USDA Natural Resources
Conservation Service

Ecological site R042CY154NM
Swale

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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 in concave or depressional positions of valleys along drainageways or as sinkholes. As such, it receives significant runoff from adjacent sites. Slopes vary from 0 to 4 percent.
The soils on this site are very deep and well-drained. Surface textures are loam, very fine sandy loam, silt loam, and silty clay loam. Subsurface textures are silt loam and silty clay loam.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bouteloua curtipendula* (2) *Bouteloua gracilis*

Physiographic features

This site occurs in concave or depressional positions of valleys along drainageways or as sinkholes. This site receives significant runoff from adjacent sites to increase the effective moisture. This site transports water from higher, upland sites to lower, bottomland sites. Slopes vary from 0 to 4 percent. Direction of slope varies and is not significant. Elevations range from 4,000 to 7,000 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Depression (2) Valley floor
Elevation	4,000–7,000 ft
Slope	0–4%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this area is “semi-arid continental.”

Annual average precipitation ranges from 11 to 19 inches. Variations of 5 inches, more or less, are not uncommon. Approximately 70 percent of the precipitation occurs from May through October. Most of the summer rain comes in the form of high-intensity, short- uration thunderstorms. Winter moisture is usually negligible.

Temperatures are characterized by distinct seasonal changes and large annual and dirnal temperature changes. The average annual temperature ranges from 55 degrees F to 60 degrees F, with extremes of 20 degrees F below zero in the winter to 110 degrees F in the summer not uncommon.

The average frost-free season is 170 to 189 days. The last killing frost is in early April and the first killing frost is in mid October.

Both temperature and precipitation favor a warm-season perennial plant community. However, because of the position of this site, water and cold air drainage, conditions are good for an important cool season component on this site. Winds that blow from the west and southwest from February through June tend to dry the soil during a critical period for cool season plant growth.

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

Table 3. Representative climatic features

Frost-free period (average)	189 days
Freeze-free period (average)	211 days
Precipitation total (average)	19 in

Influencing water features

This is an upland site, and is not associated with water features or wetlands. During heavy rain events, this site may receive run-on moisture from landforms above and contribute runoff to landforms below.

Soil features

The soils on this site are very deep and well-drained. The surface textures are loam, very fine sandy loam, silt loam, and silty clay loam. Subsurface textures are silt loam and silty clay loam. Permeability is moderate to slow and water-holding capacity is high. The effective rooting depth is 60 inches or more. These soils, once wetted, can store water for relatively long periods. Soil blowing hazard is moderate and water erosion hazard could be severe. Organic matter in the surface soil is significant for this area.

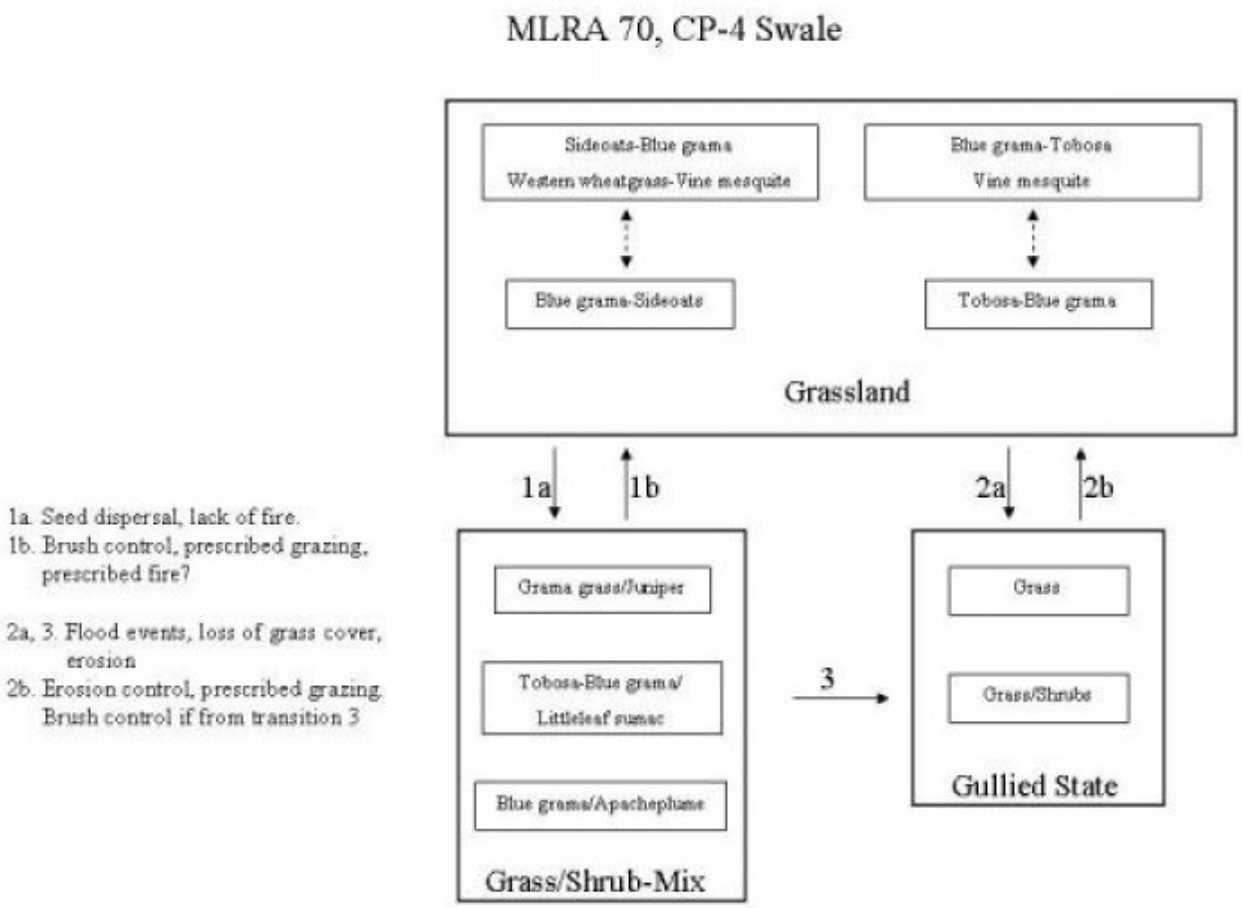
Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderate
Soil depth	60–72 in
Surface fragment cover <=3"	0–15%
Available water capacity (0-40in)	9–12 in
Soil reaction (1:1 water) (0-40in)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–25%

Ecological dynamics

This site is associated with Limestone Hills, Very Shallow and Bottomland sites. The Swale site occurs along drainageways of intermittent streams, flanked by Limestone Hills or Very Shallow sites. This site receives and transports water from these higher upland sites to lower Bottomland sites. The aspect of this site is grassland with a few shrubs scattered throughout. production and composition can vary considerably with elevation. Dominant grasses of the historic plant community include blue grama, sideoats grama, tobosa, western wheatgrass, and vine mesquite. This site is subject to encroachment by woody species, such as juniper, littleleaf sumac, and Apache plume. Wind dispersal of Apache plume seed, and dispersal of juniper and littleleaf sumac fruits by birds and other wildlife may be important in facilitating the encroachment of these shrubs. Fire suppression may also contribute to shrub encroachment. This site is also susceptible to erosion caused by flood events, loss of grass cover, or a combination of the two.

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

Grassland: Sideoats grama, blue grama, western wheatgrass, and vine mesquite are the dominant grasses at mid to higher elevations, with tobosa, blue grama, and vine mesquite dominant at lower to mid-elevations. Alkali sacaton, giant sacaton, silver and cane bluestem are also present across the range of elevations as sub-dominants in the historic community. Some of the shrubs characteristic of this site include sumac species, juniper species,

Apache plume, fourwing saltbush, yucca, and catclaw acacia. Typically shrubs are confined to the margins of the swale. Under continuous heavy grazing, there will typically be a decrease in sideoats grama, western wheatgrass, vine mesquite, and fourwing saltbush. Blue grama can increase and become dominant at higher elevations, and tobosa may dominate at lower elevations. Threeawns, dropseeds, and mat muhly will also increase with heavy grazing. Transitions to a Grass/Shrub-Mix may occur in response to a lack of fire, or dispersal and successful establishment of shrub seed. Flood events and loss of grass cover can increase erosion and facilitate the transition to a gullied state. Diagnosis: Grass cover is uniform and evenly distributed. Sideoats grama, western wheatgrass, blue grama, or tobosa are the dominant grasses. Grass and litter cover are high and litter movement is limited to smaller size class litter and short distances (<1m), except following flood events. Shrub canopy cover is low averaging less than 5 percent. Other grasses, which would appear on this site, include: plains bristlegrass, green sprangletop, big bluestem, Indiangrass, switchgrass, Canadian wildrye, plains lovegrass, bottlebrush squirreltail, and wolftail. Other shrubs include: broom baccharis, desert willow, winterfat, tarbush, broom snakeweed, sumac spp., and juniper. Other forbs include: desert holly, blanket flower, threadleaf groundsel, cudweed, and mullin.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	940	1250	1560
Forb	40	50	60
Total	**980**	**1300**	**1620**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	30%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	8-12%

Figure 5. Plant community growth curve (percent production by month). NM4604, R070DY154NM Swale Reference State. R070DY154NM Swale Reference State Mixed mid and tall grassland with scattered shrubs. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	5	10	10	25	30	12	5	0	0

State 2
Grass/Shrub-Mix

Community 2.1
Grass/Shrub-Mix

Additional States: Grass/Shrub-mix: This state is characterized by the notable increase of shrubs relative to the grassland state, especially juniper, littleleaf sumac, or Apacheplume. However, grasses remain dominant. Shrubs are no longer confined to the margins of the swale, instead tending to occur in motts scattered throughout the site. Sideoats grama-blue grama-juniper communities occur at mid to higher elevations, and tobosa- littleleaf sumac, and

blue grama-Apache plume communities are more typical of lower to mid elevations. Grass cover on swale sites may remain relatively high for extended periods when associated with light to moderate densities of littleleaf sumac, Apache plume, or juniper species. Diagnosis: Shrubs are found at increased densities relative to the grassland state, especially juniper, littleleaf sumac, or Apacheplume. Grass cover is variable, ranging from uniformly distributed to patchy. Typically sideoats grama, blue grama or tobosa remain as the dominant grass species. Transition to Grass/Shrub-mix (1a) Fire suppression and seed dispersal are believed to facilitate the increase and encroachment of shrubs on Swale sites. Historically, fire may have kept shrubs in check by completely killing some species, disrupting seed production cycles, and/or suppressing the establishment of shrub seedlings.1 Wildlife (especially birds) are instrumental in the dispersal of littleleaf sumac and juniper seeds.2, 4 Apacheplume produces abundant feathery seed and the dispersal mechanism is mainly wind.3 Key indicators of approach to transition: Indicators are limited as transitions occur slowly over time and may only require seed dispersal mechanisms. Decrease or change in distribution or composition of grass cover. Increase in amount of shrub seedlings. Transition back to Grassland (1b) Brush control is necessary to initiate the transition back to the grassland state. Possibly, the reintroduction of fire as a management tool may assist in the transition back to the Grassland state, if adequate fuel loads remain. The effectiveness of fire varies by species. Oneseed juniper is susceptible to fire and generally considered a non-sprouting species. Alligator juniper, Pinchot juniper, littleleaf sumac, and Apache plume are reported to be tolerant of fire due to their ability to root sprout and may recover or increase following fire. Prescribed grazing will help ensure adequate rest following brush control and will assist in the establishment and maintenance of grass cover.

State 3
Gullied State

Community 3.1
Gullied State

Gullied State: Loss of grass cover, accelerated erosion, and gully formation characterize this state. Sideoats grama, blue grama, or tobosa are the dominant grass species. Shrub densities are the same as in the Grassland state if the transition is caused by major flood events. If the transition was from the Grass/Shrub-Mix to the Gullied state, then shrubs are found at increased densities, especially juniper, littleleaf sumac, or Apacheplume. Diagnosis: Grass cover is typically patchy with large bare areas present. Erosion is evident by the presence of water flow patterns, litter dams, rills, and gullies. Transition to Gullied State (2a,3) Transitions to the gullied state may occur in response to flood events, and/or loss of grass cover (on or off site), and subsequent erosion. As grass cover decreases, organic matter and surface soil stability decrease. 5,6 Erosion may occur due to increased water flow volume and rate, alongside decreased soil surface stability, and reduced infiltration. Key indicators of approach to transition: Reduction in grass cover (on site, or on surrounding uplands) and increase in size and frequency of bare patches.

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				80–560	
	blue grama	BOGR2	*Bouteloua gracilis*	80–560	–
2				160–320	
	sideoats grama	BOCU	*Bouteloua curtipendula*	160–320	–
3				320–480	
	tobosagrass	PLMU3	*Pleuraphis mutica*	320–480	–
4				160–320	
	western wheatgrass	PASM	*Pascopyrum smithii*	160–320	–
5				160–320	
	vine mesquite	PAOB	*Panicum obtusum*	160–320	–
6				80–240	

	cane bluestem	BOBA3	*Bothriochloa barbinodis*	80–240	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	80–240	–
7				160–240	
	alkali sacaton	SPAI	*Sporobolus airoides*	160–240	–
	big sacaton	SPWR2	*Sporobolus wrightii*	160–240	–
8				48–80	
	threeawn	ARIST	*Aristida*	48–80	–
9				48–80	
	dropseed	SPORO	*Sporobolus*	48–80	–
10				80–160	
	Hall's panicgrass	PAHA	*Panicum hallii*	80–160	–
11				48–80	
	mat muhly	MURI	*Muhlenbergia richardsonis*	48–80	–
	burrograss	SCBR2	*Scleropogon brevifolius*	48–80	–
12				48–80	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	48–80	–
Forb					
13				15–30	
	buckwheat	ERIOG	*Eriogonum*	16–32	–
14				15–50	
	sagebrush	ARTEM	*Artemisia*	16–48	–
15				15–30	
	verbena	VEPO4	*Verbena polystachya*	16–32	–
16				15–50	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	16–48	–
Shrub/Vine					
17				50–80	
	fourwing saltbush	ATCA2	*Atriplex canescens*	48–80	–
18				50–80	
	catclaw acacia	ACGR	*Acacia greggii*	48–80	–
19				80–130	
	Apache plume	FAPA	*Fallugia paradoxa*	80–128	–
20				50–80	
	yucca	YUCCA	*Yucca*	48–80	–
21				50–80	
	Shrub, deciduous	2SD	*Shrub, deciduous*	48–80	–

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

Inventory data references

Data collection for this site was done in conjunction with the progressive soil surveys within the Pecos-Canadian Plains and Valleys (MLRA 70) Major Land Resource Area of New Mexico. This site has been mapped and

correlated with soils in the following soil surveys: Otero, Eddy, Chaves, Lincoln.

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: Otero, Eddy, Chaves, Lincoln.

1. 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.

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5. U.S. Department of Agriculture, Natural Resources Conservation Service. 2001. Soil Quality Information Sheet. Rangeland Soil Quality—Aggregate Stability. Rangeland Sheet 3, [Online]. Available: http://www.statlab.iastate.edu/survey/SQI/range.html

6. U.S. Department of Agriculture, Natural Resources Conservation Service. 2001. Soil Quality Information Sheet. Rangeland Soil Quality—Organic Matter. Rangeland Sheet 6, [Online]. Available: http://www.statlab.iastate.edu/survey/SQI/range.html

Characteristic Soils Are:
Dev, Gabaldon, Pima, Shanta

Contributors

David Trujillo
Don Sylvester
Elizabeth Wright
John Tunberg

Approval

Kendra Moseley, 10/21/2024

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	11/13/2024
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:**

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:

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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:**
