USDA Natural Resources Conservation Service

Ecological site R070AY009NM
Shale Hills

Last updated: 9/12/2023
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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.

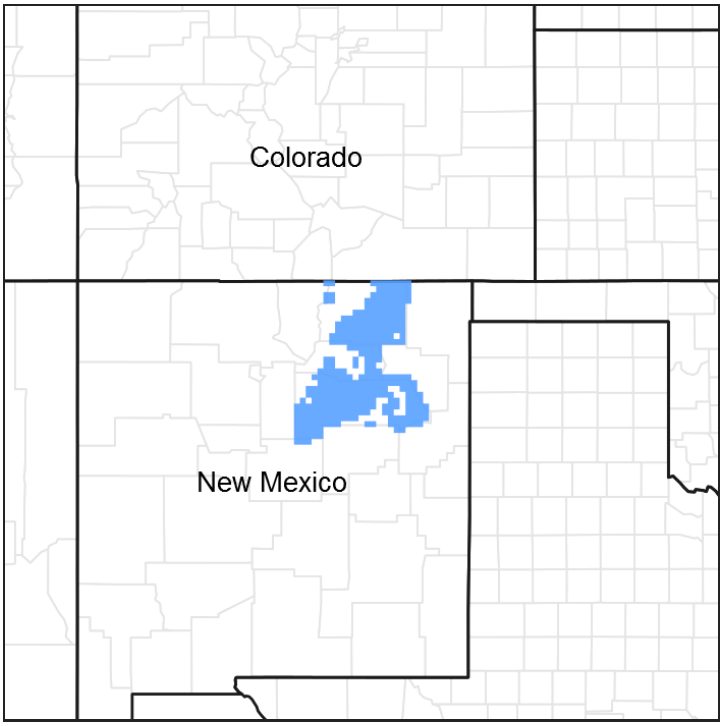

Figure 1. Mapped extent

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.

Ecological site concept

From an old ESD key for MLRA 70A:
16. Slopes 25 to 50 percent, shallow or very shallow to shale or limestone. Texture is clay, clay loam, with channery or stony surfaces. Vegetation includes blue grama, sideoats grama, little bluestem, galleta, western wheatgrass, threeawn, New Mexico feathergrass,

needle and thread, wild buckwheat, piñon, juniper, mountain mahogany, fringed sagewort, Apache plume, fourwing saltbush, oak, and broom snakeweed.

This site correlates to the Canadian Plateaus LRU of MLRA 70A, and to the Shallow Ecological Site Group (GX070A01XESG02).

Two LRU-specific sites overlap this concept: Slopes (GX070A01X006) and Limy Escarpments (GX070A01X007).

Similar sites

GX070A01X006	**Slopes** This site occurs on escarpments in LRU 70A.1 that do not exhibit rock outcrop (typically limestone).
GX070A01X007	**Limy Escarpments** This site occurs on escarpments in LRU 70A.1 that exhibit rock outcrop (typically limestone).

Table 1. Dominant plant species

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

Physiographic features

This site is on steep and very steep slopes along the mesa escarpments, scarp slopes, ridges and hillsides. The landscape is characteristically steep and very steep slopes, or low escarpments composed of interbedded shale and limestone with soil on moderately steep benches or fans. Slopes are 25 to 50 percent and are on all aspects. North and east-facing slopes usually produce more vegetation than south and west-facing slopes. Elevation ranges from 4,500 to 7,500 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Escarpment (3) Scarp slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,372–2,286 m
Slope	25–50%

Aspect	N, E

Climatic features

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

Precipitation averages 14 to 16 inches. Seventy seven percent of the year’s moisture normally falls during the period of May through October. Practically all of it is brought by brief afternoon and evening thunderstorms. In July and August, normally the wettest months of the year, one can expect about one day in five when rainfall exceeds one-tenth inch. Early spring precipitation in May benefits the cool-season plants. Winter precipitation, supplying 24 percent of the year’s moisture, normally has no more than two days a month with as much as one-tenth inch of moisture. Much of the winter precipitation falls as snow.

Air temperatures vary from a monthly mean of 20 degrees F in January to 69 degrees F in July. Daily high temperatures average in the 80’s and low 90’s during the summer. Winter low temperatures fall below the freezing mark much of the time from November through March with minimum temperatures approaching 25 degrees F below zero. Dates of the last killing frost may vary from May 9th through May 17th, and the first killing frost from September 27th to October 8th. The frost-free season ranges from 141 days to 153 days from early May to early October.

Wind velocities for the area average 10 to 12 miles per hour and prevail from the south and southwest. Generally, March is the windiest month. Strong winds during the spring cause rapid drying of the soil surface.

Nearby mountains to the west intercept much of the precipitation from the Pacific storms coming through this area during the winter. About 70 percent of the 14 to 16 inches of annual precipitation falls in the form of rainfall during the frost-free season. About 40 percent of the annual precipitation benefits cool-season plants, 50 percent benefits warm-season plants and 10 percent falls during the season of plant dormancy. Relative humidity is moderately low. The sun shines approximately 75 percent of the time.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50 percent 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)	149 days
Freeze-free period (average)	171 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 over shale or limestone. Surface texture are clay loam, clay, channery loam, channery clay loam or stony loam. Subsurface textures are clay loam, clay, channery loam, channery clay loam or stony loam. Permeability is moderate to slow. Available water-holding capacity is very low to low. Effective rooting depth is 7 to 20 inches. Because of the predominant slopes, the hazard of water erosion is severe.

Minimum and maximum values listed below represent the characteristic soils for this sites.

Characteristic soils:
Litle
Mion
Penrose

Table 4. Representative soil features

Surface texture	(1) Channery clay loam (2) Stony clay (3) Permanently frozen clay loam
Family particle size	(1) Clayey
Drainage class	Well drained to moderately well drained
Permeability class	Moderately slow
Soil depth	25–51 cm
Surface fragment cover <=3"	7–35%
Surface fragment cover >3"	5–10%
Available water capacity (0-101.6cm)	2.54–10.16 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)	7.4–8.4

Subsurface fragment volume <=3" (Depth not specified)	7–35%
Subsurface fragment volume >3" (Depth not specified)	5–10%

Ecological dynamics

Text from the Grazing Section that is relevant to plant ecology:

Approximately 70 percent of the total annual yield are from species that furnish forage for grazing and browsing animals. The large variety of grasses, forbs and shrubs provide a good balance feed and excellent nutrition for all grazing animals. Continuous grazing during the growing season will cause the more desirable forage plants such as sideoats grama, little bluestem, western wheatgrass, hairy mountain mahogany, New Mexico feathergrass, and winterfat decrease. Species most likely to increase are blue grama, galleta, threeawn, oneseed juniper, sleepygrass. and oak brush. As the condition deteriorates, it is accompanied by a sharp increase of oneseed juniper and oak. The ground cover is greatly reduced causing excessive erosion, which exposes the unweathered shale. Rest during April, May and June allows the western wheatgrass to grow and reproduce. Rest during the late winter and early spring is beneficial to shrubs such as hairy mountain mahogany.

State and transition model

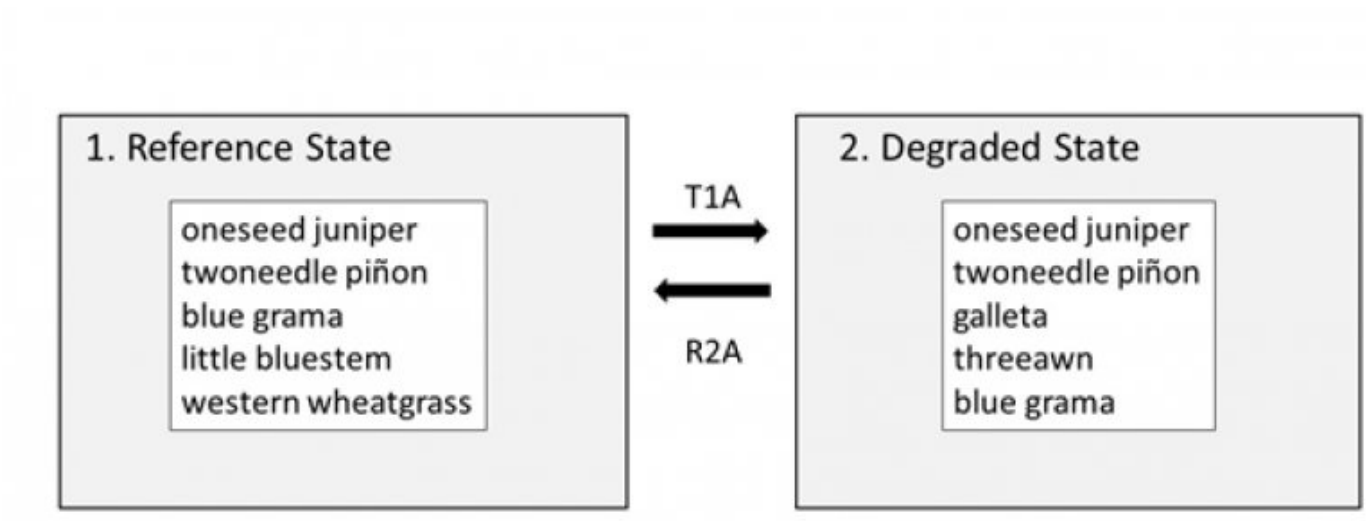

Figure 4. Generalized STM for shallow sites in 70A. For more site-specific information, see the interactive STM.

State 1
Reference State

Community 1.1
Reference Plant Community

The structure of the potential natural plant community is predominantly grasses due to vegetative production, but has the appearance of being dominated by woody species. Grass species are dominated by warm-season mid-grasses. Woody species make up about 35 percent of the vegetation. Juniper, hairy mountain mahogany, and oak are the major woody species. Forbs make up 10 percent of the vegetation.

Forest understory. Other grasses tht could appear include: prairie junegrass and big bluestem.

Other shrubs that could appear include: winterfat, skunkbush sumack, and Bigelow sagebrush.

Other forbs that could appear include: asters

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	404	572	740
Shrub/Vine	191	269	347
Forb	56	78	101
Total	**651**	**919**	**1188**

Table 6. Ground cover

Tree foliar cover	5-10%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-25%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%
Surface fragments >0.25" and <=3"	3-15%
Surface fragments >3"	30-35%
Bedrock	0%

Water	0%
Bare ground	10-15%

Figure 6. Plant community growth curve (percent production by month). NM3709, R070AY009NM Shale Hills HCPC. R070AY009NM Shale Hills HCPC Grassland with a major component of shrubs and a minor component of forbs..

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
Degraded

This state is generally dominated by blue grama, galleta, threeawn, oneseed juniper, sleepygrass, and oak brush.

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

Restoration pathway resulting from the implementation of prescribed grazing.

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				146–191	
	blue grama	BOGR2	*Bouteloua gracilis*	143–191	–
2				90–146	
	sideoats grama	BOCU	*Bouteloua curtipendula*	95–143	–

3				90–146	
	little bluestem	SCSC	*Schizachyrium scoparium*	95–143	–
4				45–90	
	James' galleta	PLJA	*Pleuraphis jamesii*	48–95	–
5				45–90	
	western wheatgrass	PASM	*Pascopyrum smithii*	48–95	–
6				34–45	
	threeawn	ARIST	*Aristida*	29–48	–
7				34–45	
	needle and thread	HECO26	*Hesperostipa comata*	29–48	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	29–48	–
8				34–45	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	29–48	–
Forb					
9				34–45	
	buckwheat	ERIOG	*Eriogonum*	29–48	–
10				34–45	
	Forb, annual	2FA	*Forb, annual*	29–48	–
11				34–45	
	Forb, perennial	2FP	*Forb, perennial*	29–48	–
Tree					
12				45–90	
	juniper	JUNIP	*Juniperus*	48–95	–
	twoneedle pinyon	PIED	*Pinus edulis*	48–95	–
Shrub/Vine					
13				34–45	
	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	29–48	–
14				34–45	
	prairie sagewort	ARFR4	*Artemisia frigida*	29–48	–
15				34–45	
	fourwing saltbush	ATCA2	*Atriplex canescens*	29–48	–
	Apache plume	FAPA	*Fallugia paradoxa*	29–48	–

16				45–90	
	oak	QUERC	*Quercus*	48–95	–
17				34–45	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	29–48	–
18				45–90	
	Shrub, deciduous	2SD	*Shrub, deciduous*	48–95	–

Animal community

Habitat for Wildlife:

This site provides habitats which support a resident animal community that is characterized by mule deer, coyote, bobcat, eastern cottontail, rock squirrel, southern plains woodrat, pinyon mouse, great horned owl, ferruginous hawk, plain titmouse, brown towhee, scrubjay, western diamondback rattlesnake, and red-spotted toad.

The mountain lion hunts through these habitats. There is seasonal use by band pigeons in years of heavy mast production.

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
Litle--------- D
Mion---------- D
Penrose------- D

Recreational uses

This site has good aesthetic appeal and natural beauty with its large variety of plants and the physiographic features breaks the open space of the landscape. Hiking is fair to good, camping and picnicking are poor to fair. Hunting for deer is good. This site is a good range for deer. Bird watching is fair.

Wood products

Some limited harvest of piñon and juniper for fence posts and firewood.

Other products

Grazing:

This site is adapted for spring, summer and fall grazing. Distribution of domestic livestock is a problem on this site. All ages and classes prefer to graze flatter slopes leaving the steeper slopes ungrazed. It is better suited to a younger age livestock. Goats would be best suited to utilize the large amount of woody species in the plant community. Approximately 70 percent of the total annual yield are from species that furnish forage for grazing and browsing animals. The large variety of grasses, forbs and shrubs provide a good balance feed and excellent nutrition for all grazing animals. Continuous grazing during the growing season will cause the more desirable forage plants such as sideoats grama, little bluestem, western wheatgrass, hairy mountain mahogany, New Mexico feathergrass, and winterfat decrease. Species most likely to increase are blue grama, galleta, threeawn, oneseed juniper, sleepygrass, and oak brush. As the condition deteriorates, it is accompanied by a sharp increase of oneseed juniper and oak. The ground cover is greatly reduced causing excessive erosion, which exposes the unweathered shale. A system of deferred grazing, which varies the time of grazing and rest in a pasture during successive years, is needed to maintain or improve the plant community. Rest during April, May, and June allows the western wheatgrass to grow and reproduce. Rest during the late winter and early spring is beneficial to shrubs such as hairy mountain mahogany.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index---- Ac/AUM
100 - 76---------- 3.4 – 4.6
75 – 51---------- 4.5 – 6.8
50 – 26---------- 6.7 – 12.6
25 – 0---------- 12.6+

Contributors

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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	05/21/2025
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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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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:**