USDA Natural Resources Conservation Service

Ecological site R042BE057NM
Bottomland, Cool Desert Grassland

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs along intermittent streams and on floodplains and stream terraces that may be periodically inundated and deeply wetted. Slopes range from 0 to 3 percent. Elevations range from 4,200to 5,500 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Braided stream (3) Stream terrace
Flooding duration	Long (7 to 30 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	4,200–5,500 ft
Slope	0–3%
Water table depth	27–72 in
Aspect	Aspect is not a significant factor

Climatic features

This site has an arid climate with distinct seasonal temperature variations and large annual and diurnal temperature changes characteristic of a continental climate.
Precipitation averages 8 to 10 inches annually. Deviations of 4 inches or more from the average are quite common. Fifty percent of the precipitation is received from July to November, which is the predominant growing season of native plants. Summer precipitation is characterized by high-intensity, short-duration rainstorms. Winter precipitation averages less than one-half inch per month, usually in the form of rain. There are occasional snowstorms of short duration.
Temperatures vary from a mean monthly average of 77 F in July to 34 F in January, with a maximum of 104 F and

a minimum of -10 F. The average last killing frost in spring is April 15 and the average first killing frost in fall is October 28. Frost-free season averages 185 days. Temperatures are conducive to native grass and forb growth from March through November.
Spring winds of 15 to 40 miles per hour are common from February to June. These winds increase transpiration rates of native plants and rapidly dry the surface soil. Small soil particles are often displaced by the wind near the soil surface. This results in structural damage to native plants, especially young seedlings.
The deep wetting this site receives influences soil temperature and effective soil moisture so that it is conducive to early spring green-up and high production.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F, respectively.

Table 3. Representative climatic features

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

Influencing water features

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

Water table between 30 and 60+ inches.

Soil features

The soils are deep and very deep. Surface textures range from loam, sandy clay loams, sandy clay, fine sand, coarse sand, or very fine sand. Subsoils textures are stratified sandy clay loams, sandy clay loam, fine sand, coarse sand, loam or very fine sand. With thin stratas of clay loams, silty clay loams, or clays. Some soils may have higher amounts of salts.

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

Characteristic soils:
Agua
Brazito
Armijo
Glendale
Gilco
Hantz
Jocity
Sparham
suwanee
Tome
Trail
Vinton

Table 4. Representative soil features

Surface texture	(1) Sandy clay loam (2) Clay (3) Loam
Family particle size	(1) Loamy

Drainage class	Poorly drained to well drained
Permeability class	Rapid to slow
Soil depth	60–72 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	8.4–10.8 in
Calcium carbonate equivalent (0-40in)	1–5%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	1–5
Soil reaction (1:1 water) (0-40in)	6.6–9.6
Subsurface fragment volume <=3" (Depth not specified)	1–15%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

MLRA-42, SD-1: Bottomland

Overview

The loamy site occurs largely on relatively level, lower portions of piedmont slopes. Soils classified as loamy vary continuously in texture and soil moisture regime such that different potential communities occupy different soil series and different landscape positions within soil series. Loamy soils intergrade with sandy soils and clayey soils.

This site is associated with Draw ecological sites, and often occurs at the downslope ends of draws. The historic plant community type of this site is dominated by either giant sacaton (*Sporobolus wrightii*) or alkali sacaton (*Sporobolus airoides*), the distinction depending upon unknown factors (perhaps salinity). Vine mesquite (*Panicum obtusum*) and sideoats grama (*Bouteloua curtipendula*) may also be common. Reduced cover and hummocking of these grasses characterize initial stages of degradation due to overgrazing, and perhaps due to reductions in soil moisture availability with changes in hydrology. Transitions to first tobosa (*Pleuraphis mutica*) and then to burrograss (*Scleropogon brevifolius*)-dominated states may occur in response to the redistribution of run-in water via overgrazing and subsequent erosion and gullying or changes in hydrology. **On soils where blue grama is common, it may also be driven to a burrograss state. Although soil-sealing may occur in some loamy soils (especially in the burrograss state), shrub invasion is not usually observed.

Catalog of states and community pathways

State Containing Historic Plant Community

Bottomland grasslands: The historic plant community is dominated by giant sacaton and alkali sacaton either alone or in mixture, and harbors several other grass species including vine mesquite, tobosa, burrograss, and sideoats grama. It is not known what conditions or circumstances lead to the differing abundances of the sacaton species among bottomlands, or if shifts in their relative abundances occur over time. Alkali sacaton may dominate on more saline soils. Each of these species has relatively high palatability when compared to tobosa and burrograss during the growing season. Thus, reduction of populations of bottomland grass species due to overgrazing and erosion is a risk. The giant sacaton grasslands have been reduced to 5% of their original extent (Cox 1988), thus there is great interest in preserving the remaining stands. Grazing giant sacaton during dry summers or fall may expose crowns to freezing temperatures and cause grass mortality (Cox 1988). Burning of bottomland grasslands may do more harm than good. Giant sacaton, for example, is relatively slow to recover from fire, taking from 2-3 years. Suitable burning strategies for this site are unknown, but post-fire protection of grasslands from grazing can aid the recovery of grasses.

Diagnosis: Giant sacaton and/or alkali sacaton dominates (often more than 50% basal cover) and cover is uniform. Open patches are few and less than 2 m in length, most ground is covered with litter. Mesquite is generally absent.

Additional States:

Galleta-dominated: Black grama abundance is persistently depressed or eliminated, leaving galleta, dropseeds, and burrograss as dominants. Blue grama may also be present. Burrograss tends to increase with grazing pressure. Overall grass cover may be somewhat reduced, but galleta and other grass growth may compensate black grama's absence. This state is not frequently observed.

Diagnosis: Black grama is very rare or absent. Galleta, dropseeds, or burrograss are dominant. Bare ground patches up to 1 m across may be observed, with patchy evidence of soil sealing on some soils.

Transition to tobosa-dominated state (1a): Transitions from bottomland communities to tobosa-dominated communities can occur in response to diversion in run-in water flow catalyzed by overgrazing or blockage of surface flow. Removal of grasses may increase the rate of water flow in parts of the bottomland and result in gullying. Channelization of subsequent flood waters into the gully diverts run-in water and reduces the amount of time that areas of the bottomland are submerged. Once the duration of submersion is reduced below an unknown value, tobosa establishment and persistence may be favored at the expense of bottomland grasses, especially in the presence of grazing. It is not known what conditions promote either the transition to shrub-invaded grassland versus a mesquite-free, tobosa-burrograss grassland.

Key indicators of approach to transition: Increases in bare ground cover, tobosa, and burrograss cover, increases in the size of bare ground patches, decreases in the cover and reproduction of giant and alkali sacaton, appearance of water flow patterns, rills, gullies, and debris dams associated with open spaces, reduced frequency and duration of flooding.

Tobosa-burrograss grassland: This grassland is believed to occur as gullying increases (or flows are blocked by dams) and soil moisture levels during flood periods decline. Tobosa and/or burrograss dominate overall, but giant sacaton may occur along gully margins or in wetter patches. Mesquite is absent or rare, perhaps due to dispersal limitation.

Diagnosis: Giant sacaton and/or alkali sacaton restricted to wetter patches. Tobosa and burrograss dominant in large, many large (> 2m) bare patches. Large gullies are present and physical soil crusts and shrink-swell cracking is visible in bare patches.

Burrograss-Dominated: Burrograss is dominant and interspaces between plants are sealed. Erosion may have stripped away surface soils. Galleta, dropseeds, and other perennial grasses are rare or absent. Burrograss seeds are well adapted to establishment in soils that have developed physical crusts due to raindrop impact1,3. These plants also reproduce by stolons. Long-term monitoring within the Sevilleta NWR indicates that the burrograss-dominated state may be quite stable. Over 20 years in ungrazed conditions on the Turney loam map unit, burrograss canopy cover fluctuated between 15-28% in one transect and 5-14% in another, with very little or no recruitment of other species 5, 6. Burrograss cover may decline to very low levels with drought and continuous grazing and take decades to recover. Burrograss is relatively tolerant of drought3.

Diagnosis: Burrograss is dominant, other grasses are usually rare, and soil sealing in exposed soil is extensive.

Transition to Burrograss state (2a, 3) Intense, continuous heavy grazing, possibly with drought, drives blue grama, galleta and other grasses to low overall cover. Exposed soils (loam and sandy clay loam surface) seal due to raindrop impact or surface horizons are eroded away during this low-cover period. Persisting burrograss recovers over time and other species do not.

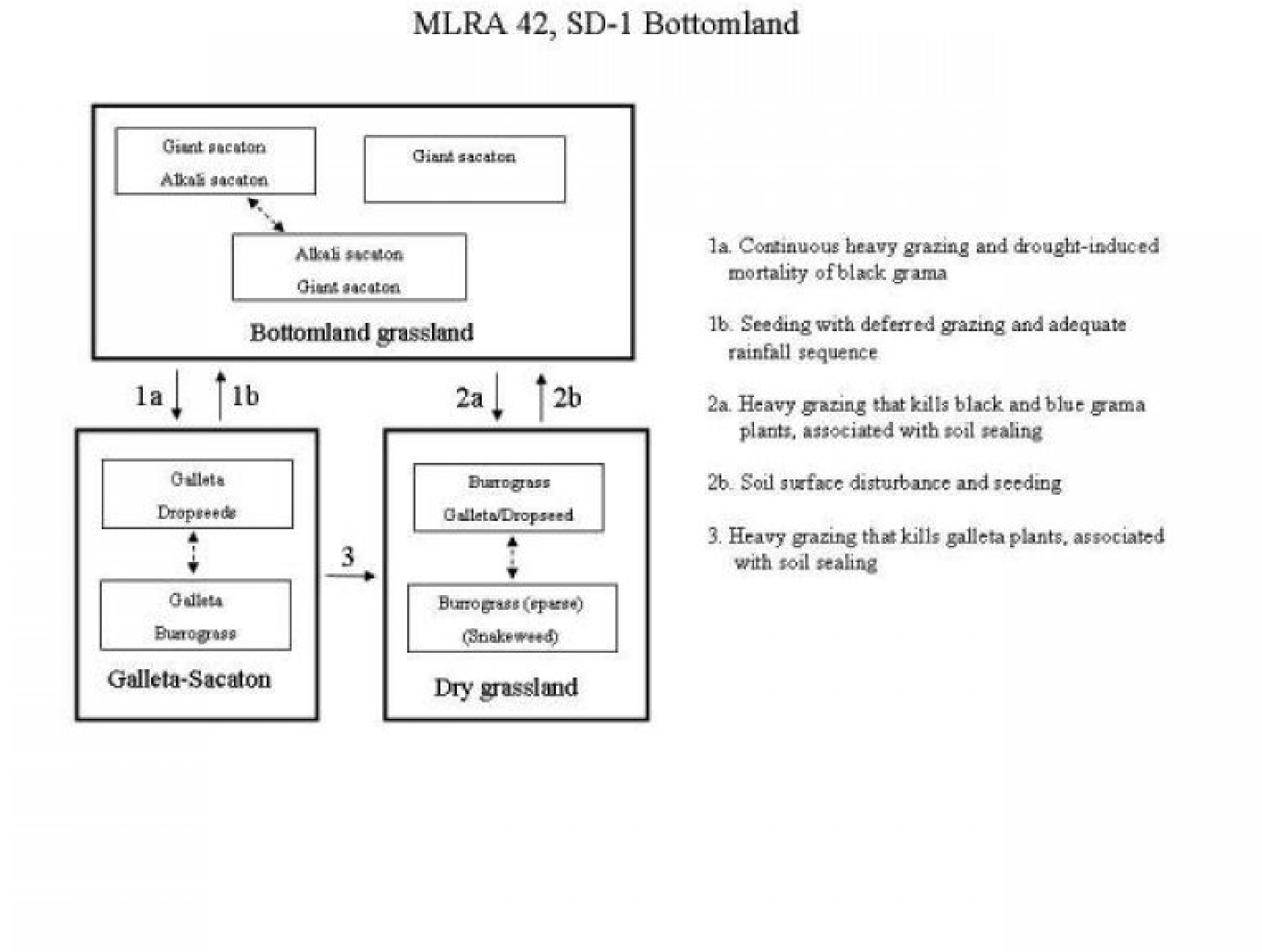
Key indicators of approach to transition:
? Overutilization, decadence, and mortality of perennial grasses

? Increase in size and frequency of bare patches
? Evidence of soil physical crusts, lack of cryptobiotic crust.

Transition back to Grama Grassland (2b) Seeding with grazing deferment and soil-surface disturbance would be necessary. If erosion has stripped away part or all of the A horizon, then soil addition would be necessary.

Contributors. Data and ideas were provided by Darrel Reasner, Gary Garrison, George Chavez, Elizabeth Wright, Will Hooper, and David Trujillo.

State and transition model



State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

The aspect is that of a mid- to tall grassland site with scattered shrubs. It may often appear as a monoculture of giant sacaton and scattered fourwing saltbush. Forbs comprise a minor component of this site. Trees may be scattered along the main stream channel. Total annual herbage production (air-dry): Average of favorable years – 4,000 pounds per acre. Average of unfavorable years – 800 pounds per acre. Other grasses that could appear on this site include: cane bluestem, sideoats grama, and feather fingergrass. Other woody plants include: skunkbush sumac, littleleaf sumac, saltcedar, and screwbean mesquite. Other forbs include kochia, locoweed, and globemallow.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	704	2112	3520
Shrub/Vine	72	216	360
Forb	24	72	120
Total	**800**	**2400**	**4000**

Figure 7. Plant community growth curve (percent production by month). NM2261, R042XA057NM-Bottomland-Warm Season Plants-HCPC. SD-1 Bottomland HCPC Warm Season Plant Community.

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

Figure 8. Plant community growth curve (percent production by month). NM2262, R042XA057NM-Bottomland-Cool Season Plants-HCPC. SD-1 Bottomland HCPC Cool Season Plant Community.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	15	20	20	2	5	10	15	13	0	0

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season**			1080–1320	
	big sacaton	SPWR2	*Sporobolus wrightii*	1080–1320	–
2	**Warm Season**			360–480	
	alkali sacaton	SPAI	*Sporobolus airoides*	360–480	–
3	**Warm Season**			72–168	
	vine mesquite	PAOB	*Panicum obtusum*	72–168	–
4	**Warm Season**			48–120	
	James' galleta	PLJA	*Pleuraphis jamesii*	48–120	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	48–120	–
5	**Warm Season**			48–120	
	blue grama	BOGR2	*Bouteloua gracilis*	48–120	–
6	**Cool Season**			0–168	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–168	–
7	**Warm Season**			72–168	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	72–168	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	72–168	–
	burrograss	SCBR2	*Scleropogon brevifolius*	72–168	–
Shrub/Vine					
8	**Shrub**			120–288	
	fourwing saltbush	ATCA2	*Atriplex canescens*	120–288	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	120–288	–
9	**Shrub**			0–120	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–120	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	0–120	–
	Apache plume	FAPA	*Fallugia paradoxa*	0–120	–
Forb					
10	**Forb**			48–120	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	48–120	–
	broadleaf milkweed	ASLA4	*Asclepias latifolia*	48–120	–
	thistle	CIRSI	*Cirsium*	48–120	–
	Russian thistle	SAKA	*Salsola kali*	48–120	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	48–120	–

Animal community

This ecological site provides habitats which support a resident animal commuity that is characterized by raccoon, striped skunk, tawny-bellied cotton rat, western jumping mouse, roadrunner,northern harrier, sage thrasher, loggerhead shrike,western diamondback rattlesnake, fence lizard, and Sonora gopher snake.
When woody vegetation is present, these sites are important nesting areas for mourning doves. These sites provide essential cover during infrequent snowstorms.

Hydrological functions

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

Hydrologic Interpretations
Soil Series Hydrologic Group
Agua B
Armijo D
Anapra D
Brazito B
Glendale B
Gila B
Vinton B

Recreational uses

This site is not usually considered as having recreational value. However, this site is suited to specific interests such as hunting and nature observation.

Wood products

This site produces no significant wood products in its potential plant community.

Other products

Approximately 95 percent of the vegetation production on this site is suitable as forage for domestic livestock and wildlife. Grazing pressure on adjacent sites may be a problem since the grazing animals are attracted to this site during early green-up. Heavy grazing pressure during early green-up, as well as trampling damage on wet soils, may lead to deterioration of the potential plant community. Such deterioration is indicated by a decrease in production and ground cover of such plant species as vine mesquite, blue grama, western wheatgrass, and fourwing saltbush. The large proportion of giant sacaton and alkali sacaton eventually becomes replaced by galleta, burrograss, mat muhly, and rabbitbrush spp. A planned grazing system with periodic deferment is best to maintain the desirable balance between plant species and to maintain high productivity.
Removal of the past year's growth, either by grazing or by prescribed burning, will remove old plant growth and lead to increased production and palatability of the coarser grasses found on this site.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index-------Ac/AUM
100 - 76---------------0.8 – 1.1
75 – 51----------------1.0 – 1.7
50 – 26----------------1.6 – 3.4
25 – 0-----------------3.4 – 3.4+

Other references

Other References:
Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains, Major Land Resource Area 42, of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: Valencia, Socorro, and Bernalillo.

Characteristic Soils Are:
Mimbre, flooded phase (mapped in Socorro County)

References

1. Allred, K.W. 1989. Observations on seed dispersal and implantation in burrograss (*Scleropogon brevifolius* - Gramineae). Sida 13:493-496.

2. Campbell, R.S. 1931. Plant succession and grazing capacity on clay soils in southern New Mexico. Journal of Agricultural Research 43:1027-1051.

3. Cox, J.R. 1988. Seasonal burning and mowing impacts on *Sporobolus wrightii* grasslands. Journal of Range Management 41:12-15.

Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that**

become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. **Perennial plant reproductive capability:**