

Ecological site R070BY051NM

Sandstone Savanna

Last updated: 9/12/2023

Accessed: 05/19/2024

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.

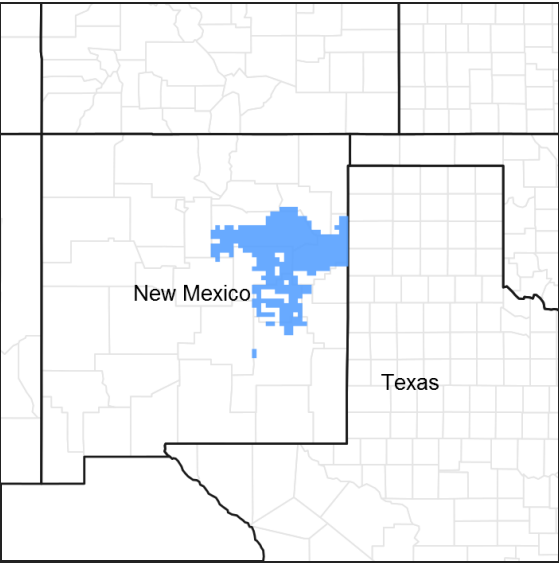


Figure 1. Mapped extent

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.

Ecological site concept

This site occurs on gently sloping to moderately steep canyon walls, hillsides, and mesa tops. Slopes are usually 5 to 15 percent but may range from 0 (flat rock areas) to 25 percent (inclusions of short steeper slopes). Soils are very shallow to shallow. Surface textures are fine sandy loam, sandy loam, or loamy fine sand. Some may have textures of stony sandy loam or cobbly fine sandy loam. Sandstone bedrock is at depths of 7 to 20 inches.

The Sandstone Savannah ecological site is associated with Shallow Sandstone, Sandy Loam, and Loamy ecological sites.

Table 1. Dominant plant species

Tree	(1) <i>Juniperus</i> (2) <i>Pinus edulis</i>
Shrub	(1) <i>Krascheninnikovia lanata</i> (2) <i>Yucca glauca</i>
Herbaceous	(1) <i>Bouteloua gracilis</i> (2) <i>Bouteloua curtipendula</i>

## Physiographic features

This site is on gently sloping to moderately steep canyon walls, hillsides, and mesa tops. Slopes are usually 5 to 15 percent but may range from 0 (flat rock areas) to 25 percent (inclusions of short steeper slopes). Elevation ranges from 3,800 to 5,500 feet. The landscape is typically a complex of small pockets of soil interspersed with sandstone outcrop in the form of ledges.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Mesa (3) Cuesta
Elevation	1,158–1,676 m
Slope	0–25%
Aspect	Aspect is not a significant factor

## Climatic features

The climate of this area can be classified as “semi-arid continental”.

Annual average precipitation ranges from 11 to 16 inches. Roughly 78 percent of the moisture falls during the 6-month period of May through October. Most of this summer precipitation falls in the form of brief and heavy afternoon and evening thunderstorms. Hail may accompany the more severe summer storms. In the winter, there is normally only one day a month when as much as one-tenth inch of moisture falls, usually in the form of snow. Snow seldom lies on the ground for more than a few days.

Temperatures are characterized by a distinct seasonal change and large annual and diurnal temperature ranges. Summers are moderately warm. Maximum temperature average above 90 degrees F from July to August, and an average summer includes about 80 days with high readings exceeding 90 degrees F and 10 days with readings above 100 degrees F. Temperatures usually fall rapidly after sundown and lows average 60 degrees F on most summer nights. Winters are mild, sunny, and dry. Daytime shade temperatures in midwinter usually rise to the 50's. However, freezing temperatures normally occur at night from mid-November to mid-March.

The freeze-free season ranges from 196 to 218 days. Dates of the last freeze range from April 11th to April 17th and the first freeze ranges from October 20th to October 25th.

Both temperature and rainfall distribution favor warm-season, perennial plant communities in the area. However, sufficient late winter and early spring moisture allows cool-season species to occupy a minor component within the plant community.

Climate data was obtained from <http://www.wrcc.dri.edu/summary/climsmnm.html> web site. Data were interpreted utilizing NM Climate Summarizer spreadsheet.

**Table 3. Representative climatic features**

Frost-free period (average)	192 days
Freeze-free period (average)	218 days
Precipitation total (average)	406 mm

## Influencing water features

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

## Soil features

Soils are very shallow to shallow. Surface textures are fine sandy loam, sandy loam, and loamy fine sand. Some may have textures of stony sandy loam or cobbly fine sandy loam. Subsurface textures are most often fine sandy loam, sandy loam, stony sandy loam, or cobbly fine sandy loam. Less often, subsoils have textures of sandy clay loam, and contain clay films.

Sandstone bedrock is at depths of 7 to 20 inches. The air-water relationship is favorable for plant growth. Rock fragments make up 5 to 30 percent of the soil profile.

Characteristic soils:

Lacoca

Latom

Newkirk

**Table 4. Representative soil features**

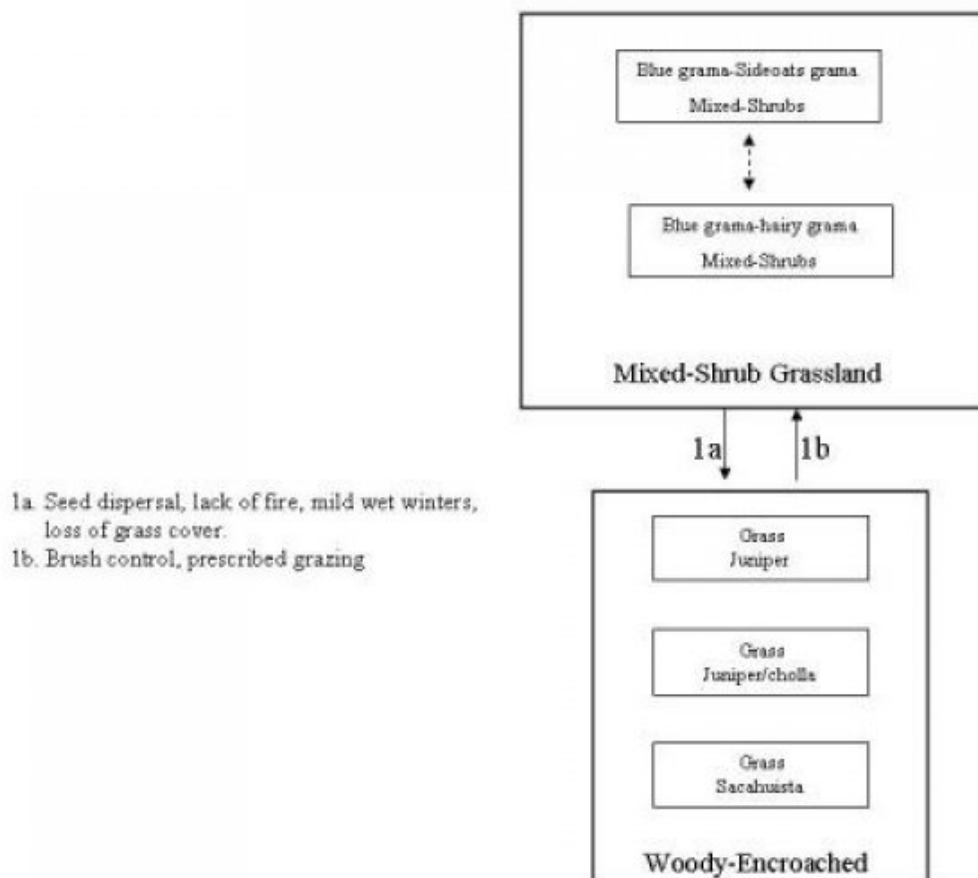
Surface texture	(1) Loamy fine sand (2) Cobbly fine sandy loam (3) Fine sandy loam
Drainage class	Well drained to moderately well drained
Permeability class	Moderately slow
Soil depth	18–51 cm
Surface fragment cover ≤3"	5–15%
Surface fragment cover >3"	5–10%
Available water capacity (0-101.6cm)	2.54–7.62 cm
Calcium carbonate equivalent (0-101.6cm)	1–7%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.4–8.4
Subsurface fragment volume ≤3" (Depth not specified)	5–15%
Subsurface fragment volume >3" (Depth not specified)	5–10%

## Ecological dynamics

This ecological site occurs on hills, mesas, and dipslopes of cuestras. It is dominated by warm-season short and mid-grasses, with scattered trees, shrubs and forbs. Grasses make up approximately 70 percent of the annual vegetative production. Shrubs and forbs are evenly distributed and can make up an important portion of the plant community. Juniper and pinyon are often associated with very shallow soils along ledges and rock outcrop. Blue grama and sideoats grama are the dominant grasses of the reference plant community. Seed dispersal by livestock and wildlife, decreased fire frequency, loss of grass cover, and periods of mild wet winters may facilitate an increase in woody species.

## State and transition model

## MLRA 70, CP-2 Sandstone Savannah



### State 1

#### Reference State

This state represents the most ecologically stable conditions in terms of resistance to erosion. Moreover, this state has the highest potential for productivity and plant diversity.

### Community 1.1

#### Reference Plant Community

Mixed-Shrub Grassland: In the reference plant community, blue grama and sideoats grama are the dominant grasses. Other species that typically occur in significant amounts include black grama, little bluestem, and New Mexico feathergrass. Common forbs include, bladderpod, Indian paintbrush, and globemallow. Juniper, winterfat, yucca, pinyon, sacahuista, and skunkbush sumac are a few of the woody species common to this site. Continuous heavy grazing pressure can cause a decrease in sideoats grama, black grama, little bluestem, New Mexico feathergrass, and winterfat. Communities dominated by blue and hairy grama may result. Other subordinate species that typically increase in representation includes, ring muhly, threeawns, wolfstail, and broom snakeweed. Diagnosis: Species of grama grasses dominate the site. Grass cover is uniform with few large bare areas. Shrubs are present and evenly distributed. Combined canopy cover of shrubs and trees averages 10 percent. There is little evidence of erosion.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	314	628	942
Forb	67	135	202
Tree	45	90	135
Shrub/Vine	22	45	67
<b>Total</b>	<b>448</b>	<b>898</b>	<b>1346</b>

**Table 6. Soil surface cover**

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

**Figure 5. Plant community growth curve (percent production by month).**  
**NM4001, R070BY051NM Sandstone Savanna HCPC. R070BY051NM**  
**Sandstone Savanna HCPC Mid and short grassland with minor components**  
**of forbs and shrubs..**

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

## State 2

### Woody Encroached

This state has been encroached by woody species--most often oneseed juniper.

### Community 2.1

#### Woody Encroached

**Additional States: Woody-Encroached:** This site is characterized by the noticeable increase of woody species including juniper, cholla, or sacahuista. These species may occur in combination or individually. Under proper grazing management grass communities tend to be similar to those that occur in the Mixed-Shrub Grassland state. Under continued heavy grazing pressure, species such as ring muhly, threeawns, wolfstail, and broom snakeweed may continue to increase in representation. **Diagnosis:** Woody species, including juniper, cholla, or sacahuista are found at increased densities. Grass cover is variable ranging from fairly uniform to patchy with frequent large bare areas present. Rills and small gullies may be present especially on the steeper slopes. Wind scoured or depositional areas may be present as cover declines. **Transition to Woody-Encroached (1a) )** Seed dispersal by livestock and wildlife and decreased fire frequency may facilitate the encroachment of juniper, cholla, and sacahuista. Variation in precipitation patterns such as a period of mild winters and above average precipitation may produce conditions favorable to the expansion of woody species initiating periods of increased recruitment and establishment. Additionally, decreased grass cover may aid the establishment of woody species by providing competition-free areas for seedling establishment. **Key indicators of approach to transition:** Decrease or change in

distribution of grass cover. Increase in amount of woody seedlings. Transition back to Mixed-Shrub Grassland (1b) Brush control is necessary to reduce the canopy cover of woody species and maintain grass dominance. Periodic use of prescribed fire may be useful in reducing and maintaining shrub densities.2,4 Prescribed grazing will help ensure proper forage use following brush control.

## Transition T1A

### State 1 to 2

Seed dispersal by livestock and wildlife and decreased fire frequency may facilitate the encroachment of juniper, cholla, and sacahuista. Variation in precipitation patterns such as a period of mild winters and above average precipitation may produce conditions favorable to the expansion of woody species initiating periods of increased recruitment and establishment. Additionally, decreased grass cover may aid the establishment of woody species by providing competition-free areas for seedling establishment. Key indicators of approach to transition: Decrease or change in distribution of grass cover. Increase in amount of woody seedlings.

## Restoration pathway R2A

### State 2 to 1

Brush control is necessary to reduce the canopy cover of woody species and maintain grass dominance. Periodic use of prescribed fire may be useful in reducing and maintaining shrub densities. Prescribed grazing will help ensure proper forage use following brush control.

## Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1				135–152	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	135–152	–
2				135–152	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	141–152	–
3				63–81	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	63–81	–
4				63–81	
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	63–81	–
5				63–72	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	63–72	–
6				27–45	
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	27–45	–
7				27–45	
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	27–45	–
8				18–27	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	18–27	–
9				18–27	
	threeawn	ARIST	<i>Aristida</i>	18–27	–
10				9–27	
	sacahuista	NOMI	<i>Nolina microcarpa</i>	9–27	–
11				0–28	
	silver bluestem	BOSA	<i>Bothriochloa saccharoides</i>	0–11	–
	squirreltail	ELEL5	<i>Elvmus elvmoides</i>	0–11	–

	slim tridens	TRMUE	<i>Tridens muticus</i> var. <i>elongatus</i>	0–6	–
12				0–18	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–18	–
13				0–18	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–18	–
<b>Forb</b>					
14				9–27	
	pea	LATHY	<i>Lathyrus</i>	9–27	–
15				0–18	
	bladderpod	LESQU	<i>Lesquerella</i>	0–18	–
16				0–18	
	scarlet Indian paintbrush	CACO17	<i>Castilleja coccinea</i>	0–18	–
17				0–18	
	globemallow	SPHAE	<i>Sphaeralcea</i>	0–18	–
18				0–18	
	milkvetch	ASTRA	<i>Astragalus</i>	0–18	–
19				36–54	
	Forb, perennial	2FP	<i>Forb, perennial</i>	36–54	–
20				36–54	
	Forb, annual	2FA	<i>Forb, annual</i>	36–54	–
27				0–18	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–18	–
<b>Tree</b>					
21				27–45	
	juniper	JUNIP	<i>Juniperus</i>	27–45	–
23				9–27	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	9–27	–
<b>Shrub/Vine</b>					
22				18–36	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	18–36	–
24				9–27	
	yucca	YUCCA	<i>Yucca</i>	9–27	–
25				9–27	
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	9–27	–
26				0–18	
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0–18	–
28				0–18	
	sagebrush	ARTEM	<i>Artemisia</i>	0–18	–

## Animal community

Habitat for Wildlife: This site provides habitat which supports a resident animal community that is characterized by mule deer, bobcat, spotted skunk, eastern cottontail, rock squirrel, rock mouse, great horned owl, scrub jay, canyon wren, prairie rattlesnake, and eastern fence lizard. Roadrunner, magpie, mockingbird, and loggerhead shrike utilize the juniper and shrub foliage for nesting.

## 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  
Lacoca D  
Latom D  
Newkirk D

## Recreational uses

This site has good aesthetic appeal and natural beauty with its large variety of plants that bloom from early spring to late fall. The physiography interrupts the “wide open space” of the plains. This site has fair suitability for camping, hiking and picnicking. Hunting is fair for deer and rabbits; quail hunting is fair to good. This site provides fair screening. Photography and birdwatching for small birds and raptors is fair.

## Wood products

Juniper and pinyon provide limited fuel for firewood and a limited quantity of fence posts.

## Other products

Grazing: This site can be grazed any season of the year by all classes and ages of livestock. Because of the steeper slopes and rock outcrop, younger livestock best utilize this site. Browsing animals should be considered because of the site’s potential to produce shrubs and forbs. Continuous yearlong or season-long (April-October) grazing by cattle will result in a decrease of species such as sideoats grama, little bluestem, New Mexico feathergrass, black grama, and winterfat. Species such as hairy grama, juniper, ring muhly, and broom snakeweed will increase. On sites with scattered juniper, continuous heavy grazing pressure will allow this tree to increase to the point that it appears dominant. A system of periodic grazing by domestic livestock, which varies the season of grazing and rest during successive years, will result in a healthy, well-balance plant community. Fall and winter rest will benefit shrubby species such as winterfat. Spring rest (April-June) will allow cool-season grasses to mature. Cattle show a definite seasonal preference for black grama, and usually utilize it heavily from January to March. A large variety of grasses, forbs, and shrubs provide well-balanced feed and good nutrition for all grazing animals. Ninety percent of the annual production is from species that provide forage for grazing animals.

## Other information

Other Information: Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index Ac/AUM  
100 - 76 3.4 – 5.4  
75 – 51 4.3 – 7.8  
50 – 26 5.6 – 11.2  
25 – 0 11.3+

## Inventory data references

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

## Other references

References.



1. Johnsen, T.N., Jr. 1962. One-seeded juniper invasion of northern Arizona grasslands. Ecological Monographs. 32:187-207.
2. Johnson, D.E., H. A. M. Mukhtar, R. Mapston, and R.R. Humphrey. 1962. The mortality of oak-juniper woodland species following a wildfire. Journal of Range Management 15: 201-205
3. Miller, R.F., and R.J. Tausch. 2001. The role of fire in pinyon and juniper woodlands: a descriptive analysis. Pages 15–30 in K.E.M. Galley and T.P. Wilson (eds.). Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 11, Tall Timbers Research Station, Tallahassee, FL.
4. Van Dyne, G.M., G.F. Payne, compilers. 1964. Grazing responses of western range plants. Bozeman, MT: Montana State College, Department of Animal and Range Sciences. 69 p.

## Contributors

Christine Bishop  
David Trujillo  
Don Sylvester  
Elizabeth Wright  
John Tunberg

## Approval

Kendra Moseley, 9/12/2023

## 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	05/19/2024
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:**

---