USDA Natural Resources Conservation Service

Ecological site R070CY117NM
Sandstone Hills

Last updated: 10/21/2024
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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.

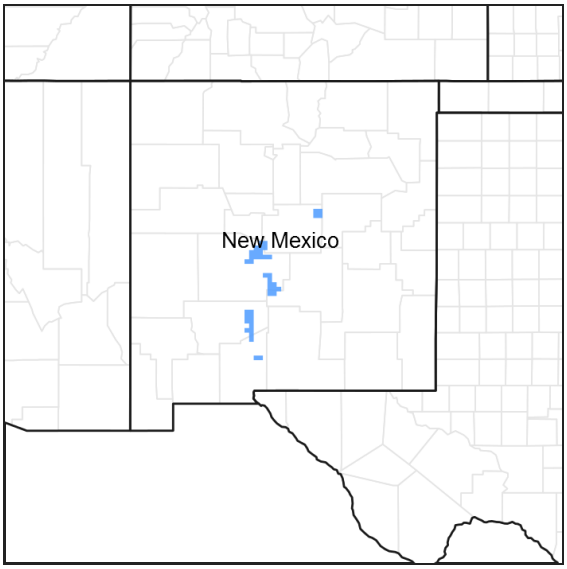

Figure 1. Mapped extent

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.

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) *Juniperus* (2) *Pinus edulis*
Shrub	(1) *Rhus microphylla* (2) *Rhus trilobata*
Herbaceous	(1) *Bouteloua curtipendula* (2) *Schizachyrium scoparium*

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, cuestas, 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	4,600–7,000 ft
Slope	15–70%
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)	173 days
Freeze-free period (average)	187 days
Precipitation total (average)	16 in

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, cuestas, 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	0–20 in
Available water capacity (0-40in)	1 in
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–35%
Subsurface fragment volume >3" (Depth not specified)	15–35%

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

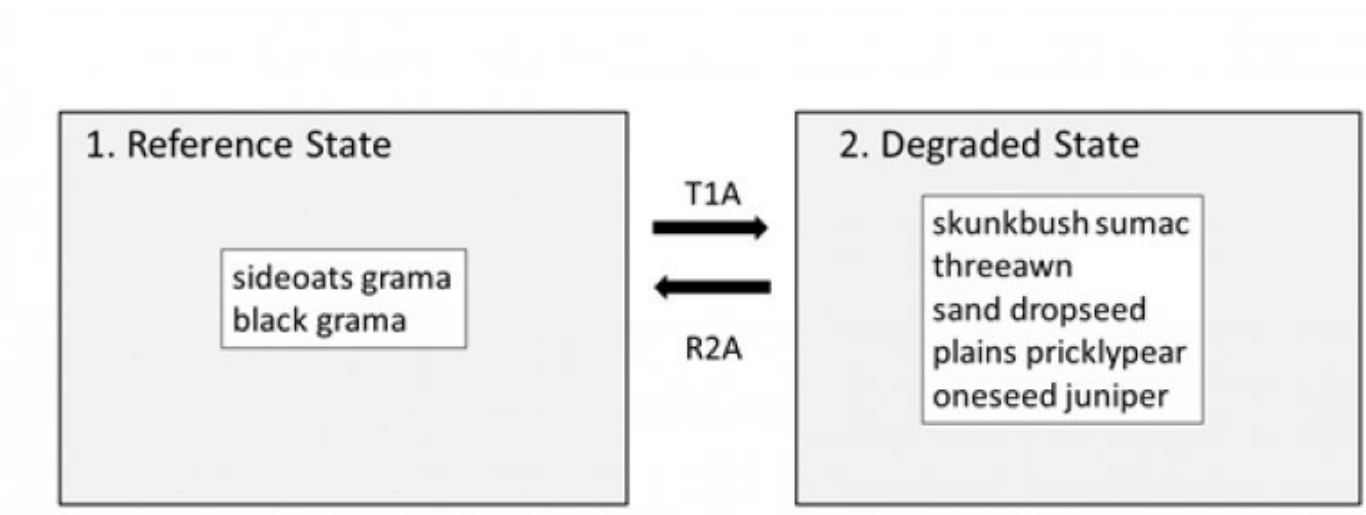

Figure 4. Generalized STM for shallow sites in 70C

State 1
Reference State

This state includes little bluestem, sideoats grama, black grama, and New Mexico feathergrass.

Characteristics and indicators. little bluestem, sideoats grama, black grama, New Mexico feathergrass, Arizona

fescue, and pinyon ricegrass

Resilience management. 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.

Community 1.1
Reference Plant Community

A mixed grassland, shrubs, half-shrubs aspect with scattered tree-type juniper and pinyon characterize this phase. Mid- and short grasses dominate the phase. 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. Other grasses that could appear on this phase include: hairy grama, galleta, Metcalf muhly, curlyleaf muhly, spike muhly, ring muhly, mat muhly, prairie junegrass, western wheatgrass, sand dropseed, curly mesquite, tridens spp., big bluestem and Arizona cottontop. Other shrubs include: ephedra spp., winterfat, yucca spp., fourwing saltbush, sacahuista, cacti spp., agave spp., broom snakeweed, and cliff fendlerbush. Other forbs include: locoweed, lamberts crazyweed, globemallow, marigold, yarrow, mariola, penstemon spp., and threadleaf groundsel.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	260	450	650
Forb	30	60	80
Total	**290**	**510**	**730**

Table 6. Ground cover

Tree foliar cover	5-10%
Shrub/vine/liana foliar cover	7-15%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-8%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	25-35%

Figure 6. Plant community growth curve (percent production by month). NM4217, R070CY117NM Sandstone Hills Reference State. 70CY117NM Sandstone Hills Reference State.

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 contains blue grama, threeawn, pinyon, and juniper.

Characteristics and indicators. 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.

Resilience management. 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. 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.

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 text: "Restoration pathway resulting from the implementation of prescribed grazing." It should be noted that prescribed grazing alone may not effectively diminish woody plants here. Brush control may also be required. 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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				140–170	
	sideoats grama	BOCU	*Bouteloua curtipendula*	140–175	–
	little bluestem	SCSC	*Schizachyrium scoparium*	140–175	–
2				70–100	
	black grama	BOER4	*Bouteloua eriopoda*	70–105	–
3				30–100	
	blue grama	BOGR2	*Bouteloua gracilis*	35–105	–
4				30–100	
	needle and thread	HECO26	*Hesperostipa comata*	35–105	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	35–105	–
5				10–30	
	Arizona fescue	FEAR2	*Festuca arizonica*	14–35	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	14–35	–
6				30–100	
	mountain muhly	MUMO	*Muhlenbergia montana*	35–105	–
	New Mexico muhly	MUPA2	*Muhlenbergia pauciflora*	35–105	–
7				30–60	

	plains lovegrass	ERIN	*Eragrostis intermedia*	35–56	–
	common wolfstail	LYPH	*Lycurus phleoides*	35–56	–
8				10–30	
	threeawn	ARIST	*Aristida*	14–35	–
9				10–30	
	squirreltail	ELEL5	*Elymus elymoides*	14–35	–
10				20–30	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	21–35	–
Forb					
11				5–20	
	scarlet Indian paintbrush	CACO17	*Castilleja coccinea*	4–21	–
12				5–20	
	woolly plantain	PLPA2	*Plantago patagonica*	4–21	–
13				5–20	
	showy goldeneye	HEMUM	*Heliomeris multiflora var. multiflora*	4–21	–
14				5–20	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	4–21	–
Tree					
15				30–100	
	juniper	JUNIP	*Juniperus*	35–105	–
	twoneedle pinyon	PIED	*Pinus edulis*	35–105	–
Shrub/Vine					
16				30–60	
	littleleaf sumac	RHMI3	*Rhus microphylla*	35–56	–
	skunkbush sumac	RHTR	*Rhus trilobata*	35–56	–
17				20–30	
	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	21–35	–
	algerita	MATR3	*Mahonia trifoliolata*	21–35	–
18				20–30	
	oak	QUERC	*Quercus*	21–35	–
19				20–30	
	Shrub, deciduous	2SD	*Shrub, deciduous*	21–35	–

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:
Rizozo

Contributors

Christine Bishop
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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	05/11/2025
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:

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17. **Perennial plant reproductive capability:**
