USDA Natural Resources
Conservation Service

Ecological site DX035X03A121
Shallow Sandstone

Accessed: 07/17/2024

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.

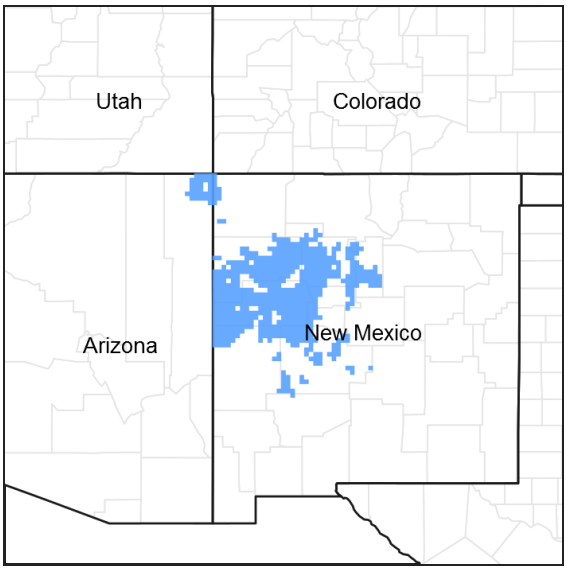


Figure 1. Mapped extent

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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bouteloua curtipendula* (2) *Bouteloua gracilis*

Legacy ID

R035XG121NM

Physiographic features

The topography of this site is level to moderately sloping with slopes ranging from 0 to 25 percent. Elevation range from about 6,000 to 7,500 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Cuesta (2) Mesa (3) Plateau

Flooding frequency	None
Ponding frequency	None
Elevation	6,000–7,500 ft
Slope	0–25%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation varies from about 10 inches to just over 16 inches. Fluctuations ranging from about 5 inches to 25 inches are not uncommon. The overall climate is characterized by cold dry winters in which winter moisture is less than summer. As much as half or more of the annual precipitation can be expected to come during the period of July through September. Thus, fall conditions are often more favorable for good growth of cool-season perennial grasses, shrubs, and forbs than are those of spring.

The average frost-free season is about 120 days and extends from approximately mid May to early or mid September. Average annual air temperatures are 50 degrees F or lower and summer maximums rarely exceed 100 degrees F. Winter minimums typically approach or go below zero. Monthly mean temperatures exceed 70 degrees F for the period of July and August.

Rainfall patterns generally favor warm-season perennial vegetation, while the temperature regime tends to favor cool-season vegetation. This creates a somewhat complex community of plants on any given ecological site, which is quite susceptible to disturbance and is at or near its productive potential only when both the natural warm and cool-season dominants are present.

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)	148 days
Freeze-free period (average)	174 days
Precipitation total (average)	16 in

Influencing water features

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

Soil features

These soils are shallow to very shallow over sandstone. Surface textures are medium to coarse and may be stony or gravelly. Permeability is rapid to moderately slow. The available water-holding capacity is generally low.

Table 4. Representative soil features

Surface texture	(1) Gravelly fine sandy loam (2) Channery sandy loam (3) Cobbly loamy fine sand
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Very slow to moderately rapid
Soil depth	4–20 in
Surface fragment cover <=3"	40–60%
Surface fragment cover >3"	5–15%
Available water capacity (0-40in)	3–6 in

Calcium carbonate equivalent (0-40in)	2–20%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	20–40%
Subsurface fragment volume >3" (Depth not specified)	5–10%

Ecological dynamics

Overview
This site occurs on summits of mesas, hills, and ridges, and dipslopes of cuestas. Loamy and Savannah Ecological Sites often occur as areas of deeper soils interspersed or adjacent to the Shallow Sandstone site. This is a moderately productive site characterized by a mixture of warm- and cool-season grasses, shrubs, and scattered trees. Sideoats grama, blue grama, galleta, little bluestem, Indian ricegrass, and New Mexico feathergrass are characteristic grasses. Bigelow sagebrush and fourwing saltbush are shrubs common to this site, while pinyon pine and juniper species characterize the tree aspect. Climate change, loss of grass cover and the associated decrease in resource competition by grasses are believed to facilitate the encroachment of woody species and may initiate the transition to the Pinyon-juniper State. A decrease in fire frequency may also facilitate this transition. Brush control, in conjunction with prescribed grazing, is necessary to remove the competitive advantage of shrubs and trees and reestablish grass dominance.

Reference State:
Reference Plant Community. Grasses are the dominant component of the reference plant community, accounting for as much as 75 to 85 percent of the annual production. Sideoats grama is the dominant grass with lesser amounts of blue grama. Little bluestem, Indian ricegrass, New Mexico feathergrass, and galleta also typically occur in significant amounts. Bigelow sagebrush and fourwing saltbush are shrubs that frequently occur scattered across the site. Other shrubs such as sand sagebrush, rubber rabbitbrush, winterfat, and mountain mahogany may also occur on this site. Sand sagebrush may be more common on coarse-textured soils while rubber rabbitbrush is favored on soils with finer-textured surface- or subsurface horizons. Winterfat may be more common on sites with calcareous soils. Mountain mahogany is favored on cooler or wetter sites. Pinyon and juniper are scattered across the site, with juniper being more common on warmer or dryer sites (lower elevation/southerly aspect) and pinyon pine more common on cooler or wetter sites (higher elevation/northerly aspect). Sideoats grama, little bluestem, many cool-season grasses, mountain mahogany, and winterfat typically decrease in response to overgrazing. A community dominated by blue grama with subdominant galleta (Community 1.2) may result.

Diagnosis: Grasses are dominant and cover is fairly uniform with few large bare areas present. Scattered shrubs and trees comprise a canopy cover averaging 10%. Evidence of erosion such as pedestalling of grasses, rills and gullies is infrequent.
Additional States:

Pinyon-juniper State. This state is characterized by an increase of pinyon-juniper. Other woody species such as Bigelow sagebrush, broom snakeweed, sand sagebrush, or rabbitbrush may also increase. Blue grama is typically the dominant grass species.

Diagnosis: Pinyon and juniper are found at higher densities relative to the Reference State. Grass cover is patchy with large bare areas present. Blue grama is typically the dominant grass species. Evidence of erosion, such as pedestalling of plants, elongated water flow patterns, litter dams, and rills may be common.

Transition to Pinyon-juniper State (T1A) Favorable climatic periods, persistent loss of grass cover, associated decreased competition by grasses, and lack of fire are believed to facilitate the encroachment of pinyon and juniper

(1, 2, 3, 5, 7). Climatic periods of mild winters and wet summers may produce conditions favorable to juniper establishment and result in episodic events of juniper expansion (5). Loss of herbaceous cover due to overgrazing and drought can provide competition-free areas for pinyon and juniper seedling establishment and afford a competitive advantage to established woody species. The natural spatial variability of ground cover may also allow woody species to establish on existing bare areas (4). As pinyon-juniper canopy cover increases, total herbaceous biomass decreases (6). Loss of herbaceous cover can also reduce fuel levels beyond the point capable of carrying fire. Where fire was historically important in the development of plant communities on Shallow Sandstone Ecological Sites by suppressing pinyon-juniper seedlings, then disruption of natural fire frequency may facilitate pinyon-juniper encroachment (2, 5).

Key indicators of approach to transition
--Decrease or change in composition or distribution of grass cover
--Increase in size and frequency of bare patches
--Increase in amount of juniper, pinyon, and shrub seedlings

Restoration Pathway to the Reference State (R2A) Brush control is necessary to reduce the competitive influence of pinyon-juniper and facilitate grass recovery. Prescribed grazing will help ensure adequate rest following brush control and will assist in the establishment and maintenance of grass cover.

References
1. Brockway, D.G., R.G. Gatewood, and R.B. Paris. 2002. Restoring grassland savannas from degraded pinyon-juniper woodlands: effects of mechanical overstory reduction and slash treatment alternatives. Journal of Environmental Management. 64: 179-197.

2. Fuchs, E.H. 2002. Historic increases in woody vegetation in Lincoln County, New Mexico. Albuquerque, NM, USA: Vanguard Printing Company. 115 p.

3. Johnsen, T.N., Jr. 1962. One-seeded juniper invasion of northern Arizona grasslands. Ecological Monographs. 32:187-207.

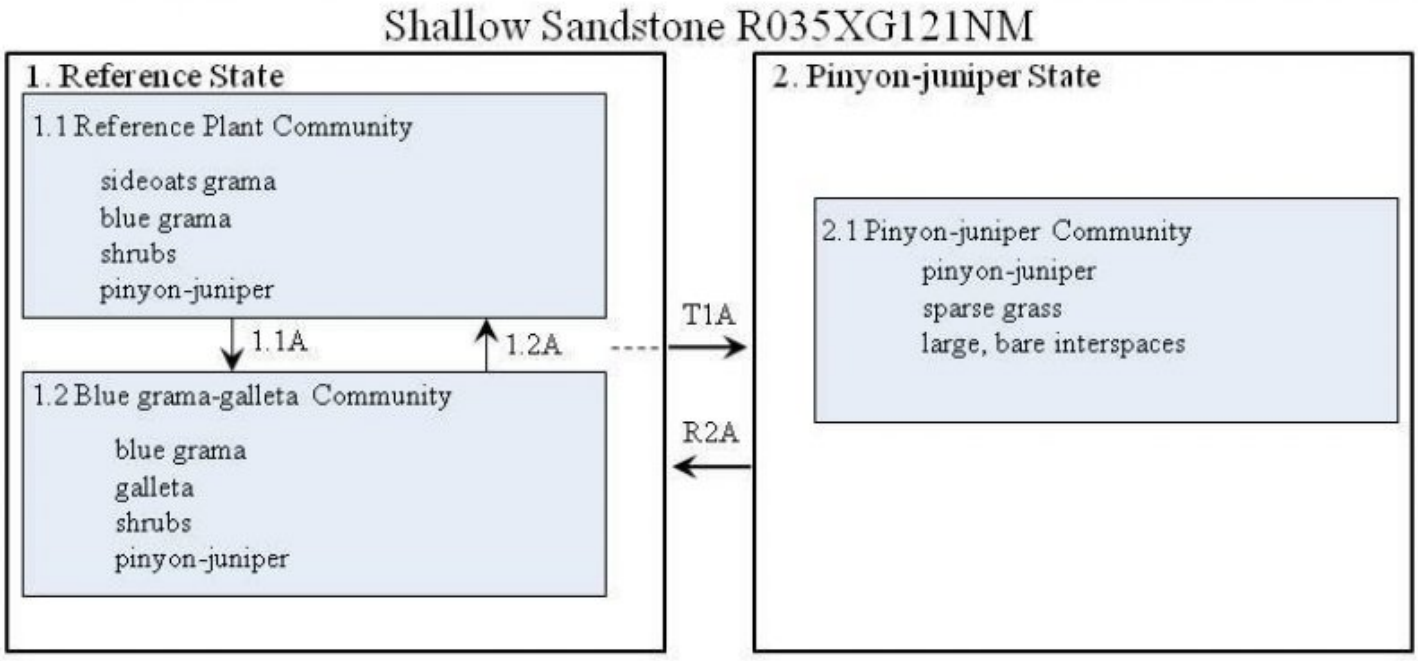
4. Jurena, P.N. and S. Archer. 2003. Woody plant establishment and spatial heterogeneity in Grasslands. Ecology 84: 907-919.

5. 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.

6. Pieper, R.D. 1990. Overstory-understory relations in pinyon-juniper woodlands in New Mexico. Journal of Range Management. 43: 413-415.

7. Richardson, D.M. and W.J. Bond. 1991. Determinants of plant distribution: Evidence from pine invasions. The American Naturalist. 137: 639-668.

State and transition model



1.1A. Repeated yearlong excessive grazing.
1.2A. Growing-season rest from grazing; prescribed grazing.
T1A. Fire suppression, lack of fine fuels; mild winters and wet summers leading to episodic juniper establishment.
R2A. Brush control; growing-season rest from grazing; prescribed fire, seeding, rest from grazing.

State 1
Reference State

Community 1.1
Reference Plant Community

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	220	390	560
Forb	23	39	56
Total	**243**	**429**	**616**

Table 6. Ground cover

Tree foliar cover	2-5%
Shrub/vine/liana foliar cover	5%
Grass/grasslike foliar cover	35-45%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-15%
Surface fragments >0.25" and <=3"	40-60%
Surface fragments >3"	5-15%
Bedrock	0%

Water	0%
Bare ground	10-20%

Figure 5. Plant community growth curve (percent production by month). NM0312, R035XG121NM-Shallow Sandstone-HCPC. Mixed warm/cool-season grassland with scattered shrubs..

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

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				122–171	
	sideoats grama	BOCU	*Bouteloua curtipendula*	122–171	–
2				49–73	
	blue grama	BOGR2	*Bouteloua gracilis*	49–73	–
3				24–73	
	little bluestem	SCSC	*Schizachyrium scoparium*	24–73	–
4				49–98	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	49–98	–
	squirreltail	ELEL5	*Elymus elymoides*	49–98	–
	needle and thread	HECO26	*Hesperostipa comata*	49–98	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	49–98	–
	western wheatgrass	PASM	*Pascopyrum smithii*	49–98	–
	muttongrass	POFE	*Poa fendleriana*	49–98	–
5				5–24	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	5–24	–
	common wolfstail	LYPH	*Lycurus phleoides*	5–24	–
	James' galleta	PLJA	*Pleuraphis jamesii*	5–24	–
	alkali sacaton	SPAI	*Sporobolus airoides*	5–24	–
	spike dropseed	SPCO4	*Sporobolus contractus*	5–24	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	5–24	–
6				5–20	
	black grama	BOER4	*Bouteloua eriopoda*	5–20	–
7				5–24	
	threeawn	ARIST	*Aristida*	5–24	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	5–24	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	5–24	–
Forb					
8				15–39	
	Forb, perennial	2FP	*Forb, perennial*	15–39	–
9				5–15	

	Forb, annual	2FA	*Forb, annual*	5–15	–
Tree					
10				5–24	
	juniper	JUNIP	*Juniperus*	5–24	–
	twoneedle pinyon	PIED	*Pinus edulis*	5–24	–
Shrub/Vine					
11				24–49	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	24–49	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	24–49	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	24–49	–
	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	24–49	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	24–49	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	24–49	–

Animal community

Habitat for Wildlife:
This ecological site provides habitats which support a resident animal community that is characterized by pronghorn antelope, coyote, black-tailed jackrabbit, white-throated woodrat, pinyon mouse, sparrow hawk, Cassin's kingbird, chipping sparrow, common raven, plains spadefoot toad, leopard lizard, plateau whiptail, desert short-horned lizard, and prairie rattlesnake. Mourning dove nest on the site and the golden eagle and prairie falcon hunt over it.

Hydrological functions

Hydrology Functions:
The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.
Hydrologic Interpretations
Soil Series----------Hydrologicic Group
Atarque----------D
Bond----------D
Evpark----------D
Farb----------D
Mion----------D
Moenkopi----------D
Puertecito----------D
Rizno----------D
Rizozo----------D
San Mateo----------D
Skyvillage----------D
Travessilla----------D
Vessilla----------D
Winona----------D

Recreational uses

The site has moderate to high potential for semi-improved picnicking and camping sites which are designed with erosion hazard and other problems inherent to shallow soils in mind. It also offers potential for hiking, horseback riding, hunting, nature observation
and photography. Ancient and gnarled junipers are found which, for many, provide a very striking source of natural beauty. This is especially true when they are seen against a backdrop of distant open-space landscapes typical of

the region in which the site is found.

Wood products

This site has very limited potential for wood products, and this is restricted almost entirely to fence post and firewood production.

Other products

Grazing:
This site is suitable for grazing by most kinds and classes of livestock without regard to season of the year. It should not, however, be subjected to continuous heavy use and is not well suited for continuous year-long grazing on a long-term basis. Under these conditions, rapid deterioration of the plant community may take place, and the site may become characterized by a dominance of low-value grasses, woody plants, vastly reduced productivity, and a high incidence of surface erosion. Mechanical brush control is generally unfeasible due to shallow soil, and recovery using improved grazing management alone may be difficult to achieve.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index----------Ac/AUM
100 - 76----------4.0 – 5.2
75 – 51----------5.0 – 7.5
50 – 26----------7.0 – 13.5
25 – 0----------13.5+

Type locality

Location 1: Catron County, NM
Location 2: Socorro County, NM

Other references

Data collection for this site was done in conjunction with the progressive soil surveys within the New Mexico and Arizona Plateaus and Mesas 36 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: McKinley, Sandoval, Catron, Socorro, Cibola.
Characteristic Soils Are:
Moenkopi
Other Soils included are:
Atarque, Bond, Evpark, Farb, Mion, Rizno Rizozo, San Mateo, Skyvillage, Travessilla Vessilla, Winona

Contributors

Christine Bishop
Don Sylvester
John Tunberg
Michael Carpinelli

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	
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:**
