

## Ecological site R048AY016NM Mountain Meadows

Last updated: 3/05/2024  
Accessed: 04/20/2024

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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): 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 basins and valleys and below seeps and springs on mountain side slopes. Drainages associated with the site are not dissected and allow the water to fan out. This results in a high water table and even some surface water in the spring and summer. Slopes are less than 5 percent. Elevation ranges from 7,200 to 9,000 feet above sea level.

The soils are deep and somewhat poorly drained with a high water table. Depth of the water table ranges from 0 to 60 inches. The surface soil textures are loam, silt loam, or clay loam.

Subsoils range from gravelly loam, gravelly clay, clay loam, silty clay loam, silt loam, to clay. The soil profiles are characterized by high amounts of organic matter and dark colors. Permeability is moderate to slow, runoff is medium, and water-holding capacity is high.

Soils characterized by this site are:

This ecological site used to have the ID number of R048BY006NM in RM-2 subresource area in 1982.

## Associated sites

R048AY011NM	<p><b>Subalpine Grassland Dry</b></p> <p>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 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.</p>
R048AY012NM	<p><b>Mountain Loam Dry</b></p> <p>This site occurs on gently sloping to moderately rolling uplands below or ranging into the ponderosa pine-Douglas fir woodlands. It may occur on open parks within the true woodlands. Slopes range from 1 to 20 percent. Elevation ranges from 7,200 to 9,200 feet above sea level. The soils are deep. Surface textures are loam or silt loam with subsoils varying from gravelly loam. very gravelly sandy clay loam, extremely cobbly clay loam. clay loam, or loam. Permeability is moderate slow to moderately rapid. This ecological site used to have the ID number of R048BY004NM in RM-2 subresource area in 1982.</p>

## Similar sites

R048AY006NM	<p><b>Mountain Meadow</b></p> <p>The site occurs as lower lying drainageways, flood plains, swales or other depressional areas where extra moisture accumulates as a result of runoff from surrounding higher sites. A high water table is characteristic of this site particularly in the spring and a portion of the area may have open water during this season. Springs or seeps bring the water table to the subsoil or even to the surface, in which instance the site may colloquially be called a "cienaga". Slopes vary from flat to gently sloping, not to exceed 5 percent. The exposure varies and is not significant. Elevation ranges from 7,000 to 9,500 feet above sea level. These soils consist of deep to very deep soils and poorly to very poorly drained. The surface texture ranges from a very fine sandy loam to a mucky silty clay and clay surface layers. They have an active water table, which varies from the surface to 3 feet below the surface. They are normally non-saline and have high organic content. These soils have moderate to moderately slow permeability. Available water-holding capacity is moderate. The effective rooting depth is 20 inches to more than 60 inches.</p>
R048AY241CO	<p><b>Mountain Meadow</b></p> <p>This site occurs flood plains, stream terraces, drainageways, ephemeral streams, flood-plain step and depressions. This site has natural sub-irrigation. Slopes is between 0 to 12%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived from alluvium from sandstone and shale, sedimentary rock, igneous, metamorphic and sedimentary rock, or shale. Soil surface texture is loam, silty clay loam, clay loam, clay, sandy clay loam or sandy loam with fine-loamy or fine textured subsurface. It has a typical aquic or oxyaquic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Deschampsia cespitosa</i> (2) <i>Carex nebrascensis</i>

## Physiographic features

This site occurs on basins and valleys and below seeps and springs on mountain side slopes. Drainages associated with the site are not dissected and allow the water to fan out. This results in a high water table and even some surface water in the spring and summer. Slopes are less than 5 percent. Elevation ranges from 7,200 to 9,000 feet above sea level.

**Table 2. Representative physiographic features**

Landforms	(1) Flood plain (2) Stream terrace (3) Swale (4) Valley floor
Runoff class	High to very high
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding frequency	None to frequent
Elevation	7,200–9,000 ft
Slope	0–5%
Ponding depth	0–1 in
Water table depth	Not specified

## 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)	16-30 in
Frost-free period (actual range)	47-125 days
Freeze-free period (actual range)	82-157 days
Precipitation total (actual range)	16-30 in
Frost-free period (average)	86 days
Freeze-free period (average)	120 days

Precipitation total (average)

23 in

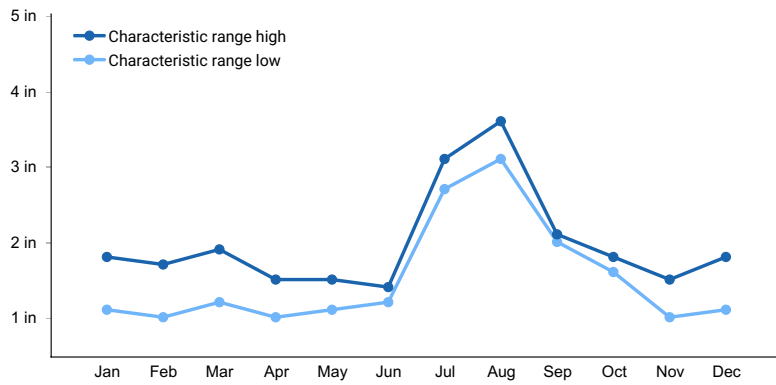


Figure 1. Monthly precipitation range

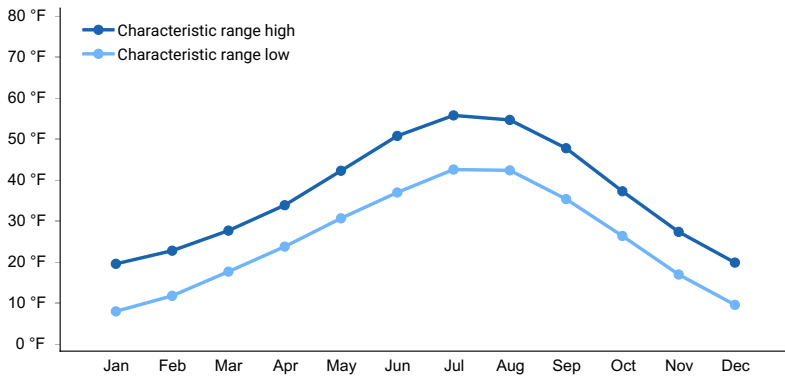


Figure 2. Monthly minimum temperature range

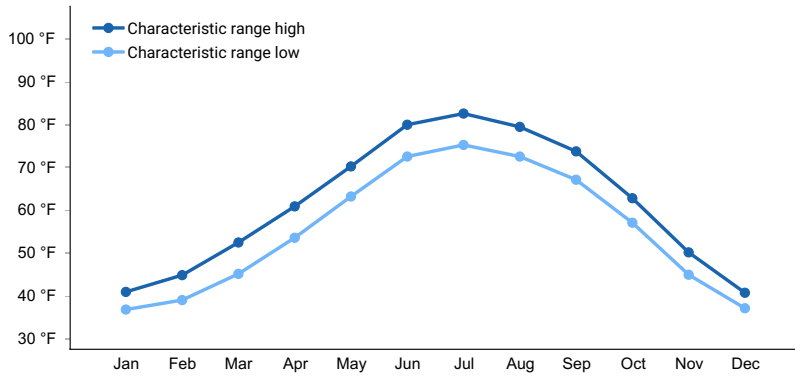


Figure 3. Monthly maximum temperature range

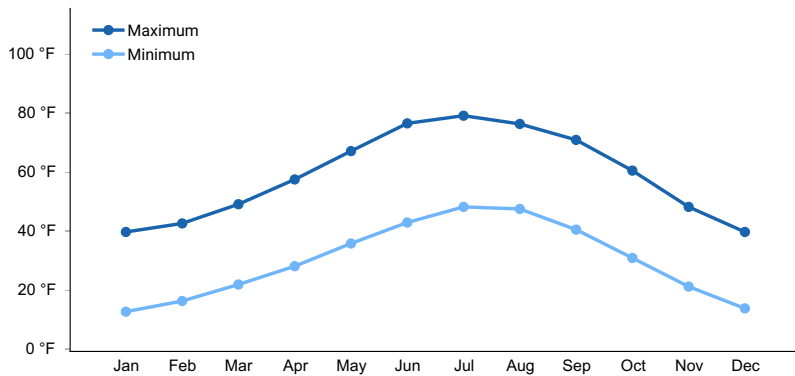


Figure 4. Monthly average minimum and maximum temperature

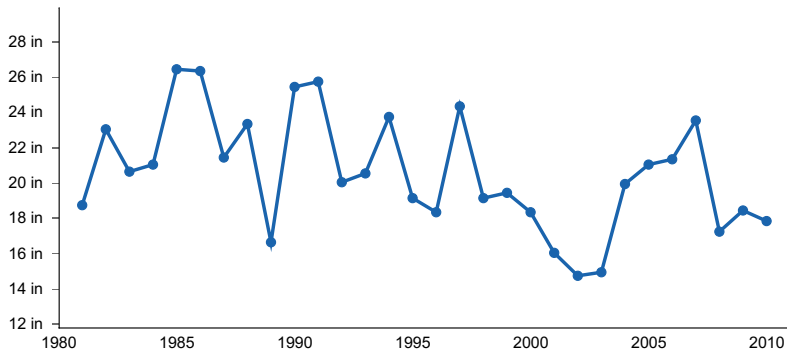


Figure 5. Annual precipitation pattern

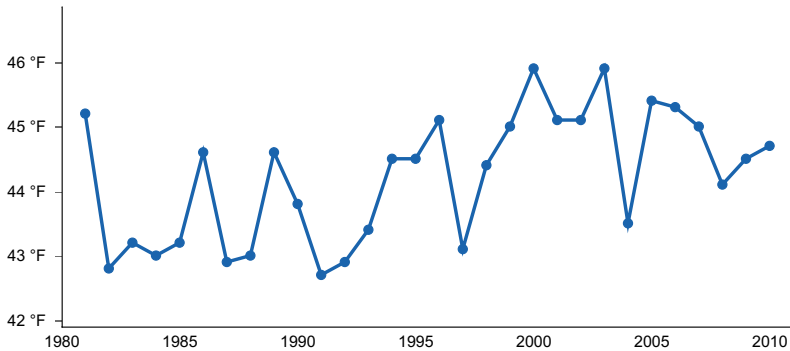


Figure 6. Annual average temperature pattern

### Climate stations used

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

### Influencing water features

This site has an active water table, which varies from the surface to 5 feet below the surface.

Figure 7-1 The hydrologic cycle with factors that affect hydrologic processes

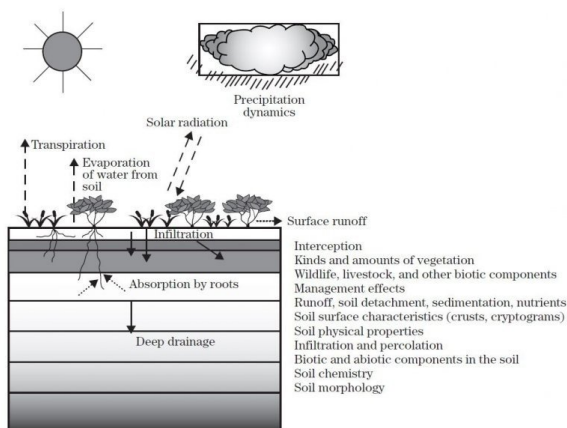


Figure 7.

### Soil features

The soils are deep and somewhat poorly drained with a high water table. Depth of the water table ranges from 0 to

60 inches. The surface soil textures are loam, silt loam, or clay loam.

Subsoils range from gravelly loam, gravelly clay, clay loam, silty clay loam, silt loam, to clay. The soil profiles are characterized by high amounts of organic matter and dark colors. Permeability is moderate to slow, runoff is medium, and water-holding capacity is high.

Soils characterized by this site are:

Chamita, Crubas, Jarola, Nusmag and Tottles

**Table 4. Representative soil features**

Parent material	(1) Alluvium–metamorphic and sedimentary rock (2) Alluvium–igneous rock (3) Alluvium–sandstone and shale (4) Alluvium–sedimentary rock
Surface texture	(1) Loam (2) Clay loam (3) Silt loam
Family particle size	(1) Fine-loamy (2) Fine
Drainage class	Poorly drained to moderately well drained
Permeability class	Moderate to slow
Soil depth	60–100 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	5.5–8.5 in
Calcium carbonate equivalent (Depth not specified)	0–10%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–2
Soil reaction (1:1 water) (Depth not specified)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

Deterioration of the potential plant community is indicated by a decrease in tufted hairgrass, red top, and alpine timothy. Species that increase include sedges, rushes, meadow barley, Kentucky bluegrass, forbs, and shrubby cinquefoil.

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**

# R048A016NM Mountain Meadows

## State 1: Reference State

### 1.1 Grass Meadow

Tufted Hairgrass, Nebraska sedge, other grasses other sedges and rushes.

1.1A

### 1.2 Grass with Mixed Shrubs

Rushes have increased. Nebraska sedge, tufted haorgrass, willows, shrubby cinquefoil other grasses other sedges and rushes are present.

1.2A

T1A

## State 2: Current Potential State

### 2.1 Grass Meadow

Tufted Hairgrass, Nebraska sedge, other grasses other sedges and rushes. Present of introduced grasses (Kentucky blugrass, timothy, redtop) and forbs.

2.1A

### 2.2 Grasses with Mixed Shrubs

Kentucky bluegrass, timothy and redtop are dominant. Other grasses, sedges and rushes with willows are present introduced grasses and forbs are present.

2.2A

T2A

## State 3: Altered State

### 3.1 Grass Dominated

Seeded grass species, other grasses, shrubs and forbs. Present of introduced grasses and forbs.

3.2A

3.1A

### 3.2 Grasses with Shrubs

Seeded grass species, shrubs and forbs. Present of introduced grasses and forbs.



## Legend

1.1A, 2.1A, 3.1A – lack of fire, improper grazing, prolonged drought, time without disturbance

1.2A, 2.2A, 3.2A – disturbance, fire, insect herbivory of shrubs, proper grazing, wetter climate cycles

T1A – Establishment of non-native invasive plants

T2A – Vegetation and/or mechanical treatments of the landscape

### State 1

#### Reference State

#### Community 1.1

#### Grass Meadow (Reference Plant Community)

The plants characterizing this site are mid to tall bunchgrasses and sedges which contrast strongly in appearance with sites adjacent to it. Shrubs may be scattered throughout the site but are a minor component. Soils are not particularly noticeable except when in bloom. Other species include meadow barley, prairie junegrass, spike trisetum, Arizona fescue, false hellebore, wild parsnips, thistle, wild rose, and willow species. Tree, shrub, and half-shrub canopy of this site averages 3 percent.

**Table 5. Annual production by plant type**

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2040	2550	2975
Forb	240	300	350
Shrub/Vine	120	150	175
<b>Total</b>	<b>2400</b>	<b>3000</b>	<b>3500</b>

**Table 6. Ground cover**

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	60-70%
Forb foliar cover	1-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	25-35%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	1-10%

## Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1				750–1050	
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	750–1050	–
2				300–600	
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	300–600	–
	sedge	CAREX	<i>Carex</i>	300–600	–
3				300–450	
	bluegrass	POA	<i>Poa</i>	300–450	–
	mountain brome	BRMA4	<i>Bromus marginatus</i>	300–450	–
	creeping bentgrass	AGST2	<i>Agrostis stolonifera</i>	300–450	–
	alpine timothy	PHAL2	<i>Phleum alpinum</i>	300–450	–
4				150–300	
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	150–300	–
5				90–210	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	90–210	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	90–210	–
	spike muhly	MUWR	<i>Muhlenbergia wrightii</i>	90–210	–
6				0–210	
	rush	JUNCU	<i>Juncus</i>	0–210	–
	reedgrass	CALAM	<i>Calamagrostis</i>	0–210	–
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	0–210	–
7				30–210	
	oatgrass	DANTH	<i>Danthonia</i>	30–210	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	30–210	–
	muttongrass	POFE	<i>Poa fendleriana</i>	30–210	–
	Grass, native	2GN	<i>Grass, native</i>	30–210	–
<b>Forb</b>					
8				30–90	
	vetch	VICIA	<i>Vicia</i>	30–90	–
	clover	TRIFO	<i>Trifolium</i>	30–90	–
9				60–240	
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	60–240	–
	coneflower	RUDBE	<i>Rudbeckia</i>	60–240	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	60–240	–
	buttercup	RANUN	<i>Ranunculus</i>	60–240	–
	Forb, native	2FN	<i>Forb, native</i>	60–240	–
<b>Shrub/Vine</b>					
10				120–180	
	shrubby cinquefoil	DAFR6	<i>Dasiphora fruticosa</i>	30–90	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–60	–

## Animal community

### Grazing:

Approximately 95 percent of the vegetation produced on this site is suitable for grazing or browsing by domestic livestock and wildlife. Grazing pressure on this site may be a problem due to lush vegetation as compared with adjacent sites. Waterings and saltings should be distributed away from this site to prevent it constant overuse. A planned grazing system with periodic grazing and rest is best to maintain the natural balance between plant species and to maintain high productivity.

Animal gains on this site may be low during the growing season due to the high moisture-low fiber content of the forage.

The grazing of this site in conjunction with adjacent sites producing more fibrous forage will result in a better feed-to-gain ratio.

### Habitat for Wildlife:

This ecological site provides habitat which supports a resident animal community that is characterized by raccoon, ermine, water shrew, meadow vole, western jumping mouse, song and lincoln sparrows, leopard frog, tiger salamander, and western territorial garter snake. Mule deer, elk, black bear, and snowshoe hare use these sites seasonally. When permanent aquatic habitats occur, these sites are used by mallards, teal, spotted sandpiper, snipe, killdeer, and blackbirds.

## Hydrological functions

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

## Recreational uses

The visual qualities of this site are very pleasing, especially against a mountain setting. Due to the wetness of the site, recreational uses of the site are limited.

## Wood products

No wood products are obtained from this site on a sustained yield basis.

## Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index-----	Ac/AUM
100 - 76-----	0.6 – 0.9
75 – 51-----	0.9 – 1.3
50 – 26-----	1.3 – 2.6
25 – 0-----	2.7+

## 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 survey areas: Taos, Sante Fe, Sandoval, Los Alamos, Rio Arriba, Santa Fe National Forest (Coyote, Cuba, Jemez Springs, and Espanola Ranger Districts) and Carson National Forest

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

## Approval

Kirt Walstad, 3/05/2024

## 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	04/20/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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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:**
- 
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):**
- 
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):**

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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:**

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17. **Perennial plant reproductive capability:**

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