USDA Natural Resources
Conservation Service

Ecological site R070BY057NM
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 on various water-collecting landforms, including swales and playas. Soils are at least 40 inches deep, and are quite variable in properties. Slopes range from 0 to 5 percent.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Krascheninnikovia lanata* (2) *Yucca*
Herbaceous	(1) *Panicum obtusum* (2) *Bouteloua gracilis*

Physiographic features

This site is concave, nearly-level to gently-sloping swales, playas, and drainageways. In many cases, the water-collecting landforms that characterize this site occur on fan remnants, alluvial fans, and basin floor remnants. This site receives a significant amount of runoff form the adjoining sites. Slopes range from 0 to 5 percent. Elevations range from 3,800 to 4,800 feet. Aspect varies, but is not ecologically significant. This site is a minor component of upland landscapes or management units.

Table 2. Representative physiographic features

Landforms	(1) Swale (2) Fan remnant (3) Basin-floor remnant
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	1,158–1,463 m
Slope	0–5%
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 occurs on a number of water-collecting landforms which receive run-on and throughflow from landforms above.

Soil features

Soils are moderately deep to very deep. Surface textures are fine sandy loam, silty clay loam, clay loam, or clay. Subsoil textures are loam, clay loam, silty clay loam, or clay. Substratum textures include loam, clay loam, silty clay

loam, and clay. The lower portions of some soils have 5 to 15 percent finely disseminated threads, masses, and concretions of carbonates, and coarse fragments ranging from 2 to 10 percent. Reaction is slightly alkaline to moderately alkaline. Permeability is moderately slow to slow. Available water-holding capacity is high. Rooting depth is 35 to 60 inches or more.

The air water plant relationship is favorable for plant growth.

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

Characteristic Soils:
Alama
Montoya
Ranstein
Tucumcari

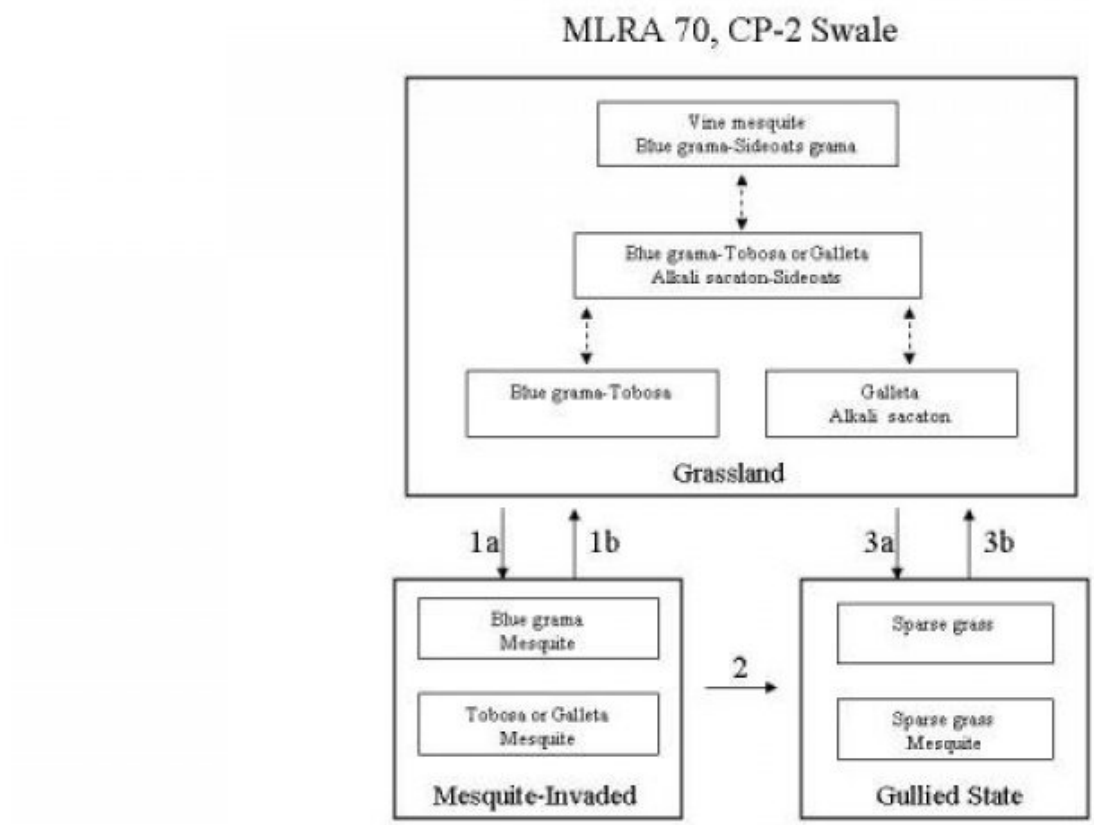
Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Silty clay loam (3) Clay loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to slow
Soil depth	89–203 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	22.86–30.48 cm
Calcium carbonate equivalent (0-101.6cm)	1–15%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–9.6
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Swale ecological site occurs as slightly concave elongated drainages on uplands and valley bottoms. It is associated with Loamy, Bottomland and Clayey sites. The Swale site receives additional runoff from adjoining upland ecological sites, and transports surface runoff to Clayey and Bottomland ecological sites. The additional water this site receives makes the plant community more productive than those of adjoining uplands.
The reference plant community is described as a warm-season grassland dominated by vine mesquite and blue grama. Cool-season grasses, forbs, and shrubs make up a minor portion of the plant community. Transitions to a Mesquite-Invaded state may occur due to seed dispersal of mesquite seed by livestock and wildlife, as well as decreased fire frequency. A decrease in grass cover may also facilitate mesquite invasion. The continued loss of grass cover can cause soil sealing, increase sheet flow, and accelerate gully formation (a transition to the Gullied State) .

State and transition model



1a. Seed dispersal, lack of fire, decreased grass cover.
1b. Brush control, Prescribed grazing

2&3a. Continued or severe grass loss, soil sealing, accelerated erosion
3b. Erosion control, brush control if from transition (2), prescribed grazing.

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: In the reference plant community, vine mesquite is the dominant grass with blue grama occurring as the sub-dominant. Other grasses that occur in substantial amounts include sideoats grama, alkali sacaton, galleta or tobosa, and western wheatgrass. Annual sunflower, globemallow, silverleaf nightshade, and western ragweed are common forbs. Shrubs, such as winterfat, yucca, Bigelow sagebrush, cholla, pricklypear, and broom snakeweed may be sparsely scattered across the site. Continuous yearlong grazing or continual grazing during the period from April through October can cause a decrease in vine mesquite, sideoats grama, and western wheatgrass. Communities dominated by blue grama, galleta, or tobosa may result. Diagnosis: Vine mesquite, blue grama, galleta, or tobosa is the dominant grass. Grass cover is uniform. Litter cover is high, and bare patches are few. Shrubs are sparse with canopy cover averaging five percent or less.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1143	1905	2668
Forb	135	224	314
Shrub/Vine	67	112	157
Total	**1345**	**2241**	**3139**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	1-5%
Grass/grasslike foliar cover	20-35%
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). NM4057, R070BY057NM Swale HCPC. R070BY057NM Swale HCPC.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	12	15	20	30	7	4	0	0

State 2
Mesquite-Invaded State

Mesquite is a significant component of this state.

Community 2.1
Mesquite-Invaded

This state is characterized by the noticeable presence of mesquite. Other shrubs typically include cholla and/or pricklypear. Grass cover is variable, ranging from fairly uniform to patchy with large bare areas present. Either singly or in combination, tobosa, galleta, and blue grama are the dominant grasses. Diagnosis: Mesquite is present in substantial amounts. Grass cover is variable and inversely related to mesquite density. It ranges from fairly uniform to patchy with large interconnected bare areas present. Transition to Mesquite-Invaded (1a) Dispersal of mesquite seed by livestock and wildlife is believed to be a key factor initiating this transition. Periodic fire may help discourage mesquite invasion by killing some plants and damaging others, increasing their susceptibility to insects, disease, and competition from grasses. Loss of grass cover due to heavy grazing pressure and drought can provide competition-free areas which facilitate mesquite establishment. Key indicators of approach to transition: Decrease or change in distribution of grass cover Increase in mesquite seedlings. Transition back to Grassland (1b) Mechanical or chemical brush control methods are effective means of controlling mesquite. Prescribed grazing will help ensure adequate rest following brush control and will assist in the establishment and maintenance of grass cover capable of sustaining fire. Periodic use of prescribed fire may help increase the palatability and production of grasses and limit mesquite seedling establishment.

Figure 6. Plant community growth curve (percent production by month).

NM4057, R070BY057NM Swale HCPC. R070BY057NM Swale HCPC.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	12	15	20	30	7	4	0	0

State 3
Gullied

This state contains active gullies.

Community 3.1
Gullied State

This state is characterized by loss of grass and litter cover, soil sealing, accelerated erosion, and gully formation. Grass cover is sparse, usually consisting of patches of blue grama, galleta, or tobosa. Species such as threeawns, mat muhly, and creeping muhly usually increase in representation. Diagnosis: Grass cover is sparse with large, interconnected bare areas present. Physical crusting of the soil surface is widespread. Rills and gullies are common and actively eroding. Transition to Gullied State (2, 3a): Transitions to the Gullied State occur in response to the loss of grass cover, soil surface sealing, and subsequent erosion. As grass cover is reduced, organic matter, infiltration, and soil surface stability decrease, making the site susceptible to accelerated erosion. Key indicators of approach to transition: Loss of grass cover and increased soil crusting. Increase in size and frequency of bare patches. Pedestalling of plants. Increase in size and length of flow patterns and rills. Transition back to Grassland (3b) The hydrology of the site must be restored. Erosion control structures or shaping and filling gullies may be necessary to restore natural overland flow patterns. Seeding is required if the seed pool of desired grasses is severely limited or absent. Utilizing mechanical means or livestock to break soil crusts prior to seeding may help to increase moisture retention and infiltration and promote seedling establishment. Brush control is necessary to reduce the competitive effect of mesquite if the transition pathway was from Mesquite-Invaded. The degree to which this site is capable of recovery depends on the restoration of hydrology and the extent of degradation to soil resources.

Figure 7. Plant community growth curve (percent production by month). NM4057, R070BY057NM Swale HCPC. R070BY057NM Swale HCPC.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	12	15	20	30	7	4	0	0

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				650–695	
	vine mesquite	PAOB	*Panicum obtusum*	650–695	–
2				538–583	
	blue grama	BOGR2	*Bouteloua gracilis*	538–583	–
3				224–269	
	sideoats grama	BOCU	*Bouteloua curtipendula*	224–269	–
4				157–202	
	alkali sacaton	SPAI	*Sporobolus airoides*	157–202	–
5				0–157	
	James' galleta	PLJA	*Pleuraphis jamesii*	0–157	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–157	–
6				112–157	
	western wheatgrass	PASM	*Pascopyrum smithii*	112–157	–
7				67–112	
	squirreltail	ELEL5	*Elymus elymoides*	67–112	–
8				45–90	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	45–90	–
	Arizona cottontop	DICA8	*Digitaria californica*	45–90	–
9				0–45	
	threeawn	ARIST	*Aristida*	0–45	–
	creeping muhly	MURE	*Muhlenbergia repens*	0–45	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–45	–
Forb					
10				22–90	
	goosefoot	CHENO	*Chenopodium*	22–90	–
	common sunflower	HEAN3	*Helianthus annuus*	22–90	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	22–90	–
	globemallow	SPHAE	*Sphaeralcea*	22–90	–
11				67–90	
	Forb, annual	2FA	*Forb, annual*	0–90	–
	Forb, perennial	2FP	*Forb, perennial*	0–90	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–90	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–90	–
Shrub/Vine					
12				45–90	
	winterfat	KRLA2	*Krascheninnikovia lanata*	45–90	–
	yucca	YUCCA	*Yucca*	45–90	–
13				22–45	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	22–45	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	22–45	–
	ragwort	SENEC	*Senecio*	22–45	–

Animal community

Habitat for Wildlife: This site provides habitats which support a resident animal community that is characterized by Plains pocket gopher, meadow vole, meadowlark, woodhouse toad, Great Plains skunk, and chorus frog. Swallows will seasonally feed over this ecological site.

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
Alama---------- B
Montoya---------- D
Ranstein---------- B
Tucumcari---------- B

Recreational uses

This ecological site has limited recreation potential. It provides poor to fair camping, hiking, and picnicking. Hunting for antelope is good to excellent. Hunting for upland game birds and rabbits is good. The aesthetic appeal is enhanced by the variety of flowering species that bloom from early spring to fall.

Wood products

This site produces no wood products.

Other products

Grazing: This ecological site can be grazed any season of the year by all classes and kinds of livestock. Approximately 95 percent of the annual yield is from species that furnish forage for livestock. The variety of species provides a well-balanced feed and good nutrition for grazing animals during most seasons of the year. Continuous yearlong grazing or grazing continually during the period from April through October will result in a community dominanted by plants of low forage value such as galleta or tobosa and broom snakeweed. Sufficient ground cover and herbage production needs to be maintained or the site will gully and production will be greatly reduced. Mesquite will easily invade where there is an available seed source. A system of deferred grazing, which varies the season of grazing and rest during successive years, is needed to maintain or improve the plant community. Fall and winter rest will benefit winterfat. Spring rest will benefit western wheatgrass and bottlebrush squirreltail. Summer rest will benefit vine mesquite, blue grama, and sideoats grama.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index Ac/AUM
100 - 76 1.8 – 3.7
75 – 51 2.7 – 5.0
50 – 26 3.6 – 11.0
25 – 0 11.0+

Other references

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

Contributors

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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	05/04/2024
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:

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:**