USDA Natural Resources Conservation Service

Ecological site R081BY340TX
Redland 23-31 PZ

Last updated: 9/19/2023
Accessed: 05/12/2025

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.

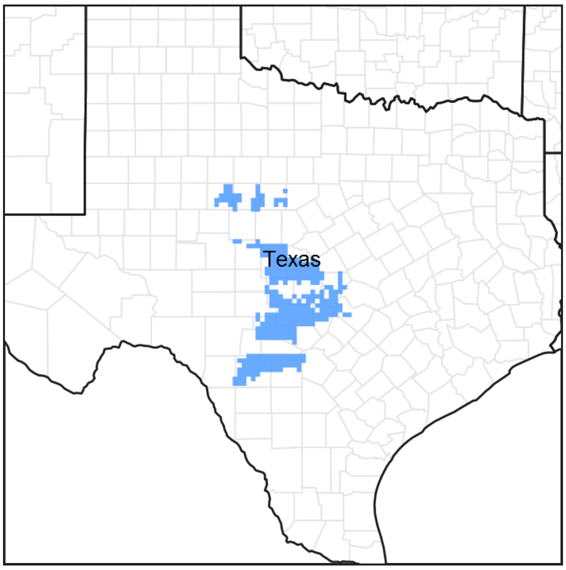


Figure 1. Mapped extent

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

Redland sites occur on uplands with greater than 10 inches of soil, but less than 40 inches. Their characteristic color has a hue redder than 5YR on the Munsell Soil Color Chart.

Associated sites

R081BY332TX	**Gravelly Redland 23-31 PZ** The Gravelly Redland site has greater than 35 percent fragments in the soil.
R081BY337TX	**Low Stony Hill 23-31 PZ** The Low Stony Hill site has more fragments and no red subsoil or Post oak trees.
R081BY328TX	**Deep Redland 23-31 PZ** The Deep Redland site has deeper soils.
R081BY348TX	**Steep Adobe 23-31 PZ** The Steep Adobe site can found on slopes greater than 20 percent.
R081BY320TX	**Adobe 23-31 PZ** The Adobe site does not have red subsoil and no Post oak trees.

Similar sites

R081BY328TX	**Deep Redland 23-31 PZ** The Deep Redland site has deeper soils.

Table 1. Dominant plant species

Tree	(1) *Quercus stellata*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Sorghastrum nutans*

Physiographic features

The sites are on nearly level to gently sloping undulating uplands. They occupy benches, in shallow valleys between steeper limestone hills, on tops of ridges, on side slopes of low hills, or as the cap on remnants of high gently sloping plateaus. Slopes are plane to complex, well drained, with low to very high runoff, depending on slope.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Ridge (2) Plateau > Plain
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,000–2,600 ft
Slope	0–8%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Low to very high
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	Not specified

Climatic features

The climate in the MLRA 81B is subtropical subhumid 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 4. Representative climatic features

Frost-free period (characteristic range)	210-260 days
Freeze-free period (characteristic range)	240-280 days
Precipitation total (characteristic range)	25-28 in
Frost-free period (actual range)	210-260 days
Freeze-free period (actual range)	240-280 days
Precipitation total (actual range)	24-30 in
Frost-free period (average)	230 days
Freeze-free period (average)	260 days
Precipitation total (average)	27 in

Climate stations used

- (1) FREDERICKSBURG [USC00413329], Fredericksburg, TX
- (2) BRADY [USC00411017], Brady, TX
- (3) EDEN [USC00412741], Eden, 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 is an upland site and is not influenced by water from a wetland or stream.

Wetland description

N/A

Soil features

Soils are brown to very dark grayish brown or dark reddish gray, shallow to moderately deep, and neutral to slightly alkaline clay loams. Depth ranges from 10 to 40 inches over limestone bedrock but most are 10 to 20 inches. Permeability is slow. Soil series correlated to this site include: Corkstone, Hensley, Speck, and Tarpley.

Table 5. Representative soil features

Parent material	(1) Residuum–limestone

Surface texture	(1) Clay loam (2) Loam (3) Stony clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Depth to restrictive layer	10–20 in
Soil depth	10–20 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–10%
Available water capacity (0-20in)	1.2–3.6 in
Calcium carbonate equivalent (0-20in)	0–25%
Electrical conductivity (0-20in)	0–2 mmhos/cm
Sodium adsorption ratio (0-20in)	0
Soil reaction (1:1 water) (0-20in)	6.1–7.8
Subsurface fragment volume <=3" (4-20in)	1–20%
Subsurface fragment volume >3" (4-20in)	0–10%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Slow to moderate
Depth to restrictive layer	10–40 in
Soil depth	10–40 in
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-20in)	Not specified
Calcium carbonate equivalent (0-20in)	Not specified
Electrical conductivity (0-20in)	Not specified
Sodium adsorption ratio (0-20in)	Not specified
Soil reaction (1:1 water) (0-20in)	Not specified
Subsurface fragment volume <=3" (4-20in)	Not specified
Subsurface fragment volume >3" (4-20in)	Not specified

Ecological dynamics

The Redland site is a midgrass and tallgrass, predominantly oak savannah community with about 10 percent canopy of scattered trees and shrubs, along with numerous perennial forbs. Tall and midsize bunch grasses, perennial forbs, and shortgrasses cover most of the surface. This plant community was greatly influenced by grazing, climate (including periodic extended periods of drought), and fire.

Historically, extensive herds of pronghorns, as well as substantial populations of white-tailed deer, were present and had an impact on the plant community. Colonies of black-tailed prairie dogs lived on the site. They kept woody shrubs cut down around their town to avoid predators. Bison grazing was mostly intermittent. Bison, a migratory herd animal, would come through an area, graze on the move, and not come back for many months or even years. This long deferment period allowed the more palatable grasses and forbs to recover from the heavy grazing. Fire has a strong influence on plant community structure and was a factor in maintaining the original grassland vegetation. Species such as Ashe juniper (*Juniperus ashei*) and mesquite (*Prosopis glandulosa*) were probably present on the site, but not at the level we usually see today. On the average, fires occurred every 7 to 12 years and helped keep woody species under control, maintaining an open savannah community. Grazing patterns by native herbivores and climate were also significant factors in maintaining a well-balanced plant community.

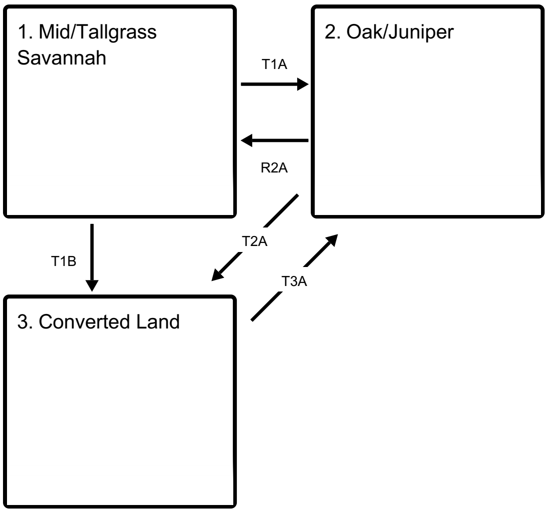
Extremes in climate exerted tremendous influence on the site long before European man arrived. Geologic formations, archeological findings and rainfall records since the mid-1900’s show wide variations in precipitation, with cycles of long, dry periods going back thousands of years. Reference community 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.

The more palatable plants such as big bluestem (*Andropogon gerardii*, little bluestem (*Schizachyrium scoparium*), Indiangrass (Sorgastrum nutans),awnless bushsunflower (*Simsia calva*), Engelmann’s daisy (Engelmannia perestinia), catclaw sensitivebriar (Mimosa nutallii), and Maximilian sunflower (*Helianthus maximiliani*) were selected repeatedly and eventually began to disappear from the ecosystem to be replaced by lower successional, less palatable and productive species such as buffalograss (*Bouteloua dactyloides*), curlymesquite (*Hilaria belangeri*), Hall's panicum (*Panicum hallii*), perennial threeawn (Aristida spp.), and annual forbs. As overgrazing continued, overall production of grasses and forbs declined, more bare ground appeared, soil erosion increased, and woody and succulent increasers such as Ashe juniper, algerita (Mahonia trifiolata), condalia (Condalia spp.), mesquite, catclaw acacia (Acacia gregii), and catclaw mimosa (Mimosa biuncifera) began to multiply. 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



T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

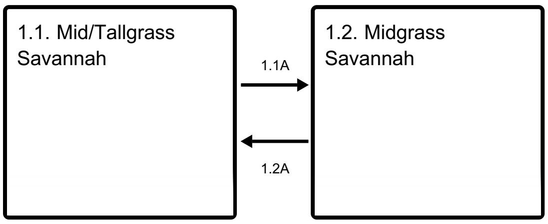
T1B - Extensive soil disturbance followed by seeding

R2A - Reintroduction of historic disturbance return intervals

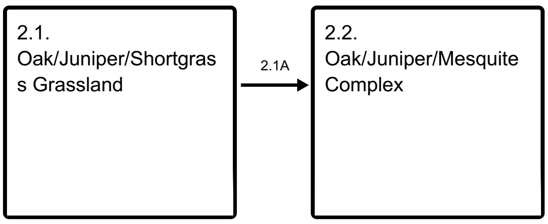
T2A - Extensive soil disturbance followed by seeding

T3A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

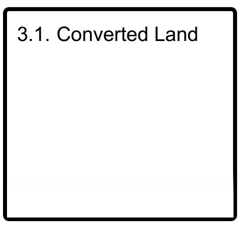
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Mid/Tallgrass Savannah

Dominant plant species

- post oak (*Quercus stellata*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Community 1.1

Mid/Tallgrass Savannah

This community is a savannah composed of mid and tallgrasses with scattered trees that evolved under the influence of grazing, periodic fire, and climate. The overstory shades less than 10 percent of the site and consists primarily of scattered post oak (*Quercus stellata*), live oak (*Quercus virginiana*), blackjack oak (*Quercus marilandica*), and several other species. Also present are occasional shrubs such as algerita, bumelia (Sideroxylon spp.), elbowbush (*Forestiera pubescens*), ephedra (Ephedra spp.), and littleleaf sumac (*Rhus microphylla*). Mid and tallgrasses such as big bluestem, little bluestem, Indiangrass, plains lovegrass (*Eragrostis intermedia*), and sideoats grama (*Bouteloua curtipendula*) dominate the site. Perennial forbs such as awnless bushsunflower, Maximilian sunflower, Engelmann's daisy, and bundleflower (Desmanthus spp.) are a smaller but important component of the plant community. In wet years, annual forbs produce significant herbaceous vegetation, particularly when precipitation follows a long dry spell. Plants are vigorous, and reproduction is rapid during wet weather. Interspaces between plants are moderately covered with litter. The soil surface is relatively cool, rich in humus, and hosts a microbe population actively decomposing organic matter. Soil erosion is insignificant. Infiltration is slow due to the high clay content of the soil but enhanced by the deep root systems of the taller grasses and perennial forbs. Runoff only occurs during heavier rainfall but is dispersed and slowed by vegetative ground cover. Concentrated water flow patterns are rare. Recurrent periodic fire, climatic patterns and grazing by bison, pronghorn and other herbivores are natural processes that maintain this plant community. Interruption of the ecological processes of a site brings about change. The reference plant community includes large populations of high successional 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, palatable forage grasses decrease as do palatable perennial forbs. Less palatable or productive midgrasses such as Wright's three-awn (*Aristida purpurea* var. wrightii), slim tridens (*Tridens muticus*), fall witchgrass (*Digitaria cognata* var. cognata), and shortgrasses like buffalograss, red grama (*Bouteloua trifida*), and curlymesquite (*Hilaria belangeri*) along with lower successional forbs such as croton (Croton spp.), globemallow (Sphaeralcea spp.), and annuals begin to increase. Small Ashe juniper, mesquite, algerita, condalia (Condalia spp.) 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 Midgrass Savannah Community (1.2).

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1680	2600	3280
Forb	160	245	310
Tree	155	240	305
Shrub/Vine	105	165	205
Total	**2100**	**3250**	**4100**

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
Midgrass Savannah

This community still resembles a Mid/Tallgrass Savannah Community (1.1) plant structure to casual observation. There has been a measurable decline of dominant midgrasses, tallgrasses and perennial forbs. This decline is caused by overstocking, elimination of fire, lack of brush management, and possibly changes in weather patterns. These changes have allowed the population of juniper and other woody species to increase. Vigor and reproduction of the dominant grass species decline and they begin to be replaced by buffalograss, slim tridens, fall witchgrass, Hall's panicum, and other shortgrasses. Less palatable annual and perennial forbs increase. Shrub canopy is between 10 and 20 percent with a higher proportion of less palatable species. Invading small Ashe juniper regrowth seedlings are apparent, as are a few scrubby mesquite seedlings. Ground cover by litter decreases. Soil organic matter is decreasing. Infiltration begins to drop off and runoff increases. Signs of erosion begin to appear. Encroachment by brush, replacement of mid and tallgrasses, loss of topsoil, and loss of soil organic matter make the reversal difficult for these abused areas to return to the reference plant community even if stressors are removed. However, the retrogression at this point can be reversed 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 plants. Prescribed burning can be used to control small woody plants and their seedlings, especially Ashe juniper that is up to four feet tall. These species can also be controlled through individual plant treatment (IPT), mechanically, or with appropriate chemical application. If the trend is not reversed, the community will eventually shift to the Oak/Juniper/Shortgrass Grassland community (2.1), which will require higher investment of labor and financial resources.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1345	2080	2625
Tree	265	410	520
Forb	115	180	225
Shrub/Vine	115	180	225
Total	**1840**	**2850**	**3595**

Figure 11. Plant community growth curve (percent production by month). TX3610, Midgrass Savannah with woody encroachment. Midgrass savannah with woody encroachment. Tallgrasses decline in population and increase of woody canopy to 20%..

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

Pathway 1.1A
Community 1.1 to 1.2

With heavy abusive grazing and no fires, the Mid/Tallgrass Savannah Community will shift to the Midgrass Savannah Community.

Pathway 1.2A
Community 1.2 to 1.1

With institution of sound management practices, this trend can usually be reversed and 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 (IPT) and prescribed burning is key to any attempt to return to the reference community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Oak/Juniper

Dominant plant species

- oak (*Quercus*), tree
- Ashe's juniper (*Juniperus ashei*), tree

Community 2.1

Oak/Juniper/Shortgrass Grassland

This community represents a significant vegetation shift, crossing the threshold from the Mid/Tallgrass Savannah State to the Oak/Juniper State. The major woody increaser species (live oak, post oak, and Ashe juniper) have multiplied until they comprise about 20 percent of the overstory canopy and exert strong influence on the site. The mid and tallgrasses are scarce, heavily grazed or shaded out. Shortgrasses and three-awn species are predominant. Cool-season grasses such as Texas wintergrass (*Nassella leucotricha*) increase. Palatable perennial forbs are nearly gone. Toxic plants to livestock appear such as groundsel (Senecio spp.) and twoleaf senna (*Senna roemeriana*). The site contains juniper over four feet tall as well as major increases in shrubs such as condalia, algerita, catclaw acacia, and Hercules-club pricklyash (*Zanthoxylum clava-herculis*). Much of the ground is bare, which lends itself to a proliferation of annual forbs in some years, particularly when a wet fall/winter follows a dry spring/summer. Some, such as filaree (Erodium spp.) species or redseed plantain (*Plantago rhodosperma*), provide a certain amount of high-quality forage for sheep, goats, and deer during winter and early spring, but quickly dry up when summer arrives. Litter is scarce. Organic matter is low. Less water infiltrates. Runoff increases. Topsoil loss through erosion accelerates, evidenced by plants on pedestals, rills, and plant growth. Sheet erosion, though not easily detected, is high. If proper management is not planned and implemented, the site will continue to degrade and the community site will shift toward an Oak/Juniper/Mesquite Complex Community (2.2). By implementing conservation measures such as brush management, prescribed grazing and prescribed burning, this community can possibly be shifted back toward the Mid/ Tallgrass Savannah State.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1010	1560	1970
Tree	310	480	610
Shrub/Vine	125	200	245
Forb	120	185	230
Total	**1565**	**2425**	**3055**

Figure 13. Plant community growth curve (percent production by month). TX3611, Oak/Juniper Grassland. Oak/Juniper grassland with 20% canopy of oaks, junipers and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	5	8	13	18	12	5	3	12	10	7	4

Community 2.2
Oak/Juniper/Mesquite Complex

The Oak/Juniper/Mesquite Complex Community (2.2) is the result of an extreme shift of site characteristics from the original mid and tallgrass savannah plant community (1.1). Overstory species like Ashe juniper, mesquite, and live oak dominate the site and can reach heights of 20 feet. Species found in the midstory include shrubs like algerita, condalia, elbowbush, and littleleaf sumac. Woody canopy cover exceeds 30 percent. This strong competition for water, sunlight, and nutrients has severely limited or eliminated shortgrass populations, let alone the original mid/tallgrass community. Three-awns, hairy tridens (*Erioneuron pilosum*), red grama (*Bouteloua trifida*), Texas grama (*Bouteloua rigidiseta*), and annuals dominate the grass plant population of this plant community. The forb component consists predominantly of annuals or unpalatable perennials. Up to 60 percent is bare ground which is void of grasses and forbs. Most of the original, fertile topsoil has been eroded away. The top soil can be cemented and is relatively impermeable by water. 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 mid/tallgrass savannah have negatively impacted soil properties, species diversity, site integrity, and hydrological processes. It can, however, be manipulated toward a community similar in composition and function through extensive mechanical and chemical brush management, range planting, and implementation of intensive grazing management. Before beginning, planning may be necessary by the land manager to review the relative value of livestock and wildlife to the ranch and plan the desired methods of brush management that will effectively benefit goals and objectives of the land manager.

Table 10. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	620	960	1220
Grass/Grasslike	420	650	820
Shrub/Vine	210	330	410
Forb	80	120	155
Total	**1330**	**2060**	**2605**

Figure 15. Plant community growth curve (percent production by month). TX3612, Oak/Juniper Complex. Yearlong green forage due to shrubs and cool-season species growth in winter and spring. Peak rainfall period from April through September provides most productivity during summer growing season. Ashe Juniper, oaks, and shrub dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	7	8	12	15	10	5	4	12	10	7	5

Pathway 2.1A
Community 2.1 to 2.2

The Oak/Juniper/Shortgrass Grassland Community shifts to the Oak/Juniper/Mesquite Complex Community due to heavy abusive grazing, no brush management, no fires, and invasion of brush species.

State 3
Converted Land

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

Community 3.1
Converted Land

This community is the product of endeavors to reclaim the Oak/Juniper/Mesquite Complex community (2.2) or, less frequently, the Oak/Juniper Grassland community (2.1). The Converted Land Community can be planted into cropland, pastureland, or reclaimed land. Depending on the goals of the land manager, reclamation efforts might involve the whole site or only portions. A land manager involved primarily with livestock operations might prefer more open, grassy areas, whereas one interested mostly in wildlife operations may want to leave substantial brushy areas. Reclaimed land or pastureland can be achieved through brush management involving heavy equipment, reseeding of native species (both grasses and forbs), prescribed grazing, and re-introduction of fire. The manager can possibly manipulate this site successfully towards a reference community appearance. A very high treatment cost should be expected. The site will not be able to mirror exactly the original plant community; however, utilizing natives as the reseeding source will greatly benefit most wildlife. This plant community may also be comprised of seeded species which are introduced to the area and are most effective as a monoculture plant community. This type of community may contain less cover or food for wildlife which leads to native grasses and forbs being practically devoid. The site's capacity to produce vegetation must be determined over time under careful management. Maintenance through prescribed grazing, prescribed burning, and individual plant treatment (IPT) with appropriate chemicals can preserve the annual production. Without these measures, encroachment of woody species is inevitable.

Table 11. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1715	2080	2905
Forb	195	235	330
Tree	40	50	65
Shrub/Vine	0	0	0
Total	**1950**	**2365**	**3300**

Figure 17. Plant community growth curve (percent production by month). TX3600, Cool Season Crops. Cool season species are planted in the fall for winter and spring growth. Species include wheat and oats..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	5	10	10	5	0	0	0	20	25	15	5

Figure 18. Plant community growth curve (percent production by month). TX3601, Warm Season Crops. Warm season species are planted in early spring. Their peak growth is in late May with a lesser peak in September. Forage and Grain sorghum that are planted during the warm season months..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	8	20	25	20	10	10	5	2	0	0

Figure 19. Plant community growth curve (percent production by month). TX3613, Reclaimed Land. Reclaimed Land seeded with native or introduced species..

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

Transition T1A
State 1 to 2

Heavy abusive grazing, no brush management, no fires, and brush invasion has led to a shift from the Mid/Tallgrass Savannah State to Oak/Juniper State.

Transition T1B
State 1 to 3

Brush management, pasture planting, range planting, and crop cultivation are some practices that shift from the Savannah State to a Converted Land State.

Restoration pathway R2A
State 2 to 1

The Oak/Juniper State can be restored to the Mid/Tallgrass Savannah State through the application of prescribed grazing, prescribed burning, and brush management conservation practices.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Transition T2A

State 2 to 3

With the implementation of various conservation practices including brush management, pasture planting, range planting, and crop cultivation, the Oak/Juniper State can shift to the Converted Land State.

Transition T3A
State 3 to 2

The Converted Land State can be reverted back to the Oak/Juniper State due to abusive grazing, no fires, no brush management, invasion of brush species, no pasture/cropland management, land abandonment/idle, and no pest management.

Additional community tables

Table 12. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass**			1075–1725	
	big bluestem	ANGE	*Andropogon gerardii*	1075–1725	–
	little bluestem	SCSC	*Schizachyrium scoparium*	1075–1725	–
	Indiangrass	SONU2	*Sorghastrum nutans*	1075–1725	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	1075–1725	–
2	**Midgrasses**			350–580	
	sideoats grama	BOCU	*Bouteloua curtipendula*	350–580	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	350–580	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	350–580	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	350–580	–
	composite dropseed	SPCO16	*Sporobolus compositus*	350–580	–
	purpletop tridens	TRFL2	*Tridens flavus*	350–580	–
3	**Midgrasses**			40–200	
	vine mesquite	PAOB	*Panicum obtusum*	40–200	–
	white tridens	TRAL2	*Tridens albescens*	40–200	–
4	**Cool Season Grasses**			180–400	
	cedar sedge	CAPL3	*Carex planostachys*	180–400	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	180–400	–
	Canada wildrye	ELCA4	*Elymus canadensis*	180–400	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	180–400	–
	Texas bluegrass	POAR	*Poa arachnifera*	180–400	–
5	**Shortgrasses**			40–200	
	buffalograss	BODA2	*Bouteloua dactyloides*	40–200	–
	curly-mesquite	HIBE	*Hilaria belangeri*	40–200	–
6	**Shortgrasses**			25–175	
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	25–175	–
	fall witchgrass	DICO6	*Digitaria cognata*	25–175	–
	Hall's panicgrass	PAHA	*Panicum hallii*	25–175	–
	slim tridens	TRMU	*Tridens muticus*	25–175	–
7	**Shortgrasses**			15–30	

7	**Shortgrasses**			15–30	
	Grass, annual	2GA	*Grass, annual*	15–30	–
	Texas grama	BORI	*Bouteloua rigidiseta*	15–30	–
	red grama	BOTR2	*Bouteloua trifida*	15–30	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	15–30	–
Forb					
8	**Forbs**			150–300	
	Indian mallow	ABUTI	*Abutilon*	150–300	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	150–300	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	150–300	–
	spurred butterfly pea	CEVI2	*Centrosema virginianum*	150–300	–
	prairie clover	DALEA	*Dalea*	150–300	–
	zarzabacoa comun	DEIN3	*Desmodium incanum*	150–300	–
	bundleflower	DESMA	*Desmanthus*	150–300	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	150–300	–
	milkpea	GALAC	*Galactia*	150–300	–
	beeblossom	GAURA	*Gaura*	150–300	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	150–300	–
	lespedeza	LESPE	*Lespedeza*	150–300	–
	hoary blackfoot	MECIH	*Melampodium cinereum var. hirtellum*	150–300	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	150–300	–
	smartweed leaf-flower	PHPO3	*Phyllanthus polygonoides*	150–300	–
	snoutbean	RHYNC2	*Rhynchosia*	150–300	–
	awnless bushsunflower	SICA7	*Simsia calva*	150–300	–
	creepingoxeye	WEDEL	*Wedelia*	150–300	–
9	**Forbs**			10–20	
	Forb, annual	2FA	*Forb, annual*	10–20	–
Shrub/Vine					
10	**Shrubs/Vines**			105–205	
	catclaw acacia	ACGR	*Acacia greggii*	105–205	–
	snakewood	CONDA	*Condalia*	105–205	–
	jointfir	EPHED	*Ephedra*	105–205	–
	stretchberry	FOPU2	*Forestiera pubescens*	105–205	–
	desert-thorn	LYCIU	*Lycium*	105–205	–
	algerita	MATR3	*Mahonia trifoliolata*	105–205	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	105–205	–
	prairie sumac	RHLA3	*Rhus lanceolata*	105–205	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	105–205	–
	bully	SIDER2	*Sideroxylon*	105–205	–
	greenbrier	SMILA2	*Smilax*	105–205	–
	Hercules' club	ZACL	*Zanthoxylum clava-herculis*	105–205	–
Tree					

11	**Trees**			155–305	
	Texas redbud	CECAT	*Cercis canadensis var. texensis*	155–305	–
	hackberry	CELTI	*Celtis*	155–305	–
	blackjack oak	QUMA3	*Quercus marilandica*	155–305	–
	bastard oak	QUSI	*Quercus sinuata*	155–305	–
	post oak	QUST	*Quercus stellata*	155–305	–
	live oak	QUVI	*Quercus virginiana*	155–305	–

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 hydrology functions according to the existing plant community and its management. The water cycle functions most effectively when the site is dominated by mid and tall bunchgrasses. Rapid rainfall infiltration, high soil organic matter, good soil structure, and good porosity exist with a good cover of bunchgrass. Quality of surface runoff is high with low erosion and sedimentation levels. The higher infiltration rates facilitate water movement to deeper root zones and below, contributing to the recharge of aquifers and sustained streamflow.

In case of loss of bunchgrass and ground cover, the hydrologic cycle is impaired. Infiltration is decreased and runoff is increased due to poor ground cover, rainfall splash, soil capping, low organic matter, and poor structure. Some infiltration can still occur due to surface cracking of the soil when dry. A sparse ground cover combined with heavy rainfall contributes to increased frequency of flooding in a watershed, accelerated soil erosion, poor surface runoff, and increased sedimentation.

As the site becomes dominated by woody species the water cycle is further altered. An increase of woody species is matched by a decline in grass cover, duplicating some of the results of heavy abusive grazing. Increased interception of rainfall by tree canopies and its subsequent evaporation reduces the amount of water reaching the surface. The funneling effect of the canopy produces higher stemflow, concentrating more soil moisture at tree bases. Increased transpiration reduces deep percolation. Brush management combined with good grazing management can help restore the natural hydrology of the site.

Recreational uses

The Redland usually has a scenic setting, bordered by rolling hills or steep bluffs. The abundant mid and tall grasses and scattered oaks produce beautiful fall colors variations. The area is also popular for hunting, birding, hiking, and other eco-tourism related activities.

Wood products

Mesquite and oaks can be used for firewood and the specialty wood industry. Ashe juniper is often used for fence posts. A type of oil can be extracted from dry Ashe juniper wood.

Other products

Some of the bedrock is mined commercially for building stone or crushed rock.

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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	06/01/2005
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** Some water flow patterns are expected due to runoff from Adobe, Steep Adobe, and Low Stony Hill sites.

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

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

bare ground): Expect no more than five percent bare ground randomly distributed throughout and having small and non-connected areas.

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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 and short.

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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):** Soil surface is resistant to erosion. Stability class range is expected to be 5 to 6.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil is reddish brown clay with medium blocky structure that is about eight inches thick in depth. SOM is one to three percent.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High canopy, basal cover and density with small interspaces should make rainfall impact negligible. This site has well drained soils, moderately deep with one to three percent slopes which may allow noticeable runoff and erosion.

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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):** No evidence of compaction under reference conditions.

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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 tallgrasses

    Sub-dominant: Warm-season midgrasses Cool-season midgrasses

    Other: Warm-season shortgrasses Trees Forbs Shrubs

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There should be little mortality or decadence for any functional groups in the reference community.

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14. **Average percent litter cover (%) and depth (in):** Litter is dominantly herbaceous.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,500 pounds per acre for below average moisture years, 3,500 pounds per acre for average moisture years and 4,800 pounds per acre for above average moisture years.

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:** Ashe juniper, mesquite, prickly pear, Bermudagrass, Johnsongrass, and King Ranch bluestem.

17. **Perennial plant reproductive capability:** All perennial plants should be capable of reproducing, except during periods of prolonged drought conditions, herbivory and/or wildfire disturbances.