Ecological site R042BB024NM
Gravelly Sand, Desert Shrub

Accessed: 05/11/2025

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 usually occurs on arroyo terraces, alluvial fans, terraces or dissected piedmont slopes. Slopes range 1 to 15 percent, and average less than 15 percent. Elevations range from 3,700 feet to 5,000 feet.

Note: The Caliza soil has slopes between 15 to 50 percent slopes on ridge slopes and have a variable aspect.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Pediment (3) Terrace
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	1,128–1,524 m
Slope	0–15%
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 moderately deep to deep. Surface textures are Gravelly sandy loam, very gravelly sandy loam or extreamly gravelly loam with some textures that are grading towards a loamy sand. The underlying material textures are extreamly gravelly sandy loam, very gravelly sandy loam, gravelly loamy sand or very gravelly sand. They are noncalcareous to moderately calcareous throughout. Permeability is rapid or very rapid. Runoff is slow to moderate.

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

Characteristic Soil:
Canutio
Caliza*
Piquin
Adelino Var.
Arizo

*Note: Caliza soils have slopes greater than 15 percent and less than 50 percent.

Table 4. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Extremely gravelly sandy loam (3) Very gravelly sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Very rapid to moderately rapid
Soil depth	61–183 cm
Surface fragment cover <=3"	15–60%
Surface fragment cover >3"	5–20%
Available water capacity (0-101.6cm)	0.1–0.13 cm
Calcium carbonate equivalent (0-101.6cm)	1–15%
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)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–50%
Subsurface fragment volume >3" (Depth not specified)	5–20%

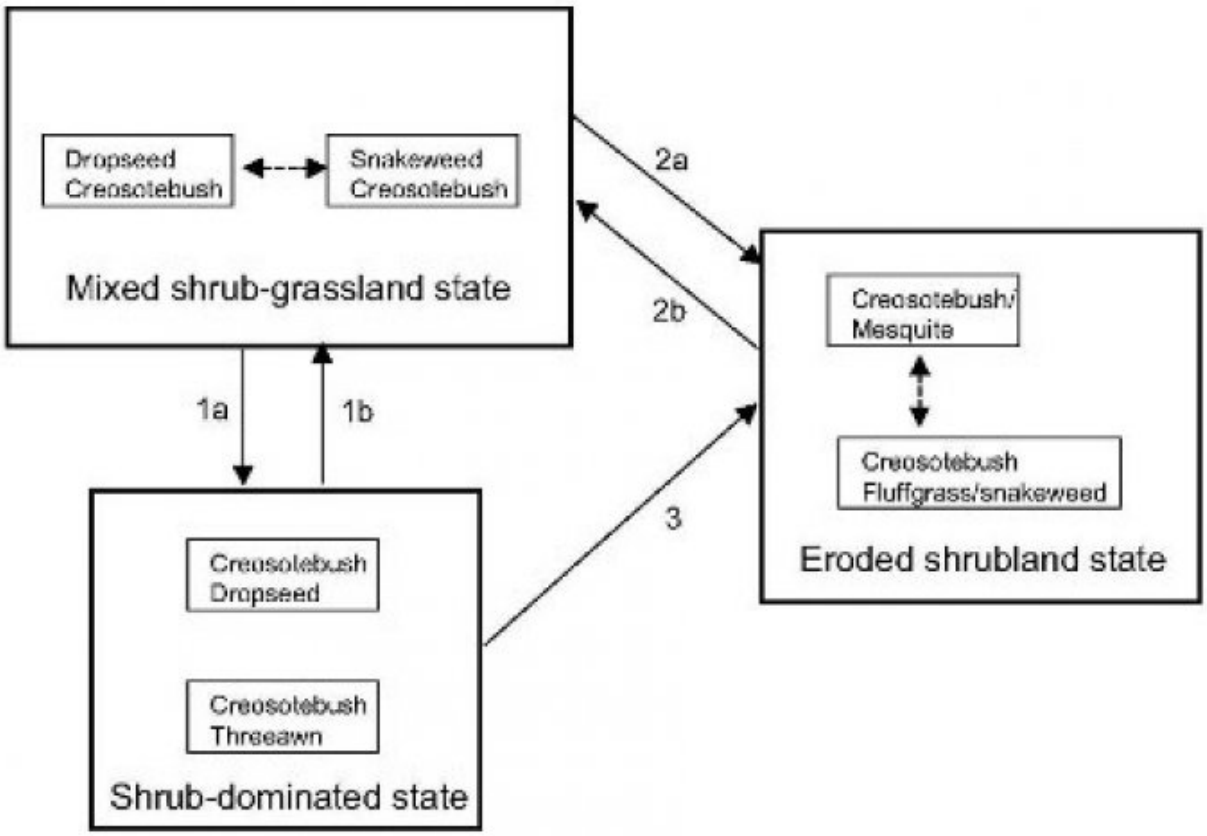
Ecological dynamics

Overview

This ecological site is associated with the gravelly ecological site and may grade into sandy or deep sand ecological sites. This site often occupies arroyos and is flanked by gravelly sites (e.g. Caliza gravelly sandy loam). In some cases, Bluepoint loamy sand soils (classified as deep sand sites) on dissected piedmont slopes may contain sufficient gravel so as to behave similarly to gravelly sands (e.g. in the Bluepoint-Caliza-Yturbide complex). The historic plant community type is generally assumed to exhibit dominance by dropseed grasses (mesa dropseed, *Sporobolus flexuosus* and sand dropseed, *Sporobolus cryptandrus*), and, secondarily black grama (*Bouteloua eriopoda*) and bush muhly (*Muhlenbergia porteri*). Creosotebush (*Larrea tridentata*) is a secondary dominant and annuals may be important components. Loss of these grasses due to overgrazing and/or drought, or due to climate change, may lead to a transition to dominance by creosotebush and mesquite (*Prosopis glandulosa*). Persistent lack of grass permits wind erosion, leading to loss of soil fertility and eventual loss of the A horizon and exposure of the calcic horizon on some soils (transition to eroded shrubland state).
No studies have been conducted on the ecology of the gravelly sand ecological site. Generally, this site is less susceptible to effects of erosion than the gravelly ecological site due to the absence of a shallow petrocalcic horizon. The coarse texture of the soils and lack of a restrictive layer, on the other hand, increase percolation from shallow soil layers and overall productivity is slightly lower.

State and transition model

State-Transition model: MLRA 42, SD-2, Gravelly subgroup: Gravelly sand



1a. Reduction of grass cover, grazing, drought, climate change favoring shrubs
1b. Shrub removal
2a, 3. Persistent absence of grass, erosion, loss of soil fertility, loss of A horizon, exposure of calcic horizon
2b. Removal of exposed calcium carbonate, soil addition, or adding organic matter

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

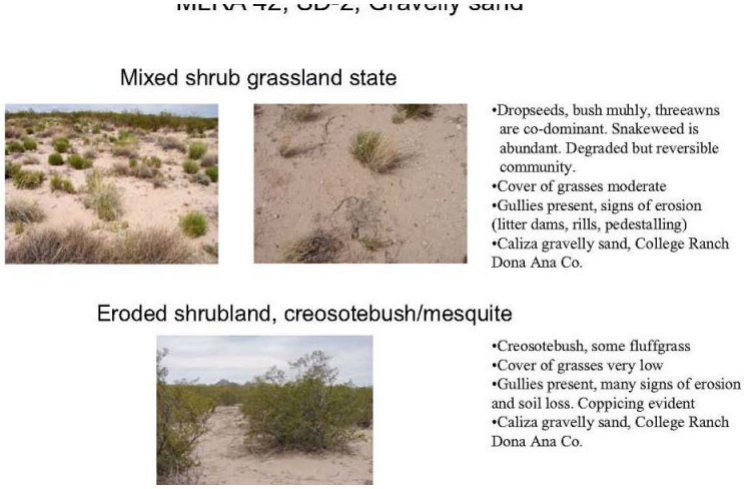


Figure 4. MLRA 42; SD-2; Gravelly sand

This site is dominated by drought-tolerant grasses and shrubs. Ground cover is sparse and litter accumulates slowly, relative even to other semi-arid sites. Mixed-shrub grassland: The historic plant community is believed to be dominated by dropseeds and secondarily, bush muhly and black grama. Creosotebush and mesquite are subdominant to the grasses and their combined dry mass is less than a third of that of the grasses. Grazing-induced retrogression from this community is characterized by a reduction in the cover of black grama, bush muhly and then dropseeds, and an increase in the proportional representation of creosotebush, fluffgrass (*Dasyochloa pulchella*) and snakeweed (*Gutierrezia sarothrae*; Snakeweed/dropseed community and several variants). While black grama may be extirpated from this site, dropseeds are wind-dispersed and may recolonize and regain dominance if soil degradation has not occurred. Diagnosis: Creosotebush density is low and perennial grasses are dominant. Evidence of erosion is infrequent. Transition to shrub-dominated state (1a): The cause of this transition is presumably due to poor grazing management or other soil disturbance, possibly in combination with drought. Climate change may also play a role. Key indicators of approach to transition: Increases in bare ground, decreases in black grama and dropseed cover, possibly increased germination of creosotebush. Transition to eroded shrubland state (2a): With persistent lack of grass and litter cover and high rates of erosion, soil surface conditions may be altered such that grass establishment is rare across the site. Herbel and Gibbens (1987) note that on Canutio soils, the erosional loss of the top 10 cm of soil, including the A horizon, was associated with a shift from black grama to creosotebush dominance. In the case of Caliza soils, this may also be due to the exposure of calcic horizons (and thus high levels of calcium carbonate) at the surface which inhibits grass germination and survival. Key indicators of approach to transition: Increases in bare ground, loss of dropseed cover, increased evidence of erosion (rills, gullies, deepening of gullies) including loss of A horizon. Pedestalling should also be apparent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	89	194	300
Shrub/Vine	28	62	95
Forb	24	53	81
Total	**141**	**309**	**476**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	11%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	4%

Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	45%

Figure 6. Plant community growth curve (percent production by month). NM2513, R042XB024NM-Gravelly Sand-Warm Season Plant-HCPC. SD-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-Dominated

Community 2.1
Shrub-Dominated

Additional States: Shrub-dominated state: This state is characterized by the persistent dominance of creosotebush and mesquite (*Prosopis glandulosa*) and a patchy cover of dropseeds or threeawn as the grass dominants. Black grama is usually eliminated and bush muhly may occur at the bases of shrubs. Fluffgrass and snakeweed are important components. Diagnosis: Creosotebush/mesquite density is moderate and grass occurrence is patchy Evidence of erosion, including gullies and rills, may be apparent in bare areas. Transition to eroded shrubland state (3): See 2a above, remaining grass patches are lost due to drought and/or disturbance to grasses by overgrazing or ORV use. Erosion rates increase. Transition to mixed-shrub grassland state (1b): If competition with shrubs for water and/or nutrients reduces grass dominance in many patches, then shrub control may facilitate grass establishment and vegetative growth. If climatic conditions are not suitable for grass growth then such treatments will be ineffective.

State 3
Eroded Shrubland

Community 3.1
Eroded Shrubland

Eroded shrubland state: Dropseeds and bush muhly are virtually absent and bare ground cover is high. Snakeweed or fluffgrass may be secondary dominants depending upon rainfall or variation in other, unknown factors. In some cases, nearly pure shrublands of creosotebush and mesquite exist with little ground cover (Creosotebush/mesquite community). Diagnosis: Creosotebush density is moderate to high and perennial grass cover is absent or restricted to a few individual bunchgrasses, often associated with shrub bases. Fluffgrass may occur in shrub interspaces. Evidence of erosion, especially pedestalling of shrubs, is apparent throughout the site. Transition to mixed-shrub grassland state (2b): See 2a above, remaining grass patches are lost due to drought and/or disturbance to grasses by overgrazing or ORV use. Erosion rates increase. Data and information sources and theoretical background: Communities and states are derived largely from Jim Powell, NRCS, retired and observations by Brandon Bestelmeyer, USDA-ARS Jornada Experimental Range. Mechanisms driving transitions are assumed to be similar to those described for the Gravelly ecological site. Specifically soil truncation due to water erosion and creosotebush allelopathic effects on plants and soil microbes are believed to cause transitions (also see Herbel and Gibbens 1987). Erosion to a petrocalcic horizon is not a factor on these soils, but the exposure of calcic horizons at the surface may result in interference of nutrient uptake in the grasses. The loss of organic matter needed to retain water at the rooting depth of grasses may also be a key mechanism.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				62–77	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	62–77	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	62–77	–
2				31–46	
	black grama	BOER4	*Bouteloua eriopoda*	31–46	–
3				31–46	
	bush muhly	MUPO2	*Muhlenbergia porteri*	31–46	–
4				16–31	
	low woollygrass	DAPU7	*Dasyochloa pulchella*	16–31	–
5				3–16	
	threeawn	ARIST	*Aristida*	3–16	–
6				0–9	
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–9	–
7				3–16	
	sixweeks grama	BOBA2	*Bouteloua barbata*	3–16	–
8				3–9	
	Grass, annual	2GA	*Grass, annual*	3–9	–
	Grass, perennial	2GP	*Grass, perennial*	3–9	–
Shrub/Vine					
9				31–46	
	creosote bush	LATR2	*Larrea tridentata*	31–46	–
10				3–9	
	longleaf jointfir	EPTR	*Ephedra trifurca*	3–9	–
11				3–16	
	yucca	YUCCA	*Yucca*	3–16	–
12				3–16	
	fourwing saltbush	ATCA2	*Atriplex canescens*	3–16	–
13				3–9	
	mariola	PAIN2	*Parthenium incanum*	3–9	–
14				3–9	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	3–9	–
15				3–16	
	Apache plume	FAPA	*Fallugia paradoxa*	3–16	–
16				3–9	
	littleleaf ratany	KRER	*Krameria erecta*	3–9	–
17				3–16	
	broom dalea	PSSC6	*Psorothamnus scoparius*	3–16	–
Forb					
18				16–31	
	dwarf desertpeony	ACNA2	*Acourtia nana*	16–31	–
	croton	CROTO	*Croton*	16–31	–
	herb sophia	DESO2	*Descurainia sophia*	16–31	–

	Texan phacelia	PHINT	*Phacelia integrifolia var. texana*	16–31	–
	woolly paperflower	PSTA	*Psilostrophe tagetina*	16–31	–
	Russian thistle	SAKA	*Salsola kali*	16–31	–
19				16–31	
	Forb, annual	2FA	*Forb, annual*	16–31	–
	Forb, perennial	2FP	*Forb, perennial*	16–31	–

Animal community

This site provides habitats which support a resident animal community that is characterized by badger, kit fox, black-tailed jackrabbit, spotted ground squirrel, Merriam's kangaroo rat, desert pocket mouse, southern plains woodrat, black-throated sparrow, mourning dove, roadrunner, greater earless lizard, roundtail horned lizard and striped whipsnake.

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
Canutio B
Caliza B
Piquin A
Adelino Var. B
Arizo A

Recreational uses

Suitability for camping and picnicking is poor, and hunting is fair for pronghorn antelope, quail, dove, and small game. Photography and bird watching for numerous birds, raptors and others can be fair to good, especially during migration seasons. Most small animals of the site are nocturnal and secretive, seen only at night, early morning or evening. Scenic beauty is greatest during spring and sometimes summer months when flowering of forbs and shrubs occurs.

Wood products

This site has no significant value for wood products.

Other products

This site is generally suitable for grazing without regard to class of animal or season of use. It is adapted to grazing by cattle, sheep, goats, and horses, but is characteristically droughty, and a highly flexible stocking rate is necessary on rangelands where this site makes up a significant percentage of the total range unit. Upon deterioration, the site is characterized by very sparse vegetation which is primarily creosote bush, broom snakeweed, and fluffgrass. Recovery is slow if affected through grazing management alone.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index----------Ac/AUM

100 - 76----------7.9 – 8.8
75 – 51----------8.6 – 10.2

50 – 26----------9.7 – 17.0
25 – 0----------17.0 -+

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:
Canutio gravelly sandy loam, very gravelly sandy loam
Kokan very gravelly loam sand
Caliza gravelly sandy loam, very gravelly sandy loam

Contributors

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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:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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):**

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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:**
