USDA Natural Resources
Conservation Service

Ecological site R070BY055NM
Sandy Plains

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.

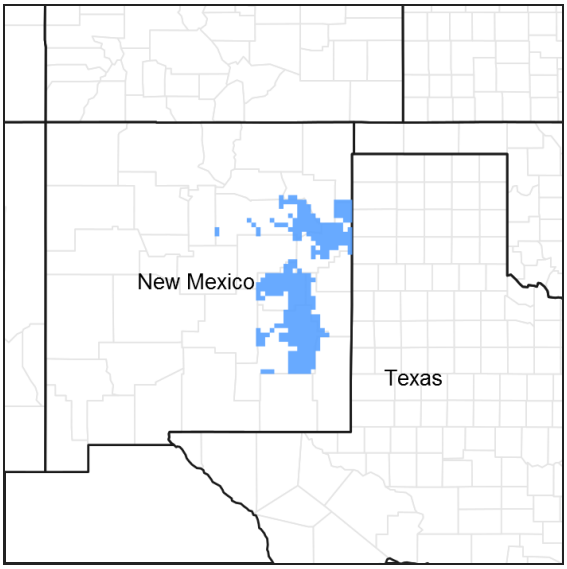


Figure 1. Mapped extent

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

This site occurs on gentle slopes (0 to 9 percent). Soils are greater than 40 inches to root-restrictive layers. Surface textures are sandy: fine sand, loamy fine sand, fine sandy loam, or sandy clay loam. Clay is higher in subsurface horizons. Parent materials are derived from Triassic stratigraphy.

The Sandy Plains site occurs adjacent to or intergrades with Deep Sand, Sandhill, and Sandy Loam sites. The Sandy Plains site is differentiated from Deep Sand and Sandhill sites by the presence of an argillic horizon (accumulation of clay) occurring from 8 to 36 inches below the soil surface. Coarser soil surface textures (fine sand or loamy fine sand) of Sandy Plains distinguish it from the Sandy Loam ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Quercus havardii* (2) *Yucca glauca*
Herbaceous	(1) *Andropogon hallii* (2) *Schizachyrium scoparium*

Physiographic features

This site consists of very deep, well drained, moderately permeable soils that formed in moderately fine textured calcareous and noncalcareous alluvium derived from red siltstone, shale, and sandstone of Triassic age. The site occupies hillslopes, alluvial fan terraces, fan remnants, and valley side slopes. Slope ranges from 0 to 9 percent.

Exposure varies, but is not ecologically significant.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Fan remnant (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,097–1,707 m
Slope	0–9%
Aspect	Aspect is not a significant factor

Climatic features

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

Annual average precipitation ranges from 11 to 16 inches. Roughly 78 percent of the moisture falls during the 6-month period of May through October. Most of this summer precipitation falls in the form of brief and heavy afternoon and evening thunderstorms. Hail may accompany the more severe summer storms. In the winter, there is normally only one day a month when as much as one-tenth inch of moisture falls, usually in the form of snow. Snow seldom lies on the ground for more than a few days.

Temperatures are characterized by a distinct seasonal change and large annual and diurnal temperature ranges. Summers are moderately warm. Maximum temperature average above 90 degrees F from July to August, and an average summer includes about 80 days with high readings exceeding 90 degrees F and 10 days with readings above 100 degrees F. Temperatures usually fall rapidly after sundown and lows average 60 degrees F on most summer nights. Winters are mild, sunny, and dry. Daytime shade temperatures in midwinter usually rise to the 50’s. However, freezing temperatures normally occur at night from mid-November to mid-March.

The freeze-free season ranges from 196 to 218 days. Dates of the last freeze range from April 11th to April 17th and the first freeze ranges from October 20th to October 25th.

Both temperature and rainfall distribution favor warm-season, perennial plant communities in the area. However, sufficient late winter and early spring moisture allows cool-season species to occupy a minor component within the plant community.

Climate data was obtained from http://www.wrcc.dri.edu/summary/climsmnm.html web site. Data were interpreted utilizing NM Climate Summarizer spreadsheet.

Table 3. Representative climatic features

Frost-free period (average)	192 days
Freeze-free period (average)	218 days
Precipitation total (average)	406 mm

Influencing water features

This site is not influenced by water from a wetland or stream. During high-intensity rain events, this site may receive run-on from landforms above, and shed water to landforms below.

Soil features

Soils are generally deep or very deep. Surface textures are fine sand, sandy clay loam, sandy loam, or loamy fine sand. Textures of the argillic subsoil are sandy clay loam, fine sandy loam, or loamy fine sand. In some soils, a calcic horizon occurs at a depth below 30 inches which can include fragments ranging up to 25 percent. The soils have moderately rapid or moderate permeability. The available water-holding capacity is moderate or high. The plant soil air water relationship is good.

Because of their coarse surface textures, topsoils, if unprotected by plant cover and organic residue, become wind-blown and low hummocks or dunes are formed around shrubs.

The Pojo and Pyote soils have a petrocalcic horizon between 20 and 40 inches.

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

Characteristic soils:
Armesa
Berwolf
Canez
Faskin
Ima
Jalmar
Malstrom
Pojo
Pyote
Redona
San Jose
Stromal

Table 4. Representative soil features

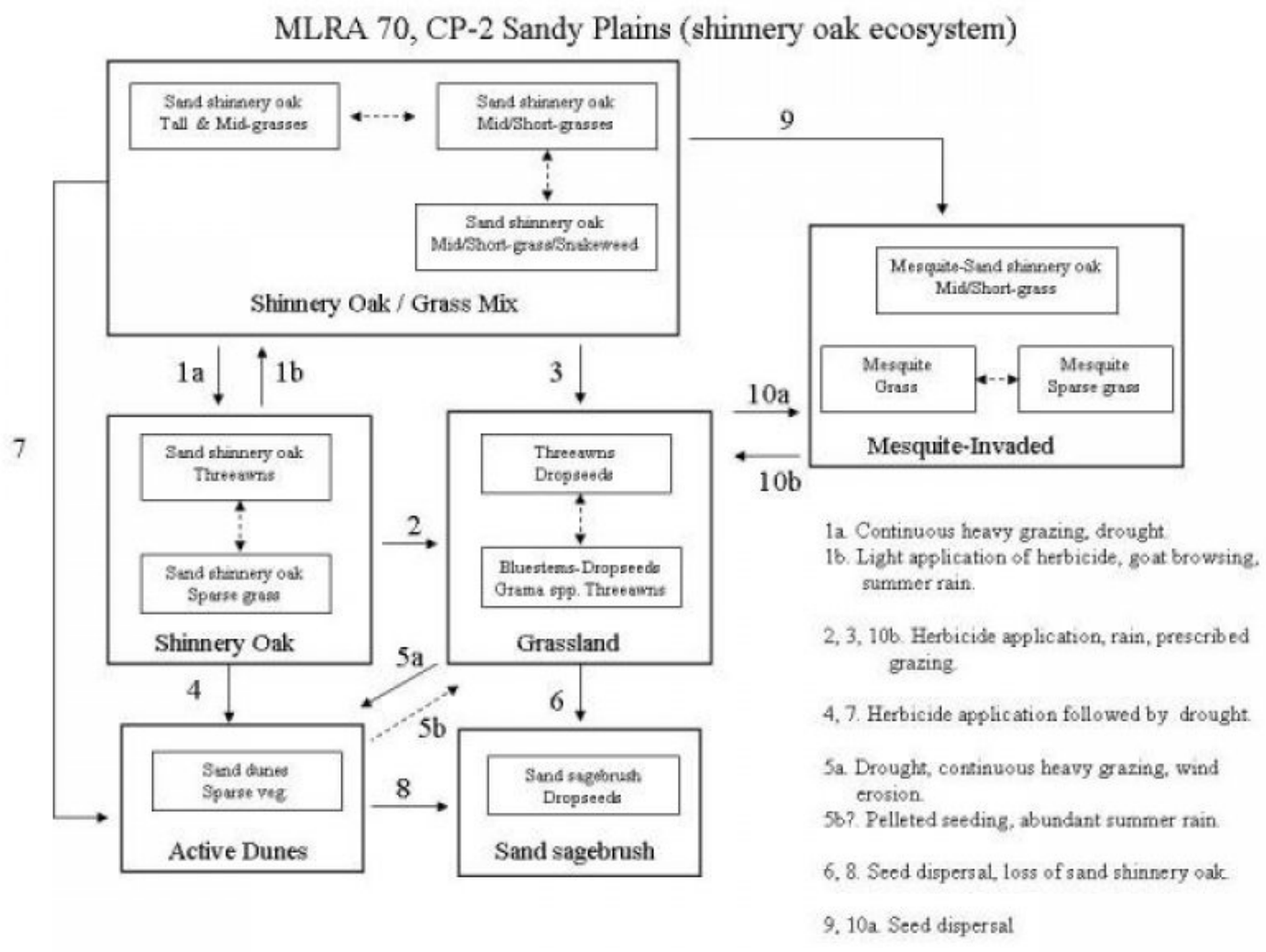
Surface texture	(1) Loamy fine sand (2) Sandy clay loam (3) Fine sand
Family particle size	(1) Sandy
Drainage class	Moderately well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	15.24–30.48 cm
Calcium carbonate equivalent (0-101.6cm)	5–15%
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)	6.6–9.1
Subsurface fragment volume <=3" (Depth not specified)	0–15%

Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The historic plant community is believed to be a shinnery oak/grass mix composed predominantly of warm-season tall and mid grasses and sand shinnery oak. Continuous heavy grazing, especially in conjunction with drought, can result in a decrease or loss of tall grasses and initiate a transition to a state dominated by sand shinnery oak. Light application rates of herbicide or long-term grazing by goats may decrease shinnery oak and allow grasses to re-colonize, approximating historic plant community composition. Alternatively, heavier application rates of herbicide can dramatically reduce or kill sand shinnery oak, allowing grasses to dominate (Grassland state). This transition to grass dominance may be aided by decreased competition and a flush of nutrients from the decomposing oak. This transition requires the presence of sufficient perennial grasses prior to treatment, adequate rainfall necessary to establish grasses, and proper management. If drought and or mismanagement follow sand shinnery oak control, grasses may not establish and sparsely vegetated dunes and severe erosion (Active Dunes state) may result. Over a period of years, sand sagebrush may encroach on the Grassland state, perhaps due to reduced competition resulting from the loss of shinnery oak or proximity to seed source (Sand Sagebrush state). Dispersal of mesquite seed by wildlife and livestock can result in a mesquite-invaded state.

State and transition model



State 1
Reference State

This state represents the most ecologically stable conditions in terms of resistance to erosion. Moreover, this state has the highest potential for productivity and plant diversity.

Community 1.1
Reference Plant Community

Shinnery oak/Grass-Mix: The historic plant community is believed to be a Shinnery oak/Grass-mix, where tall and mid-grasses are co-dominant with shinnery oak. Grasses consist predominately of little bluestem, sand bluestem, and dropseeds. Community composition varies with soil characteristics and geographic location. On soils where the argillic horizon is sandy clay loam and occurs less than 20 inches from the surface, grasses such as sideoats grama, New Mexico feathergrass, and black grama may dominate. In the southeastern portion of Chaves County, giant dropseed is typically the dominant grass with little bluestem and sand bluestem occurring as subordinates. Other common grasses throughout Sandy Plains sites include threeawns; fall witchgrass; black, hairy, and sideoats grama; sand paspalum; red lovegrass; and spike dropseed. Shinnery oak is the dominant shrub. Other shrubs that occur on this site include yucca, sand sagebrush, broom snakeweed and pricklypear. Forbs fluctuate from year to year, being the most abundant in years of early spring moisture. Annual sunflower, annual buckwheat, and western ragweed are a few of the common forbs. Continuous heavy grazing, especially in conjunction with drought, typically results in a decrease of tall grasses. Application of foliar absorbed (phenoxy) herbicides or perhaps prescribed fire, may temporarily suppress shinnery oak, reducing resource competition, and accelerate a community shift back towards the historic community. Diagnosis: Shinnery oak and grasses are co-dominant. Tall and mid-grasses such as sand bluestem, giant dropseed, and little bluestem are present in substantial amounts. Grass cover is not continuous, but is fairly uniform across the more stable areas. Shinnery oak and grasses limit erosion.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1143	1715	2287
Shrub/Vine	252	429	572
Forb	252	379	572
Total	**1647**	**2523**	**3431**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-20%
Grass/grasslike foliar cover	20-25%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	20-30%
Surface fragments >0.25" and <=3"	0-3%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	25-35%

Figure 5. Plant community growth curve (percent production by month). NM4005, R070BY055NM Sandy Plains HCPC. R070BY055NM Sandy Plains HCPC Warm-season tall and mid-grassland mixed with shrubs and forbs..

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

State 2

Shinnery Oak

This state contains robust stands of shinnery oak.

Community 2.1
Shinnery Oak

Shinnery Oak: Shinnery oak dominates this state. Other shrubs that typically occur include yucca, mesquite, broom snakeweed, sand sagebrush, and pricklypear. Two communities have been recognized in this state. In the first community, shinnery oak is dominant with threeawns occurring as the sub-dominant. Tallgrasses are scattered across the site or are absent. Subordinate grasses typically present in this community include dropseeds, hairy grama, fall witchgrass, lovegrass species, and field sandbur. Shinnery oak is the sole dominant in the second community with only sparse grass cover. This second community is believed to develop during extended periods of drought, which may cause a large-scale reduction in threeawns and other grasses. Favorable rainfall conditions and a persistent seed bank of threeawns in the soil may cause a shift back to a shinnery oak/threeawn community. When shinnery oak is the main source of forage, livestock should not be allowed to graze pastures during the spring, when shinnery oak is in the late bud and early leaf stage. During this period (normally six weeks) tannin concentrations are highest and livestock poisoning can occur. In the fall, care must be taken during years of high acorn production. The acorns are also poisonous and are relished by livestock. Diagnosis: Shinnery oak is dominant with threeawns occurring as the sub-dominant, or shinnery oak is the sole dominant with few grasses present. Tallgrasses are sparsely scattered across the site or are absent. The cover of shinnery oak helps to limit erosion. Key indicators of approach to transition: A decrease in tallgrass and more palatable mid-grass species. Increase in threeawns. Transition to Shinnery oak (1a) Transitions to this state are believed to occur in response to grazing pressure, especially in conjunction with drought, or in response to severe, long-term drought. Shinnery oak has low palatability for cattle and is used primarily as emergency feed during droughts. The extensive root system of shinnery oak and its ability to store water enable it to better withstand drought than associated grasses. Low palatability and high drought resistance enable shinnery oak to remain relatively stable. Transition back to Shinnery oak/Grass-Mix (1b) Light application rates of root-absorbed herbicides can reduce shinnery oak and under favorable rainfall conditions initiate the transition back to the Shinnery Oak/Grass-Mix. Longterm browsing by goats has shown promise in reducing shinnery oak and helping to reestablish co-dominance between shinnery oak and grass.

State 3
Grassland

This state is dominated by grasses.

Community 3.1
Grassland

Grassland: This state is dominated by herbaceous vegetation with little to no shinnery oak present. There are various communities that can express themselves depending on the grass component prior to treatment and amount of precipitation following treatment. Generally there is an initial increase in threeawns, dropseeds, annual grasses, and forbs. Over time and with proper management, the community may shift to dominance by bluestems and dropseeds with gramas, threeawns, and other short grasses as sub-dominants. Proper management is essential to maintain grass cover and limit erosion. Diagnosis: Shinnery oak is either absent or poorly represented. Grasses are dominant. Typically bluestems, dropseeds, or threeawns are the main species. Litter cover is lower than in either the Shinnery oak or Shinnery oak/Grass-Mix states. Transition to Grassland (2, 3, 10b) Transitions to the Grassland state from the Shinnery Oak, Shinnery Oak / Grass Mix, or Mesquite-Invaded states can occur with the use of herbicides such as tebuthiuron. The results are dependent on the initial vegetation, herbicide application rate, and adequate rainfall and management following treatment. Control of shinnery oak should be limited to those sites with adequate perennial grasses present and during years exhibiting favorable climatic conditions. Control of shinnery oak on the Sandy Plains ecological site should be carefully evaluated due to the extreme erosion hazard associated with cover loss. Transition to Grassland (5b?) Theoretically this transition is accomplished by utilizing pelleted seed to reestablish vegetation and stabilize the dunes. The seed is designed to germinate only after receiving rainfall in amounts necessary to confer a high probability of survival. Abundant summer rain following germination is necessary to enable the plants to establish. The chance of seedling survival is diminished where erosion is active.

State 4
Sand Sagebrush

This state contains significant sand sagebrush.

Community 4.1
Sand Sagebrush

Sand Sagebrush: This state is characterized by the predominance of sand sagebrush. Dropseeds and bluestems are typically the main grasses. Other subordinate grasses common on this site include threeawns, fall witchgrass, plains bristlegrass, hairy grama, sand paspalum, red lovegrass, and sand lovegrass. Diagnosis: Sand sagebrush is dominant. Grass cover is variable ranging from fairly evenly distributed to patchy. Blowouts and bare areas may be common. Litter cover is lower than in states with similar densities of shinnery oak. Transition to Sand Sagebrush (6, 8) Transitions to this state are thought to occur as the result of seed dispersal by sand sagebrush from adjacent sites and decreased competition for soil moisture as a result of the loss of shinnery oak.

State 5
Active Dunes

Community 5.1
Active Dunes

Active Dunes: Sparsely vegetated dunes and active erosion characterize this state. Grass cover is minimal. Threeawns and dropseeds are sparsely scattered across the site. Small soapweed yucca is typically present. Diagnosis: Vegetation is sparse. Erosion is active and severe. Transition to Active Dunes (4, 7) Transitions to this state result from herbicide application and unsuccessful grass establishment. Drought following herbicide treatment may decrease seedling survival and reduce cover of established grasses beyond the point necessary to protect the site from accelerated erosion. Transition to Active Dunes (5a) Drought, especially in conjunction with heavy grazing pressure may cause this transition.

State 6
Mesquite-Invaded

Community 6.1
Mesquite-Invaded

Mesquite Invaded: This state is characterized by the noticeable presence of mesquite. Grass cover may remain relatively high where mesquite cover averages less than 15 percent. On sites with mesquite densities higher than 15 percent grass cover is inversely related to mesquite density. Diagnosis: Mesquite is present in substantial amounts. Grass cover is variable, ranging from fairly uniform to patchy with large bare areas present. Transition to Mesquite-Invaded (9, 10a) Dispersal of mesquite seed may be all that is necessary for this transition. Those sites with sandy clay loam subsoil may be more susceptible to invasion by mesquite. Periodic fire may help discourage mesquite invasion by killing some plants and damaging others, increasing their susceptibility to insects, disease, and competition from grasses.9

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				252–303	
	sand bluestem	ANHA	*Andropogon hallii*	252–303	–
2				379–504	
	little bluestem	SCSC	*Schizachyrium scoparium*	379–504	–

3				0–127	
	red lovegrass	ERSE	*Eragrostis secundiflora*	0–127	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–127	–
4				76–127	
	old-man-in-the-Spring	SEVU	*Senecio vulgaris*	76–127	–
5				76–127	
	hairy grama	BOHI2	*Bouteloua hirsuta*	76–127	–
6				76–127	
	threeawn	ARIST	*Aristida*	76–127	–
7				76–127	
8				177–252	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	177–252	–
9				151–202	
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	151–202	–
10				76–127	
	black grama	BOER4	*Bouteloua eriopoda*	76–127	–
11				76–127	
	Indiangrass	SONU2	*Sorghastrum nutans*	76–127	–
12				76–127	
	spike dropseed	SPCO4	*Sporobolus contractus*	76–127	–
13				76–127	
	sideoats grama	BOCU	*Bouteloua curtipendula*	76–127	–
14				0–50	
	Grass, annual	2GA	*Grass, annual*	0–50	–
15				0–26	
	mat sandbur	CELO3	*Cenchrus longispinus*	0–26	–
Forb					
16				26–76	
	queen's-delight	STSY	*Stillingia sylvatica*	26–76	–
17				6–76	
	annual buckwheat	ERAN4	*Eriogonum annuum*	11–76	–
	common sunflower	HEAN3	*Helianthus annuus*	6–76	–
	globemallow	SPHAE	*Sphaeralcea*	11–76	–
18				0–50	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–50	–
	mustard	BRASS2	*Brassica*	0–50	–
	prairie clover	DALEA	*Dalea*	0–50	–
	spurge	EUPHO	*Euphorbia*	0–50	–
	Adonis blazingstar	MEMU3	*Mentzelia multiflora*	0–50	–
19				50–101	
	Forb, perennial	2FP	*Forb, perennial*	50–101	–
20				50–101	

	Forb, annual	2FA	*Forb, annual*	50–101	–
Shrub/Vine					
21				0–303	
	Havard oak	QUHA3	*Quercus havardii*	0–303	–
22				76–127	
	soapweed yucca	YUGL	*Yucca glauca*	76–127	–
23				26–50	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	26–50	–
24				127–177	
	sand sagebrush	ARFI2	*Artemisia filifolia*	127–177	–
25				26–76	
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	26–76	–
26				0–26	
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–26	–

Animal community

Habitat for Wildlife: This site provides habitats which support a resident animal community that is characterized by pronghorn antelope, desert cottontail, hispid pocket mouse, Ord's kangaroo rat, lesser prairie chicken, burrowing owl, plains spadefoot toad, and ornate box turtle. The upland plover and the savannah sparrow utilize this site for breeding.

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
Armesa---------- B
Berwolf---------- B
Canez---------- B
Faskin---------- B
Ima---------- B
Jalmar---------- A
Malstrom---------- B
Pojo---------- C
Pyote---------- A
Redona---------- B
San Jose---------- B
Stromal---------- B

Recreational uses

Recreation potential is limited due to the lack of access roads for two-wheel drive vehicles, loose sand, lack of surface water, and lack of shade. The “wide open spaces” of the area provide aesthetic appeal. Hunting for prairie chicken is good to excellent. Hunting for antelope is fair to good. Photography of prairie chickens during their “booming” season is excellent to good. The natural beauty is enhanced by the the varying hues of bluestems, and by various forbs which bloom from early spring to late fall.

Wood products

This site produces no wood products.

Other products

Grazing: This site can be grazed any season of the year except during spring when shinnery oak is in the late bud and early leaf stage. During this period of time (normally six weeks), domestic livestock should be removed from pastures because of shinnery oak toxicity. Care must be taken in years of high production of acorns, which are both poisonous and relished by livestock. Immediately following this stage, shinnery provides forage for livestock for about six weeks before the leaves become tough and brittle. Due to the variety of grasses, forbs, and shrubs; cattle, goats, and sheep can graze this site. However, cattle most efficiently utilize it.
Continuous, yearlong grazing by cattle results in a plant community of low forage value plants such as threeawn spp., field sandbur, shinnery oak, small soapweed, sand sagebrush, and forbs. Mesquite will easily invade where there is a nearby seed source. These plant community shifts are usually accompanied by reduced ground cover causing wind erosion. A system of deferred grazing, which varies the season of grazing and rest is needed to maintain or improve a healthy well-balanced plant community. Rest in different seasons benefits different plants. Winter rest will benefit all woody species. Spring rest will encourage forb production and benefit New Mexico feathergrass. Summer rest (July-September) allows species such as sand bluestem and little bluestem to grow and reproduce. Fall rest allows all warm-season species to complete their growth cycle and mature. Shinnery oak can be best utilized if cattle are concentrated into small pastures immediately following the toxic stage.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index Ac/AUM
100 - 76 2.1 – 4.3
75 – 51 2.6 – 6.8
50 – 26 4.3 – 9.0
25 – 0 9.0+

Inventory data references

Other References: Data collection for this site was done in conjunction with the progressive soil surveys within the Pecos-Canadian Plains and Valleys 70 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: San Miguel, Quay, Guadalupe, De Baca, and Chaves.

Other references

References

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Contributors

Christine Bishop
David Trujillo
Don Sylvester
John Tunberg

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	05/19/2024
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:**

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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:**
