Ecological site R042BE051NM
Sandy, Cool Desert Grassland

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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 upland site occurs on alluvial fans, fan piedmonts, fan remnant or fan terrace between the foothills of mountains and the floodplains. These fans are often dissected by small arroyos. Slopes range from 1 to 8 percent. It occurs on all exposures. Elevations range form about 4,500 feet above sea level to 5,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Fan piedmont (3) Fan remnant
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	4,500–5,500 ft
Slope	1–8%
Water table depth	60–80 in
Aspect	Aspect is not a significant factor

Climatic features

This site has an arid climate with distinct seasonal temperature variations and large annual and diurnal temperature changes characteristic of a continental climate.

Precipitation averages 8 to 10 inches annually. Deviations of 4 inches or more from the average are quite common. Fifty percent of the precipitation is received from July to November, which is the dominant growing season of native plants. Summer precipitation is characterized by high-intensity, short-duration rainstorms. Winter precipitation averages less than one-half inch per month,
usually in the form of rain. There are occasional snowstorms of short duration.

Temperatures vary from a mean monthly average of 77 F in July to 34 F in January, with a maximum of 104 F and a minimum of -10 F. The average last killing frost in the spring is April 15 and the average first killing frost in the fall is October 28. Frost-free season averages 185 days. Temperatures are conducive to native grass and forb growth from March through November.

Spring winds of 15 to 40 miles per hour are common from February to June. These winds increase transpiration rates of native plants and rapidly dry the surface soil. Small soil particles are often displaced by the wind near the soil surface. This results in structural damage to native plants, especially young seedlings.

Table 3. Representative climatic features

Frost-free period (average)	201 days
Freeze-free period (average)	152 days
Precipitation total (average)	9 in

Influencing water features

The plant community is not influenced by water from a wetland or stream.

Soil features

These soils are deep to moderately deep. The surface textures are sandy loam, gravelly sandy loam, gravelly fine sandy loam, fine sandy loam, gravelly loamy fine sand. The subsoil textures are sandy clay loam, sandy loam, gravelly loam, or gravelly sandy loam. The substrata are loamy fine sand, fine sandy loam, very cobbly loam, gravelly sandy loam, or gravelly loamy sand. The soils are usually calcareous throughout.

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

Characteristic soils:
Berino
Brazito
Dona Ana
Madurez
Pajarito
Turney
Wink

Table 4. Representative soil features

Surface texture	(1) Gravelly loamy sand (2) Loamy fine sand (3) Fine sand
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to rapid
Soil depth	20–72 in

Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	3–6 in
Calcium carbonate equivalent (0-40in)	15–35%
Electrical conductivity (0-40in)	0–16 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–9.6
Subsurface fragment volume <=3" (Depth not specified)	5–20%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

MLRA-42, SD-1: Sandy

Overview

The sandy site occurs largely on eolian or fluvial deposits of various ages derived from river sediments. Landscape positions include relict basin floor and lower to middle piedmont slopes. Sandy soils are usually old enough to have developed calcic or argillic horizons, and so are often higher on the landscape and farther from Rio Grande than deep sand soils. Sandy sites may intergrade with both loamy sites and gravelly sand sites.

The historic community type is dominated by black grama (*Bouteloua eriopoda*) and depending on texture variations and rainfall patterns may feature subdominance by dropseeds (*Sporobolus cryptandrus* and flexuosus), Indian ricegrass (*Achnatherum hymenoides*), or galleta (*Pleuraphis jamesii*). Heavy grazing leads to reductions of palatable grasses (especially black grama and ricegrass) and possibly the persistent loss of black grama. On soils that have not developed a stage 3 or greater calcic horizon (i.e., the calcic horizon is not white with many nodules), sand sage (*Artemisia filifolia*) may be present historically and fill in areas where grasses have been lost. On soils with well-developed calcic horizons, sand sage tends to be absent. Mesquite may be present on these soils but persistent grass loss and dune formation has not been observed. Herbicides may be used to increase the grass component in sand sage dominated areas, but it is unclear whether sand sage will inevitably reestablish.

Catalog of states and community pathways

State Containing Historic Plant Community

Black grama Grassland:

Black grama and dropseeds are likely to have dominated soils included within this site. The abundance of subordinate species, however, probably varied among soils. Indian ricegrass and scattered sand sage may have been present on soils with a deeper loamy sand mantle over the calcic horizon or with a poorly developed (stage 2 or less) calcic horizon within 1 m. Loamier soils featured substantial amounts of galleta. Scattered mesquite (*Prosopis glandulosa*) may have been present, especially on the soils with argillic and shallow calcic horizons. Periodic fires may have limited mesquite abundance, but its effect on sand sage is unknown. There is evidence that fire may have favored sand sage6. Continuous heavy grazing, especially during drought, reduces the dominance of black grama and in some cases Indian ricegrass, leaving dropseeds, threeawns and snakeweed (Xanthocephalum spp.) which may increase in overall cover. Because Indian ricegrass is a cool-season plant, its abundance may also respond to the seasonality of rainfall, being favored in wet springs3. On loamier soils in concave positions that collect surface water runoff, burrograss and galleta may become dominant under continuous grazing. There is evidence that periodic fires may have a characteristic of this state (see photos).

Diagnosis: Grass cover is uniform with bare patches typically > 50 cm in width. Black grama is dominant and stabilizes much of the soil surface such that there is little evidence of wind erosion. Sand sage and/or mesquite are present, but not abundant.

Additional States:
Bunchgrass-snakeweed: Black grama abundance is persistently depressed or eliminated, leaving snakeweed and bunchgrasses including dropseeds and Indian ricegrass as dominants. This reinforces relatively high erosion rates and persistent soil degradation. Overall grass cover is substantially reduced, but shrubs are not dominant. It is not clear if this state actually exists. All bunchgrass-dominated communities we observed had a black grama component. Black grama recovery (from trace to 8%) with cessation of livestock grazing may occur over 20 years (1976-1996) in the extreme southern part of SD-14,5 on Turney loamy sand soil. Thus, the lack of black grama reestablishment observed in warmer areas (SD-22) may not apply to SD-1 as long as some plants remain. Bunchgrass-snakeweed communities would then be considered as occurring within the black grama grassland state, although black grama recovery may take decades.

Diagnosis: Black grama is very rare or absent. Bunchgrasses and/or snakeweed are dominant. Shrubs may be present but are not dominant. Bare ground patches > 1m are common and bare ground cover is interconnected. Evidence of wind and water erosion includes blowouts and litter dams.

Transition to Bunchgrass-Snakeweed (1a) Loss of black grama grass cover due to continuous heavy grazing through drought periods causes the transition. Once most plants are eliminated, recovery of black grama cover via stolons would require periods of high rainfall, and be very slow even with grazing rest. Establishment by seed appears to be limited. Soil degradation during periods of low grass cover (specifically, loss of fungal associates and soil water holding capacity) may also limit black grama reestablishment.

Key indicators of approach to transition:
? Overutilization, decadence, and mortality of black grama.
? Absence of stolons
? Increasing size of bare ground patches

Transition back to Black Grama Grassland (1b) The recolonization of black grama may be facilitated by prescribed grazing and seeding in SD-1, although establishment rates are low.

Transition to Sand Sage (4b) Bunchgrass-dominated communities may be produced by the use of herbicides in the sand sage state. The seed pool of sand sage may be large. Reestablishment of sand sage during periods of high winter-spring rainfall may occur, especially if measures are not taken to ensure high grass abundance or the reestablishment of black grama.

Sand Sage Dominated: Sand sage is dominant and black grama is a subdominant. Cover of sand sage may exceeds 25%. Sand sage competes with grasses for space and soil water, thereby limiting grass recovery. Basal bare ground cover is greater than in the black grama grassland, but canopy cover is similar. Thus, soil degradation does not appear to be significant. Remaining black grama may decline with continuous grazing, leaving dropseeds, threeawns, and Indian ricegrass as primary grasses depending on rainfall patterns. This state has not been recorded on soils with white, stage 3 calcic horizons within 100 cm (e.g., Madurez, Turney) but has been recorded on soils with stage 2 calcic development to this depth (Pajarito, Wink).

Diagnosis: Sand sagebrush is dominant or co-dominant with black grama and bunchgrasses. Bare ground patches are usually < 1m. Where sand sagebrush is dense, there is little evidence of erosion.

Transition to Sand Sage Dominated State (2a) Sand sagebrush may expand due to reductions in black grama cover and increased resource availability. Climatic variation (increased winter/spring precipitation) may also play a role. Reductions in fuel loads and fire frequency may contribute to persistent sand sage dominance, but sand sage is only top-killed by fire and has resprouted vigorously in other studies6.

Key indicators of approach to transition:
? Increase in size and frequency of bare patches.

? Increased amounts of sand sage seedlings.

Transition back to Black Grama Grassland (2b) Herbicides can be used to reduce sand sage dominance and allow the reestablishment of grasses. Prescribed grazing may sustain grasses as dominants under suitable climatic conditions.

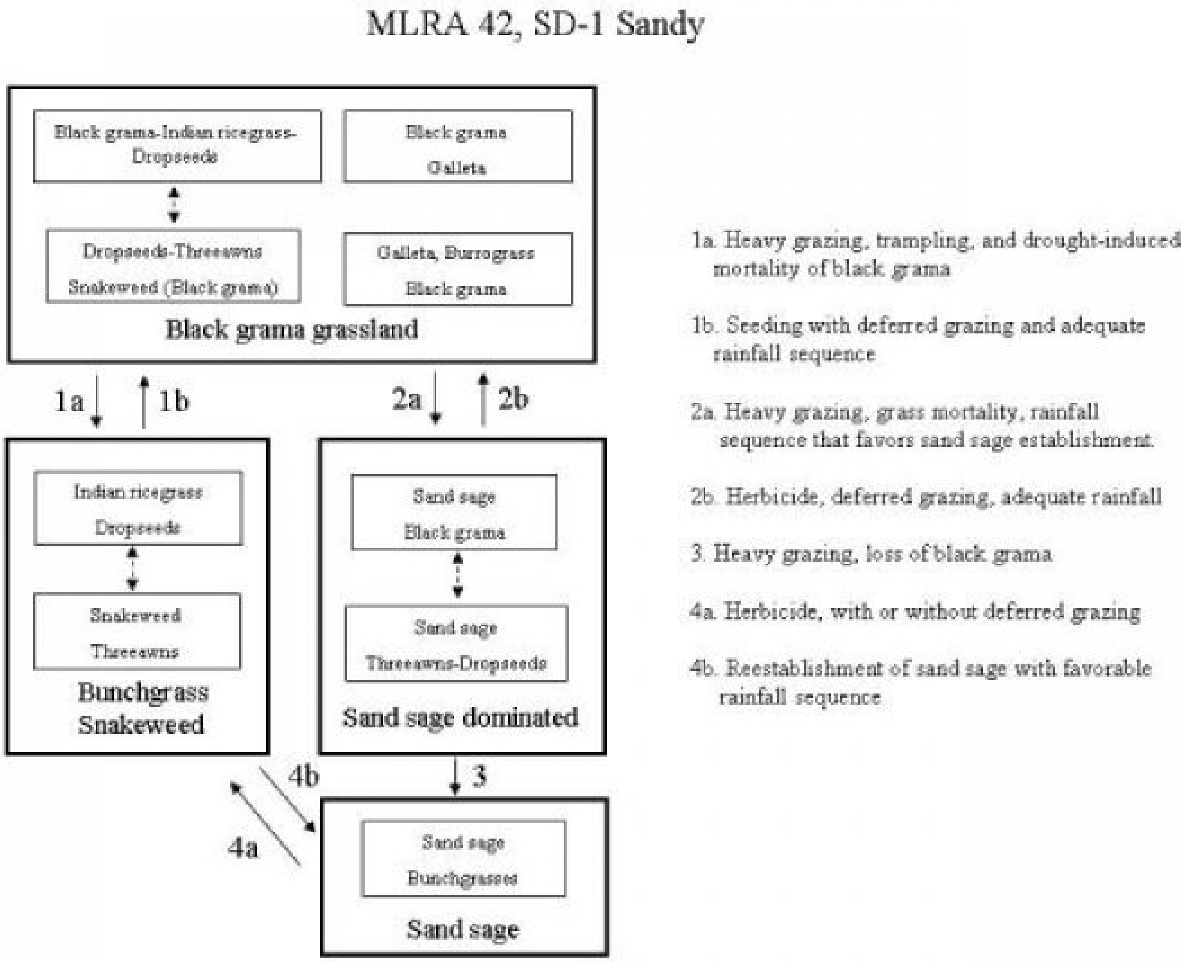
Sand Sage: Sand sage is dense and dominant, but black grama has been lost and is difficult to recover. Scattered bunchgrasses may remain or be absent and reappear in wet years. Because of the overall high canopy cover of sand sage, soil erosion by wind is low. The low cover of grass is due to the high dominance and resource monopolization of sand sage.

Transition to Sand Sage (3) Continuous heavy grazing within the sand-sage dominated state will remove remaining grass patches and these patches may be replaced by sand sage during periods of high winter/spring rainfall.

Key indicators of approach to transition:
? Overutilization, decadence and mortality of remaining grasses

Transition to Bunchgrass Snakeweed (4a) Similar to 2b except black grama cannot be recovered without seeding and perhaps repeated herbicide applications. Poor grazing management and high winter spring rain may lead to recovery of sand sage dominance (4b).

State and transition model



State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

The aspect and biomass of vegetation on this site is predominantly grassland characterized by short grass. Perennial shrubs, half-shrubs, and forbs comprise a minor component of the plant community. Annual forbs are present in appreciable amounts during spring and summer in years of above-average precipitation. The potential plant community produces approximately 900 pounds per acre, air dry weight, during years of favorable growing conditions, and about 400 pounds during unfavorable years. The average annual production is 700 pounds.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	280	455	630
Forb	80	130	180
Shrub/Vine	40	65	90
Total	**400**	**650**	**900**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5%
Grass/grasslike foliar cover	20%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	5%
Surface fragments >0.25" and <=3"	10%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	60%

Figure 7. Plant community growth curve (percent production by month). NM2201, R042XA051NM-Sandy-Warm Season-HCPC. SD-1 Sandy HCPC Warm Season Plant Community.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	5	10	7	25	30	15	5	0	0

Figure 8. Plant community growth curve (percent production by month). NM2202, R042XA051NM-Sandy-Cool Season-HCPC. SD-1 Sandy HCPC Cool Season Plant Community.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	15	20	20	2	5	10	15	13	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	**Warm Season**			260–390	

	black grama	BOER4	*Bouteloua eriopoda*	260–390	–
2	**Warm Season**			33–98	
	spike dropseed	SPCO4	*Sporobolus contractus*	33–98	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	33–98	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	33–98	–
3	**Cool Season**			65–130	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	65–130	–
4	**Warm Season**			33–98	
	James' galleta	PLJA	*Pleuraphis jamesii*	33–98	–
5	**Warm Season**			33–65	
	threeawn	ARIST	*Aristida*	33–65	–
6	**Cool Season**			33–65	
	needle and thread	HECO26	*Hesperostipa comata*	33–65	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	33–65	–
7	**Warm Season**			33–65	
	blue grama	BOGR2	*Bouteloua gracilis*	33–65	–
8	**Warm Season**			20–33	
	sand muhly	MUAR2	*Muhlenbergia arenicola*	20–33	–
9	**Warm Season**			33–65	
	bush muhly	MUPO2	*Muhlenbergia porteri*	33–65	–
10	**Warm Season**			20–33	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	20–33	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	20–33	–
Shrub/Vine					
11	**Shrub**			7–65	
	sand sagebrush	ARFI2	*Artemisia filifolia*	7–65	–
12	**Shrub**			7–33	
	winterfat	KRLA2	*Krascheninnikovia lanata*	7–33	–
13	**Shrub**			7–33	
	mormon tea	EPVI	*Ephedra viridis*	7–33	–
14	**Shrub**			13–33	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	13–33	–
15	**Cacti**			13–33	
	plains pricklypear	OPPO	*Opuntia polyacantha*	13–33	–
16	**Shrub**			7–33	
	fourwing saltbush	ATCA2	*Atriplex canescens*	7–33	–
17	**Shrub**			7–33	
	yucca	YUCCA	*Yucca*	7–33	–
Forb					
18	**Forb**			7–20	
	buckwheat	ERIOG	*Eriogonum*	7–20	–
19	**Forb**			7–20	
	herb sophia	DESO2	*Descurainia sophia*	7–20	–
20	**Forb**			7–33	

20	**Forb**			7–33	
	Russian thistle	SAKA	*Salsola kali*	7–33	–
21	**Forb**			7–13	
	fiddleneck	AMSIN	*Amsinckia*	7–13	–
22	**Forb**			7–20	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	7–20	–
23	**Forb**			7–13	
	verbena	VEPO4	*Verbena polystachya*	7–13	–
24	**Forb**			7–20	
	fleabane	ERIGE2	*Erigeron*	7–20	–
25	**Forb**			7–20	
	desertsenna	SEAR8	*Senna armata*	7–20	–
26	**Forb**			7–33	
27	**Other Forbs**			7–33	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	7–33	–

Animal community

This ecological site provides habitats which support a resident animal community that is characterized by badger, kit fox, black tailed jackrabbit, desert cottontail, black tailed prairie dog, Ord's kangaroo rat, white-tailed antelope squirrel, northern grasshopper mouse, burrowing owl, scaled quail, meadowlark, brown towhee, house finch, prairie rattlesnake, round-tailed horned lizard, lesser earless lizard, and New Mexico whiptail. These sites are breeding areas for mockingbird, western kingbird, curve billed thrasher, and vesper sparrow.

Hydrological functions

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

Recreational uses

This site has limited potential for recreational use.

Wood products

This site has no potential for wood products.

Other products

This site is well suited for year-long grazing use by cattle, sheep, horses, antelope, deer, and burros.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index-----Ac/AUM
100 - 76-------------3.2 – 4.2
75 – 51--------------4.1 – 6.4
50 – 26--------------6.3 – 12.7
25 – 0--------------12.7 +

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 Area 42, of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: Valencia, Socorro, and Bernalillo.

Other references

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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):**

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:**