

Ecological site R070CY110NM Malpais

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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.



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): 042C—Central New Mexico Highlands

Major Land Resource Area (MLRA): 070C—Central New Mexico Highlands

Major Land Resource Area (MLRA) 70C - will become 42C - is a high elevation portion of central New Mexico that is the convergence of four major physiographic provinces: Basin and Range, Southern Rocky Mountains, Great Plains, and Colorado Plateau. As such, it contains parts or characteristics of each, though tectonically, as a region, it is the easternmost extent of the Basin and Range Province and, more specifically, a structural expression of the Rio Grande Rift. It consists mostly of rangeland with some forested areas associated with numerous disconnected mountain ranges such as the Guadalupe, Sacramento, and Manzano Mountains. Other major physiographic features include the Galisteo Basin or the enclosed Estancia Basin, the structural Chupadera and Glorieta Mesas, and the piedmonts of the Buchanan and Guadalupe Mesas.

LRU notes

Site does not yet have an LRU designation

Ecological site concept

This site occurs on soils that are very shallow to moderately deep over basalt bedrock. Textures vary from stony fine sandy loams to stony clay loams. The soils may be calcareous on the surface or throughout the profile. Slopes range from 0 to 15 percent.

Vegetation includes galleta, blue grama, burro-grass, mat muhly, ring muhly, cholla, snakeweed, and Russian thistle.

Table 1. Dominant plant species

Tree	(1) <i>Juniperus</i> (2) <i>Pinus edulis</i>
Shrub	(1) <i>Cercocarpus montanus</i> (2) <i>Purshia mexicana</i>
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Bouteloua gracilis</i>

Physiographic features

This site occurs as lava flows, usually across broad areas and over uniform slopes. Slopes are nearly level to moderately sloping but may range as high as 15 percent. The terrain may frequently be interrupted by basalt outcrops, rock, or boulders and may have low hills, breaks or knobs that break the uniformity of the slope. Aspect varies but is not significant. Elevations range from 5,000 to 7,000 feet above sea level.

The Clovis soils are on plains. Slopes range from 0 to 20 percent. The soils formed in medium and moderately fine textured mixed sediments from quartzite, gneiss, schist, sandstone, and limestone. Elevations range from 4,500 to 7,200 feet.

Darvey soils are on hills. Slope is 0 to 5 percent. The soils formed in alluvium derived from calcareous sandstone and shale and limestone. The elevation is 4,500 to 6,500 feet.

Socorro soils are on basalt surfaces. Slope ranges from 0 to 8 percent. They formed in alluvium derived from basalt and eolian material. Elevation ranges from 5,200 to 6,200 feet.

The Tapia soils are on summits of interfluvies and mesa tops. Slope ranges from 0 to 15 percent. The soils formed in calcareous medium to moderately fine textured material derived from mixed igneous and sedimentary rocks over gravelly very limy deposits. Elevations range from 5,400 to 7,200 feet.

Witt soils are on mesas. Slope ranges from 0 to 12 percent. They formed in silty calcareous sediments derived from mixed parent materials including quartzite, gneiss, sandstone, shale, limestone, eolian material, and Triassic and Jurassic redbed sediments. Elevation ranges from 5,200 to 7,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Lava flow
Elevation	1,524–2,134 m
Slope	15%
Aspect	Aspect is not a significant factor

Climatic features

The climate of the area is "semi-arid continental".

The average annual precipitation ranges from 13 to 16 inches. Variations of 5 inches, more or less, are not uncommon. Seventy-five percent of the precipitation falls from April to October. Most of the summer precipitation comes in the form of high intensity-short duration thunderstorms.

Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature is about 50 degrees F with extremes of -29 degrees F in the winter and 103 degrees F in the summer.

The average frost-free season is 130 to 160 days. The last killing frost falling in early May and the first killing frost in early October.

Both temperature and precipitation favor warm-season perennial species. However, about 40 percent of the annual precipitation falls at a time favorable to cool-season plant growth. This allows the cool-season species to occupy an important component of the site. Strong winds blow across this area from the west and southwest from February to June and can dry the soil profile rapidly during a critical period for cool-season plant growth.

Climate data was obtained from <http://www.wrcc.sage.dri.edu/summary/climsmnm.html> web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

Clovis - The climate is semiarid continental. Typically, the mean annual temperature is about 49 to 57 degrees F. The mean annual precipitation is typically 10 to 14 inches, but has ranged to 16 inches in some areas. Frost-free period is 140 to 185 days. In Arizona, the mean annual temperature drops to 48 degrees and the frost-free period is 120 to 165 days.

Darvey - The mean annual precipitation is 10 to 13 inches, but has ranged to 17 inches in the past. The mean annual soil temperature ranges from 48 to 59 degrees F. The frost-free period is about 150 to 190 days.

Socorro - The mean annual temperature ranges from 48 to 57 degrees F., mean annual precipitation ranges from 10 to 12 inches, but has ranged to 15 inches in the past. The frost-free period ranges from about 140 to 190 days.

Tapia - The average annual precipitation ranges from about 10 to 16 inches and the mean annual soil temperature ranges from 48 to 52 degrees F. The precipitation pattern is characterized by a marked summer maximum resulting from thunderstorms. The frost-free season ranges from 120 to 170 days.

Witt - The mean annual precipitation ranges from 10 to 14 inches. Mean annual temperature ranges from 45 to 54 degrees F. The frost-free period ranges from 120 to 160 days.

Table 3. Representative climatic features

Frost-free period (average)	173 days
Freeze-free period (average)	187 days
Precipitation total (average)	406 mm

Influencing water features

This is an upland site, and is not associated with water features or wetlands. During heavy rain events, this site may receive run-on moisture from landforms above and contribute runoff to landforms below.

Soil features

The soils on this site are very shallow to moderately deep over basalt bedrock. Textures vary from stony fine sandy loams to stony clay loams. These soils may be calcareous on the surface or throughout the profile. Permeability is moderate to slow and water-holding capacity is low to moderately high, depending on the depth to basalt. the classic concept is probably closest related to components of the Socorro series.

This site is correlated to mapunit components using soil series such as:

Clovis FINE-LOAMY, MIXED, SUPERACTIVE, MESIC USTIC CALCIARGIDS

Darvey FINE-LOAMY, MIXED, SUPERACTIVE, MESIC USTIC HAPLOCALCIDS

Socorro - LOAMY-SKELETAL, CARBONATIC, MESIC USTIC HAPLOCALCIDS

Tapia FINE-LOAMY, MIXED, SUPERACTIVE, MESIC PETRONODIC USTIC CALCIARGIDS

Witt FINE-SILTY, MIXED, SUPERACTIVE, MESIC USTIC CALCIARGIDS

The Clovis series consists of very deep, well drained, moderately permeable soils that formed in medium and moderately fine textured sediments from quartzite gneiss, schist, sandstone, and limestone. The Clovis soils are on fan terraces, piedmont slopes, and plains. Slopes are 0 to 20 percent. TAXONOMIC CLASS: Fine-loamy, mixed, superactive, mesic Ustic Calciargids. Well drained. Permeability is moderate or moderately slow. Runoff is negligible on slopes less than 1 percent, very low on 1 to 3 percent slopes, low on 3 to 5 percent slopes and medium on 5 to 20 percent slopes.

The Darvey series consists of very deep, well drained, moderately permeable soils that formed in alluvium from calcareous sandstone, shale and limestone. These soils are on hills, fan terraces, and valley fill. Slope ranges from

0 to 5 percent. Well drained; slow runoff; moderate permeability.

The Socorro series consists of moderately deep, well drained, moderately permeable soils that formed in alluvium derived from basalt and eolian materials. Slope ranges from 0 to 8 percent. Well drained. Permeability is moderate. Runoff is negligible on slopes less than 1 percent, very low on 1 to 5 percent slopes and low on 5 to 8 percent slopes.

The Tapia series consists of very deep, well drained, moderately permeable soils that formed in alluvium and eolian material derived from mixed sources. These soils are on piedmont fans and mesas and on interfluvies of undulating plains. Well drained. Permeability is moderate. Runoff is negligible on slopes less than 1 percent slopes, low on 1 to 5 percent slopes and medium on 5 to 15 percent slopes.

The Witt series consists of very deep, well drained, moderately or moderately slowly permeable soils that formed in eolian material and alluvium derived from sedimentary materials on fan terraces, piedmonts, bajadas and mesas. Slope ranges 0 to 12 percent. Well drained. Permeability is moderately slow. Runoff is low on slopes less than 1 percent, medium on 1 to 5 percent slopes and high on 5 to 15 percent slopes.

Table 4. Representative soil features

Surface texture	(1) Gravelly fine sandy loam (2) Stony clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	51–102 cm
Surface fragment cover <=3"	35–60%
Surface fragment cover >3"	15–35%
Available water capacity (0–101.6cm)	0–5.08 cm
Electrical conductivity (0–101.6cm)	0–2 mmhos/cm
Soil reaction (1:1 water) (0–101.6cm)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	15–35%
Subsurface fragment volume >3" (Depth not specified)	15–35%

Ecological dynamics

This site is not suited to continuous year-long grazing or continuous grazing during the growing season. Under the above condition, the site will deteriorate. Deterioration is characterized by a decrease in total production and the composition of western wheatgrass, black grama, sideoats grama, New Mexico feathergrass, Arizona fescue, and pine dropseed. There will be a corresponding increase in bare ground and low-vigor sod-type blue grama. Species such as threeawns, broom snakeweed, Gambel oak, pinyon, and juniper will also increase. In a deteriorated condition, this site is severely erodible. The site responds best to a system of grazing that rotates the season of use. The use of goats can be a good management tool in maintaining a healthy balance of vegetation.

State and transition model

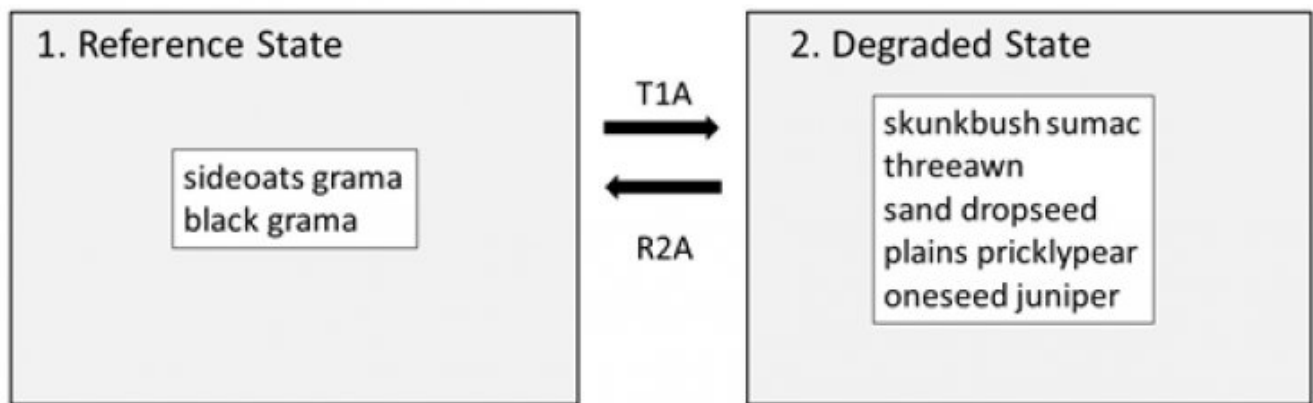


Figure 4. Generalized STM for shallow sites in 70C

State 1
Reference State

This state includes western wheatgrass, black grama, and sideoats grama.

Characteristics and indicators. the composition of western wheatgrass, black grama, sideoats grama, New Mexico feathergrass, Arizona fescue, and pine dropseed.

Resilience management. Grazing: This site is suitable for grazing by all kinds and classes of livestock during all seasons of the year. However, this site is not suited to continuous year-long grazing or continuous grazing during the growing season. Under the above condition, the site will deteriorate. The site responds best to a system of grazing that rotates the season of use.

Community 1.1
Reference Plant Community

This phase is dominated by perennial grasses. Shrubs and half-shrubs dot the landscape. During years of abundant spring and fall moisture, a large variety of forbs are scattered throughout the landscape. Other grasses that could appear on this phase include: big bluestem, cane bluestem, prairie junegrass, pinyon ricegrass, Indian ricegrass, and vine-mesquite. Other shrubs include: algerita, sacahuista, winterfat, fourwing saltbush, apacheplume, rubber rabbitbrush, yucca and ephedra. Other forbs include: happlopappus spp., bloodweed, annual wildbuckwheats, and locoweed spp.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	415	717	1009
Forb	45	78	112
Total	460	795	1121

Table 6. Ground cover

Tree foliar cover	1-3%
Shrub/vine/liana foliar cover	2-7%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	8-10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	10-20%

Figure 6. Plant community growth curve (percent production by month). NM4310, R070CY110NM Malpais HCPC. R070CY110NM Malpais HCPC Mixed warm/cool-season grassland with scattered shrubs and half-shrubs with a minor forb component. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	10	15	25	25	8	5	0	0

State 2 Degraded

This state is characterized by bare ground and low-vigor sod-type blue grama.

Characteristics and indicators. Deterioration is characterized by a decrease in total production and the composition of western wheatgrass, black grama, sideoats grama, New Mexico feathergrass, Arizona fescue, and pine dropseed. There will be a corresponding increase in bare ground and low-vigor sod-type blue grama. Species such as threeawns, broom snakeweed, Gambel oak, pinyon, and juniper will also increase.

Resilience management. The site responds best to a system of grazing that rotates the season of use. The use of goats can be a good management tool in maintaining a healthy balance of vegetation.

Transition T1A State 1 to 2

Season-long grazing providing little rest and recovery for preferred grazed plants during critical growing periods, coupled with high utilization.

Restoration pathway R2A State 2 to 1

Legacy Statement: "Restoration pathway resulting from the implementation of prescribed grazing." It should be noted that the legacy statement does not indicate a timeframe, or other conditions, such as a favorable climatic period. Future work on this ESD should seek to clarify this.

Conservation practices

Grazing Management Plan - Applied

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				90–146	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	95–143	–
2				90–191	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	95–191	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	95–191	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	95–191	–
3				90–191	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	95–191	–
4				90–146	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	95–143	–
5				34–45	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	29–48	–
6				34–45	
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	29–48	–
7				45–67	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	48–67	–
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	48–67	–
8				45–67	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	48–67	–
9				34–45	
	spike muhly	MUWR	<i>Muhlenbergia wrightii</i>	29–48	–
10				45–67	
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	48–67	–
11				45–67	
	pine dropseed	BLTR	<i>Blepharoneuron tricholepis</i>	48–67	–
	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	48–67	–
12				22–45	
	threeawn	ARIST	<i>Aristida</i>	19–48	–
13				11–22	
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	10–19	–
14				22–45	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	19–48	–
Forb					
15				11–45	
	buckwheat	ERIOG	<i>Eriogonum</i>	10–48	–
16				11–34	
	scarlet Indian paintbrush	CACO17	<i>Castilleja coccinea</i>	10–29	–
17				11–34	
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	10–29	–
18				11–22	

	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	10–19	–
Shrub/Vine					
19				22–45	
	hairy mountain mahogany	CEMOP	<i>Cercocarpus montanus var. paucidentatus</i>	19–48	–
20				22–45	
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	19–48	–
	Gambel oak	QUGA	<i>Quercus gambelii</i>	19–48	–
22				11–34	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	10–29	–
23				11–34	
	Shrub, deciduous	2SD	<i>Shrub, deciduous</i>	10–29	–
Tree					
21				45–90	
	juniper	JUNIP	<i>Juniperus</i>	48–95	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	48–95	–

Type locality

Location 1: Chaves County, NM
Location 2: De Baca County, NM
Location 3: Guadalupe County, NM
Location 4: Lincoln County, NM
Location 5: San Miguel County, NM
Location 6: Santa Fe County, NM
Location 7: Torrance County, NM

Other references

Data collection for this site was done in conjunction with the progressive soil surveys within the Pecos-Canadian Plains and Valleys 70 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: Chaves, De Baca, Guadalupe, Lincoln, Sna Miguel, Santa Fe, Torrance.

Characteristic Soils Are:
Apache, Cabezon, Socorro

Contributors

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Approval

Kendra Moseley, 10/21/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/14/2025
Approved by	Kendra Moseley
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:**
-