2	<i>Hordeum brachyantherum</i>	0-11	–
	spike muhly	MUWR	<i>Muhlenbergia wrightii</i>	0-11	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-11	–
9				40-67	
	bluegrass	POA	<i>Poa</i>	40-67	–
10				40-67	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	40-67	–
Forb					
11				40-67	
	pale agoseris	AGGL	<i>Agoseris glauca</i>	40-67	–
12				40-67	
	beardtongue	PENST	<i>Penstemon</i>	40-67	–
13				40-67	
	larkspur	DELPH	<i>Delphinium</i>	40-67	–
	lupine	LUPIN	<i>Lupinus</i>	40-67	–
15				40-67	
	aster	ASTER	<i>Aster</i>	40-67	–
	geranium	GERAN	<i>Geranium</i>	40-67	–
	common cowparsnip	HEMA80	<i>Heracleum maximum</i>	40-67	–
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	40-67	–
	clover	TRIFO	<i>Trifolium</i>	40-67	–
16				40-67	
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	40-67	–
Shrub/Vine					
17				40-67	
	shrubby cinquefoil	DAFR6	<i>Dasiphora fruticosa</i>	40-67	–
	currant	RIBES	<i>Ribes</i>	40-67	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	40-67	–
18				40-67	
	Shrub, deciduous	2SD	<i>Shrub, deciduous</i>	40-67	–
	willow	SALIX	<i>Salix</i>	0-67	–
	blue elderberry	SANIC5	<i>Sambucus nigra ssp. cerulea</i>	0-67	–
	blackberry	RUBUS	<i>Rubus</i>	0-67	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Animal community

Grazing: Approximately 85 percent of the annual herbage yield are from plants, which furnish forage for grazing animals. Elk extensively uses this site. This site can be used by all classes of livestock during the period from June 15th to September 15th, and this also represents the principal growing season. Due to the steep slopes and short grazing season, yearling calves are better suited than mature cows with calves. Grazing by sheep is also favored due to the site's potential to produce forbs. To reduce spot grazing and grazing of the flatter slopes, herding of all classes of livestock is highly desirable. Habitat for Wildlife: This site provides habitats, which support a resident animal community that is characterized by yellow-bellied marmot, northern pocket gopher, montane vole and least chipmunk. Elk and mule deer feed in these sites during late spring. The blue grouse will nest around the margins of these sites and bring young broods to feed on insects occurring on the herbaceous vegetation. This site provides habitat for elk and deer for summer use and for rabbits.

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 Hillery-----C Wellsville-----B

Recreational uses

This site offers recreation potential for hiking, picnicking, horseback riding, nature observations, winter sports, hunting for elk and deer and photography of wildflowers. During the spring, forbs are showy when in bloom and display a colorful array of wildflowers during July and August.

Wood products

This site produces no commercial wood products. The site occurs as an intermixture with timberstands. Timber species adjoining this site include the following: Douglas fir, Engelmann spruce, blue spruce, white fir, bristlecone pine and aspen.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month Similarity Index-----Ac/AUM 100 - 76-----2.1
- 3.8 75 - 51-----2.4 - 4.4 50 - 26-----3.6 - 6.7 25 - 0-----6.7+

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: Colfax, Taos, Mora, and San Miguel. These site descriptions were developed as part a Provisional ESD project using historic soil survey manuscripts, and 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

Elizabeth Wright
Don Sylvester

Approval

Kirt Walstad, 4/02/2025

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	04/02/2025
Approved by	
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:
