USDA Natural Resources Conservation Service

Ecological site R048AY004NM
Mountain Loam

Last updated: 3/05/2024
Accessed: 05/10/2025

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.

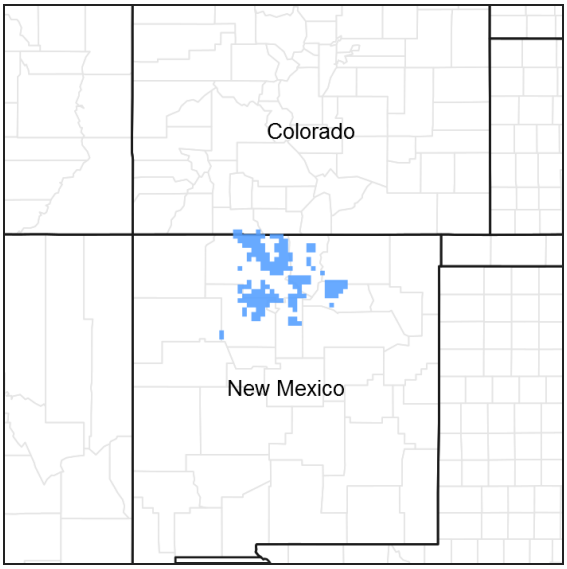


Figure 1. Mapped extent

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-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 is on steep to moderately steep slopes on benches within the steeper slopes of the surrounding ponderosa pine tree zone. The slope is to the southwest; south and southeast, making the site directly exposed to the dry south and southwest winds and more intensive heat from the sun. Slopes vary from 5 to 70 percent. Elevation ranges from 6,900 to 9,000 feet above sea level.

The soils on this site are moderately deep to deep and well drained. The surface texture is stony/cobbly silt loam or cobbly loam. The subsurface is stony loam or cobbly loam. They have a moderate permeability. The available water-holding capacity is low. Effective rooting depth is from 20 to 40 inches. There is cobble or stone throughout the profile and on the surface. Air-water-plant relationship is fair.

Characteristic Soils Are:
Dalcan and Des Moines

Associated sites

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.

R048AY006NM	**Mountain Meadow** 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.
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.

Similar sites

R048AY003NM	**Mountain Valley** This site is located in mountain valleys in the ponderosa pine zone. It has gentle to moderate slopes and receives occasional light overflow from the main stream course or adjacent side slopes. The alluvial slopes immediately adjacent to the main 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.
R048AY012NM	**Mountain Loam Dry** 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.
R048AY228CO	**Mountain Loam** This site occurs mainly alluvial fans, mountain slopes, benches, terraces, or hills. Slopes average between 5 and 10% but can range from 0 to 30%. Soils are moderately deep to deep (20-60 inches) loamy soils derived from residuum from igneous and metamorphic rocks or sandstone and shale; slope alluvium from sandstone and shale, or igneous and metamorphic rocks; colluvium from igneous and metamorphic rocks or sandstone and shale, and/or alluvium from igneous and metamorphic rocks. Soil surface texture are loam, sandy loam or silt loam with loamy subsurface. It is a Mountain Big Sagebrush - Arizona Fescue community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.

Table 1. Dominant plant species

Tree	(1) *Pinus edulis* (2) *Pinus ponderosa*
Shrub	(1) *Cercocarpus montanus* (2) *Quercus*

Herbaceous	(1) *Muhlenbergia montana* (2) *Bouteloua curtipendula*

Physiographic features

This site is on steep to moderately steep slopes on benches within the steeper slopes of the surrounding ponderosa pine tree zone. The slope is to the southwest; south and southeast, making the site directly exposed to the dry south and southwest winds and more intensive heat from the sun. Slopes vary from 5 to 70 percent. Elevation ranges from 6,900 to 9,000 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Mesa
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	6,900–9,000 ft
Slope	5–70%
Aspect	SE, S, SW

Climatic features

Annual precipitation varies from 15 to 25 inches on this site and of this amount approximately 30 percent occurs in the form of winter snows. Variations in both winter and summer precipitation may be quite extreme ranging from rather open, dry winters to winters during which several feet of snow are accumulated. Summer thunderstorm activity, which is greatest during July and August, is also very sporadic.

Air temperatures vary from a monthly mean of 19 degrees F in January to 68 degrees F in July. Mean monthly temperatures also vary elevationally. Winter low temperatures fall below the freezing mark much of the time from mid September through the first of June. Dates of the last killing frost vary elevationally. At lower elevations the last killing frost occurs around May 6th and at higher elevations June 22nd. Dates of the first killing frost vary from September 9th at higher elevations and October 11th at the lower elevations.

The freeze-free season ranges elevationally from 141 days at the lower elevations to 79 days at the higher elevations. About 50 percent of the precipitation falls in the form of rainfall during the freeze-free season. The precipitation pattern is beneficial to both cool-season and warm-season plants. The growing season lasts from 3 to 5 months extending from early May through October. Some cool-season plants begin their growth with snow recession and also enjoy a brief growing period in the fall.

Mountain winds have an effect on growing conditions within this site in their effect on increasing moisture losses and litter in the surface soil horizon. Availability of the moisture for plant growth is more of a limiting factor on this site than it is on site of higher elevations. Forage production is dependent upon both winter and summer moistures; and therefore, yields of forage fluctuate directly with the amount of precipitation. Evaporation rates vary with elevations within the site. Rates are generally lower at higher elevations and increase at lower elevations, particularly on southern and western exposures.

Table 3. Representative climatic features

Frost-free period (characteristic range)	36-65 days
Freeze-free period (characteristic range)	86-98 days
Precipitation total (characteristic range)	17-25 in
Frost-free period (actual range)	33-77 days
Freeze-free period (actual range)	86-104 days

Precipitation total (actual range)	17-25 in
Frost-free period (average)	52 days
Freeze-free period (average)	93 days
Precipitation total (average)	22 in

Climate stations used

- (1) ANGEL FIRE 1S [USC00290407], Cimarron, NM
- (2) EAGLE NEST [USC00292700], Eagle Nest, NM
- (3) GASCON [USC00293488], Mora, NM

Influencing water features

This site is not influenced by water from a wetland or stream.

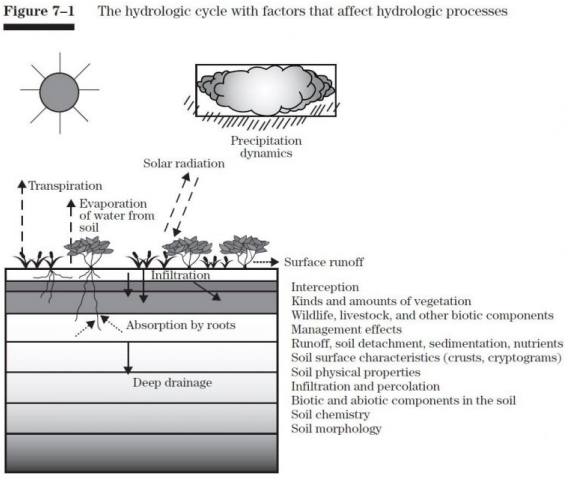


Figure 8.

Soil features

The soils on this site are moderately deep to deep and well drained. The surface texture is stony/cobbly silt loam or cobbly loam. The subsurface is stony loam or cobbly loam. They have a moderate permeability. The available water-holding capacity is low. Effective rooting depth is from 20 to 40 inches. There is cobble or stone throughout the profile and on the surface. Air-water-plant relationship is fair.

Characteristic Soils Are:
Dalcan and Des Moines

Table 4. Representative soil features

Parent material	(1) Residuum–basalt (2) Residuum–andesite (3) Colluvium–andesite (4) Alluvium–igneous rock (5) Colluvium–igneous rock (6) Residuum–igneous rock
Surface texture	(1) Cobbly, stony silt loam (2) Cobbly loam
Family particle size	(1) Clayey-skeletal
Drainage class	Well drained
Permeability class	Slow

Soil depth	20–60 in
Surface fragment cover <=3"	10–20%
Surface fragment cover >3"	10–25%
Available water capacity (Depth not specified)	1.5–3.5 in
Subsurface fragment volume <=3" (Depth not specified)	5–25%
Subsurface fragment volume >3" (Depth not specified)	25–40%

Ecological dynamics

Continuous grazing during the grazing season will cause the more desirable forage plants such as mountain muhly, little bluestem, sideoats grama, Arizona fescue and western wheatgrass to decrease. The species most likely to invade this site are Kentucky bluegrass, broom snakeweed and pingue. Species most likely to increase from small amounts or trace amounts are blue grama, oak and forbs. As the ecological conditions deteriorate, it is accompanied by a sharp increase in blue grama. Most of the mid-grasses and bunch grass species will disappear as deterioration advances. In some areas there may be large patches of sleepygrass and a variety of annual and perennial forbs. Oak brush will also increase to the point where it is dominant. A system of deferred grazing, which varies the time of grazing and rest in the pastures during successive years, is needed to maintain or to improve a healthy, well-balanced plant community.

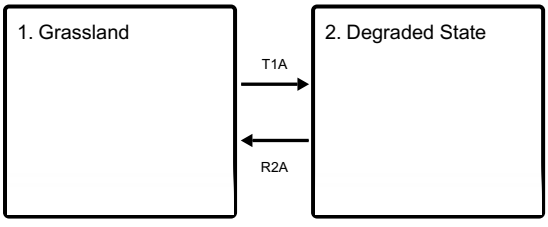
Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas 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.

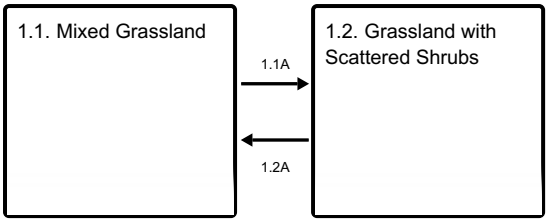
The state and transition model was added to comply with the provisional ecological site instruction. It is a very general model.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Grassland

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.

Community 1.1
Mixed Grassland

This site is a mixed grassland characterized by both cool-season and warm-season mid-grasses and bunch grasses and a minor amount of woody plants and forbs. Ponderosa pine or pinyon pine is widely scattered throughout the site. Grasses or grasslike plants make up approximately 90 percent of the total vegetative composition. Woody plants and forbs are evenly distributed and make up a minor portion of the plant community. Tree species associated with this site are ponderosa pine and pinyon pine. Overstory canopy is less than 2 percent. Other species that could appear include: sand dropseed, galleta, vine-mesquite, bottlebrush squirreltail, threeawn, lupine, rubber rabbitbrush and sagebrush.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	630	900	1260
Forb	35	50	70
Shrub/Vine	35	50	70
Total	**700**	**1000**	**1400**

Table 6. Ground cover

Tree foliar cover	0-2%
Shrub/vine/liana foliar cover	1-5%
Grass/grasslike foliar cover	20-30%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	15-25%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	10-20%

Figure 10. Plant community growth curve (percent production by month). NM3104, R048AY004NM Mountain Loam HCPC. R048AY004NM Mountain Loam HCPC Mixed cool/warm-season mid/bunch grass grassland with minor components of shrubs and forbs. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	5	10	10	25	30	12	5	0	0

Community 1.2
Grassland with Scattered Shrubs

Continuous grazing during the grazing season will cause the more desirable forage plants such as mountain muhly, little bluestem, sideoats grama, Arizona fescue and western wheatgrass to decrease. The species most likely to invade this site are Kentucky bluegrass, broom snakeweed and pingue. Species most likely to increase from small amounts or trace amounts are blue grama, oak and forbs.

Pathway 1.1A
Community 1.1 to 1.2

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

Pathway 1.2A
Community 1.2 to 1.1

Proper grazing, browsing of shrubs, fire and/or wet climatic cycles.

State 2
Degraded State

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. As the ecological conditions deteriorate, it is accompanied by a sharp increase in blue grama. Most of the mid-grasses and bunch grass species will disappear as deterioration advances. In some areas there may be large patches of sleepygrass and a variety of annual and perennial forbs. Oak brush will also increase to the point where it is dominant.

Transition T1A
State 1 to 2

Removal of periodic fire may result in an increase in woody canopy across the site. Abusive grazing practices can limit the amount of fine fuel and further reduce the effectiveness of fire on suppressing woody species. 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

Re-introduction of fire in the system couple with proper grazing/fuel management can reduce the amount of woody canopy and favor herbaceous species. In some instances, site-specific alternative brush management practices may be needed to facilitate this restoration.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				130–150	
	mountain muhly	MUMO	*Muhlenbergia montana*	130–150	–
2				130–150	
	sideoats grama	BOCU	*Bouteloua curtipendula*	130–150	–

	sideoats grama	BOCU	*Bouteloua curtipendula*	100–100	
3				80–100	
	little bluestem	SCSC	*Schizachyrium scoparium*	80–100	–
4				80–100	
	blue grama	BOGR2	*Bouteloua gracilis*	80–100	–
5				80–100	
	Arizona fescue	FEAR2	*Festuca arizonica*	80–100	–
6				80–100	
	western wheatgrass	PASM	*Pascopyrum smithii*	80–100	–
8				30–50	
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	30–50	–
9				30–50	
	sedge	CAREX	*Carex*	30–50	–
10				30–50	
	big bluestem	ANGE	*Andropogon gerardii*	30–50	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	30–50	–
	common wolfstail	LYPH	*Lycurus phleoides*	30–50	–
	mountain brome	BRMA4	*Bromus marginatus*	30–50	–
	oatgrass	DANTH	*Danthonia*	30–50	–
	spike muhly	MUWR	*Muhlenbergia wrightii*	30–50	–
	Grass, native	2GN	*Grass, native*	30–50	–
	squirreltail	ELEL5	*Elymus elymoides*	0–10	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–10	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–10	–
	threeawn	ARIST	*Aristida*	0–10	–
	vine mesquite	PAOB	*Panicum obtusum*	0–10	–
Forb					
12				30–50	
	vetch	VICIA	*Vicia*	30–50	–
	Grass, native	2GN	*Grass, native*	30–50	–
	common yarrow	ACMI2	*Achillea millefolium*	30–50	–
	Rocky Mountain iris	IRMI	*Iris missouriensis*	30–50	–
	bush vetchling	LAEU	*Lathyrus eucosmus*	30–50	–
	lupine	LUPIN	*Lupinus*	0–10	–
Shrub/Vine					
15				30–50	
	oak	QUERC	*Quercus*	30–50	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	30–50	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	30–50	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	30–50	–
Tree					
16				0–30	
	twoneedle pinyon	PIED	*Pinus edulis*	0–30	–

	ponderosa pine	PIPO	*Pinus ponderosa*	0–30	–

Animal community

Grazing:
This site can be grazed from May until mid-October. It is better suited to a younger age of livestock due to the slope and the stony or cobbly surface. Distribution of domestic livestock is a problem on this site. All ages and classes of livestock ten to graze the flatter slopes leaving the steeper slopes ungrazed. Approximately 90 percent of the total annual yield are from species that furnish forage for livestock or grazing animals when accessible. This site generally greens up first in the spring due to the exposure of the south facing slopes.
Livestock distribution can be improved by use of mechanically constructed tails.

Habitat for Wildlife:
This site provides habitats, which support a resident animal community that is characterized by elk, heather vole, Gunnison's prairie dog, golden-mantled ground squirrel, pygmy owl, western bluebird and kingsnake. Mule deer use this site seasonally.

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
Des Moines ----------C
Dalcan ----------C

Approximate hydrologic curve number when hydrological cover conditions are optimum are C soils - 79.

Recreational uses

This site provides limited recreation potential for hiking and horseback riding. The main limitation is the steep slope and stony soil surface. It also provides hunting for rabbits, deer and turkey.

Wood products

This site produces no wood products except for occasional fuel for campfires.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index----------Ac/AUM
100 - 76----------2.5 – 5.0
75 – 51----------3.4 – 5.6
50 – 26----------4.3 – 9.8
25 – 0----------9.8+

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, Santa Fe National Forest (Pecos-Las Vegas Ranger District), and San Miguel.

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	05/10/2025
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):**

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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):**

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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:**