UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION

ECOLOGICAL SITE CHARACTERISTICS

Site Type: Rangeland

Site ID: R042XD006NM

Site Name: Shallow Sandy

Precipitation or Climate Zone: 12-14 inches

Phase:

PHYSIOGRAPHIC FEATURES

Narrative:

This site occurs on gently sloping to moderately sloping erosional fan remnants. Slops average from 1 to 5 percent. Elevations range from approximately 4700 to 6000 feet above sea level.

Land Form:

1. Fan piedmont
2.
3.

Aspect:

1. No influence on this site.
2.
3.

	Minimum	Maximum
Elevation (feet)	4700	6000
Slope (percent)	1	5
Water Table Depth (inches)		

Flooding:	**Minimum**	**Maximum**
Frequency	None	**None**
Duration	None	**None**

Ponding:	**Minimum**	**Maximum**
Depth (inches)	None	**None**
Frequency	None	**None**
Duration	None	**None**

Runoff Class:

Very High

CLIMATIC FEATURES

Narrative:

Average precipitation for this site is approximately 12 to 14 inches. Variations of 5 inches are not uncommon. Approximately 75 percent of this occurs from May through October with most of the rainfall occurring from July to September. Most of the summer precipitation comes in the form of high intensity short duration thunderstorms. Although little precipitation does occur during the winter month, rain and snow of low intensity usually characterize the precipitation that does occur. Temperatures are mild. Freezing temperatures are common at night from December through April, however, temperatures during the day are frequently above 50 degrees F. Occasionally in December to February brief periods of 0 degree F. Temperatures may be expected. During June to August some days may exceed 100 degrees F.

The mean annual precipitation figures are derived from rain gauge data collected by the BLM (1971 to 1990), and NOAA weather maps utilizing prism model estimation techniques. There are no permanent weather stations within the boundaries of the Land Resource Unit.

	Minimum	**Maximum**
Frost-free period (days):	140	180
Freeze-free period (days):	145	185
Mean annual precipitation (inches):	12	14

Monthly moisture (inches) and temperature (^{0}F) distribution:

	Precip. Min.	Precip. Max.	Temp. Min.	Temp. Max.
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				

Climate Stations:

Station ID _____ Location _____ Period From: _____ To: _____

Station ID _____ Location _____ Period From: _____ To: _____

Station ID _____ Location _____ Period From: _____ To: _____

Station ID _____ Location _____ Period From: _____ To: _____

INFLUENCING WATER FEATURES

Narrative:

This site is not influenced by water from wetland or stream.

Wetland description:

System	Subsystem	Class

If Riverine Wetland System enter Rosgen Stream Type:

REPRESENTATIVE SOIL FEATURES

Narrative:

The soils on this site are very shallow to shallow, less than 20 inches in depth. The Surface layer is very fine sandy loam. Subsurface textures are loam, sandy clay loam or clay loam. An indurate caliche layer (petrocalcic) occurs at depths of 8 to 20 inches with an average depth of 15 inches from the surface. The soils are well drained and have moderately slow permeability above and below the very slowly permeable petrocalcic horizon.. The petrocalcic horizon restricts water movement and plant root penetration. Available water holding capacity is low.

Parent Material Kind: Alluvium modified by eolian sands
Parent Material Origin:

Surface Texture:

1. Very fine sandy loam
2.
3.

Surface Texture Modifier:

1.
2.
3.

Subsurface Texture Group: Loamy
Surface Fragments <=3" (% Cover): 0
Surface Fragments >3" (% Cover): 0
Subsurface Fragments <=3" (%Volume): 11
Subsurface Fragments >=3" (%Volume): 3

	Minimum	Maximum
Drainage Class:	Well Drained	Well Drained
Permeability Class:	Moderately slow	Moderately slow
Depth (inches):	6	19
Electrical Conductivity (mmhos/cm):	0	2
Sodium Absorption Ratio:		
Soil Reaction (1:1 Water):	7.4	8.4
Soil Reaction (0.1M CaCl2):		
Available Water Capacity (inches):	2	3
Calcium Carbonate Equivalent (percent):	0	40

PLANT COMMUNITIES

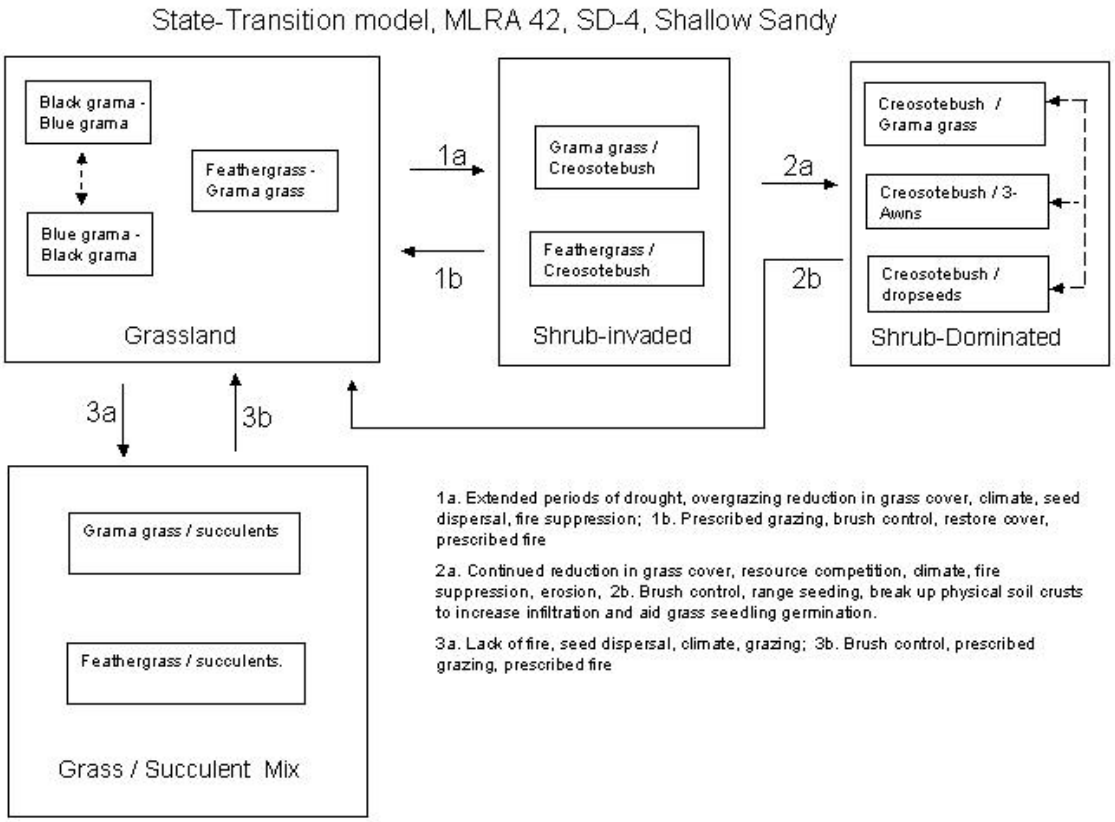
Ecological Dynamics of the Site:

Overview

The Shallow Sandy ecological site occurs as a distinct unit adjacent to or as a component associated with both the Gravelly and Limy ecological sites. When the shallow sandy site occurs associated with the Limy site, the Limy site occupies a lower slightly concave or bottom (inset fan) position of the piedmont slope, whereas the Shallow Sandy site is situated on the more convex side slopes or top position on the piedmont slope. Where the Shallow Sandy site and the Gravelly site occur together, they intergrade and form a mosaic where there is no apparent distinction in landscape position.

The aspect of this site is open grassland sparsely dotted with shrubs. Black grama and blue grama are the dominant species. Forb production and composition fluctuates both seasonally and from year to year. Some of the more common forbs include globemallow, croton and bladderpod. Characteristic shrubs include winterfat, banana and soaptree yucca, four-wing saltbush, prickly pear and cholla. This site is subject to invasion by creosotebush. Drought, overgrazing, or a combination of the two can initiate the transition from grassland to shrub-invaded state. Above average winter precipitation may also favor the encroachment of shrubs[5]. Seed dissemination by rodents and lagomorphs can aid in the establishment of creosotebush. Fire suppression may also play a part by allowing shrub seedlings to survive and flourish which otherwise may have been killed or kept in check by natural fire regimes.[2] Creosotebush invasion may be facilitated by proximity to areas where creosotebush is already established. Once creosotebush is established, prescribed grazing may be necessary to alter the path to shrub dominance. The continued reduction of grass cover, resource competition, climate, fire suppression, and erosion are factors that enhance the probability of the site becoming dominated by creosotebush. Edaphic characteristics, fire suppression, seed dispersal, climate and grazing may all play a part in the transition to Grass/Succulent Mix state.

Plant Communities and Transitional Pathways (diagram)



MLRA 42; SD-4; Shallow Sandy

Grassland State


- Black grama – Blue grama community with a few widely scattered yucca.
- Grass cover very high
- Jerag very fine sandy loam, Fort Bliss Soil Survey, Otero Co.

Grassland State


- Grama grass-NM feathergrass community
- Grass cover high to moderate
- Jerag-Amnesa complex, Fort Bliss Soil Survey, Otero Co.

Grass-Succulent Mix


- Black grama – blue grama with scattered yucca baccata and cholla
- Grass cover (during drought) moderate to low
- Jerag very fine sandy loam, Fort Bliss Soil Survey, Otero Co.

Shrub-Invaded State


- Black grama – blue grama with scattered creosotebush
- Grass cover moderate, bare patch size expanding
- Jerag very fine sandy loam, Fort Bliss Soil Survey, Otero Co.

Shrub-Dominated State


- Creosotebush / black grama-blue grama
- Grass cover low to moderate
- Large bare patches evident., cryptobiotic crusts present
- Jerag-Amnesa complex, Fort Bliss Soil Survey, Otero Co.

State Containing Historic Climax Plant Community

Grassland: The soils on this site are shallow to a petrocalcic layer, which helps to absorb and keep water perched and available for plants.[3] Black grama and blue grama are the dominant grass species of the historic plant community. New Mexico feathergrass, sand muhly, tobosa, sand dropseed and vine mesquite also occur in significant numbers distributed throughout the site. On Otero Mesa, Fort Bliss Soil Survey, the Shallow Sandy site often occurs in association with the Limy site and the soils appear in a repeating pattern of concave and convex landscapes. New Mexico feathergrass inhabits the convex or high spots on the Jerag soils. When the Shallow Sandy site is adjacent to Limestone Hill sites, feathergrass occurs at higher densities. This increase in feathergrass may in part be due to slight differences in the amount of winter and early spring precipitation received. Dropseeds or threeawns species increase in response to a decrease in grama grass cover. This decrease in cover may be climate or grazing induced. Succulents and shrubs may be favored during years with increased winter precipitation. Succulents and shrubs associated with this state include banana and soaptree yucca, cholla, prickly pear, fourwing saltbush, and winterfat. This site is susceptible to invasion by creosotebush.

Diagnosis: Black grama and blue grama are the dominant species. Grass cover is uniformly distributed with few large bare areas. There is little evidence of active rills and gully formation. Litter movement limited to smaller size class litter and short distances. Creosotebush is absent.

Ground Cover and Structure: presently being revised.

Plant Community Annual Production (by plant type):

Annual Production (lbs/ac)

Plant Type	Low	RV	High
Grass/Grasslike	700	1104	1330
Forb	64	60	42
Tree/Shrub/Vine	36	36	28
Lichen			
Moss			
Microbiotic Crusts			

Plant Community Composition and Group Annual Production:

Plant Type - Grass/Grasslike

Group Number	Scientific Plant Symbol	Common Name	Species Annual Production	Group Annual Production
1	BOER4	Black grama	420-540	420-540
2	BOGR2	Blue grama	240-300	240-300
3	HANE5	NM feathergrass	72-96	72-96
4	MUAR2	Sand muhly	60-72	60-72
4	PLMU3	Tobosa	60-72	
4	SPCR	Sand dropseed	60-72	
5	PAOB	Vine mesquite	48-60	48-60
5	PAHA	Hall's panicum	48-60	

5	BOHI2	Hairy grama	48-60	
6	ARIST	Threeawns	24-36	24-36

Plant Type - Forb

Group Number	Scientific Plant Symbol	Common Name	Species Annual Production	Group Annual Production
7	SPHAE	Globemallow	12-24	12-24
7	CROTO	Croton	12-24	
7	LESQU	Bladderpod	12-24	
8	2FP	Perennial forbs	12-24	12-24
9	2FA	Annual forbs	6-12	6-12

Plant Type – Tree/Shrub/Vine

Group Number	Scientific Plant Symbol	Common Name	Species Annual Production	Group Annual Production
10	KRLA2	Winterfat	6-12	6-12
10	ATCA2	Fourwing saltbush	6-12	
11	YUCCA	Yucca spp.	12-24	12-24
11	OPIM	Cholla	12-24	
11	OPUNT	Prickly pear	6-12	

Plant Type - Lichen

Group Number	Scientific Plant Symbol	Common Name	Species Annual Production	Group Annual Production

Plant Type - Moss

Group Number	Scientific Plant Symbol	Common Name	Species Annual Production	Group Annual Production

Plant Type - Microbiotic Crusts

Group Number	Scientific Plant Symbol	Common Name	Species Annual Production	Group Annual Production

Plant Growth Curves

Growth Curve ID 5806

Growth Curve Name: HCPC Grassland State

Growth Curve Description: SD-4 Warm Season Grassland - Average rainfall year

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
0	0	3	3	8	7	18	28	25	6	2	0

Additional States:

Shrub Invaded State This state is characterized by the invasion of creosotebush. However, grasses (black grama and blue grama) are still the dominant species. The susceptibility of the Shallow Sandy site to creosotebush invasion may be higher when it is located adjacent to Gravelly or Limestone Hills sites, where creosotebush is present as part of the natural plant community. Shrub cover varies from just a few widely scattered individuals to approaching co-dominance with grasses. As shrub cover increases herbaceous cover correspondingly decreases. Retrogression within this state is characterized by a decrease in black grama, blue grama, and vine mesquite and an increased representation of sand muhly, sand dropseed, threeawns and creosotebush.

Diagnosis: Production is usually reduced from grassland state. Creosotebush is present. Grass cover varies from near grassland conditions to patchy, with bare areas present and usually larger around invading shrubs.

Transition to Shrub Invaded (1a): A reduction in grass cover may facilitate the establishment of shrub seedlings by reducing competition between species for resources and reducing natural fire fuel loads. This reduction in cover may be grazing or climate induced. Drought alone can reduce forage production by more than 50 percent.[4] In addition to drought, periods of climate with above average winter precipitation and dry summers may favor shrub establishment[5]. Wind and rodents are the primary dispersal agents of creosotebush seed. The chewing and burying of seeds by rodents and lagomorphs may help promote germination of creosotebush seedlings. Historically fire was believed to be a natural part of the grassland ecosystem and in the past may have limited invasion by creosotebush.[6] Fire suppression therefore may increase the probability of shrub seedling establishment.

Key indicators of approach to transition:

- Decrease or change in distribution of grass cover and increase in amount of bare ground.
- Appearance of shrub seedlings.
- Evidence of litter movement—indicating loss or redistribution of organic matter.
- Formation of physical crusts—indicating loss of organic matter and decrease in soil aggregate stability and reduced infiltration.
- Increase in biological crusts—indicating increased bare area for colonization.

Transition back to Grassland (1b) Brush management is necessary to remove shrubs and increase grass cover. Reestablishing cover will also provide organic matter and fine fuels necessary to carry fire. Prescribed grazing will help ensure proper forage utilization and plant vigor, especially during times of drought.

Shrub Dominated State. This state is characterized by the dominance of creosotebush. Grass cover is minimal for the site. This reduction in grass cover results in increased wind and water erosion; however, slope, soil crusts, and remaining herbaceous and shrub cover may stabilize erosion rates. Retrogression within this state is characterized by a decrease in black grama and blue grama and an increase in threeawns, dropseeds, and broom snakeweed. Threeawns or dropseeds may become the dominant grass species.

Diagnosis: Creosotebush cover is high, exceeding that of grasses. Grass cover is minimal for the site, disconnected and patchy. Erosion is indicated by the presence of water flow patterns, pedestals and terracettes. Rills or shallow gullies may be present. Physical crusts are present in bare areas and biotic crusts are present around shrubs and in bare areas. The preceding erosion diagnostic features may be limited to patches and not characteristic of the entire site.

Transition to Shrub Dominated (2a) Continued overgrazing or drought will severely reduce grass cover promoting increased shrub densities. Competition by shrubs for resources, especially available water may limit grass seedling establishment. Extended periods of above average winter precipitation may favor shrub expansion[5]. Prescribed fire may be lost as a management option if insufficient grass cover remains to carry a fire. Loss of grass cover in between shrubs and increased soil surface crusts can inhibit grass seedling establishment and further resource redistribution favoring shrub expansion. Erosion can transport soil organic matter and surface soil off site.

Key indicators of approach to transition:

- Loss of grass cover and increased size of bare patches.
- Increases in shrub cover
- Increase in amount of shrub seedlings.
- Erosion and soil degradation indicated by the occurrence of pedestalling, soil deposition, litter movement, and loss of surface soil (exposed sub-surface soil) [7]
- Formation of rills or gullies

Transition back to Grassland (2b)
Brush control will be necessary to remove resource competition from shrubs. Pitting and seeding just prior to summer rains will help to break up physical crusts and aid in seedling germination. The extent of erosion, soil crusting, and post seeding precipitation may dictate the degree to which the system is capable of recovery.

Grass/Succulent Mix State: This is state is characterized by the notable presence of succulents such as, banana yucca, soaptree yucca, and cholla. Dominant grasses are black grama and blue grama. Other important species include New Mexico feathergrass, sand muhly, sand dropseed, tobosa, vine mesquite and threeawns. The yucca species and cholla can appear as a mix of all three, individually, or in any combination. Grass cover and production is normally higher than shrub dominated state, unless it is negatively affected by drought or overgrazing. Black grama, blue grama, and banana yucca are dominants on large delineations of Jerag soil series (Ft. Bliss Soil Survey) on southern Otero Mesa. Cholla and soaptree yucca also occur as shrub sub-dominants either uniformly dispersed or more concentrated in small areas. The petrocalcic horizon tends to occur at a shallower depth on Jerag soils of southern Otero Mesa. It is not known if this difference in depth to the petrocalcic plays a part in determining increased density of succulents compared to their less shallow northern counterparts. New Mexico feathergrass can attain dominance on areas of Jerag soils located adjacent to Limestone Hill sites. Banana yucca occurs with feathergrass usually in clumps or scattered across the site. Soaptree yucca is the main succulent across much of the Jerag soils on northern Otero Mesa, where it tends to be less dense and more uniformly dispersed.

Diagnosis: Cover and density of succulents is higher than grassland state. Grass cover for the site is variable ranging from near that of the Grassland State, to patchy with increased amount of bare ground. During periods of extended drought or when the site is excessively grazed grass cover decreases and becomes patchy. Those grasses adjacent to cholla or inside groups of banana yucca remain protected, while those between the shrubs decrease.

Transition to Grass Succulent Mix (3a) Soil characteristics such as shallow depth to a petrocalcic horizon and amount of rock fragments in the profile provide ideal site characteristics for banana yucca, which is commonly found on rocky soils over pans and gravels. Overgrazing or drought can reduce grass cover providing drought tolerant yucca and cholla a place to colonize. Fire is an effective management tool for reducing cholla.[1] Soaptree and banana yucca are usually top killed by fire but can sprout from basal buds, rhizomes or the root crown. Mixed results have occurred with these species depending on fire intensity, time, and rate of burn. One theory is that desert grasslands with a 3-10 year fire interval will support soaptree and banana yucca but at lower densities than areas without fire.[6] An opposing theory states that the ability of banana yucca to sprout after fire may allow it to eventually dominate fire prone ecosystems.[6] Seed dispersal is mainly by wind, rodents, and other small mammals.

Key indicators of approach to transition:

- Decrease or change in distribution of grass cover and increase in amount of bare ground.
- Increase in amount of succulent seedlings.
- Increased cover of succulents

Transition back to Grassland (3b) Brush management is necessary to reduce succulents and increase grass cover. Prescribed grazing will help ensure proper forage utilization and provide a planned grazing system. The flowers of these yuccas are not self pollinating, they depend on the yucca moth for pollination. Grazing when flowers are present can decrease seed production and may disrupt the life cycle of the yucca moth.[6]

ECOLOGICAL SITE INTERPRETATIONS

Animal Community:

This site is important for many wildlife species. Major species include pronghorn antelope, scaled quail, gambel's quail, coyote, badger and bladk-tailed jackrabbit. This site provides nesting, hiding and thermal cover for a variety of small rodents, birds, reptiles and their associated predators.

Hydrology Functions:

This site normally receives approximately 12-14 inches annual precipitation. Most summer rainfall occurs as brief sometimes-heavy thunderstorms. Soils are shallow and rated as being in hydrologic group D. Slopes range from 1-5 percent. Permeability is moderately slow above and below the very slowly permeable petrocalcic horizon. The petrocalcic horizon will restrict water movement and retain it in the upper profile for short periods of time. Runoff is very high, and the hazard of water erosion is severe. Available water capacity to the root restricting layer is Very Low to Low.

Recreational Uses:

This site offers good potential for antelope and predator hunting, wildlife observation and photography. Scenic beauty of this site will especially appeal to those who value wide open prairie grasslands.

Wood Products:

This site has no significant value for wood products.

Other Products:

Grazing: This site is suitable for grazing by all kinds and classes of livestock during all seasons of the year. Because of the sandy textures and shallow profile, this site will respond well to management. As the site deteriorates there will be an increase in bare ground leaving the exposed soil susceptible to wind and water erosion. This site responds best to a system of management that rotates the season of use.

Initial starting stocking rates will be determined with the landowner or decision-maker. They will be based on past use histories and type and condition of the vegetation. Calculations used to determine initial starting stocking rate will also be based on forage preference ratings.

Other Information:

Plant Preference by Animal Kind:

Animal Kind: **Cattle**
Animal Type:

Common Name	Scientific Name	Plant Part	Forage Preferences											
			J	F	M	A	M	J	J	A	S	O	N	D
Black grama	Bouteloua eripoda	EP	D	D	P	P	P	P	P	P	P	P	P	D
Blue grama	Bouteloua gracilis	EP	D	D	P	P	P	P	P	P	P	P	P	D
NM feathergrass	Hesperostipa neomexicana	EP	P	P	P	P	P	D	D	D	P	P	P	P
Sand muhly	Muhlenbergia arenicola	EP	D	D	P	P	P	P	P	P	P	P	P	D
Tobosa	Pleuraphis mutica	EP	U	U	D	D	D	D	D	D	U	U	U	U
Sand dropseed	Sporobolus cryptandrus	EP	D	D	P	P	P	D	D	D	D	D	D	D
Vine mesquite	Panicum obtusum	EP	D	D	P	P	P	P	P	P	P	P	P	D
Halls's panicum	Panicum hallii	EP	D	D	P	P	P	P	P	P	D	D	D	D
Hairy grama	Bouteloua hirsuta	EP	D	D	P	P	P	P	P	P	P	P	P	D
Threeawn	Aristida	EP	U	U	D	D	D	U	U	U	U	U	U	U
Globemallow	Sphaeralcea	EP	D	D	D	D	D	D	D	D	D	D	D	D
Croton	Croton	EP	D	D	D	D	D	D	D	D	D	D	D	D
Bladderpod	Lesquerella	EP	D	D	D	D	D	D	D	D	D	D	D	D
Perennial forbs		EP	D	D	D	D	D	P	P	P	P	P	P	D
Annual forbs		EP	D	D	P	P	P	P	P	P	D	D	D	D
Winterfat	Krascheninnikovia lanata	S&L	P	P	D	D	D	D	D	D	D	D	D	P
Fourwing saltbush	Atriplex canescens	S&L	P	P	D	D	D	D	D	D	D	D	D	P
Yucca	Yucca spp.	F&F/S	U	U	D	D	D	D	D	D	U	U	U	U
Prickly pear	Opuntia spp.	F, F/S	U	U	U	E	E	E	E	U	U	U	U	U
Cholla	Opuntia imbricata	F, F/S	U	U	U	E	E	E	E	U	U	U	U	U

SUPPORTING INFORMATION

Associated sites:

Site Name	Site ID	Site Narrative
Gravelly **Limy**	**042XD007NM** **042XD004NM**	The Shallow Sandy ecological site occurs as a distinct unit adjacent to or as a component associated with both the Gravelly and Limy ecological sites.

Similar sites:

Site Name	Site ID	Site Narrative

Inventory Data References (narrative):

Supporting information includes limited clipping data, soil survey investigations, aerial photographs, and personal observations.

Inventory Data References:

Data Source	# of Records	Sample Period	State	County
NM-Range-26	**7**	**1997-1999**	**NM**	**Otero**

State Correlation:

This site has been correlated with the following sites: _____

Type Locality:

State: **NM**

County: **Otero**

Latitude: _____

Longitude: _____

Township: **26S.**

Range: **11E.**

Section: **14**

Is the type locality sensitive? **Yes** ☐ **No** ☒

General Legal Description: **Otero County, New Mexico; 360 feet west and 210 feet north of the southeast corner of the SE 1/4, NW 1/4, section 14, T.26S., R.11E.**

Relationship to Other Established Classifications:

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. Fort Bliss and Otero County.

Characteristic taxonomic units are:

Fort Bliss SSA:
61-Philder-Jerag Complex, 2 to 5 percent slopes (Jerag part)
63-Jerag very fine sandy loam, 1 to 5percent slopes
66-Jerag-Armesa complex 2 to 5 percent slopes (Jerag part)
Other soils included are:

Other References:

1. Ahlstrand, Gary M. 1982. Response of Chihuahuan Desert mountain shrub vegetation to burning. J. Range Manage. 35: 62-65.

2. Brooks, M.L., and D.A. Pyke. 2001. Invasive plants and fire in the deserts of North America. Pages 1–14 *in* K.E.M. Galley and T.P. Wilson (eds.). Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species.

3. Hennessy, J.T., R.P. Gibbens, J.M. Tromble, and M. Cardenas. 1983. Water properties of caliche. J. Range Manage. 36: 723-726.

4. Holechek, J.L., R.D. Pieper, and C.H. Herbel. 1989. Range Management Principles and Practices. Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

5. Moir, W. H. and J. A. Ludwig. 1991. Plant succession and changing land features in desert grasslands. P. 15-18. In P.F. Ffolliott and W.T. Swank (eds.) People and the temperate region: a summary of research from the United States Man and the Biosphere Program 1991. U.S. Dept. State, Publ No. 9839, Nat. Tech. Info. Serv., U.S. Dept. Commerce, Springfield, Illinois. 63 p.

6. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (2002, September). Fire Effects Information System, [Online]. Available: http://www.fs.fed.us/database/feis/ [accessed 9/23/02].

7.U.S. Department of Agriculture, Natural Resources Conservation Service. 2001. Soil Quality Information Sheet. Rangeland Soil Quality—Erosion. Rangeland Sheet 9, [Online]. Available: http://www.statlab.iastate.edu/survey/SQI/range.html

Site Description Approval:

{PRIVATE}Author	Date	Approval	Date
David Trujillo, Garth Grizzle & Dr. Brandon Bestelmeyer	9/10/99	George Chavez	2/20/03

Site Description Revision:

{PRIVATE}Author	Date	Approval	Date