USDA Natural Resources
Conservation Service

Ecological site R042BB021NM
Limestone Hills, Desert Shrub

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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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs as a complex of soils, rock, aspect, and directions of slope. It is characterized by rolling to steep hills and mountain footslopes. Slopes range in extreme from 15 to 75 percent, and average about 25 percent. Elevations range from 4,000 to 5,200 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,219–1,585 m
Slope	15–50%
Aspect	Aspect is not a significant factor

Climatic features

Annual average precipitation ranges from 7.35 to 11.90 inches. Wide fluctuations from year to year are common, ranging from a low of about 2 inches to a high of over 20 inches. At least one-half of the annual precipitation comes in the form of rainfall during July, August, and September. Precipitation in the form of snow or sleet averages less than 4 inches annually. The average annual air temperature is about 60 degree F. Summer maximums can exceed 100 degrees F. and winter minimums can go below zero. The average frost-free season exceeds 200 days and extends from April 1 to November 1. Both the temperature regime and rainfall distribution favor warm-season perennial plants on this site. Spring moisture conditions are only occasionally adequate to cause significant growth during this period of year. High winds from the west and southwest are common from March to June, which further tends to create poor soil moisture conditions in the springtime.

Climate data was obtained from
http://www.wrcc.dri.edu/summary/climsmnm.html

Table 3. Representative climatic features

Frost-free period (average)	205 days
Freeze-free period (average)	227 days
Precipitation total (average)	305 mm

Influencing water features

This site is not influenced by water from wetlands or streams.

Soil features

Soils are shallow and very shallow. The surface is a Extreamly Cobbly loam, very stony loam and gravelly loam. The substratum is an extreamly gravelly loam or extreamly gravelly silty clay loam over limestone bedrock.

The profile is usually calcareous throughout have moderate to moderately slow permeability. Slopes are 10 to 50 percent but average more than 25%. They usually occur on rolling to steep hills, mountain foot slopes on moderate to steep slopes.

Minimum and maximum values listed beloww represent the characteristic soils for this site.

Characteristic soils:
Lozer
Dozer

Table 4. Representative soil features

Surface texture	(1) Extremely gravelly loam (2) Extremely cobbly loam (3) Extremely stony loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow to very slow
Soil depth	10–51 cm
Surface fragment cover <=3"	15–30%
Surface fragment cover >3"	10–40%
Available water capacity (0-101.6cm)	0–2.54 cm
Calcium carbonate equivalent (0-101.6cm)	40–60%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–50%
Subsurface fragment volume >3" (Depth not specified)	20–40%

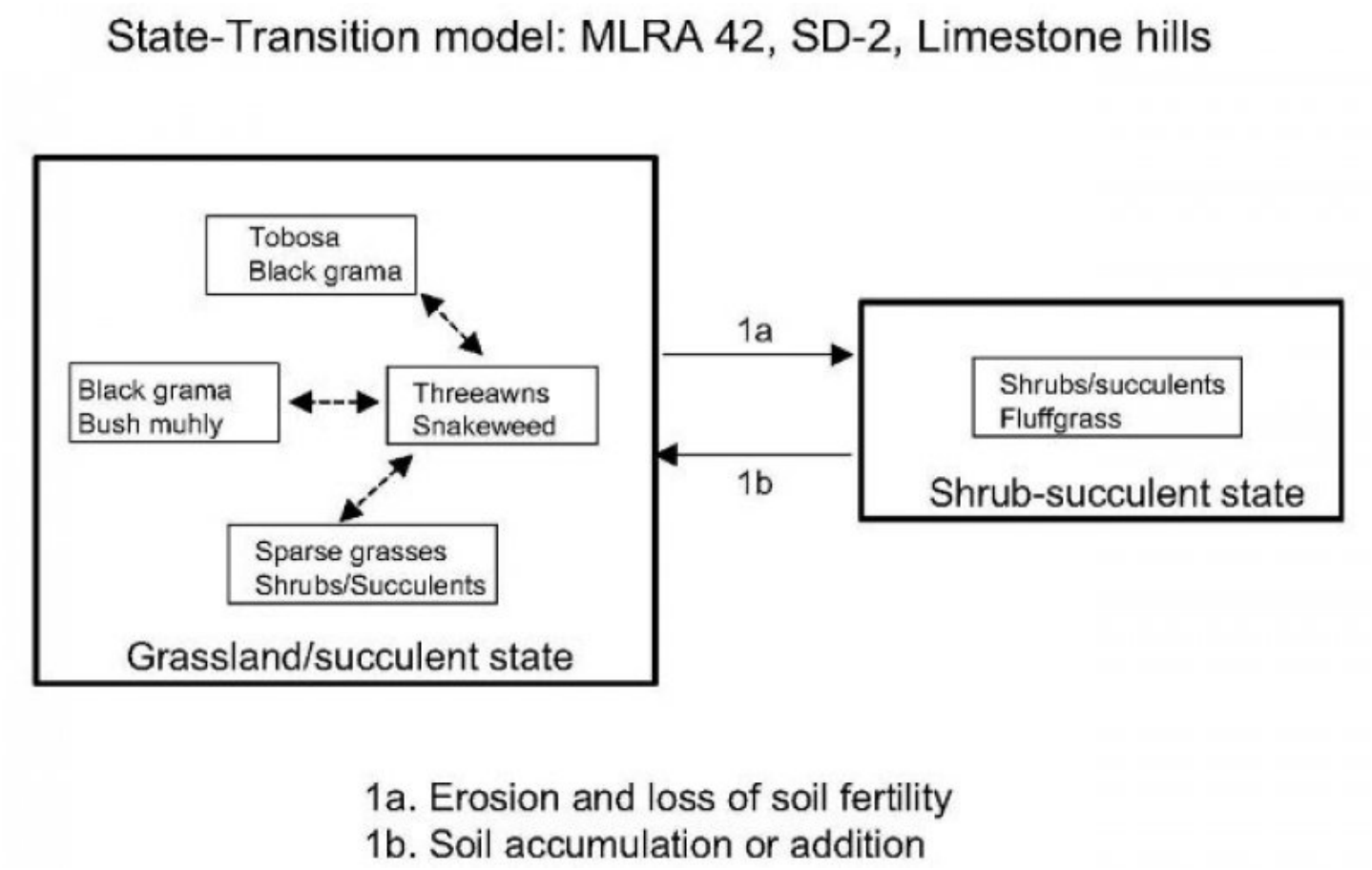
Ecological dynamics

Overview

This site frequently intergrades with gravelly and hills sites. This site tends to occur at or approaching transitions to higher-elevation land resource units (e.g. CP-4) so plant community composition may grade continuously across relatively short distances. The most common historic plant community type of the limestone hills site is dominated by black grama (*Bouteloua eriopoda*), bush muhly (*Muhlenbergia porteri*), and sideoats grama (*Bouteloua curtipendula*). Tobosa (*Pleuraphis mutica*) may be abundant on heavier soils or in areas receiving run-in water. Shrubs and succulents are common, especially on south-facing slopes. South-facing slopes often exhibit low grass cover, even when adjacent north-facing slope are grass-covered. Limestone hills sites often exhibit less shrub cover and more grass cover than adjacent hills sites, indicating the favorable properties of rocky, limestone-derived soils for grasses. The Limestone Hills site is resistant to grass loss compared with other sites in SD-2, perhaps due to the presence of a rough, stony surface that 1) retards sheet flow velocity and erosional soil loss and 2) protects the crowns of grasses from herbivory by livestock. Furthermore, fissures forming in limestone rocks may facilitate infiltration and rock cover retards evaporative water loss relative to other soils.

No systematic studies of communities, states or transitions have been performed in the Limestone Hills site.

State and transition model



State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

Figure 4. MLRA 42; SD-2; Limestone Hills

Black grama is typically dominant and bush muhly, sideoats grama, blue grama (*Bouteloua gracilis*), and curlyleaf muhly (*Muhlenbergia setifolia*) may be subordinates. On heavier soils and in patches receiving run-in water, tobosa may be locally dominant. Succulents are also common plants, especially ocotillo (*Fouquieria splendens*), agaves (Agave spp.), and beargrass (Nolina spp.), especially at higher elevations within SD-2. Banana yucca (Yucca bacata), sotol (Dasylirion spp.), creosotebush (*Larrea tridentata*), and mariola (*Parthenium incanum*) are often common. Cool season grasses, such as New Mexico feathergrass (*Hesperostipa neomexicana*) may also be present. Heavy grazing or drought disturbance within this state leads to increasing bare ground and/or increases in the representation of threeawns (Aristida spp.), hairy grama (*Bouteloua hirsuta*), fluffgrass (*Dasyochloa pulchella*), and snakeweeds (Gutierrezia spp.). Drier, south-facing slopes tend to have a greater representation of succulents and shrubs, more bare ground, and less grass cover even when currently ungrazed. In some cases, the cover of succulents and shrubs may be very high. Abundant rocks and very shallow soils may also result in low grass cover. Steep, northerly-facing slopes often exhibit surprisingly abundant grass growth even where adjacent sites are degraded. With heavy grazing, grasses may be restricted to a few spaces between rocks but may increase with good management and adequate rainfall. Fissuring of limestone rocks seems to promote infiltration compared to igneous rocks, thus imparting a comparatively high degree of resilience to this site. Shrub encroachment that results in competitive influences on grasses is generally not observed, although creosotebush may increase with continuous heavy grazing. Invasions of whitethorn acacia (*Acacia constricta*) as described for the hills site seems not to be as common in limestone hills sites. Diagnosis: Black grama and/or tobosa are usually dominant in undisturbed settings, especially on north-facing slopes. Grass cover is more or less continuous, with patches of bare ground becoming more common on the drier slopes and with grazing pressure. Shrubs and succulents may be dominant on south-facing slopes. In cases of drought or heavy grazing, grasses may be inconspicuous and found only alongside rocks. Additional States: Transition to bare state (1a): South-facing slopes or flat areas that are easily accessible to livestock, or sites with relatively little soil development, may be susceptible to grass loss and erosion. Key indicators of approach to transition: Increases in bare ground, evidence of sheet flow including litter dams and loss of soil around rocks, gullies.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	273	452	631
Shrub/Vine	66	109	151
Forb	25	43	58
Total	**364**	**604**	**840**

Figure 6. Plant community growth curve (percent production by month). NM2511, R042XB021NM-Limestone Hills-Warm Season Plants-HCPC. SE-2 Warm season plant community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	10	25	30	15	5	0	0

State 2
Shrub-Succulent

Community 2.1
Shrub-Succulent

Shrub-succulent state: These communities are dominated by succulents and shrubs or may be largely barren with a variable cover of fluffgrass, snakeweeds, and annuals. Distinguishing human-induced loss of grasses from situations in which grass cover is naturally low may be difficult. Diagnosis: Black grama and other large perennial grasses are scattered, rare, or absent. Gullies may be present. Transition to grassland/succulent state (1b): If soil loss exposes the stony substrate, then soil would need to accumulate or be added before large perennial grasses could recover. Gullies may need to be blocked and water flow redistributed more evenly. Seeding would likely be required if source populations were unavailable. Information sources and theoretical background: Communities, states, and transitions are based upon information in the ecological site description and observations by Jim Powell, NRCS, retired, and Brandon Bestelmeyer, Jornada Experimental Range. The speculations regarding the role of surface roughness in providing resistance to grass degradation can and should be empirically verified.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season**			180–482	
	black grama	BOER4	*Bouteloua eriopoda*	180–482	–
2	**Warm Season**			91–121	
	bush muhly	MUPO2	*Muhlenbergia porteri*	91–121	–
	curlyleaf muhly	MUSE	*Muhlenbergia setifolia*	91–121	–
3	**Warm Season**			30–61	
	sideoats grama	BOCU	*Bouteloua curtipendula*	30–61	–
	blue grama	BOGR2	*Bouteloua gracilis*	30–61	–
4	**Warm Season**			30–61	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	30–61	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	30–61	–
	green sprangletop	LEDU	*Leptochloa dubia*	30–61	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	30–61	–
5	**Warm Season**			6–30	
	Arizona cottontop	DICA8	*Digitaria californica*	6–30	–

	tanglehead	HECO10	*Heteropogon contortus*	6–30	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	6–30	–
6	**Warm Season**			6–30	
	threeawn	ARIST	*Aristida*	6–30	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	6–30	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	6–30	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	6–30	–
7	**Annual Grass**			6–18	
	Grass, annual	2GA	*Grass, annual*	6–18	–
8	**Perennial Grass**			6–18	
	Grass, perennial	2GP	*Grass, perennial*	6–18	–
Shrub/Vine					
9	**Shrub**			18–48	
	ocotillo	FOSP2	*Fouquieria splendens*	18–48	–
	sacahuista	NOMI	*Nolina microcarpa*	18–48	–
10	**Shrub**			6–30	
	featherplume	DAFO	*Dalea formosa*	6–30	–
	Apache plume	FAPA	*Fallugia paradoxa*	6–30	–
	Mexican oregano	LIGR6	*Lippia graveolens*	6–30	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	6–30	–
11	**Shrub**			6–30	
	agave	AGAVE	*Agave*	6–30	–
	common sotol	DAWH2	*Dasylirion wheeleri*	6–30	–
	yucca	YUCCA	*Yucca*	6–30	–
12	**Shrub**			6–30	
	littleleaf ratany	KRER	*Krameria erecta*	6–30	–
	mariola	PAIN2	*Parthenium incanum*	6–30	–
13	**Shrub**			6–18	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–18	–
14	**cactus**			6–18	
	plains pricklypear	OPPO	*Opuntia polyacantha*	6–18	–
Forb					
15	**Forb**			6–30	
	buckwheat	ERIOG	*Eriogonum*	6–30	–
	Indian blanket	GAPU	*Gaillardia pulchella*	6–30	–
	woolly plantain	PLPA2	*Plantago patagonica*	6–30	–
16	**Annual/Perennial Forb**			30–61	
	Forb, annual	2FA	*Forb, annual*	30–61	–
	Forb, perennial	2FP	*Forb, perennial*	30–61	–

Animal community

This site provides habitats which support a resident animal community that is characterized by mule deer, gray fox, ringtail, desert cottontail, Texas antelope squirrel, rock pocket mouse, white throated woodrat, curved billed

thrasher, scaled quail, meadowlark, pyrrhuloxia, patch nosed snake and canyon tree frog.

Golden eagles hunt over this site and desert bighorn sheep range into it from adjacent peaks in the San Andres Mountains.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydraulic cover conditions and hydrologic soil groups.

Hydrologic Interpretations
Soil Series Hydrologic Group
Lozier D
Dozer D

Recreational uses

Suitability for camping and picnicking is fair, limited mostly by topography, rockiness, and stoniness. The site has limited suitability for hiking, “rockhounding” and spelunking. Hunting is fair to good for deer, quail, dove, and small game.

Wood products

This site has no significant value for wood production.

Other products

This site, at its potential, is suitable for grazing in all seasons of the year, although most of the green forage is produced during summer months. The site is suitable for grazing by all classes of livestock. In order to maintain and improve this site, grazing management that includes a flexible stocking rate is especially important.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index Ac/AUM
100 - 76 3.5 – 4.4
75 – 51 4.1 – 6.5
50 – 26 6.2 – 11.0
25 – 0 11.0 - +

Other references

Other References:
Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Areas of New Mexico. This site has been mapped and correlated with soils in the following soil surveys. Sierra County Dona Ana County Grant County Hidalgo County Luna County Otero County

Characteristic Soils Are:
Lozier stony loam
Lozier gravelly loam

Contributors

Don Sylvester
Dr. Brandon Bestelmeyer

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:**