

Ecological site R042CY117NM

Sandstone Hills

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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): 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.

Ecological site concept

Sandstone Hills sites occur in colluvial soils on steeper escarpments and backslopes below mesas, structural benches, and plateaus. Soils are generally shallow to sandstone bedrock but can have deeper pockets. Soils are variable along steep slopes with some occurring on brief and narrow but nearly-level risers that catch colluvium. Soils are loamy with a variety of fragments on the surface and within the soils. They are rarely well developed but can have some carbonates inherited from parent material deposits and sometimes accumulations of organic horizons also inherited from eroding soil surfaces higher in the catena.

Table 1. Dominant plant species

Tree	(1) <i>Juniperus</i> (2) <i>Pinus edulis</i>
Shrub	(1) <i>Rhus microphylla</i> (2) <i>Rhus trilobata</i>
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Schizachyrium scoparium</i>

Physiographic features

The topography of this area varies from moderately steep to steep and occurs with sandstone rock outcrop, or badlands. Slopes generally exceed 15 percent and may on occasion range as high as 70 percent. Direction of slope varies and generally shows that the north and east slopes are cooler and moister and therefore produce more forage. Elevations range from 4,600 to 7,000 feet above sea level.

Travessilla - Parent material: calcareous eolian sediments and residuum weathered from sandstone and shale. Outcrops of sandstone with a minor amount of shale are common on steep slopes. Landform: hills, cuestras, scarps, and mesas. Slopes: 0 to 75 percent. Elevation: 4,700 to 8,000 feet

Ponciano soils are on hillslopes below mesa escarpments and structural benches and on cuesta scarp faces. Ponciano soils formed in colluvium and alluvium derived from sandstones and mudstones. Slope ranges from 15 to 60 percent.

The Bernal soils are on mesa tops and upland ridge crests on bedrock controlled landscape. Slopes range from 0 to 30 percent. Elevations are 5,300 to 7,900 feet. The soils formed in moderately fine textured noncalcareous sandy material weathered from the sandstone, with possible minor addition of eolian material.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Scarp slope
Elevation	1,400 – 2,130 m
Slope	20 – 70 %
Aspect	N, E

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.

Distinct seasonal changes and large annual and diurnal temperature changes characterize temperatures. 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, approximately 40 percent of the annual precipitation fall at a time favorable to cool-season plant growth. This allows the cool-season species to occupy an important component of this site. On the north and east slopes, this cool-season component may dominate the vegetative community. Strong winds that blow from February to June can dry the soil profile quickly during a critical time 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.

Table 3 Representative climatic features

Frost-free period (average)	170 days
Freeze-free period (average)	190 days
Precipitation total (average)	410 mm

Influencing water features

This site is not influenced by water from a wetland or stream. These sites can be influenced from run-on as well as be excessively well drained, depending on their position along the catena. This site may also contribute moisture to landforms below during/following heavy precipitation events.

Soil features

The soils on this site are generally shallow to very shallow over sandstone. Surface textures are typically sandy loams and silt loams. Pockets of deeper soil occur in association with this site, as well as occasional for frequent outcroppings of sandstone bedrock that may affect livestock movements. Water intake rates are moderate to moderately rapid, and water-holding capacity is low.

The Travessilla series consists of very shallow and shallow, well drained soils that formed in calcareous eolian sediments and material weathered from sandstone. These soils are on hills, cuestras, scarps, and mesas with slopes ranging from 0 to 75 percent. TAXONOMIC CLASS: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents

The Ponciano series consists of very deep, well drained, slowly permeable soils that formed in colluvium and alluvium derived from sandstone and mudstones. Ponciano soils are on hillslopes below mesas and structural benches and on cuesta scarp faces. TAXONOMIC CLASS: Fine, mixed, superactive, mesic Ustic Haplocambids

The Bernal series consists of shallow to sandstone bedrock, well drained soils that formed in material weathered from sandstone. Bernal soils are on mesa tops and upland ridge crests, and have slopes of 0 to 25 percent. TAXONOMIC CLASS: Loamy, mixed, superactive, mesic Aridic Lithic Argiustolls

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Silt loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	0 – 50 cm
Available water capacity (0-101.6cm)	2.54 cm
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	20 – 40 %
Subsurface fragment volume >3" (Depth not specified)	20 – 40 %

Ecological dynamics

A mixed grassland, shrubs, half-shrubs aspect with scattered tree-type juniper and pinyon characterize this site. Mid- and short grasses dominate the site. However, during years of abundant spring and fall moisture, a large variety of forbs occur throughout this site. Cool-season species are more prevalent on the north and east slopes and at higher elevations.

Vegetation includes little bluestem, sideoats grama, black grama, blue grama, needlegrasses, Arizona fescue, piñon ricegrass, mountain muhly, New Mexico muhly, common wolftail, threeawn, plains lovegrass, bottlebrush squirreltail, Indian paintbrush, wooly indianwheat, showy goldeneye, piñon, juniper, skunkbush, littleleaf sumac, mountain mahogany, algerita, and oak

This site is suited for grazing by all kinds and classes of livestock during all season of the year. On areas of excessively steep slopes, accessibility may become limited, and stocking rates should be adjusted accordingly. This site responds best to a system of grazing that rotates the season of use. Under continuous yearlong grazing or continuous grazing during the growing season, this site will deteriorate. Deterioration of this site is characterized by a decrease in little bluestem, sideoats grama, black grama, New Mexico feathergrass, Arizona fescue, and pinyon ricegrass. A corresponding increase in blue grama, threeawn, pinyon, juniper, and oak will occur. Under severe deterioration, erosion hazard becomes quite high, and the site may become severely limited for livestock use. Mechanical brush control is rarely justified on this site. Because of this, the use of goats may be a good tool for helping to maintain a healthy, balanced plant community.

Ponciano - soils are used for livestock grazing. Present vegetation is sideoats grama, black grama, galleta, Stipa spp., sacahuista, oneseed juniper and scattered pinyon.

Travessilla - Rangeland. Juniper, pinyon, squawbush, oakbrush, blue grama, sideoats grama and snakeweed are the principal plants.

Bernal - Rangeland. Principal native plants are blue grama, sand dropseed, and galleta, and commonly with an overstory of pinyon and juniper.

State and transition model

Figure 3. Generalized STM for shallow sites in 70C

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				157-191	
	sideoats grama	BOCU	Bouteloua curtipendula	157-196	–
	little bluestem	SCSC	Schizachyrium scoparium	157-196	–
2				78-112	
	black grama	BOER4	Bouteloua eriopoda	78-118	–
3				34-112	
	blue grama	BOGR2	Bouteloua gracilis	39-118	–
4				34-112	
	needle and thread	HECO26	Hesperostipa comata	39-118	–
	New Mexico feathergrass	HENE5	Hesperostipa neomexicana	39-118	–
5				11-34	
	Arizona fescue	FEAR2	Festuca arizonica	16-39	–
	pinyon ricegrass	PIFI	Piptochaetium fimbriatum	16-39	–
6				34-112	
	mountain muhly	MUMO	Muhlenbergia montana	39-118	–
	New Mexico muhly	MUPA2	Muhlenbergia pauciflora	39-118	–
7				34-67	
	plains lovegrass	ERIN	Eragrostis intermedia	39-63	–
	common wolfstail	LYPH	Lycurus phleoides	39-63	–
8				11-34	
	threeawn	ARIST	Aristida	16-39	–
9				11-34	
	squirreltail	ELEL5	Elymus elymoides	16-39	–
10				22-34	
	Graminoid (grass or grass-like)	2GRAM	Graminoid (grass or grass-like)	24-39	–
Forb					
11				6-22	

	scarlet Indian paintbrush	CACO17	<i>Castilleja coccinea</i>	4-24	–
12				6-22	
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	4-24	–
13				6-22	
	showy goldeneye	HEMUM	<i>Helimeris multiflora var. multiflora</i>	4-24	–
14				6-22	
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	4-24	–
Tree					
15				34-112	
	juniper	JUNIP	<i>Juniperus</i>	39-118	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	39-118	–
Shrub/Vine					
16				34-67	
	littleleaf sumac	RHMI3	<i>Rhus microphylla</i>	39-63	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	39-63	–
17				22-34	
	hairy mountain mahogany	CEMOP	<i>Cercocarpus montanus var. paucidentatus</i>	24-39	–
	algerita	MATR3	<i>Mahonia trifoliolata</i>	24-39	–
18				22-34	
	oak	QUERC	<i>Quercus</i>	24-39	–
19				22-34	
	Shrub, deciduous	2SD	<i>Shrub, deciduous</i>	24-39	–

Type locality

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

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	09/17/2026
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:
