USDA Natural Resources Conservation Service

Ecological site R080BY157TX
Sandstone Hill 26-33" 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): 080B–Texas North-Central Prairies

MLRA 80B consists of gently rolling, dissected plains with very steep hillsides and sideslopes and narrow flood plains associated with small streams. Loamy and clayey soils range from very shallow to deep and developed in sandstones, shales, and limestones of Pennsylvanian age.

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

Ecological site concept

These sites occur on shallow sandy loam soils over sandstone bedrock. The reference vegetation consists of a native oak savanna with an understory of tallgrasses and forbs. Without periodic fire or other brush management, woody species may increase and dominate the site.

Associated sites

R080BY159TX	**Sandy Loam 26-33" PZ** Sandy Loam site has no surface rocks, and is level to gently rolling terrain.

Similar sites

R080BY159TX	**Sandy Loam 26-33" PZ** Sandy Loam site has higher production, no surface rocks, and is level to gently rolling terrain.
R080BY152TX	**Loamy 26-33" PZ** Loamy Prairie site much higher production potential, no surface rocks, and is level to gently rolling terrain.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on linear to convex side slopes, nose slopes, interfluves, and crests of dip slopes and ridges in the Texas North-Central Prairies. This site is characteristically a water distributing site. Slopes are typically less than 12 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Ridge (2) Hills > Dip slope
Runoff class	Low to high
Elevation	750–2,400 ft
Slope	1–12%
Aspect	Aspect is not a significant factor

Climatic features

The climate is subtropical subhumid and is characterized by hot humid summers and relatively mild winters. Tropical maritime air controls the climate during spring, summer and fall. In winter and early spring, frequent surges of polar Canadian air cause sudden drops in temperatures and add considerable variety to the daily weather. The average first frost generally occurs about November 5 and the last freeze of the season usually occurs about March 19. The average frost free period ranges from 215 days in the northern counties, to 240 days in the south.

The average relative humidity in mid-afternoon is about 60 percent in the summer months. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible during the summer and 50 percent in winter. The prevailing wind direction is from the southwest and highest windspeeds occur during the spring months.

Approximately 75% of annual rainfall occurs between April 1 and October 31. Rainfall during the months of April through September typically occurs during thunderstorms which tend to be intense and brief, resulting in large amounts of rain in a short time. The wettest months of the year are May, June, September, and October. The driest months during the growing season are July and August. The winter months of November, December, January, and February are the driest months overall.

Average annual precipitation for the entire MLRA is approximately 28 inches. There is a noticeable difference in the average annual precipitation in the northern counties in comparison to the southern and western counties of this Major Land Resource Area. Jack, Clay, Young, and Palo Pinto Counties all have an average annual precipitation of

more than 31 inches. Stephens, Eastland, McCulloch, and San Saba Counties all have an average annual precipitation of less than 28 inches.

Winters tend to be mild, with occasional periods of very cold temperatures which can be accompanied by strong northerly winds and freezing precipitation. Snow is infrequent and significant accumulations are rare. These periods of very cold weather are generally short-lived. Summers tend to be hot and dry. Drought conditions are common during most summers. Air temperatures of more than 95oF are common from mid-June through September. In the northern counties nearest to the Red River, temperatures are generally slightly cooler during winter months and slightly warmer during summer months than in the other counties in the North Central Prairie.

Table 3. Representative climatic features

Frost-free period (characteristic range)	184-200 days
Freeze-free period (characteristic range)	211-225 days
Precipitation total (characteristic range)	30-32 in
Frost-free period (actual range)	183-204 days
Freeze-free period (actual range)	210-226 days
Precipitation total (actual range)	29-33 in
Frost-free period (average)	193 days
Freeze-free period (average)	217 days
Precipitation total (average)	31 in

Climate stations used

- (1) SAN SABA 7NW [USC00417994], Richland Springs, TX
- (2) BROWNWOOD 2ENE [USC00411138], Early, TX
- (3) EASTLAND [USC00412715], Eastland, TX
- (4) BRECKENRIDGE [USC00411042], Breckenridge, TX
- (5) MINERAL WELLS AP [USW00093985], Millsap, TX
- (6) GRAHAM [USC00413668], Graham, TX
- (7) JACKSBORO [USC00414517], Jacksboro, TX

Influencing water features

These sites will shed some water via runoff to lower areas. However, the presence of good ground cover and deep rooted grasses can help facilitate rainwater infiltration into the soil. These sites are not associated with wetlands.

Wetland description

NA

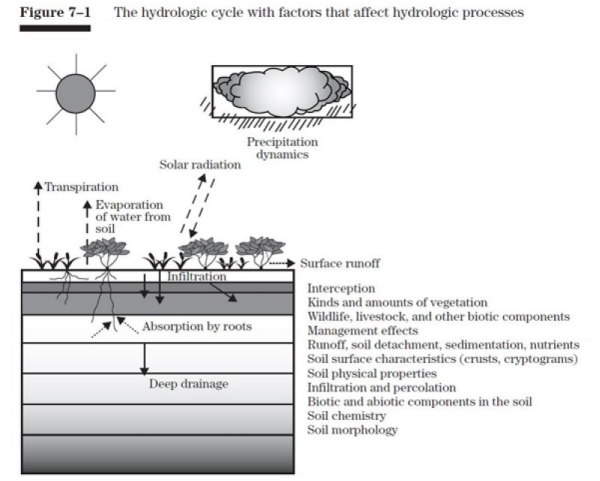


Figure 8.

Soil features

Representative soil components for this ecological site include: Bonti, Exray, Jacksboro, Jolly, Nocken, Shavash

The site is characterized well drained soils that are shallow to bedrock as well as soils that are moderately deep or deep to bedrock with a surface cover of sandstone fragments.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone (2) Residuum–claystone
Surface texture	(1) Stony fine sandy loam (2) Very stony fine sandy loam (3) Stony loam (4) Very stony loam
Drainage class	Well drained
Permeability class	Slow to moderately slow
Soil depth	10–60 in
Surface fragment cover <=3"	0–45%
Surface fragment cover >3"	0–45%
Available water capacity (0-40in)	1–6 in
Calcium carbonate equivalent (0-40in)	0–2%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–35%

Ecological dynamics

The reference plant community for the Sandstone Hill ecological site is a Tallgrass Oak Savanna with a variety of

forbs and a significant presence of trees and shrubs. Oaks (Quercus spp.), elms (U
lmus spp.), hackberry (Celtis spp.), junipers (Juniperus spp.), and several other tree and shrub species are distributed throughout the site to create a diverse mosaic of grasses, forbs, shrubs, and trees. It is a very productive site in its pristine state. Evidence of the historic vegetation can be found in the journals and records of explorers, military expeditions, and boundary survey teams.

Climate is a major factor influencing vegetation on the site. Long-term droughts lasting multiple years or growing seasons are infrequent, but when they do occur, they can have a negative impact on the vegetation. If abusive grazing occurs during or immediately following the drought period, the results can be dramatic. However, this site is very resilient, and can respond very quickly to rainfall and proper management. The effects of erratic seasonal moisture and short-term dry spells lasting a few months are not as severe as those caused by long-term droughts. However, the lower the ecological status of the site, the greater the negative impact will be during drought periods regardless of duration.

Fire was an important part of the ecosystem. Most ecosystems in the North Central Prairie developed in a 4 to 6 year regime of recurring fires. Many of these fires resulted from lightning strikes during thunderstorms. Native Americans frequently set fires to manipulate the movement of bison and other animals as well as a defensive or offensive technique when dealing with their enemies. These historic fires were usually severe because of the amount of grass fuel available to carry the fire. The intensity of fires kept shrubs and sapling trees suppressed and allowed grasses and forbs to flourish. Tallgrass species are fire tolerant and are enhanced by periodic burning. Forbs usually increase for a year or two following these fires before the grasses become dominant again.

Lack of fire allows herbaceous vegetation to become senescent and may eventually lead to the loss of the most desirable species. Seedlings of non-native brush species and invasive weeds may encroach on the site from adjacent sites

Prior to settlement, this site was subject to periodic grazing and browsing by vast herds of bison, wild cattle, wild horses, and deer. Because of the steep, rugged terrain, the Sandstone Hill site was probably not grazed as frequently or as severely as other sites in the vicinity. However, at times the site was grazed heavily along with adjacent sites. These grazing and browsing episodes were intense and severe, but periods of heavy use were followed by long periods of non-use as the herds migrated to fresh grazing areas before returning to previously grazed areas. At times these grazing and browsing episodes were intense and severe, but periods of heavy use were followed by long periods of non-use as the herds migrated to fresh grazing areas before returning to previously grazed areas. The grazed areas had an opportunity to rest, regrow, regain vigor, and reproduce prior to the next grazing event. Intervals between grazing periods were frequently influenced by the amount of time that had elapsed since the last fire on the area.

As the region was settled, fire was reduced or eliminated and grasslands were fenced off to control movement and facilitate grazing by domestic livestock. As a result of abusive grazing or lack of grazing and/or the elimination of fire, in association with extreme climatic events, the tallgrass plant community has been eliminated or severely altered on most Sandstone Hill sites.

Further deterioration leads to the loss of the perennial warm-season midgrass and forb plant community and an increase in short grasses, annuals, and bare ground. This provides the opportunity for less desirable woody species such as mesquite and juniper to encroach from adjacent sites.

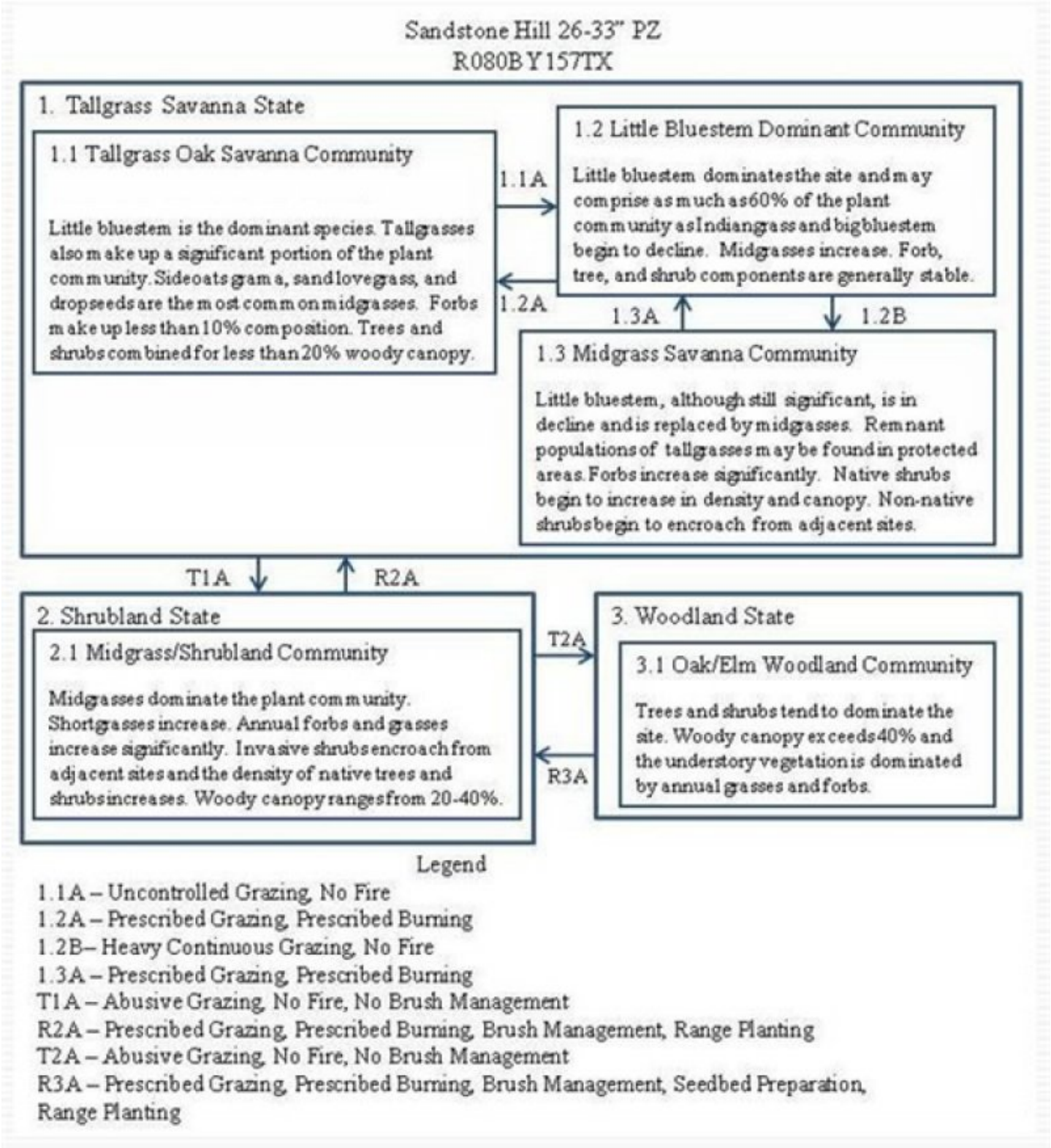
Selective individual removal of undesirable trees and shrubs is relatively easy and more practical when brush plants initially appear on the site. The increase of brush can be fairly rapid and the plants per acre will soon become too numerous for individual control to be feasible. Once woody plants become mature or develop into dense stands, control is expensive, uneconomical, impractical, and difficult to achieve. Brush management is most successful using a systems approach. Initial treatment by mechanical methods can be followed by using approved herbicides, and using prescribed fire as a maintenance technique. Prescribed grazing with a reasonable stocking rate can sustain the grass species composition and production at a near reference level.

Changes in plant communities and vegetation states on the Sandstone Hill site are result of the combined influences of natural events (rainfall, temperature, droughts, etc.) and the accompanying management systems implemented on the area (prescribed fire, grazing management, and brush management).

Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

State and Transitional Pathways:
The State and Transition Diagram which follows provides information on some of the most typical pathways that the vegetation on this site can follow as the result of natural events, management inputs, and application of conservation treatments. There may be other plant communities that can exist on this site under certain conditions. Consultation with local experts and professionals is recommended prior to application of practices or management strategies in order to ensure that specific objectives will be met.

State and transition model



State 1
Tallgrass Savanna State - Reference

The reference plant community for the Sandstone Hill ecological site is a tallgrass oak savanna. In reference conditions, the Tallgrass Oak Savanna Community is a very productive site and is very resilient. Little bluestem is the dominant species, but other tallgrasses comprise a significant part of the plant community as well. Sideoats grama is the dominant midgrass. Shortgrasses such as buffalograss and curlymesquite are also present. A wide variety of perennial forbs occur on this state in the reference state. Trees, shrubs, and vines are a key component of this savanna plant community. Total crown canopy of trees and shrubs is generally less than 10%, but may reach 15% in some situations. Annual production ranges from 2300 to 4000 pounds per acre. The Little Bluestem Dominant Community is noted that during the early stages of departure from the original plant community, little bluestem will initially act as an increaser on this site. As Indiangrass, big bluestem, and switchgrass begin to decline, they are gradually replaced by the more aggressive and disturbance-resistant little bluestem. In this phase, little bluestem totally dominates the site and may comprise as much as 60% of the entire plant community. Species composition of midgrasses, forbs, trees, and shrubs generally remains stable. Annual production is not significantly reduced, but species diversity and overall quality are. Production ranges from 2100 to 3800 pounds per acre. The Midgrass Savanna Community occurs as little bluestem continues to remain a significant part of the plant community, and Indiangrass, big bluestem, and switchgrass plants are usually still present. As they continue to decline, they are replaced by various midgrass species. Forbs increases noticeably on the site. Native shrubs such as sumacs, lotebush, pricklyash, pricklypear, and yucca begin to increase in density and canopy. Mesquite and juniper begin to encroach from adjacent sites. Canopy of trees and shrubs varies from 10% to 20%. Annual production ranges from 1700 to 3000 pounds per acre.

Dominant plant species

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

Community 1.1
Tallgrass Oak Savanna Community

Figure 9. 1.1 Tallgrass Oak Savanna Community

The reference plant community for the Sandstone Hill ecological site is a tallgrass oak savanna. This is a very productive site and is very resilient. It responds quickly to rainfall and proper management. Little bluestem (*Schizachyrium scoparium*) is the dominant species, but Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), and switchgrass (*Panicum virgatum*) are tallgrasses that comprise a significant part of the plant community as well. Sideoats grama (*Bouteloua curtipendula*) is the dominant midgrass. Other important midgrasses include tall (*Sporobolus compositus* var. compositus) and meadow dropseed (*Sporobolus compositus* var. drummondii), Texas wintergrass (*Nassella leucotricha*), silver (*Bothriochloa laguroides*) and cane bluestem (*Bothriochloa barbinodis*), sand lovegrass (*Eragrostis trichodes*), Texas cupgrass (*Eriochloa sericea*), and vine mesquite (*Panicum obtusum*). Shortgrasses such as buffalograss (*Bouteloua dactyloides*), curlymesquite (*Hilaria belangeri*), hairy grama (*Bouteloua hirsuta*), slim (*Tridens muticus* var. muticus) and rough tridens (*Tridens muticus* var. elongatus), and sedges (Carex spp.) are also present. A wide variety of perennial forbs occur on this state in the reference state. They include Engelmann daisy (Engelmannia persistenia), Maximilian sunflower (*Helianthus*

maximiliani), heath aster (*Symphyotrichum ericoides*), gaura (Gaura spp.), bundleflower (Desmanthus spp.), sensitivebriar (Mimosa spp.), yellow neptunia (*Neptunia lutea*), partridgepea (*Chamaecrista fasciculata*), sagewort (Artmesia spp.), gayfeather (Liatris spp.), western ragweed (*Ambrosia psilostachya*), basketflower (*Centaurea americana*), and wild buckwheat (Polygonum spp.). Trees, shrubs, and vines are a key component of this savanna plant community. Post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), live oak (*Quercus virginiana*), Texas oak (*Quercus buckleyi*), elms, hackberry, and ash (Fraxinus spp.) are the primary trees. Shrubs include sumacs (Rhus spp.), bumelia (Sideroxylon spp.), elbowbush (*Forestiera pubescens*), bush honeysuckle (Lonicera diervilla), catclaw acacia (*Acacia greggii*), lotebush (*Ziziphus obtusifolia*), pricklyash (Zanthoxylum spp.), yucca (Yucca spp.), and pricklypear (Opuntia and Cylindropuntia spp.). Vines such as greenbriar (Smilax spp.), Carolina snailseed (*Cocculus carolinus*), Virginia creeper (*Parthenocissus quinquefolia*), ivy treebine (Cissus incisa), and grape (Vitis spp.) are commonly found in the trees and shrubs. Total crown canopy of trees and shrubs is generally less than 10%, but may reach 15% in some situations. Annual production ranges from 2300 to 4000 pounds per acre.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1400	2250	3200
Shrub/Vine	300	300	300
Tree	300	300	300
Forb	300	250	200
Total	**2300**	**3100**	**4000**

Figure 11. Plant community growth curve (percent production by month). TX3014, Tall and mid-grass Savannah, 10 % canopy. Tall and mid grass savannah with some forbs and woody species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

Community 1.2
Little Bluestem Dominant Community

Figure 12. 1.2 Little Bluestem Dominant Community

The tallgrass plant community composition is impacted by disturbances such as uncontrolled grazing, lack of fire, and drought. In the early stages of departure from the original plant community, little bluestem will initially act as an increaser on this site. As Indiangrass, big bluestem, and switchgrass begin to decline, they are gradually replaced by the more aggressive and disturbance-resistant little bluestem. In this phase, little bluestem totally dominates the site and may comprise as much as 60% of the entire plant community. Species composition of midgrasses, forbs, trees, and shrubs generally remains stable. Annual production is not significantly reduced, but species diversity and overall quality are. Production ranges from 2100 to 3800 pounds per acre.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1200	2050	3000
Shrub/Vine	300	300	300
Tree	300	300	300
Forb	300	300	300
Total	**2100**	**2950**	**3900**

Figure 14. Plant community growth curve (percent production by month). TX3014, Tall and mid-grass Savannah, 10 % canopy. Tall and mid grass savannah with some forbs and woody species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

Community 1.3
Midgrass Savanna Community

Figure 15. 1.3 Midgrass Savanna Community

Extended drought conditions, continuing lack of fire and long-term uncontrolled grazing resulted in a new plant community since the midgrasses becomes the dominant plant group. The new community is the Midgrass Savanna Community. Little bluestem remains a significant part of the plant community, and Indiangrass, big bluestem, and switchgrass plants are usually still present. As they continue to decline, they are replaced by sideoats grama, silver bluestem, dropseeds, Texas wintergrass, and other midgrasses. Western ragweed, eryngo (Eryngium spp.), basketflower, curlycup gumweed (*Grindelia squarrosa*), silverleaf nightshade (*Solanum elaeagnifolium*), greenthread (Thelesperma spp.) and beebalm (Monarda spp.) increases noticeably on the site. Native shrubs such as sumacs, lotebush, pricklyash, pricklypear, and yucca begin to increase in density and canopy. Mesquite and juniper begin to encroach from adjacent sites. Canopy of trees and shrubs varies from 10% to 20%. Annual production ranges from 1700 to 3000 pounds per acre.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	750	1400	2150
Shrub/Vine	350	350	350
Tree	300	300	300
Forb	300	250	200
Total	**1700**	**2300**	**3000**

Figure 17. Plant community growth curve (percent production by month). TX3020, Midgrass Savannah, 10% canopy. Midgrass savannah with 10 percent canopy cover. Continuous overgrazing led to the decline of tall grasses and the rise of the midgrass species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

Pathway 1.1A
Community 1.1 to 1.2

Tallgrass Oak Savanna Community

Little Bluestem Dominant Community

With uncontrolled grazing pressure and no fires, the Tallgrass Oak Savanna Community will shift to the Little Bluestem Dominant Community.

Pathway 1.2A
Community 1.2 to 1.1

Little Bluestem Dominant Community

Tallgrass Oak Savanna Community

With Prescribed Grazing and Prescribed Burning conservation practices, the Little Bluestem Dominant Community can be shifted back to the Tallgrass Oak Savanna Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.2B
Community 1.2 to 1.3

Little Bluestem Dominant Community

Midgrass Savanna Community

With heavy continuous grazing pressure and no fires, the Little Bluestem Dominant Community will shift to the Midgrass Savanna Community.

Pathway 1.3A
Community 1.3 to 1.2

Midgrass Savanna Community

Little Bluestem Dominant Community

Prescribed Grazing and Prescribed Burning are several conservation practices that are required in order to shift the Midgrass Savanna Community back to the Little Bluestem Dominant Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

In the Midgrass/Shrubland Community, the tallgrasses are almost completely eliminated and sideoats grama is severely reduced in this state. Midgrasses such as silver bluestem and dropseeds as well as shortgrasses are the dominant grasses. Forbs increases significantly and broomweed invades the site. Trees and shrubs create a midstory canopy below the overstory of oaks, elms, and other trees. Total canopy ranges from 20-40%. Total annual production ranges from 1400 to 2200 pounds per acre.

Dominant plant species

- post oak (*Quercus stellata*), tree
- elm (*Ulmus*), tree
- netleaf hackberry (*Celtis laevigata var. reticulata*), tree
- silver beardgrass (*Bothriochloa laguroides*), grass

Community 2.1
Midgrass/Shrubland Community

Figure 18. 2.1 Midgrass/Shrubland Community

Tallgrasses are almost completely eliminated and sideoats grama is severely reduced in this state. Midgrasses such as silver bluestem and dropseeds as well as shortgrasses including buffalograss, curlymesquite, Texas grama (*Bouteloua rigidiseta*), threeawns(Aristida spp.), and sedges are the dominant grasses. Western ragweed increases significantly and broomweed invades the site. Mesquite (*Prosopis glandulosa*), juniper, lotebush, sumacs, pricklyash, pricklypear, and yucca create a midstory canopy below the overstory of oaks, elms, and other trees. Total canopy ranges from 20-40%. Total annual production ranges from 1400 to 2200 pounds per acre.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	400	800	1300
Shrub/Vine	400	400	400
Tree	300	300	300
Forb	300	250	200
Total	**1400**	**1750**	**2200**

Figure 20. Plant community growth curve (percent production by month). TX3042, Midgrasses/Shrubs/Juniper, 30% Canopy. Midgrass community with significant increase in overstory and midstory canopy, predominantly oak and juniper species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	15	20	20	5	5	14	7	3	2

State 3
Woodland State

At this stage of Oak/Elm Woodland Community, the overstory and midstory canopy of trees and shrubs exceeds 40%. Herbaceous vegetation is primarily early successional midgrasses and perennial forbs, as well as shortgrasses, sedges, and annual forbs and grasses. The original herbaceous plant community has essentially been eliminated at this stage. All of the original tree and shrub species still exist, but most of them have increased in frequency of occurrence and canopy because of the lack of fire. Invading trees and shrubs may become the dominant species in many instances. Annual production ranges from 1000 to 1400 pounds per acre.

Dominant plant species

- post oak (*Quercus stellata*), tree
- elm (*Ulmus*), tree
- netleaf hackberry (*Celtis laevigata var. reticulata*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- brome (*Bromus*), grass
- sedge (*Carex*), other herbaceous

Community 3.1
Oak/Elm Woodland Community

Figure 21. 3.1 Oak/Elm Woodland Community

At this stage, the overstory and midstory canopy of trees and shrubs exceeds 40%. Herbaceous vegetation is primarily early successional midgrasses and perennial forbs, as well as shortgrasses, sedges, and annual forbs and grasses. The original herbaceous plant community has essentially been eliminated at this stage. All of the original

tree and shrub species still exist, but most of them have increased in frequency of occurrence and canopy because of the lack of fire. Invading trees and shrubs may become the dominant species in many instances. Annual production ranges from 1000 to 1400 pounds per acre.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	400	400	400
Tree	400	400	400
Forb	100	200	300
Grass/Grasslike	100	200	300
Total	**1000**	**1200**	**1400**

Figure 23. Plant community growth curve (percent production by month). TX3046, Juniper Woodland, Closed Canopy. Juniper woodland with more than 50% canopy, significantly reduced herbaceous understory vegetation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	5	10	15	20	5	3	2	10	10	10	5

Transition T1A
State 1 to 2

Abusive grazing pressure, no fires, and no brush management leads the transition from the Tallgrass Savanna State to the Shrubland State.

Restoration pathway R2A
State 2 to 1

With the implementation of various conservation practices including Prescribed Grazing, Prescribed Burning, Brush Management, and Range Planting, the Shrubland State can be restored to the Tallgrass Savanna State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A
State 2 to 3

With abusive grazing practices, no fires, and no brush management, the Shrubland State will transition into the Woodland State.

Restoration pathway R3A
State 3 to 2

With Prescribed Grazing, Prescribed Burning, Brush Management, Seedbed preparation, and Range Planting, the Woodland State can be restored to the Shrubland State.

Conservation practices

Brush Management
Prescribed Burning

Prescribed Grazing
Range Planting

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass**			600–1300	
	little bluestem	SCSC	*Schizachyrium scoparium*	600–1300	–
2	**Tallgrasses**			200–800	
	big bluestem	ANGE	*Andropogon gerardii*	50–500	–
	Indiangrass	SONU2	*Sorghastrum nutans*	100–500	–
	switchgrass	PAVI2	*Panicum virgatum*	0–300	–
3	**Midgrass**			100–400	
	sideoats grama	BOCU	*Bouteloua curtipendula*	100–400	–
4	**Midgrasses**			200–450	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	0–200	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	0–200	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	0–200	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	0–200	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–200	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	0–200	–
	vine mesquite	PAOB	*Panicum obtusum*	0–200	–
	bristlegrass	SETAR	*Setaria*	0–200	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–200	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	0–200	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–200	–
	purpletop tridens	TRFL2	*Tridens flavus*	0–200	–
5	**Mid/Shortgrasses**			100–250	
	buffalograss	BODA2	*Bouteloua dactyloides*	0–200	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–100	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–100	–
	cedar sedge	CAPL3	*Carex planostachys*	0–100	–
	hooded windmill grass	CHCU2	*Chloris cucullata*	0–100	–
	tumble windmill grass	CHVE2	*Chloris verticillata*	0–100	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–100	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–100	–
	gummy lovegrass	ERCU	*Eragrostis curtipedicellata*	0–100	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	0–100	–
	tumble lovegrass	ERSE2	*Eragrostis sessilispica*	0–100	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–100	–
	Hall's panicgrass	PAHAH	*Panicum hallii var. hallii*	0–100	–

	panicgrass	PANIC	*Panicum*	0–100	–
	crowngrass	PASPA2	*Paspalum*	0–100	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–100	–
	white tridens	TRAL2	*Tridens albescens*	0–100	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–100	–
	slim tridens	TRMUM	*Tridens muticus var. muticus*	0–100	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–100	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–100	–
Forb					
6	**Forbs**			100–200	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–200	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–200	–
	American star-thistle	CEAM2	*Centaurea americana*	0–200	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–200	–
	buckwheat	ERIOG	*Eriogonum*	0–200	–
	Leavenworth's eryngo	ERLE11	*Eryngium leavenworthii*	0–200	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–200	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–200	–
	awnless bushsunflower	SICA7	*Simsia calva*	0–200	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–200	–
	stemmy four-nerve daisy	TESC2	*Tetraneuris scaposa*	0–100	–
	spiderwort	TRADE	*Tradescantia*	0–100	–
	Texas vervain	VEHA	*Verbena halei*	0–100	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–100	–
	yellow puff	NELU2	*Neptunia lutea*	0–100	–
	evening primrose	OENOT	*Oenothera*	0–100	–
	Drummond's skullcap	SCDR2	*Scutellaria drummondii*	0–100	–
	Texas skeletonplant	LYTE	*Lygodesmia texana*	0–100	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–100	–
	lespedeza	LESPE	*Lespedeza*	0–100	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–100	–
	beeblossom	GAURA	*Gaura*	0–100	–
	Dakota mock vervain	GLBIB	*Glandularia bipinnatifida var. bipinnatifida*	0–100	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–100	–
	partridge pea	CHFA2	*Chamaecrista fasciculata*	0–100	–
	whitemouth dayflower	COER	*Commelina erecta*	0–100	–
	prairie clover	DALEA	*Dalea*	0–100	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–100	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–100	–
	velvet bundleflower	DEVE2	*Desmanthus velutinus*	0–100	–
	Berlandier's sundrops	CABE6	*Calylophus berlandieri*	0–100	–
	purple poppymallow	CAIN2	*Callirhoe involucrata*	0–100	–

	Texas Indian mallow	ABFR3	*Abutilon fruticosum*	0–100	–
Shrub/Vine					
7	**Shrubs/Vines**			100–300	
	Texas persimmon	DITE3	*Diospyros texana*	0–100	–
	stretchberry	FOPU2	*Forestiera pubescens*	0–100	–
	western white honeysuckle	LOAL	*Lonicera albiflora*	0–100	–
	algerita	MATR3	*Mahonia trifoliolata*	0–100	–
	Texas Hercules' club	ZAHI2	*Zanthoxylum hirsutum*	0–100	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–100	–
	creek plum	PRRI	*Prunus rivularis*	0–100	–
	plum	PRUNU	*Prunus*	0–100	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–100	–
	prairie sumac	RHLA3	*Rhus lanceolata*	0–100	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–100	–
	gum bully	SILA20	*Sideroxylon lanuginosum*	0–100	–
	bigtooth maple	ACGRG	*Acer grandidentatum var. grandidentatum*	0–100	–
	sorrelvine	CITR2	*Cissus trifoliata*	0–50	–
	Carolina coralbead	COCA	*Cocculus carolinus*	0–50	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–50	–
	greenbrier	SMILA2	*Smilax*	0–50	–
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–50	–
	grape	VITIS	*Vitis*	0–50	–
	yucca	YUCCA	*Yucca*	0–50	–
	pricklypear	OPUNT	*Opuntia*	0–50	–
	Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	0–50	–
Tree					
8	**Trees**			100–300	
	blackjack oak	QUMA3	*Quercus marilandica*	100–300	–
	post oak	QUST	*Quercus stellata*	100–300	–
	Texas live oak	QUFU	*Quercus fusiformis*	100–200	–
	American elm	ULAM	*Ulmus americana*	0–100	–
	cedar elm	ULCR	*Ulmus crassifolia*	0–100	–
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	0–100	–
	Texas red oak	QUBU2	*Quercus buckleyi*	0–100	–

Animal community

Historically, the Sandstone Hill site was inhabited permanently and intermittently by a wide variety of mammals, reptiles, and birds. Several historical references and journals written in the 18th and 19th century by explorers, survey parties, and military expeditions refer to herds of bison, wild cattle, wild horses, deer, and antelope roaming freely across the North Central Prairie and adjacent regions.

The Sandstone Hill site provides excellent habitat for many species of wildlife due to the rough, steep terrain and the diversity of plant species, growth forms, distribution, and structure of the vegetation that occurs. The site provides shelter, escape cover, and nesting habitat, as well as a variety of browse, mast, seeds, and fruit that are

important to the diets of various wildlife species. Currently, the site is utilized by deer, wild turkey, numerous species of birds, and a variety of small fur-bearing mammals. Animal species and populations fluctuate as the vegetation cycles through temporary phases and different ecological stages.

Because of the tree and shrub component and the topography, the Sandstone Hill site is well suited for grazing and browsing by goats, but the steeper slopes and areas where there are more rocks and boulders are inaccessible or avoided by other livestock. Grazing by cattle is usually limited to the lower slopes and benches on this site. Most small statured European breeds of cattle are not well suited to this site. Some of the hardier breeds of cattle are better suited to the slopes and the rugged terrain, but are still not well adapted for the steep slopes and lack of water sources on the site. Livestock grazing and distribution can be improved by providing water sources, providing supplemental feed in strategic locations, and by implementing grazing management systems that incorporate frequent and timely deferment periods

Hydrological functions

The Sandstone Hill site has a very good soil-water-air-plant relationship because of the amount of rock on the soil surface in the upper portions of the soil profile. It is very resilient and can respond quickly to rainfall events. Showers and light rains can be very effective on this site. Surface rocks retain moisture and release it slowly to the soil and vegetation following showers and light rainfall. Rocks and fragments in the soil provide pockets for oxygen, moisture, and plant roots.

When herbaceous vegetation and ground cover are maintained in a healthy and vigorous status, water infiltration into the soil profile is increased significantly, resulting in less runoff. A healthy cover of grass results in improved water quality because it serves as a filter or trap to reduce sediments and pollutants before the water flows offsite.

Surface runoff is moderate to rapid during heavy rainfall events due to the rough, steep topography. As the canopy of trees and shrubs increases, more rainfall is intercepted before it can reach the soil surface or herbaceous vegetation below. Where dense canopies of trees and shrubs occur on this site, the effectiveness of rainfall is severely reduced or eliminated because the moisture never reaches the understory vegetation.

Recreational uses

These scenic areas offer outdoor activities including photography, shaded picnic areas, bird watching, hiking, camping, horseback riding, and off-road vehicle use. The Sandstone Hill site is a prime site for wildlife habitat. Where it is managed properly, it provides outstanding opportunities for hunting deer and turkey.

Wood products

Oaks and some of the other hardwood trees can be used for fence posts or firewood. Some of the woody species may be used for specialty products and crafts.

Other products

Plums, agarito berries and pricklypear tunas can be eaten or used to make jelly.
These scenic areas offer outdoor activities including photography, shaded picnic areas, bird watching, hiking, camping, horseback riding, and off-road vehicle use. Hunting quail, dove, deer, and turkey.

Other information

None.

Inventory data references

Vegetation data for this site was obtained from existing Range Site Descriptions, SCS-RANGE -417 Production and Composition Records for Native Grazing Lands, and on-site inventories by the author and local experts including ranchers, natural resource specialists from federal and state agencies, and personnel from cooperating agencies and organizations. A total of 39 SCS-RANGE-417’s containing data collected from 10 counties during the period

12/30/1981 to 12/12/1986 were reviewed for this site.

References

. 2021 (Date accessed). USDA PLANTS Database. http://plants.usda.gov.

Other references

Ajilvsgi, Geyata. Wildflowers of Texas. Sharer Publishing, Bryan, TX. 1984.

Burns, Paul. Personal communication. 10/4/2007.

Coffey, Chuck R., and Russell Stevens. Grasses of Southern Oklahoma and North Texas: A Pictorial Guide. The Samuel Roberts Noble Foundation, Ardmore, OK. 2004

Diggs, George M., Jr., Barney L. Lipscomb, and Robert J. O'Kennon. Illustrated Flora of North Central Texas. Botanical Research Institute of Texas. Fort Worth, TX 1999.

Egan, Dave and Evelyn A. Howell. The Historical Ecology Handbook…A Restorationist's Guide to Reference Ecosystems. Island Press, Washington, DC. 2001.

Enquist, Marshall. Wildflowers of the Texas Hill Country. Lone Star Botanical, Austin, TX. 1987.

Flores, Dan. "Indian Use of Range Resources" presented at 20th Annual Ranch Management Conference. Lubbock, TX, September 30, 1983.

Gould, Frank W., The Grasses of Texas. Texas A&M University Press, College Station, TX. 1975.

Hatch, Stephan L., Kancheepuram N. Gandhi, and Larry E. Brown. Checklist of the Vascular Plants of Texas. Texas Agricultural Experiment Station MP-1655. College Station, TX. 1990

Hatch, Stephan L., Jennifer Pluhar. Texas Range Plants. Texas A&M University Press, College Station, TX. 1993.

Kelton, Elmer. "History of Rancher Use of Range Resources" presented at 20th Annual Ranch Management Conference. Lubbock, TX, September 30, 1983.

Nelson, Paul W. The Terrestrial Natural Communities of Missouri. Missouri Department of Natural Resources. 1985.

Parker, W.B. Through Unexplored Texas In The Summer and Fall of 1854. The Texas State Historical Commission. Austin, TX 1984

Smith, Jared G. Grazing Problems in the Southwest and How to Meet Them. United States Department of Agriculture Division of Agrostology. Washington, DC. 1899.

Texas Almanac Sesquicentennial Edition 1857-2007. Dallas Morning News. Dallas, TX. 2006.

Tyrl, Ronald J., Terrence G. Bidwell, and Ronald E. Masters. Field Guide to Oklahoma Plants. Oklahoma State University, Stillwater, OK. 2002.

United States Department of Agriculture Natural Resources Conservation Service, National Plant Data Center, Baton Rouge, LA. The PLANTS Database. http://plants.usda.gov 2007.

United States Department of Agriculture Natural Resources Conservation Service, Ag Handbook 296. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. 2006.

United States Department of Agriculture Soil Conservation Service, Temple, TX. Production and Composition Record for Native Grazing Lands. SCS-RANGE 417 data from Brown, Eastland, Jack, Stephens, and Young Counties. 1981-1986.

United States Department of Agriculture Soil Conservation Service, Washington, DC. Web Soil Survey http://websoilsurvey.nrcs.usda.gov/app/. 2007

United States Department of Agriculture Soil Conservation Service, Temple, TX. Published Soil Surveys: Brown and Mills, Jack, Palo Pinto, Stephens, and Young Counties. Various publication dates.

United States Department of Agriculture Soil Conservation Service, Temple, TX. Range Site Descriptions for the North Central Prairie counties. Various publication dates.

Vines, Robert A. Trees of North Texas. University of Texas Press, Austin, TX. 1982

Weniger, Del. The Explorers' Texas. Eakin Publications. Austin, TX. 1984.

Williams, Gerald W. References On The American Indian Use Of Fire in Ecosystems. United States Department of Agriculture – Forest Service, Washington, DC. 2005.

ACKNOWLEDGEMENTS: I would like to express my thanks and appreciation to the following for their cooperation, assistance, and support in the development of this Ecological Site Description:
Tony Baeza, NRCS – Breckenridge, TX
John T. Baker, rancher – Dallas, TX
Baker Ranch – Mineral Wells, TX
Byerly Ranch – Graham, TX
Tony Dean, NRCS – Henrietta, TX
Fort Richardson State Park – Jacksboro, TX
Matt Gregory, NRCS – Jacksboro, TX
John Paclik, NRCS – Graham, TX
Richards Ranch – Jacksboro, TX

Reviewers:
Lem Creswell, RMS, NRCS, Weatherford, Texas
Kent Ferguson, RMS, NRCS, Temple, Texas
Justin Clary, RMS, NRCS, Temple, Texas

Contributors

Dan Caudle, DMS Natural Resources Management, Weatherford, Texas
PES edits by Colin Walden, Stillwater Soil Survey Office

Approval

Bryan Christensen, 9/19/2023

Acknowledgments

Site Development and Testing Plan:

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

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)	Lem Creswell, Zone RMS, NRCS, Weatherford, Texas
Contact for lead author	817-596-2865
Date	10/28/2007
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:** Deposition or erosion is uncommon during normal rainfall events, but may occur in limited areas during intense rainfall events.

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 20% bare ground scattered randomly throughout the site.

5. **Number of gullies and erosion associated with gullies:** Few rills and no gullies should occur.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Little or no litter movement or deposition during normal rainfall events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface in HCPC is resistant to wind erosion. Stability range is expected to be 5-6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0-3 inches of dark grayish brown gravelly sandy loam brown with weak fine granular structure; boulders 2-20 feet across cover

about 15% of the surface, stones 8-24 inches across cover about 45% of the surface, sandstone pebbles and conglomerate less than 3 inches across cover about 27% of the surface. SOM is 1-4%. See Soil Survey for specific information.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The tallgrass/midgrass savanna with abundant forbs, adequate litter, and little bare ground provides for maximum infiltration and negligible runoff.

---

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

---

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 midgrass > Trees > Shrubs/Vines > Forbs >

    Other: Cool-season grasses > Warm-season shortgrasses

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Perennial grasses will naturally exhibit a minor amount (less than 5%) of senescence and some mortality every year.

---

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2300 to 4000 pounds per acre.

---

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, redberry juniper, pricklypear, yucca, tasajillo, pricklyash, lotebush, mesquite, King Ranch bluestem, annual broomweed.

---

17. **Perennial plant reproductive capability:** All perennial species should be capable of reproducing every year unless disrupted by extended drought, overgrazing, wildfire, insect damage, or other events occuring immediately prior to, or during the reproductive phase.