USDA Natural Resources Conservation Service

Ecological site R081BY320TX
Adobe 23-31 PZ

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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.

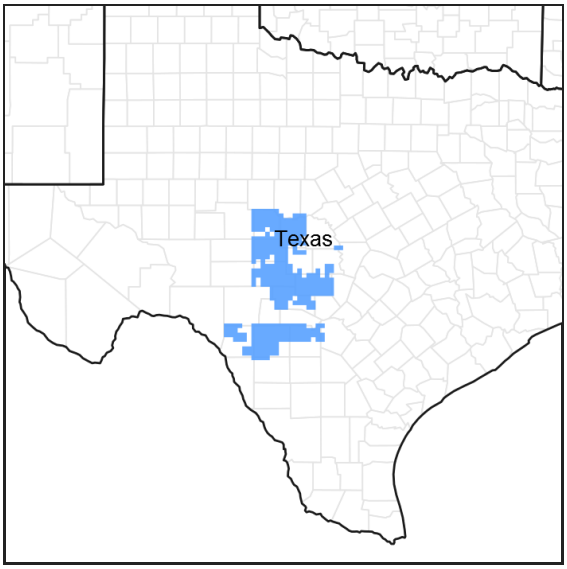


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 081B–Edwards Plateau, Central Part

This area is entirely in south-central Texas. It makes up about 11,125 square miles (28,825 square kilometers). The towns of Fredericksburg, Junction, Menard, Rocksprings, and Sonora are in this MLRA. Interstate 10 crosses the middle part of the area. A few State parks and State historic sites are in this MLRA.

Classification relationships

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

Ecological site concept

Adobe sites are located on uplands with less than 20 percent slope. They have soils less than 20 inches deep over the Glenrose Formation.

Associated sites

R081BY326TX	**Clay Loam 23-31 PZ**
R081BY337TX	**Low Stony Hill 23-31 PZ**
R081BY343TX	**Shallow 23-31 PZ**
R081BY348TX	**Steep Adobe 23-31 PZ**
R081BY593TX	**Limestone Hill 19-23 PZ**

Similar sites

R081BY593TX	**Limestone Hill 19-23 PZ**

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The Adobe site is found on shallow calcareous gravelly loams and gravelly clay loams over limestone or chalky marl on undulating to hilly uplands. In the landscape, it may be in narrow bands on steep slopes, on footslopes below steeper soils, on small isolated hills within areas of deeper soils in surrounding valleys, or along narrow ridges. Areas range up to 300 acres in size but are mostly about 150 acres or less. Slopes are complex and vary from 2 to 20 percent. Runoff is low to high and the potential erosion is moderate to high. The elevation ranges from 351 to 2,451 feet. Geological and accelerated erosion has removed most of the surface layer between the deeply cut drainage ways. Due to their high lime content and little organic matter, the forage production on some soils in the site is limited, less palatable and lower in essential minerals than that of surrounding sites.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Scarp
Flooding frequency	None
Ponding frequency	None
Elevation	351–2,451 ft
Slope	2–20%
Aspect	Aspect is not a significant factor

Climatic features

The climate in the MLRA 81B is subtropical sub humid on the eastern portion and subtropical steppe on the western portion of the MLRA. Winters are dry, and the summers are hot and humid. The precipitation increases from west to east and the temperatures increase from north to south. The area usually receives 65 to 70 percent sunshine each year. The majority of the rainfall occurs during the warm months of April to October. Most precipitation comes from thunderstorms that vary in the amount of water received and the areas covered. Spring is characterized by fluctuating patterns, but mild temperatures prevail. July and August are relatively dry and hot with little weather variability day-to-day. As summer progresses through fall, an increase of precipitation usually occurs in the eastern portions while a decrease of precipitation occurs to the west. Winter temperatures are mild, but polar Canadian air masses bring rapid drops in temperature. These cold spells last 2 or 3 days. Prevailing winds are southerly with March and April the windiest months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	190-202 days

Freeze-free period (characteristic range)	209-227 days
Precipitation total (characteristic range)	25-28 in
Frost-free period (actual range)	179-210 days
Freeze-free period (actual range)	194-238 days
Precipitation total (actual range)	24-30 in
Frost-free period (average)	195 days
Freeze-free period (average)	219 days
Precipitation total (average)	27 in

Climate stations used

- (1) BRADY [USC00411017], Brady, TX
- (2) EDEN [USC00412741], Eden, TX
- (3) FREDERICKSBURG [USC00413329], Fredericksburg, TX
- (4) FT MCKAVETT [USC00413257], Fort Mc Kavett, TX
- (5) HUNT 10 W [USC00414375], Hunt, TX
- (6) JUNCTION 4SSW [USC00414670], Junction, TX
- (7) JUNCTION KIMBLE CO AP [USW00013973], Junction, TX
- (8) MENARD [USC00415822], Menard, TX
- (9) ROCKSPRINGS 1S [USC00417706], Rocksprings, TX
- (10) SAN SABA [USC00417992], San Saba, TX

Influencing water features

This site being an upland site is not influenced by water from a wetland or stream.

Soil features

Soils in the Adobe site are primarily grayish brown to dark grayish brown calcareous gravelly loams and gravelly clay loams about 6 inches deep over weakly to moderately weakly cemented limestone or chalky limestone at depths of less than 40 inches. Gravelly limestone fragments are interspersed throughout the soils, which were formed in limestone, marl, and shale. They are well drained and are very slowly to moderately slowly permeable. Runoff rates can be slow to very high, depending mostly on slope. The available water capacity is low. Most areas of Adobe are suitable for rangeland with a few isolated areas used for cultivation. The high lime content causes nutrient imbalance that limits the quality of forage. Geological and accelerated erosion has removed most of the surface layer between the deeply cut drainage ways. Soils correlated to this site include: Brackett, Kerrville, and Real.

Table 4. Representative soil features

Surface texture	(1) Very gravelly clay loam (2) Extremely gravelly loam (3) Gravelly clay loam
Family particle size	(1) Loamy (2) Loamy-skeletal
Drainage class	Well drained
Permeability class	Very slow to moderately slow
Soil depth	10–40 in
Surface fragment cover <=3"	3–30%
Surface fragment cover >3"	1–20%
Available water capacity (0-40in)	1–4 in

Calcium carbonate equivalent (0-40in)	40–85%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–55%
Subsurface fragment volume >3" (Depth not specified)	5–30%

Ecological dynamics

The Adobe site was most likely a midgrass and tallgrass oak savannah community with scattered trees, shrubs and numerous perennial forbs. Tall and midsize bunch grasses, perennial forbs and some shortgrasses probably covered about 55 percent of the surface. Woody canopy ranged from 5 to 10 percent. Variability in slope, geologic structure and soils had a strong influence on the composition of the plant community. Flatter slopes, usually with deeper, less alkaline soils and more soil moisture, normally produced more grass cover, while tree and shrub density increased as slopes became steeper. The high lime content plus lower organic matter, essential minerals and fertility limited production, which was usually less than that of surrounding sites. These same factors made the vegetation less nutritious and palatable, thus making other sites preferred for grazing over the Adobe.

This plant community was greatly influenced by grazing, climate (including periodic extended periods of drought) and fire. The grass and forb production were not only valuable for forage and erosion control but provided fuel for periodic fires. Caused by lightning or set by Native Americans, fire helped keep the woody species suppressed. Steeper slopes tended to be droughtier, less productive and more varied in topography, thus experiencing less intensive and spottier fires. This created a more mosaic pattern of herbaceous and woody vegetation. On average, fires occurred every 7 to 12 years.

Beside fire and climate, including extended periods of drought, grazing greatly influenced the plant community. Although preferring more open country, resident herds of pronghorn could forage on the lower, flatter slopes. Populations of white-tailed deer made use of the browse and forbs available. Bison grazing was intermittent. The large resident herds ranged to the north and west, but the area was visited periodically by bison when conditions were favorable. Furbearers, quail, dove, and songbirds fed on seeds and fruit produced, as did Rio Grande turkey. This interaction between herbivores and plants helped maintain the reference community.

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

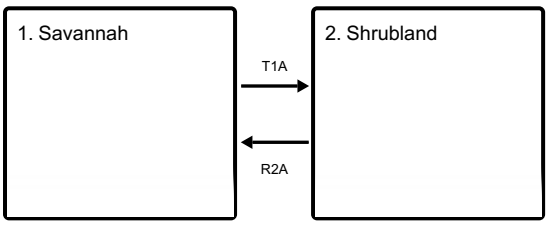
While periodic grazing is a natural component of this ecosystem, overstocking and thus overgrazing by domesticated animals has had a tremendous impact. Arriving in numbers in the 1840’s and 50’s, most early settlers were accustomed to ranching in more temperate zones of the eastern United States or even Europe and misjudged the capacity of the site for sustainable production, expecting more than the land could deliver. Overgrazing, usually in the form of heavy continuous grazing by cattle, sheep, and goats, and fire suppression disrupted ecological processes that took hundreds or thousands of years to develop. Instead of grazing and moving on, domestic livestock was present on the site most of the time. Steep Adobe is often in close proximity to streams and so was particularly hard-hit by livestock traveling to and from water, bedding down, or just being held close to water during roundups. The arrival of barbed wire fencing in the late 1870’s could have been used as a conservation tool, but for

the most part was just used to contain livestock. Another influence on grazing patterns was the advent of windmills during the same period. The windmills allowed large areas to be grazed that were previously unused by livestock due to lack of natural surface water.

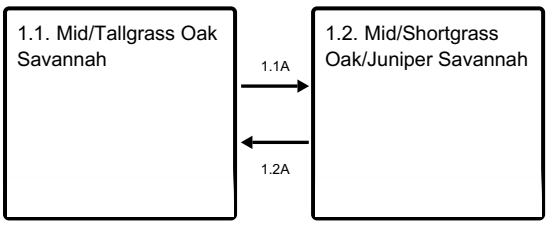
As cattle fed primarily on grasses, and the forbs and browse were prime forage for sheep, goats, and deer, the more palatable plants such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (Sorgastrum nutans), cane bluestem (*Bothriochloa barbinodis*), sideoats grama (*Bouteloua curtipendula*), awnless bushsunflower (*Simsia calva*), Engelmann's daisy (Engelmannia perestinia), catclaw sensitivebriar (Mimosa nutallii), bigtop dalea (*Dalea enneandra*), and orange zexmenia (Wedelia hispida) were selected repeatedly and eventually began to disappear. They were replaced by lower successional, less palatable and productive species such as the muhly species (Muhlenbergia spp.), slim tridens (*Tridens muticus*), silver bluestem (*Bothriochloa laguroides* ssp. torreyana), hairy grama (*Bouteloua hirsuta*), Wright's threeawn (*Aristida purpurea* var. purpurea), Queen's delight (*Stillingia sylvatica* ssp. sylvatica), gray goldaster (*Heterotheca canescens*), mealycup sage (*Salvia farinacea*), and annual forbs. As overgrazing continued, Texas grama (*Bouteloua rigidiseta*), hairy tridens (*Erioneuron pilosum*), red grama (*Bouteloua trifida*), poverty dropseed (*Sporobolus vaginiflorus*), and annuals increased in dominance. Queen's delight, mealycup sage, gray goldaster and annuals were the most prominent forbs. Woody and succulent increasers/invaders such as Texas oak (*Quercus buckleyi*), Ashe juniper (*Juniperus ashei*), Texas persimmon (*Diospyros texana*), algerita (Mahonia trifiolata), yucca species (Yucca spp.), catclaw acacia (Acacia gregii), mescalbean (*Sophora secundiflora*), and honey mesquite (*Prosopis glandulosa*) began to multiply. More bare ground appeared, and soil erosion increased. The elimination of fire due to the lack of fine fuel or by human interference assisted the rapid encroachment by herbaceous and woody increasers/invaders with a concurrent reduction of usable forage and growing danger from toxic plants.

State and transition model

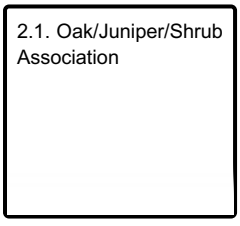
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Savannah

Community 1.1
Mid/Tallgrass Oak Savannah

The reference plant community for this site is a savannah composed of mid and tall grasses with scattered trees and shrubs that evolved under the influence of grazing, periodic fire, and climate. The overstory shades about 10 percent of the site and consists of trees such as Texas oak, live oak (*Quercus virginiana*), Lacey oak (*Quercus*

laceyi), Texas redbud (*Cercis canadensis* var. texensis), Ashe juniper, and shrubs such as evergreen sumac (*Rhus virens*), littleleaf sumac (*Rhus microphylla*), Texas kidneywood (*Eysenhardtia texana*), littleleaf leadtree (*Leucaena retusa*), and elbowbush (*Forestiera pubescens*). Grasses make up approximately 75 percent of the vegetative production, with little bluestem being the single most prolific species. Other important grasses include the tallgrasses big bluestem and Indiangrass, midgrasses such as sideoats grama, plains lovegrass (*Eragrostis intermedia*), cane bluestem, silver bluestem, and tall dropseed (*Sporobolus compositus* var. compositus). Shorter and/or less productive grasses found in some quantity include several species of muhly (Muhlenbergia spp.), hairy dropseed (*Sporobolus compositus* var. drummondii), slim tridens, rough tridens (*Tridens muticus* var. muticus), Wright's threeawn and fall witchgrass (*Digitaria cognata* var. cognata). Perennial forbs such as awnless bushsunflower, catclaw sensitivebriar, Engelmanndaisy, knotweed leaflower (*Phyllanthus polygonoides*), bigtop dalea, and orange zexmenia are found in a small (around 5 to 10 percent) but important component of the plant community, particularly for foragers such as deer that need a diet higher in protein than that furnished by grass alone. In wet years, annual forbs may produce significant herbaceous vegetation. Plant vigor and reproduction are relatively high in favorable weather, but somewhat limited by the high lime content and low fertility of the soil. Soil erosion, particularly on the flatter slopes, is controlled. With high runoff rates and slow infiltration, the vegetative ground cover helps disperse and slow down runoff, thus holding soil in place and enhancing infiltration. Recurrent fire, climate patterns and grazing by herbivores are natural processes that maintain this quite fragile historic ecological site. Change occurs when ecological processes are interrupted. Continued overuse, elimination of fire, and extended drought can result in the decline or disappearance of the reference populations of quality grasses and forbs. More dominant, palatable grasses and perennial forbs decrease and less palatable or productive midgrasses, shortgrasses, forbs, and woody species begin to increase and fill in the void left by the declining species. The decrease in vegetative ground cover facilitates lower infiltration, higher runoff rates and concentration of water flow, thus promoting soil erosion. If the process is not reversed, the community shifts toward the Mid and Shortgrass Oak/Juniper Savannah Community. This trend in a Mid/Tallgrass Oak Savannah plant community can likely be reversed and annual plant productivity restored. Understanding the effects of climate, fire and grazing on the ecology of the site combined with the application of sound grazing management, judicious brush management and prescribed burning are the keys to any attempt to return to the reference plant community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	970	1705	2400
Forb	95	165	235
Tree	95	165	235
Shrub/Vine	90	165	230
Total	**1250**	**2200**	**3100**

Figure 9. Plant community growth curve (percent production by month). TX3605, Midgrass/Oak Savannah with less 10% canopy. Warm season rangeland with peaks in annual production from herbaceous layer in May and in September..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	3	5	13	22	15	5	3	15	7	5	4

Community 1.2
Mid/Shortgrass Oak/Juniper Savannah

This community still resembles a Mid and Tallgrass Oak Savannah Community plant structure to casual observation. However, due to the measurable decline of dominant midgrasses, tallgrasses and perennial forbs caused by overstocking, elimination of fire, lack of brush management, and possibly long-term changes in weather patterns, vigor and reproduction of the dominant grass and forb species are in decline. Becoming more prominent in the landscape are grasses like Wright's threeawn, slim tridens, rough tridens, hairy dropseed, hairy grama, red grama, and other short grasses. Queen's delight, mealycup sage, gray goldaster, and annual forbs are more numerous. The woody canopy is approximately double, with noticeable increases in Texas oak, Ashe juniper and mesquite production. Shrub canopy has increased and has a higher proportion of less palatable species such as

catclaw acacia, algerita, and yucca. Ground cover by litter and soil organic matter decreased. Due to less production, infiltration decreases, and runoff increases. Noticeable signs of erosion begin to appear. This site is particularly susceptible to sheet erosion, which is not readily apparent to the naked eye. Encroachment by brush, replacement of mid and tallgrasses with degraded mid and shortgrass species, loss of topsoil and loss of soil organic matter make it difficult for these abused areas to return to the reference plant community. However, the retrogression at this point can be halted or reversed, particularly on lower slope ranges, with relatively small labor and cost input if measures are taken soon enough. Application of prescribed grazing is essential to stop the decline of high quality plant species. Prescribed burning can be used where practical to control small woody plants and their seedlings, especially Ashe juniper up to four feet tall. These can also be controlled through individual plant treatment (IPT) mechanically or with appropriate chemical control. If the trend that created the Mid and Shortgrass Oak/Juniper Savannah is allowed to continue, the plant community will eventually shift to the Oak/Juniper/Shrub Association. By that point, significant labor and financial resources will be necessary to make any changes to that community. Since the site is easily eroded and most soils in the site do not respond well to range planting, the potential for successful revegetation of grasses and forbs is relatively low by then.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	565	990	1395
Tree	190	330	465
Shrub/Vine	120	215	300
Forb	65	115	165
Total	**940**	**1650**	**2325**

Figure 11. Plant community growth curve (percent production by month). TX3615, Midgrass Dominant with Shortgrass and Scattered Shrubs. Midgrass dominant vegetation with shortgrasses and scattered shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	3	5	13	23	15	4	5	15	7	5	3

Pathway 1.1A
Community 1.1 to 1.2

With heavy continuous grazing, no brush management, no fires, brush invasion, and long-term drought conditions, the Mid/Tallgrass Oak Savannah Community transitions into the Mid/Shortgrass Oak/Juniper Savannah Community.

Pathway 1.2A
Community 1.2 to 1.1

With the implementation of prescribed grazing, prescribed burning, and brush management conservation practices, the Mid/Shortgrass Oak/Juniper Savannah Community can be reverted back to the Mid/Tallgrass Oak Savannah Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Shrubland

Community 2.1
Oak/Juniper/Shrub Association

The Oak/Juniper/Shrub Association Community is the result of an extreme shift of site characteristics from the original Mid and Tallgrass Oak Savannah Community. An overstory of Texas oak, live oak, Lacey oak, Ashe juniper, Texas persimmon, mesquite, and associated trees dominate the plant community. There is a heavy understory of shrubs such as catclaw acacia and agarito. The more palatable shrubs like elbowbush, littleleaf sumac, evergreen sumac, and bumelia are rare. Woody canopy cover ranges up to 40 percent or more. This strong competition for water, sunlight, and nutrients has severely limited or eliminated reference community grass and forb populations. Various threeawn species (Aristida spp.), rough tridens, Texas wintergrass, hairy tridens, red grama, Texas grama (*Bouteloua rigidiseta*), poverty dropseed, and annuals dominate the grass-like plant population of this site. The forb component consists predominantly of annuals or unpalatable perennials. Often most of the original, fertile topsoil on the site has eroded away and deep gully formations have occurred. Bare soil has been cemented and compacted and is relatively impermeable. Very little rainfall infiltrates through the ground and runoff is rapid. This community very likely cannot be restored to the reference plant community. Decades of transition from a Mid and Tallgrass Oak Savannah have generated a severely negative impact on soil properties, plant species diversity, site integrity, and hydrological features. It can, however, be manipulated toward a plant community similar in composition and function through extensive mechanical and chemical brush management, individual plant treatment (IPT), range planting, and implementation of intensive grazing management. Before conducting brush treatment, the land manager might have to review the relative values of livestock and wildlife to the ranch and plan brush management accordingly. The quality and quantity of brush species of this site make it a potentially diverse and beneficial site to support wildlife. Evaluating the relative values of each plant species to the targeted livestock and/or wildlife species is important in planning brush management.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	275	485	685
Grass/Grasslike	205	365	510
Shrub/Vine	140	240	340
Forb	70	120	170
Total	**690**	**1210**	**1705**

Figure 13. Plant community growth curve (percent production by month). TX3623, Oak/Juniper/Shrub Association. The mix of warm and cool season plants extends the green growing period to yearlong. Peak biomass production is in May and June with a lesser peak in September and October..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	3	7	13	20	16	7	5	11	7	5	3

Transition T1A
State 1 to 2

With heavy abusive grazing, no brush management, no fires, brush invasion, and long-term drought conditions, the Savannah State will transition into the Shrubland State.

Restoration pathway R2A
State 2 to 1

With the implementation of prescribed grazing, prescribed burning, brush management, and range planting conservation practices, the Shrubland State can be reverted to the Savannah State.

Conservation practices

Brush Management

Prescribed Burning
Prescribed Grazing
Range Planting

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			660–1475	
	big bluestem	ANGE	*Andropogon gerardii*	100–600	–
	little bluestem	SCSC	*Schizachyrium scoparium*	100–600	–
	Indiangrass	SONU2	*Sorghastrum nutans*	100–600	–
2	**Midgrasses**			110–325	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	110–325	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	110–325	–
	tall grama	BOHIP	*Bouteloua hirsuta var. pectinata*	110–325	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	110–325	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	110–325	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	110–325	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	110–325	–
	dropseed	SPORO	*Sporobolus*	110–325	–
3	**Secondary Midgrasses**			110–325	
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	110–325	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	110–325	–
	fall witchgrass	DICO6	*Digitaria cognata*	110–325	–
	muhly	MUIN	*Muhlenbergia ×involuta*	110–325	–
	Lindheimer's muhly	MULI	*Muhlenbergia lindheimeri*	110–325	–
	seep muhly	MURE2	*Muhlenbergia reverchonii*	110–325	–
	Hall's panicgrass	PAHA	*Panicum hallii*	110–325	–
	slim tridens	TRMU	*Tridens muticus*	110–325	–
4	**Cool Season Grasses**			25–170	
	cedar sedge	CAPL3	*Carex planostachys*	25–170	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	25–170	–
5	**Shortgrasses**			10–60	
	Texas grama	BORI	*Bouteloua rigidiseta*	10–60	–
	red grama	BOTR2	*Bouteloua trifida*	10–60	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	10–60	–
	puffsheath dropseed	SPNE2	*Sporobolus neglectus*	10–60	–
6	**Annuals**			5–45	
	Grass, annual	2GA	*Grass, annual*	5–45	–
Forb					

7	**Forbs**			110–220	
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	110–220	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	110–220	–
	bundleflower	DESMA	*Desmanthus*	110–220	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	110–220	–
	milkpea	GALAC	*Galactia*	110–220	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	110–220	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	110–220	–
	Chalk Hill hymenopappus	HYTE2	*Hymenopappus tenuifolius*	110–220	–
	trailing krameria	KRLA	*Krameria lanceolata*	110–220	–
	dotted blazing star	LIPU	*Liatris punctata*	110–220	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	110–220	–
	smartweed leaf-flower	PHPO3	*Phyllanthus polygonoides*	110–220	–
	mealycup sage	SAFA2	*Salvia farinacea*	110–220	–
	awnless bushsunflower	SICA7	*Simsia calva*	110–220	–
	creepingoxeye	WEDEL	*Wedelia*	110–220	–
8	**Annuals**			10–40	
	Forb, annual	2FA	*Forb, annual*	10–40	–
Shrub/Vine					
9	**Shrubs/Vines**			110–220	
	Texas kidneywood	EYTE	*Eysenhardtia texana*	110–220	–
	stretchberry	FOPU2	*Forestiera pubescens*	110–220	–
	algerita	MATR3	*Mahonia trifoliolata*	110–220	–
	winged sumac	RHCO	*Rhus copallinum*	110–220	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	110–220	–
	evergreen sumac	RHVI3	*Rhus virens*	110–220	–
	bully	SIDER2	*Sideroxylon*	110–220	–
	mescal bean	SOSE3	*Sophora secundiflora*	110–220	–
Tree					
10	**Trees**			50–110	
	Texas madrone	ARXA80	*Arbutus xalapensis*	50–110	–
	Texas redbud	CECAT	*Cercis canadensis var. texensis*	50–110	–
	Texas persimmon	DITE3	*Diospyros texana*	50–110	–
	littleleaf leadtree	LERE5	*Leucaena retusa*	50–110	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	50–110	–
	black cherry	PRSEE	*Prunus serotina var. eximia*	50–110	–
	Texas red oak	QUBU2	*Quercus buckleyi*	50–110	–
	Lacey oak	QULA	*Quercus laceyi*	50–110	–
	live oak	QUVI	*Quercus virginiana*	50–110	–
	blackhaw	VIPR	*Viburnum prunifolium*	50–110	–
11	**Evergreen**			0–25	
	Ashe's juniper	JUAS	*Juniperus ashei*	0–25	–

Animal community

This site is used to produce domestic livestock and to provide habitat for native wildlife. Cow-calf operations are the primary livestock enterprise, although stocker cattle are also grazed. Sheep, Angora goats, and Spanish goats were formerly raised in large numbers. Sheep are still present in reduced numbers, while meat goats are now present in fairly high numbers. Boer goats have been introduced, either purebred or crossed with Spanish goats, to obtain a larger meat animal. Reports indicate that Boers do not browse as heavily as earlier breeds.

Sustainable stocking rates have 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 careful observation of the plant community's response to animal foraging.

A large diversity of wildlife is native to this site. In the reference plant community, migrating bison, grazing primarily during wetter periods, pronghorn, white-tailed deer and turkey were the more predominant herbivore 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.

Except for a few domestic herds, bison have been eliminated. 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 the plant community.

Various species of exotic wildlife have been introduced on the site, including deer such as axis, sika, fallow, and red; antelope such as sable, oryx, blackbuck, and nilgai, and sheep such as barbados (mouflon) and aoudad with various degrees of success. Their numbers must be included along with livestock and native wildlife, primarily white-tailed deer, in any management plan. Feral hogs may feed on the site. They can be damaging to the plant community if their numbers are not managed. Smaller mammals include many kinds of rodents, jackrabbit, cottontail, raccoon, ringtail, skunk, 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 or ocelot 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 turkey, bobwhite quail, scaled (blue) quail and mourning dove. Turkeys prefer plant communities with substantial amounts of shrubs and trees interspersed with grassland. Quail prefer a combination of low shrubs, bunch grass (critical for nesting cover), bare ground, and low successional forbs. 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. Different species of raptors benefit from a diverse plant community as well.

Hydrological functions

The soils on this site are shallow, well drained with slow/very slow permeability and low/very low water holding capacity. Combined with the slopes of the site, they can experience rapid surface runoff during high intensity storm events. Water erosion potential is high.

The existing plant community and the way the site is managed are central to the success of the hydrological function of this site. The water cycle functions most effectively when mid and tall bunchgrasses dominate the site. This ecological condition promotes good soil structure, high organic matter, good porosity and rapid infiltration of water into the soil. Water that does run off will be higher quality, and erosion and sedimentation will be lower.

Loss or reduction of mid and tallgrasses, most frequently through heavy grazing, impairs the water cycle. Ground

cover is poor, organic matter is low, soil structure breaks down and the surface becomes crusted. Infiltration decreases and runoff increases. Erosion and sedimentation are accelerated. Given the slopes of the site, degraded conditions can contribute to increased frequency of flooding within a watershed and deposit highly alkaline sediment on more fertile lower sites and yet remain droughty between heavy rainfall events.

Recreational uses

The site supports a wide variety of wildlife. The area is heavily used for hunting various native and introduced game animals and birds. Other popular uses are hiking, birding, photography, and related eco-tourism enterprises.

Wood products

Many plants native to the site, such as Texas oak and live oak, have been incorporated into home or park landscapes. Oil can also be extracted from dry Ashe juniper wood.

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Approval

David Kraft, 9/20/2019

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):**

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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:

    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:**
