Ecological site R042BB037NM
Malpais, Desert Shrub

Accessed: 05/17/2024

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	Not specified

Physiographic features

Topography of this site varies considerably from nearly level to moderately steep with small areas or hills exceeding 25 percent slopes. The site may occur on nearly level mesa tops, valley lava flows, or on hills which are usually old volcanic cones.

The terrain is frequently interrupted by basalt outcrops, rocks, and occasional boulders. Slopes are dominantly 8 to 25 percent and range from 2 to 70 percent. Elevations range approximately from 3,800 to 5,200 feet.

Table 2. Representative physiographic features

Landforms	(1) Lava flow (2) Hill (3) Mesa
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Very rare to rare
Ponding frequency	None
Elevation	1,158–1,585 m
Slope	0–25%
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 very shallow or shallow. Surface textures are gravelly loamy fine sand, very gravelly loam, very cobbly clay loam, cobbly clay loam or clay loam. Calcium carbonate ranges from 0 to 7 percent in most soils.

Subsoil textures are gravely clay, gravelly clay loam, clay, very gravelly sandy loam, very gravelly loam, or extreamly gravelly loam. Calcium carbonate ranges from 5 to 15 percent through out the subsoil. Calcium carbonate coated basalt bedrock that is continuous or is fractured in some places is at a depth of 9 to 20 inches.

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

Characteristic soils:

Akela
Graham

Note: simular soils to Akela and Graham with depth of 20 to 27 may also be with in this ESD.

Table 4. Representative soil features

Surface texture	(1) Very gravelly loam (2) Very cobbly loam (3) Cobbly clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to very slow
Soil depth	13–51 cm
Surface fragment cover <=3"	10–35%
Surface fragment cover >3"	0–4%
Available water capacity (0-101.6cm)	2.54–5.08 cm

Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 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)	15–65%
Subsurface fragment volume >3" (Depth not specified)	0–5%

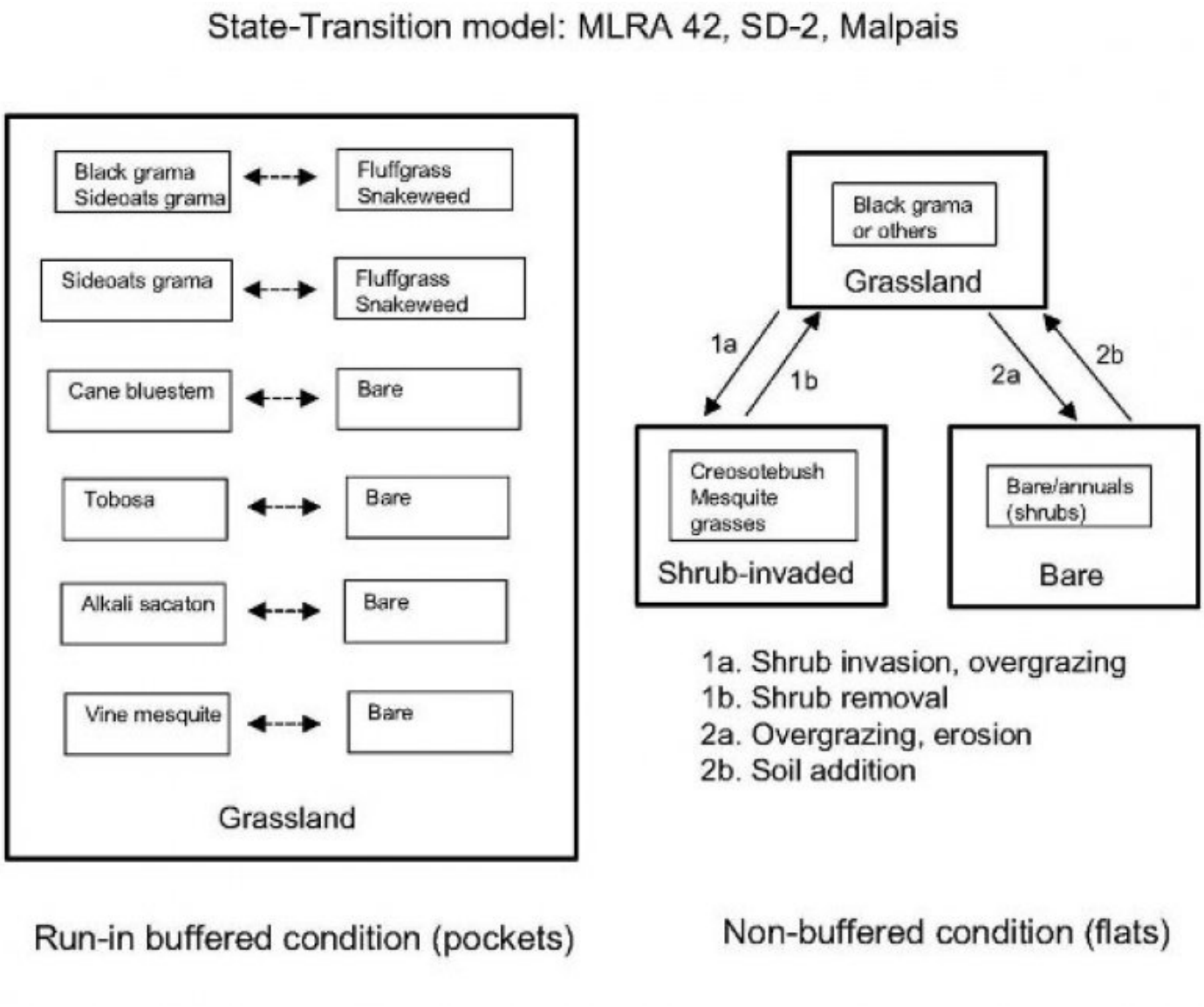
Ecological dynamics

Overview

This site is associated with lava flows and volcanic cones, and often occurs in discrete areas that are bordered by other ecological sites. The soils of malpais sites are formed, in part, by wind erosion from adjacent sites and thus reflect the soils composing areas around (especially upwind) of a malpais site. Thus, historic plant communities may be dominated by a variety of species, such as black grama (*Bouteloua eriopoda*), dropseeds (Sporobolus spp), and alkali sacaton (*Sporobolus airoides*). Where vegetation and soils in malpais sites exist in small, discrete depressions or “pockets”, grazing or drought-induced changes in vegetation may occur, but grasses tend to recover due to the favorable hydrologic conditions. Vegetation loss may result in erosion on more open, flat areas or slopes and thus result in persistent bare areas. Shrub invasion, perhaps occurring during periods when grass cover is reduced due to drought or grazing, may also occur and shrubs may compete with grasses.

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

State and transition model



State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

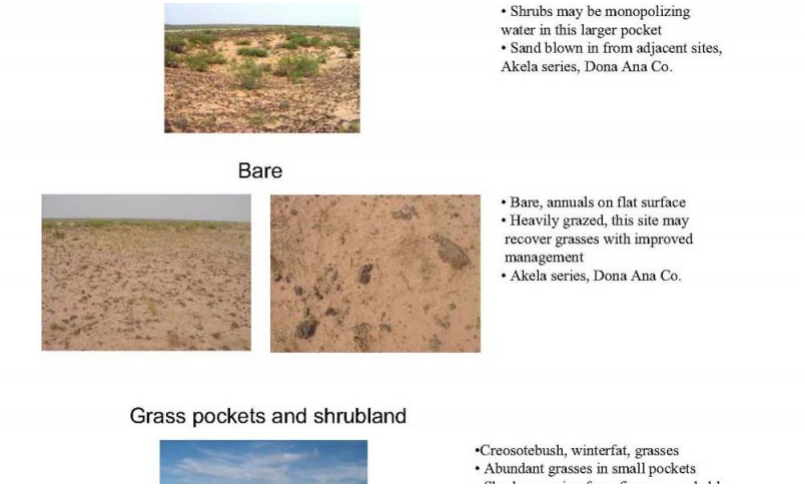


Figure 4. SD-2; Malpais•

Grassland State: Grasses dominate areas within malpais sites that have a sufficient depth of soil over the basalt. In some cases, (run-in buffered conditions or “pockets”) soil is restricted to depressions of varying sizes, interspersed

with areas of unvegetated basalt outcrops. Shrubs, including Apache plume (*Fallugia paradoxa*), littleleaf sumac (*Rhus microphylla*), saltbush (*Atriplex canescens*), creosotebush (*Larrea tridentata*), and tarbush (*Flourensia cernua*), as well as cacti may occur in pockets and in fissures in the basalt. In other cases, vegetation is distributed more evenly throughout the site and basalt is visible as cobbles, boulders, or small outcrops. The grasses and shrubs in these sites tend to reflect, to varying degrees, the soils that are blown into the basalt from adjacent areas or the weathering of basalt. Sites with finer soils (often weathered from basalt) may harbor tobosa (*Pleuraphis mutica*), vine mesquite (*Panicum obtusum*), cane bluestem (*Bothriochloa barbinodis*), sideoats grama (*Bouteloua curtipendula*), or alkali sacaton and sites with coarser soils may feature black grama or dropseeds. Depending on the relative palatabilities and other characteristics of the species present, heavy grazing or drought may result in increases in fluffgrass (*Dasyochloa pulchella*), threeawns (Aristida spp.), snakeweed (Gutierrezia spp.), and bare ground. In the case of pockets, run-in of water from adjacent outcrops and the tendency of pockets to protect soils, seeds, and plant roots from erosion results in high resilience of the plant community. In the case of flatter areas without such run-in and that are more exposed to wind and water erosion, persistent loss of grasses and soil fertility may occur. Diagnosis: Grasses are dominant, but composition and cover varies depending on soil texture, run-in conditions, and disturbance history. Soils between 5” and 20” deep are present. Various shrub species may be present. Additional States: Transition to shrub-dominated state (1a): On flat “non-buffered” positions, larger pockets, and on slopes, shrubs (especially creosotebush) may invade and dominate. This may be caused, in part, by reductions in grass cover due to drought and grazing that allow shrub establishment. Shrub dominance may also be possible in situations where fissures in the bedrock permit deep rooting and exploitation of stable water resources. Key indicators of approach to transition: Increases in bare ground, increased germination of shrub seedlings. Transition to bare state (2a): On flat “non-buffered” positions and slopes, persistent reductions in grass cover (due to overgrazing and drought) may result in wind and water erosion that expose infertile soil layers or bedrock. Key indicators of approach to transition: Increases in bare ground, decadence of grasses, reduced litter cover, pedestalling of grasses, evidence or erosion around rocks, abundant water flow patterns, reduced soil depth.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	252	442	631
Shrub/Vine	61	106	151
Forb	24	40	59
Total	**337**	**588**	**841**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	18%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	25%

Figure 6. Plant community growth curve (percent production by month). NM2519, R042XB037NM-Malpais-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

Shrub-dominated: These communities are invaded and dominated by shrubs (creosotebush; *Larrea tridentata*, mesquite; *Prosopis glandulosa*) with a variable cover of fluffgrass, snakeweeds, other grasses, and annuals. Diagnosis: Large perennial grasses are scattered, rare, or absent. Transition to grassland state (1b): If erosion is not a problem, shrub removal might result in the recovery of grasses. If erosion from shrub interspaces has occurred, shrub removal might result in a bare state.

State 3
Bare

Community 3.1
Bare

Bare: Soils may be very shallow, permitting only annuals and fluffgrass to persist. Transition to grassland state (2b): Restoration of soil fertility or soil accumulation would be necessary. 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.

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	**Warm Season**			118–147	
	black grama	BOER4	*Bouteloua eriopoda*	118–147	–
2	**Warm Season**			59–89	
	sideoats grama	BOCU	*Bouteloua curtipendula*	59–89	–
3	**Warm Season**			29–59	
	bush muhly	MUPO2	*Muhlenbergia porteri*	29–59	–
4	**Warm Season**			29–59	
	blue grama	BOGR2	*Bouteloua gracilis*	29–59	–
5	**Warm Season**			0–18	
	vine mesquite	PAOB	*Panicum obtusum*	0–18	–
6	**Warm Season**			18–47	
	curly-mesquite	HIBE	*Hilaria belangeri*	18–47	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	18–47	–
7	**Warm Season**			59–89	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	59–89	–
	Arizona cottontop	DICA8	*Digitaria californica*	59–89	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	59–89	–
	tanglehead	HECO10	*Heteropogon contortus*	58–89	–

	green sprangletop	LEDU	*Leptochloa dubia*	59–89	–
8	**Warm Season**			18–47	
	threeawn	ARIST	*Aristida*	18–47	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	18–47	–
	tridens	TRIDE	*Tridens*	18–47	–
9	**Warm Season**			18–47	
	Hall's panicgrass	PAHA	*Panicum hallii*	18–47	–
10	**Warm Season**			0–18	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–18	–
Shrub/Vine					
11	**Shrub**			18–29	
	fourwing saltbush	ATCA2	*Atriplex canescens*	18–29	–
12	**Shrub**			18–29	
	snakewood	CONDA	*Condalia*	18–29	–
	Apache plume	FAPA	*Fallugia paradoxa*	18–29	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	18–29	–
13	**Shrub**			6–29	
	agave	AGAVE	*Agave*	6–29	–
	common sotol	DAWH2	*Dasylirion wheeleri*	6–29	–
	yucca	YUCCA	*Yucca*	6–29	–
14	**Cactus**			0–6	
	pricklypear	OPUNT	*Opuntia*	0–6	–
15	**Shrub**			0–18	
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–18	–
16	**Shrub**			6–18	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	6–18	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–18	–
Forb					
17	**Annual Forbs**			6–29	
	Forb, annual	2FA	*Forb, annual*	6–29	–
18	**Perennial Forbs**			6–18	
	Forb, perennial	2FP	*Forb, perennial*	6–18	–

Animal community

This site provides habitat which support a resident animal community that is characterized by gray fox, desert cottontail, Texas antelope squirrel, rock squirrel, Merriam’s kangaroo rat, whitethroat woodrat, Apache pocketmouse (dark phase, Carrizozo Malpais), cactus mouse, rock pocketmouse, Swainson's hawk, cactus wren, curve-billed thrasher, black-throated sparrow, white-necked raven, scaled quail, and chipping sparrow, brown towhee and Cassin’s kingbird (Carrizozo Malpais only), blacktail rattlesnake, collared lizard, tree lizard and red-spotted toad.

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
Graham----------D
Akela----------C

Recreational uses

The site has appeal for rock hounding, nature study, hiking, and rock climbing. Camping and picnicking suitability is fair, limited mostly by temperature extremes. Hunting is fair to good for dove, quail, small game and predators.

Wood products

This site has insignificant value for wood products.

Other products

This site is suitable for grazing in all seasons of the year. It is adapted to cattle, sheep, goats, and horses, generally without regard to class of livestock, although whenever a high percent of rock or rock outcrop is present, breeding animals such as bulls may become sore-footed and fail to perform well. Steeper slopes, where they occur, may also affect livestock performance and accessibility for grazing.

As retrogression occurs black grama, bush muhly, and sideoats grama will be replaced by such plants as curlymesquite, tobosa, fluffgrass, and broom snakeweed.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index--------Ac/AUM
100 - 76----------4.8 – 6.0
75 – 51----------5.7 – 6.8
50 – 26----------6.5 – 11.5
25 – 0----------11.5 - +

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:
Graham rocky clay loam, 1 to 9 percent slope
Graham very rocky clay loam, 1 to 9 percent slopes
Akela gravelly sandy loam, 3 to 25 percent slopes

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:**

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):**

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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:**
