USDA Natural Resources Conservation Service

Ecological site R081AY311TX
Shallow 14-19 PZ

Last updated: 9/19/2023
Accessed: 05/17/2024

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.

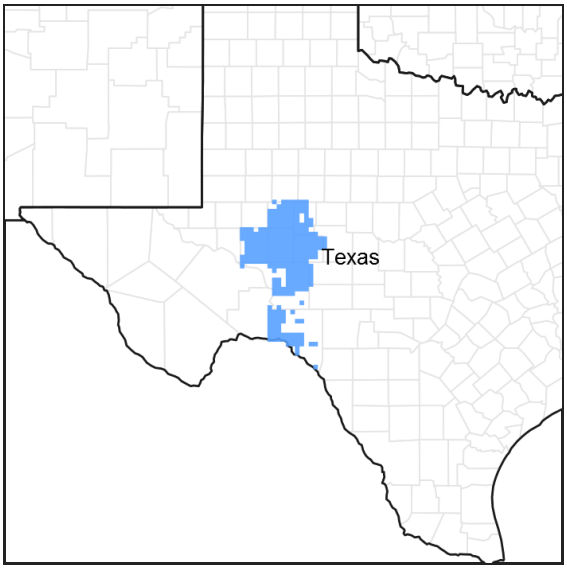


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 081A–Edwards Plateau, Western Part

This area is entirely in Texas. It makes up about 16,550 square miles (42,885 square kilometers). The cities of San Angelo and Fort Stockton and the towns of Big Lake, McCamey, Ozona, and Sheffield are in this MLRA. Interstate 20 crosses the northern part of the area, and Interstate 10 crosses the middle of the area. The eastern part of Amistad National Recreation Area is in this MLRA.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 81A

Ecological site concept

The Shallow ecological site is located on uplands with soils 10 to 20 inches deep over a petrocalcic horizon.

Associated sites

R081AY291TX	**Clay Loam 14-19 PZ** The Clay Loam ecological site has deeper soils and is more productive.
R081AY303TX	**Loamy 14-19 PZ** The Loamy ecological site has deeper soils and is more productive.
R081AY290TX	**Clay Flat 14-19 PZ** The Clay Flat ecological site has deeper soils and is more productive.
R081AY296TX	**Gravelly 14-19 PZ** The Gravelly ecological site has more gravels in the soil profile.
R081AY319TX	**Steep Rocky 14-19 PZ** The Steep Rocky ecological site occurs on slopes above 20 percent.

Similar sites

R081AY566TX	**Limestone Hill 14-19 PZ** The Limestone Hill ecological site has gravels, cobbles, and stones in the soil.

Table 1. Dominant plant species

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

Physiographic features

The sites occur on nearly level to gently uplands. Slopes range from 0 to 5 percent. Elevation of this site ranges from 1,100 to 3,500 feet above mean sea level. Due to their shallow nature and tendency to crust over when bare, these soils are droughty and prone to high runoff rates.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Ridge (2) Plateau > Plain
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	335–1,067 m
Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

The climate is semiarid and is characterized by hot summers and dry, relatively mild winters. The average relative humidity in mid-afternoon ranges from 25 to 50 percent. Humidity is higher at night, and the average at dawn is around 70 to 80 percent. The sun shines 80 percent of the time during the summer and 60 percent in winter. The prevailing wind is from the south-southwest. Approximately two-thirds of annual rainfall occurs during the May to October period. Rainfall during this period generally falls during thunderstorms, and fairly large amounts of rain may fall in a short time. The climate is one of extremes, which exert much more influence on plant communities than averages. Timing and amount of rainfall are critical. High temperatures and dry westerly winds have a tremendously negative impact on precipitation effectiveness, as well as length of time since the last rain. Records since the mid-1900's, as well as geological and archaeological findings, indicate wet and dry cycles going back many thousands of years and lasting for various lengths of time with enormous influence on the flora and fauna of the area.

Table 3. Representative climatic features

Frost-free period (characteristic range)	210-240 days
Freeze-free period (characteristic range)	240-280 days
Precipitation total (characteristic range)	381-483 mm
Frost-free period (actual range)	210-240 days
Freeze-free period (actual range)	240-280 days
Precipitation total (actual range)	381-584 mm
Frost-free period (average)	225 days
Freeze-free period (average)	255 days
Precipitation total (average)	457 mm

Climate stations used

- (1) BAKERSFIELD [USC00410482], Iraan, TX
- (2) BIG LAKE 2 [USC00410779], Big Lake, TX
- (3) COPE RCH [USC00411974], Big Lake, TX
- (4) GARDEN CITY [USC00413445], Garden City, TX
- (5) MCCAMEY [USC00415707], Mc Camey, TX
- (6) PAINT ROCK [USC00416747], Paint Rock, TX
- (7) PANDALE 1 N [USC00416780], Comstock, TX
- (8) PANDALE 11 NE [USC00416781], Comstock, TX
- (9) SHEFFIELD [USC00418252], Sheffield, TX
- (10) SANDERSON [USC00418022], Dryden, TX

Influencing water features

These sites are on uplands and not influenced by water from a wetland or a stream.

Wetland description

N/A

Soil features

The soils of this site consist of very shallow to shallow, well drained, moderate to moderately rapid permeability, nearly level to gently sloping soils of uplands. They are composed of pale brown to dark grayish-brown loams, clay loams, and fine sandy loams over a petrocalcic horizon. Parent material is loamy marl derived from limestone. Available water capacity is very low to low. Shrink-swell potential is low. Soil series associated with this site include: Blakeney, Conger, Ozona, and Shumla.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Eolian deposits–limestone
Surface texture	(1) Loam (2) Clay loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	18–51 cm

Soil depth	18–51 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–2%
Available water capacity (0-50.8cm)	2.79–9.14 cm
Calcium carbonate equivalent (0-50.8cm)	5–40%
Electrical conductivity (0-50.8cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-50.8cm)	0
Soil reaction (1:1 water) (0-50.8cm)	7.9–8.4
Subsurface fragment volume <=3" (10.2-50.8cm)	0–15%
Subsurface fragment volume >3" (10.2-50.8cm)	0–2%

Ecological dynamics

The plant communities of this site are dynamic entities. In pre-settlement times, the site was a midgrass prairie with very scattered woody shrubs and many perennial forbs. The plant community was dominated by midsize bunch grasses, with smaller populations of short grasses, forbs, and shrubs. This community was greatly influenced by grazing, climate (including periodic extended periods of drought) and fire.

Extensive herds of pronghorns, large towns of black tailed prairie dogs, as well as smaller populations of elk, white-tailed deer, and desert mule deer were present and had an impact on the plant community. Bison, a migratory herd animal, would come into an area, graze on the move, and not come back for many months or even years. This long deferment period allowed the plants to recover from the heavy grazing. Bison grazing on this site was probably intermittent, occurring during wetter periods. Very few bison were reported in the area after 1830. There were no recorded sightings after 1860. Fire has an influence on plant community structure and was probably a factor in maintaining the original grassland vegetation. Species such as prickly pear (Opuntia spp.), redberry juniper (*Juniperus pinchotii*) and scrub mesquite (*Prosopis glandulosa* var. torreyana) were likely present on the site, but not at the level we see today. Periodic fires may have helped keep mesquite as a scattered savannah and other woody species a small part of the composition. Grazing patterns by native herbivores and prairie dog activities were probably more significant factors in maintaining a well-balanced plant community.

Reference community plants developed ways to withstand periods of drought. The midgrasses and forbs shaded the ground, reduced soil temperature, improved infiltration of what little moisture might fall and maintained soil moisture longer. Their roots reached deeper into the soil, utilizing deep soil moisture no longer available to short-rooted plants. In extreme cases many species could go virtually dormant, preserving the energy stored in underground roots, crowns and stems until wetter weather arrived. Their seeds could stay viable in the soil for long periods, sprouting when conditions improved.

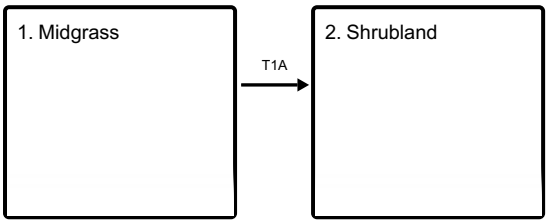
While grazing is a natural component of this ecosystem, overstocking and thus overgrazing by domesticated animals has had a tremendous impact on the site. Early settlers, accustomed to farming and ranching in more temperate zones of the eastern United States or even Europe, misjudged the capacity of the site for sustainable production and expected more of the site than it could deliver. Moreover, there was a gap of time between the extirpation of bison and the introduction of domestic livestock which resulted in an accumulation of plant material. This may have given the illusion of higher production than was actually being produced. Overgrazing and fire suppression disrupted ecological processes that took hundreds or thousands of years to develop. Instead of grazing and moving on, domestic livestock were present on the site most of the time, particularly after the practice of fencing arrived. Another influence on grazing patterns was the advent of wells and windmills. They opened up large areas that were previously unused by livestock due to lack of natural surface water. The more palatable plants were selected repeatedly and eventually began to disappear from the ecosystem to be replaced by lower successional,

less palatable species. As overgrazing continued, overall production of grasses and forbs declined, more bare ground appeared, soil erosion increased, and woody and succulent increasers began to multiply. The elimination of fire due to the lack of fine fuel or by human interference assisted the rapid encroachment of mesquite and other woody increasers and a concurrent reduction of usable forage.

Extremes in climate exerted tremendous influence on the site long before European man arrived. Geologic formations, archeological findings and rainfall records since the mid-1900's show wide variations in precipitation, with cycles of long, dry periods going back thousands of years with corresponding variations in kind and amount of flora and fauna species. With low permeability and low to very low water holding capacity, the soils of this site are droughty. When herbaceous cover is lacking, runoff is rapid, depleting topsoil and soil organic matter. Soils become compacted and crusted. Those on plateaus are highly susceptible to wind erosion. Sheet and rill water erosion accelerates. Pedestalling, rills, terracettes, and water flow patterns on the steeper slopes are indicative of deteriorating range health.

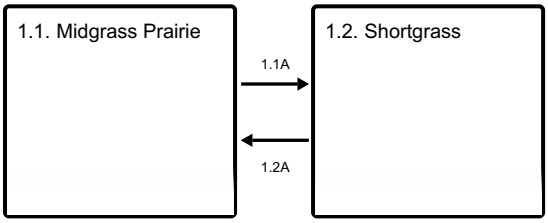
State and transition model

Ecosystem states

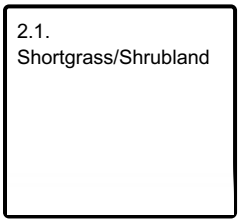


T1A - Absence of disturbance with natural regeneration overtime, may be coupled with excessive grazing pressure

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Midgrass

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass
- black grama (*Bouteloua eriopoda*), grass

Community 1.1
Midgrass Prairie

The reference plant community for this site is a midgrass prairie with short grasses, forbs, and scattered shrubs that evolved under the influence of grazing, periodic fire, and fluctuations between wet and dry periods that often last for years at a time. Fire effects are limited to areas with a dominance of midgrasses and annual rainfall over 15 inches, generally increasing from west to east. The overstory shades less than five percent of the site and consists of

occasional shrubs such as catclaw acacia (*Acacia greggii*), Roemer's acacia (Acacia roemeria), ephedra (Ephedra spp.), agarito (Mahonia trifoliata), wolfberry (*Symphoricarpos orbiculatus*), and condalia (Condalia spp.). Midgrasses such as sideoats grama (*Bouteloua curtipendula*), black grama (*Bouteloua eriopoda*), cane bluestem (Bothriochloa barbinoides), Arizona cottontop (*Digitaria californica*), Texas cupgrass (*Eriochloa sericea*), and plains bristlegrass (*Setaria leucopila*) dominate the site. Other important grasses include black grama, buffalograss (Buchloe dactyloides), curlymesquite (*Hilaria belangeri*), slim tridens (Hilaria muticus), and threeawn (Aristida spp.) species. Perennial forbs such as awnless bushsunflower (*Simsia calva*), orange zexmenia (Wedelia hispida), Mexican sagewort (Artemsia ludoviciana), low menodora (*Menodora heterophylla*), Oenothera (Oenothera spp.), and Indianmallow (Abuliton spp.) are a small but important component of the plant community. The site has no trees. In wet years annual forbs produce significant herbaceous vegetation. Plants are vigorous and reproduction is rapid during wet weather. Bare ground is less than 25 percent. Interspaces between plants are slightly covered with litter. The soil surface is relatively cool, somewhat rich in humus, and hosts a microbe population actively decomposing organic matter. Soil erosion is insignificant. Infiltration is very slow. Runoff occurs during heavier rainfall but is slowed down and dispersed by vegetative ground cover. Concentrated water flow patterns are rare. Recurrent periodic fire, climatic patterns, and grazing by herbivores are natural processes that maintained this plant community. Interruption of the ecological processes of a site brings about change. The reference plant community includes large populations of important grasses and smaller but highly important numbers of perennial forbs. Extended drought, continued overuse and elimination of fire result in their decline or disappearance from large portions of the site. The more dominant forage grasses decrease as do palatable perennial forbs. Less palatable or productive midgrasses such as perennial threeawn (*Aristida purpurea*), sand dropseed (*Sporobolus cryptandrus*), and slim tridens; shortgrasses like buffalograss, curlymesquite, red grama (*Bouteloua trifida*), and burrograss (*Scleropogon brevifolius*); and less desirable forbs such as croton (Croton spp.), globemallow (Sphaearalcea spp.), verbena (Verbena spp.), and annuals begin to increase, filling in for the declining species. Small juniper (Juniperus spp.), mesquite (*Prosopis glandulosa*), agarito, catclaw acacia, and prickly pear (Opuntia spp.) begin to appear. More bare ground is evident. If the process is not halted or reversed, the community shifts toward the Shortgrass Prairie Community. With institution of sound management practices, this trend can usually be reversed and a measure of productivity restored. Understanding the effects of climate, fire and grazing on the ecology of the site combined with use of sound grazing management, individual plant treatment, fine fuel accumulation and prescribed burning where practical are keys to any attempt to return to the reference community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1143	1793	2029
Forb	135	179	247
Shrub/Vine	67	90	123
Tree	–	–	–
Total	**1345**	**2062**	**2399**

Figure 9. Plant community growth curve (percent production by month). TX3263, Midgrass Prairie Community. Midgrass dominant with few shrubs and no trees..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	4	6	10	20	10	15	20	10	1	1

Community 1.2
Shortgrass

This plant community is the result of a significant vegetational shift. Due to overstocking/overgrazing, elimination of fire, lack of brush management, and possibly changes to weather patterns, the popular reference grass species has declined and is being replaced by threeawns, sand dropseed, Hall's panicum (*Panicum hallii*), buffalograss, curlymesquite, burrograss, red grama, and other shortgrasses. Less palatable annual and perennial forbs have increased, as have woody species. Prickly pear begins to appear. Less litter covers the ground. Soil organic matter is lower, infiltration has dropped off, and runoff has accelerated. Signs of erosion are evident. Loss of topsoil and organic matter make it very hard for these abused areas to return to the reference plant community within a

reasonable period of time.

Pathway 1.1A
Community 1.1 to 1.2

If proper management is not planned and implemented, the site will continue to degrade and shift toward a Shortgrass/Shrubland plant community. No brush management, no fire, and improper grazing will transition this community.

Pathway 1.2A
Community 1.2 to 1.1

By implementing conservation measures such as prescribed grazing, chemical/mechanical brush management, and prescribed burning where sufficient fine fuel can be accumulated, the manager can reverse the retrogression and shift the trend back toward the Midgrass Prairie plant community.

State 2
Shrubland

Dominant plant species

- pricklypear (*Opuntia*), shrub
- Pinchot's juniper (*Juniperus pinchotii*), shrub
- honey mesquite (*Prosopis glandulosa*), shrub

Community 2.1
Shortgrass/Shrubland

The Shortgrass/Shrubland community represents an extreme shift of site characteristics from the reference prairie community. Prickly pear, redberry juniper (Juniperus pinchotti), scrub mesquite, and other woody/succulent increasers/invaders dominate the site. The midgrass species are virtually eliminated and shortgrass populations are severely limited, comprised primarily of various threeawns, hairy tridens, red grama, Texas grama (*Bouteloua rigidiseta*), burrograss, and annuals. The forb component consists predominantly of annuals or unpalatable perennials. Up to 80 percent of the ground can be bare. Usually most of the original, fertile topsoil has eroded away. Bare soil has crusted and is relatively impermeable. Very little rainfall infiltrates and runoff is rapid. This community very likely cannot be restored to the reference plant community. Decades of transition from a midgrass prairie have negatively impacted soil properties, species diversity, site integrity, and hydrologic features. It can, however, be improved through mechanical and chemical brush management and implementation of intensive grazing management. Before beginning, the land manager should decide the relative value of livestock and wildlife to the ranch and plan brush management accordingly. Due to the arid nature of the site, range seeding has about a 10 percent chance of success on the average. However, during periods of above average rainfall, seeding disturbed ground following mechanical brush control might be successful. Maintaining a stand established in this manner requires very careful management.

Transition T1A
State 1 to 2

With heavy abusive grazing, no brush management, brush invasion, no fires, and drought conditions, the Midgrass State transitions to the Shortgrass State.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrasses**			605–1110	

	cane bluestem	BOBA3	*Bothriochloa barbinodis*	605–1110	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	605–1110	–
	Arizona cottontop	DICA8	*Digitaria californica*	605–1110	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	605–1110	–
	streambed bristlegrass	SELE6	*Setaria leucopila*	605–1110	–
2	**Shortgrasses**			135–247	
	buffalograss	BODA2	*Bouteloua dactyloides*	135–247	–
	black grama	BOER4	*Bouteloua eriopoda*	135–247	–
	curly-mesquite	HIBE	*Hilaria belangeri*	135–247	–
3	**Shortgrasses**			135–247	
	bush muhly	MUPO2	*Muhlenbergia porteri*	135–247	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	135–247	–
4	**Shortgrasses**			202–370	
	purple threeawn	ARPU9	*Aristida purpurea*	202–370	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	202–370	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	202–370	–
	fall witchgrass	DICO6	*Digitaria cognata*	202–370	–
	Hall's panicgrass	PAHA	*Panicum hallii*	202–370	–
	Reverchon's bristlegrass	SERE3	*Setaria reverchonii*	202–370	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	202–370	–
	slim tridens	TRMU	*Tridens muticus*	202–370	–
5	**Shortgrasses**			67–123	
	Grass, annual	2GA	*Grass, annual*	67–123	–
	Texas grama	BORI	*Bouteloua rigidiseta*	67–123	–
	red grama	BOTR2	*Bouteloua trifida*	67–123	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	67–123	–
	burrograss	SCBR2	*Scleropogon brevifolius*	67–123	–
Forb					
6	**Forbs**			135–247	
	Forb, annual	2FA	*Forb, annual*	135–247	–
	Indian mallow	ABUTI	*Abutilon*	135–247	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	135–247	–
	prairie clover	DALEA	*Dalea*	135–247	–
	beeblossom	GAURA	*Gaura*	135–247	–
	trailing krameria	KRLA	*Krameria lanceolata*	135–247	–
	low menodora	MEHE2	*Menodora heterophylla*	135–247	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	135–247	–
	evening primrose	OENOT	*Oenothera*	135–247	–
	awnless bushsunflower	SICA7	*Simsia calva*	135–247	–
	noseburn	TRAGI	*Tragia*	135–247	–
	vervain	VERBE	*Verbena*	135–247	–
	creepingoxeye	WEDEL	*Wedelia*	135–247	–
Shrub/Vine					

Shrub/Vine					
7	**Shrubs/Vines**			67–123	
	catclaw acacia	ACGR	*Acacia greggii*	67–123	–
	roundflower catclaw	ACRO	*Acacia roemeriana*	67–123	–
	snakewood	CONDA	*Condalia*	67–123	–
	featherplume	DAFO	*Dalea formosa*	67–123	–
	jointfir	EPHED	*Ephedra*	67–123	–
	desert-thorn	LYCIU	*Lycium*	67–123	–
	algerita	MATR3	*Mahonia trifoliolata*	67–123	–
	resinbush	VIST	*Viguiera stenoloba*	67–123	–

Animal community

This site is suitable to produce domestic livestock and to provide habitat for native wildlife. Cow-calf, stocker cattle, sheep, and goats can utilize this site. Carrying capacity has declined drastically over the past 100 years due to deterioration of the reference plant community. An assessment of vegetation is needed to determine the site's current carrying capacity. Calculations used to determine livestock stocking rate should be based on forage production remaining after determining use by resident wildlife, then refined by frequent and careful observation of the plant community's response to animal foraging.

A large diversity of wildlife is native to this site. In the historic plant community, migrating bison, grazing primarily during wetter periods, resident pronghorns and smaller populations of white-tailed deer, desert mule deer, quail, and prairie chickens were the more predominant species. With the subsequent transformation of the plant community, due primarily to the influence of man and climate change, the kind and proportion of wildlife species have been altered.

With the eradication of the screwworm fly, increase in woody vegetation and man-suppressed natural predation, deer numbers have increased and are often in excess of carrying capacity. Where deer numbers are excessive, overbrowsing and overuse of preferred forbs causes deterioration of the plant community. Progressive management of deer populations through hunting can keep populations in balance and provide an economically important ranching enterprise. Achieving a balance between brushy cover and more open plant communities on this and adjacent sites is important to deer management. Competition among deer, sheep, and goats must be a consideration in livestock and wildlife management to prevent damage to preferred vegetation.

Smaller mammals include many kinds of rodents, jackrabbit, cottontail rabbit, raccoon, skunks, possum, and armadillo. Mammalian predators include coyote, red fox, gray fox, bobcat, and mountain lion. Wolves were common in earlier times, bears resided in some areas, and an occasional jaguar was encountered. Many species of snakes and lizards are native to the site.

Many species of birds are found on this site including game birds, songbirds, and birds of prey. Major game birds that are economically important are bobwhite quail, scaled (blue) quail, and mourning dove. Quail prefer a combination of low shrubs, bunch grass (critical for nesting cover), bare ground, and low successional forbs. Turkeys visit the site to feed. The different species of songbirds vary in their habitat preferences. Habitat on this site that provides a large diversity of grasses, forbs, and shrubs will support a good variety and abundance of songbirds. Birds of prey are important to keep the numbers of rodents, rabbits, and snakes in balance.

Hydrological functions

The site is well drained with very slow permeability and low water holding capacity. It lends itself to aquifer recharge only when rock or caliche substrata are fractured. The site is located at higher elevations with shallow soils, so the potential for rapid runoff is high, particularly when in a denuded state during heavy rainfall.

When heavy grazing or prolonged drought occurs, the water cycle becomes impaired due to the loss or reduction of bunchgrass and ground cover. Infiltration is decreased and runoff is increased due to poor ground cover, rainfall splash, soil capping, low organic matter, and poor structure. With a combination of a sparse ground cover and

intensive rainfall, this site can contribute to increased frequency and severity of flooding within a watershed. Soil erosion is accelerated; quality of surface runoff is poor, and sedimentation is increased. Organic matter is lost from the site with surface runoff and decrease of herbaceous recycling.

As the site becomes dominated by woody species, the water cycle is further altered. Interception of rainfall by tree and shrub canopies increases, thereby reducing the amount of rainfall reaching the surface. However, stem flow is greater due to the funneling effect of the canopy, which increases soil moisture at the base of the tree and infiltration under the canopy is increased due to the mulch effect of leaf litter. Increased transpiration, especially by evergreen species such as live oak and juniper, accelerates depletion of soil moisture. As woody species increase, grass cover declines, which causes some of the same results as heavy grazing. Brush management combined with effective grazing management can help restore the natural hydrology of the site. Grass recovery, however, is slow.

Recreational uses

This site has the appeal of the wide-open spaces and a wide variety of plant and animal life. When winter and early spring moisture is available, colorful annual and perennial forbs will show well on this site. The area is also used for hunting, birding, and other eco-tourism related enterprises.

Inventory data references

Information provided here has been derived from limited NRCS clipping data, and from field observations of range trained personnel.

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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.

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Contact for lead author	(325) 944-0147
Date	10/06/2011
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

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2. **Presence of water flow patterns:** None to few. Erosion which might cause rills, flow patterns and pedestals and terracettes would have occurred only if intense rainstorms occurred during extended drought or shortly after an intense wildfire.

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3. **Number and height of erosional pedestals or terracettes:** None to few.

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

bare ground): Less than 10 percent bare ground. Small and non-connected areas. Lower slopes would have less bare ground.

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5. **Number of gullies and erosion associated with gullies:** None.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Minimal movement of fine litter for short distances.

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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):** Erosion stability values estimated at 5 to 6.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface layer is dark grayish-brown clay loam 10 to 20 inches thick. Structure is moderate, fine and medium blocky. There are many fine and medium roots throughout profile. SOM is high.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Midgrasses provide excellent infiltration and slow runoff. Except on steeper slopes runoff is essentially nil but when rainfall exceeds sites ability to hold water the runoff is free of erosive action.

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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):** None. Rock layer at 10 to 20 inches restricts water and root penetration.

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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: warm-season midgrass

    Sub-dominant: warm-season shortgrass

    Other: forb

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal. Grasses will almost always show some mortality and decadence, especially under drought conditions.

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14. **Average percent litter cover (%) and depth (in):** Interspaces between plant canopys essentially covered with various sizes of litter and mulch. Wildfires, natural herbivory and/or extended drought might reduce litter to none.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1,200 pounds per acre in years with below average moisture, 2,140 pounds per acre in good moisture years.

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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:** Mesquite, pricklypear, broom snakeweed, agarito, acacia, sumacs, junipers, Texas persimmon, and condalia.

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17. **Perennial plant reproductive capability:** Good. All species should be capable of reproducing except during periods of prolonged drought, heavy natural herbivory or intense fire. Recovery from these disturbances will take 2 to 10 years.
