USDA Natural Resources Conservation Service

Ecological site R085AY276TX
Gravelly 30-38 PZ

Last updated: 9/21/2023
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): 085A–Grand Prairie

The Grand Prairie MLRA is characterized by predominately loam and clay loam soils underlain by limestone and shale. Topography transitions from steeper ridges and summits of the Lampasas Cut Plain on the southern end to the more rolling hills of the Fort Worth Prairie to the north. The Arbuckle Mountain area in Oklahoma is also within this MLRA.

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 moderately deep, calcareous soils over limestone. Due to the high lime soils, overall production is typically lower than adjacent sites that are less calcareous. The soils associated with this site were formerly correlated to the Adobe ecological site. Future projects will further refine the concepts, production, and plant composition for this site. The reference vegetation includes native tallgrasses and midgrasses with numerous forbs and very few woody species. In the absence of fire or other brush management, the woody species may begin to dominate the site.

Associated sites

R085AY179TX	**Clayey Slope 30-38** This site is at a lower elevation, has deeper soils and less gravel.

Similar sites

R085AY176TX	**Adobe 30-38" PZ** Similar site with fewer gravels and a higher AWC.

Table 1. Dominant plant species

Tree	(1) *Quercus fusiformis* (2) *Quercus buckleyi*

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

Physiographic features

This site occurs on base slopes, side slopes, and crests of hillslopes in the Grand Prairie. This site is characteristically transitory between steep water shedding sites and concave water receiving sites. Slopes are typically less than 12 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope (2) Hills > Ridge
Runoff class	Medium to high
Ponding frequency	None
Elevation	152–579 m
Slope	1–12%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

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

Climatic features

The climate is subhumid subtropical and is characterized by hot 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 should occur around November 5 and the last freeze of the season should occur around March 19.

The average relative humidity in mid-afternoon is about 60 percent. 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 south and highest windspeeds occur during the spring months.

Approximately two-thirds of annual rainfall occurs during the April to September period. Rainfall during this period generally falls during thunderstorms, and fairly large amounts of rain may fall in a short time. The driest months are usually July and August.

Table 4. Representative climatic features

Frost-free period (characteristic range)	194-208 days
Freeze-free period (characteristic range)	216-243 days
Precipitation total (characteristic range)	813-965 mm
Frost-free period (actual range)	190-209 days
Freeze-free period (actual range)	209-245 days
Precipitation total (actual range)	787-991 mm
Frost-free period (average)	201 days
Freeze-free period (average)	230 days

Precipitation total (average)	889 mm

Climate stations used

- (1) BENBROOK DAM [USC00410691], Fort Worth, TX
- (2) CLEBURNE [USC00411800], Cleburne, TX
- (3) WHITNEY DAM [USC00419715], Clifton, TX
- (4) DENTON MUNI AP [USW00003991], Ponder, TX
- (5) DECATUR [USC00412334], Decatur, TX
- (6) EVANT 1SSW [USC00413005], Evant, TX
- (7) BROWNWOOD 2ENE [USC00411138], Early, TX
- (8) LAMPASAS [USC00415018], Lampasas, TX

Influencing water features

These sites are in upland positions that shed water to adjacent areas downslope. The presence of deep-rooted tallgrass and midgrass species help facilitate infiltration into the soil. They are not associated with wetland sites.

Wetland description

NA

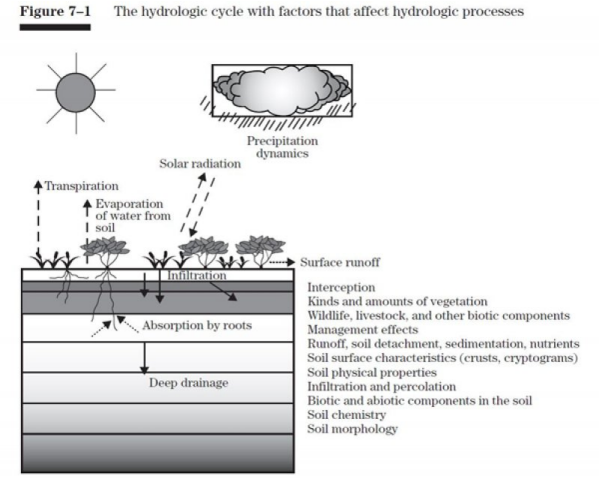


Figure 8.

Soil features

Representative soil components for this ecological site include: Cranfill and Somervell

The site is characterized by moderately deep to very deep, well drained, moderately permeable soils that formed in loamy calcareous colluvial sediments containing limestone gravel.

Table 5. Representative soil features

Parent material	(1) Residuum–limestone (2) Colluvium–mudstone (3) Residuum–mudstone (4) Colluvium–limestone
Surface texture	(1) Gravelly clay loam (2) Gravelly loam (3) Very gravelly clay loam (4) Very gravelly loam
Drainage class	Well drained

Permeability class	Moderate
Soil depth	102–203 cm
Surface fragment cover <=3"	5–50%
Surface fragment cover >3"	5–10%
Available water capacity (0-101.6cm)	7.62–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	10–85%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	25–60%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

The reference plant community for the Gravelly site is a tallgrass prairie with scattered oaks. Soils are nearly level to 8 percent slopes. The grasses are primarily little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), tall grama (Bouteloua pectinata) and smaller amounts of Virginia wildrye (*Elymus virginicus*), seep muhly (*Muhlenbergia reverchonii*) and Lindheimer's muhly (*Muhlenbergia lindheimeri*). The clay textured soils in a rainfall regime of 30 to 36 inch favors the tallgrass plant structure. Both buffalo impact and fires were dominant forces to manipulate the historic tallgrass community. Large herds of buffalo would intensely graze this site, usually following a fire, and then not come back for many months or even years. The collective influence of animal impact, fire, and weather, were the key to maintaining the open tallgrass with the broadly spaced oaks.

Fires that originated with Native Americans or lightning not only maintained the original prairie vegetation, they also had a major impact on the plant community structure. These fires would burn in mosaic patterns and go out where fuel loads were sparse, such as on the steeper slopes. Fire does not produce high mortality in older, resprouting, woody plants but does reduce canopy cover in the short term. These early fires were extensive and probably occurred any time the grass was dry enough to burn. Grass species such as little bluestem, big bluestem and Indiangrass are generally responsive to fire, while forbs are stimulated if the timing is right. Grazing following fire usually created more diversity for a year or two post-burn. Without fire and grazing the diversity decreased. Moisture of course was a major factor in creating diversity in the plant community.

With abusive grazing practices, Indiangrass will become lower in vigor; little bluestem will increase; secondary successional species such as sideoats grama, silver bluestem (*Bothriochloa laguroides*) and Texas wintergrass (*Nassella leucotricha*) will increase along with an increase of woody plants. Little bluestem is tolerant of fairly heavy grazing for long periods, but at some point, a threshold will be crossed and the ground cover is reduced, resulting in bare places where weedy species can establish. Plants such as Texas wintergrass seep muhly, Wright's (*Aristida purpurea* var. wrightii) and purple threeawn (*Aristida purpurea*), red grama (*Bouteloua trifida*), Western ragweed (*Ambrosia psilostachya*), prairie coneflower (*Ratibida columnifera*), sumpweed (*Iva annua*) and cool-season annuals will quickly invade if the principal species are in a weakened condition. Birds consume the seed of many woody species and when passed through the digestive system and excreted in the droppings, easily establish. Grazing management with cattle alone probably has minimal effect on the proliferation of woody plants, but a good cover of perennial grasses minimizes the seed-to-soil contact woody plants such as mesquite need to establish. Prescribed fire helps to control the seedlings. Selective removal of mesquite or juniper is easy and economical when a few plants begin to show up on the site. However, the increase of plants can be fairly rapid and the number of woody plants per acre will soon become too numerous for individual control to be feasible. Prescribed grazing

can sustain the grass species composition and production at a near reference levels even during the initial stages of brush invasion. However, the Adobe site can be abused to the point that the perennial warm-season grasses thin out and lower successional grasses and annual forbs begin to dominate. This process of degradation usually takes many years and is exacerbated by summer drought and above average winter moisture.

Long-term droughts that occur only three to four times in a century can effect some change in plant communities, when coupled with abusive grazing. Short-term droughts are common and usually do not have a lasting effect in changing stable plant communities, although production will be affected. When brush canopy becomes established enough to sufficiently shade the ground, the site tends to favor cool-season annual species. Once a state of brush and cool season annuals is reached, recovery to a perennial warm-season grass cover is unlikely without major inputs of brush management and reseeding. In summary, the change in states of vegetation depends on the type of grazing management as well as vegetation manipulation practices applied over many years, and the rate of invasion and establishment of woody species. The effects of seasonal moisture and short-term dry spells become more pronounced after the site crosses a threshold to a different plant community. Plant communities that consist of warm-season perennial grasses such as little bluestem and the associated species of the reference community 1.1 are resilient and can withstand climatic extremes with only minor shifts in the overall plant community.

Native Americans ruled the prairies for nearly three centuries prior to 1800 using horses imported from the Spanish explorers. These same explorers brought domesticated cattle to Texas as early as 1690 and by the late 1700's the livestock became wild and free ranging in South Texas. Unmanaged, the cattle began competing with the native ruminants such as buffalo, elk, and pronghorn antelope and had an impact on white-tailed deer. By 1845, European settlers reduced wild fires. Cattle herds continued to expand especially after the slaughter and near extinction of the buffalo in the 1870's. Then in 1867 a railhead was established in Abilene, Kansas which caused a thriving livestock industry to be born and the development of the trailing era. By early 1880's the Texas prairies became more and more overstocked. By 1885 livestock were fenced, further concentrating livestock and causing a deteriorated plant community due to overgrazing and droughts. By the 1920's large prairie land areas had been put to the plow. Early farmers had to protect their crops from burning, so it was even more important for them to control fire than it was for the livestock operators. With the cessation of fire, prairies soon gave way to woodland and shrubland in many areas. Overgrazing and drought reduced grass vigor and left little ground cover or litter to carry fire.

This site, historically, was inhabited by grassland wildlife species such as bison, grassland birds and small mammals. Over the years, as the site has changed to a more mixed-grass and shrub community hence, more wildlife species utilize it for habitat. Woody plants provide cover for white-tailed deer and bobwhite quail. These wildlife species have increased as the brushy plants increased. This created habitat for species that prefer a lower successional plant community than the historic climax community. It is often the objective of many land owners to manage for a plant community that is a compromise between these wildlife species and domestic livestock. This can be done with a carefully planned grazing and brush management program. Managing at a lower successional state may meet some wildlife species requirements very well, but may not be as productive for cattle grazing, nutrient cycling, hydrologic protection, plant community stability or soil protection. A proper balance can be achieved with careful planning that considers all resources.

Hydrologically, the site contributes runoff to various draws, creeks, and streams that are common in the MLRA. If a perennial tallgrass cover is maintained in good vigor, maximum water infiltration will occur and runoff will be reduced. More water captured in the soil will support a more productive plant community with less runoff. Runoff that does occur has less sediment. Much of the site has a benched or stair-stepped appearance, with soils high in calcium carbonate content making the soils droughty and causing rapid run off; even with good plant cover. Except for footslopes, the soils may not have an A horizon.

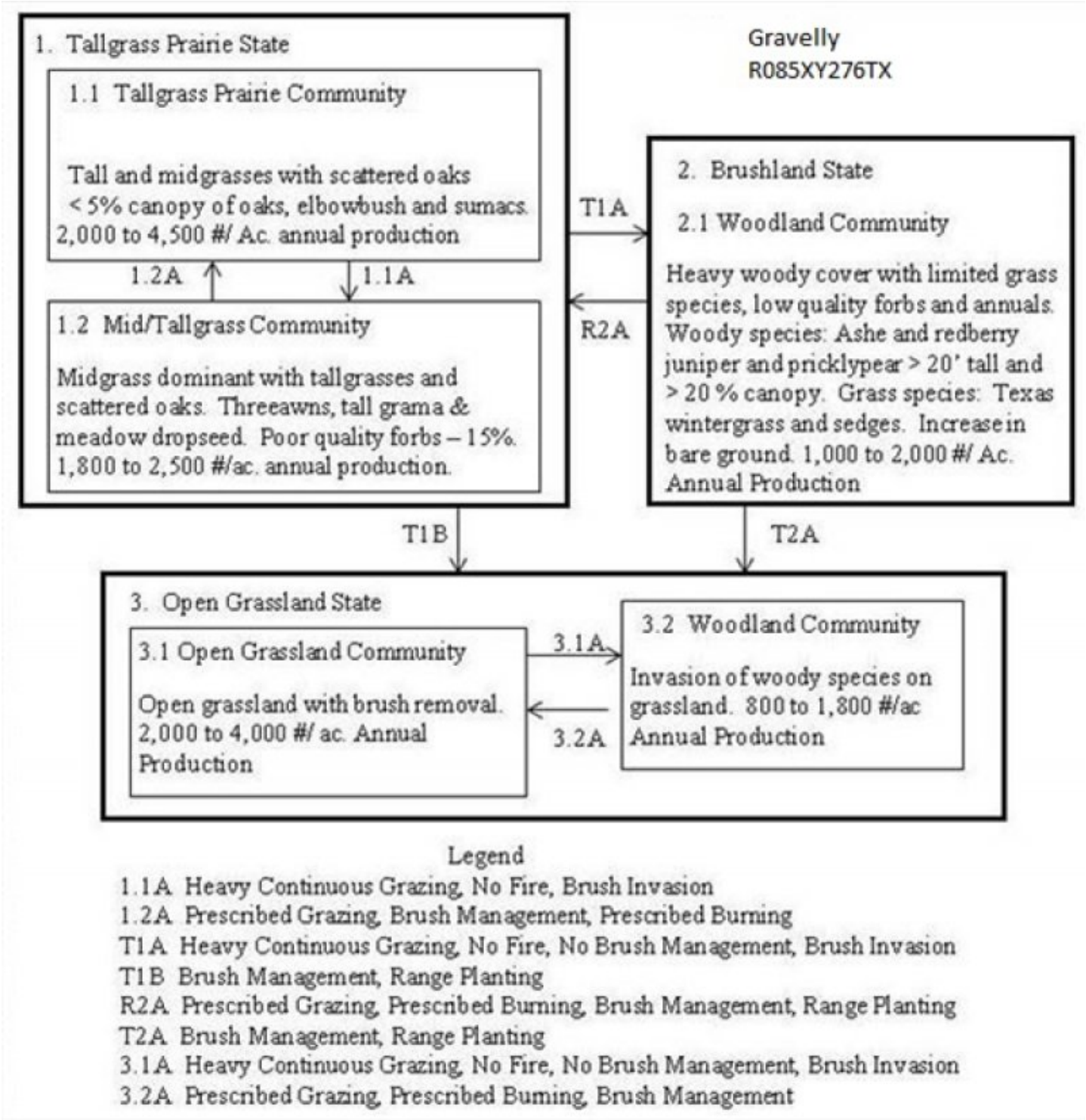
A loss of soil organic matter has a negative impact on infiltration and soil compaction. More rainfall becomes overland flow, which increases soil erosion and flooding above normal levels. Soils with low organic matter are more prone to drought stress because they store less water. Overall watershed protection is enhanced by healthy grassland communities.

State and Transitional Pathways: Narrative
The following diagram suggests some pathways that vegetation on this site might take in response to various treatments or natural stimuli over time. There may be other states that are not shown on this diagram. This information identifies the changes in plant communities that do occur due to management practices and natural factors. The plant communities described here are commonly observed on this site. Before making plans to

manipulate the plant community for specific purposes, consult local professionals.

Changes in plant community makeup may be due to many factors. Change may occur slowly or in some cases, fairly rapidly. As vegetative changes occur, certain thresholds are crossed. A threshold is means that once a certain point is reached during the transition of one community to another, a return to the previous state may not be possible without the input of some form of energy. This often means intervention with practices that are not part of natural processes. An example might be the application of herbicide to control some woody species to reduce their population and encourage more grass and forbs growth. Merely adjusting grazing practices would probably not accomplish any significant change in a plant community once certain thresholds are crossed. The amount of energy required to effect change in community would depend on the present vegetative state and the desired change.

State and transition model



State 1

Tallgrass Prairie State - Reference

The interpretive plant community for this site is a Tallgrass Prairie Community (1.1). The community is dominated by warm-season perennial tallgrasses such as little bluestem and Indiangrass. Other major perennial grass species are well dispersed through the site. Perennial forbs are well represented throughout the community. The plant community evolved under short duration, heavy use by large herbivores. This short, heavy grazing was followed by long rest periods due to herd migration along with occasional fire. Annual production ranges from 2000 to 4500 pounds per acre. The Mid/Tallgrass Community consists of tallgrasses and forbs that will start to disappear from the plant community and are replaced by midgrasses. Invader brush species such as Ashe juniper (*Juniperus ashei*) appears and becomes established. Shrubs and woody vines also start to increase. Cool-season grasses will increase as brush canopy increases. Annual production ranges from 1800 to 2500 pounds per acre.

Dominant plant species

- Texas live oak (*Quercus fusiformis*), tree
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1
Tallgrass Prairie Community

Figure 9. 1.1 Tallgrass Prairie Community

The interpretive plant community for this site is a Tallgrass Prairie Community (1.1). The community is dominated by warm-season perennial tallgrasses such as little bluestem and Indiangrass. Other major perennial grass species such as sideoats grama, tall grama, tall dropseed (*Sporobolus compositus* var. compositus), and cane (*Bothriochloa barbinodis* var. barbinodis), pinhole (*Bothriochloa barbinodis* var. perforata) and silver bluestem are well dispersed through the site. Perennial forbs such as sunflowers (Helianthus spp.), prairie clovers (Dalea spp.), bundleflowers (Desmanthus spp.), and daleas (Dalea spp.) are well represented throughout the community. The plant community evolved under short duration, heavy use by large herbivores. This short, heavy grazing was followed by long rest periods due to herd migration along with occasional fire. With heavy grazing pressure and the removal of fire, the historic community will change into a Mid/Tallgrass Community (1.2) and Woodland Community (2.1). These three communities can become an open grassland state when brush is eliminated and range planting is applied. Thus the Open Grassland community (3.1) becomes established. This may become a Woodland Community (3.2) with heavy continuous grazing and no fire. The Tallgrass Community (1.1) can go directly to the Woodland Community or Brushland State (2.1) in the absence of fire or some method of suppressing the brush species and still have the tallgrass component present. The changes within the grassland communities can change fairly rapidly while communities having an increase of woody plants change somewhat slower.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1793	2914	4035
Forb	224	364	504
Shrub/Vine	140	230	314
Tree	84	135	191
Total	**2241**	**3643**	**5044**

Figure 11. Plant community growth curve (percent production by month). TX6011, Warm-season perennial tallgrass prairie. The community is dominated by warm-season perennial tallgrasses with few shrubs, trees and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	2	18	23	17	6	4	16	6	3	2

Community 1.2
Mid/Tallgrass Community

Figure 12. 1.2 Mid/Tallgrass Community

This transition state occurs without fire or brush management coupled with heavy yearlong grazing. The tallgrasses and forbs such as little bluestem, Indiangrass, bush sunflower (*Simsia calva*), and Engelmann's daisy (*Engelmannia peristenia*) will start to disappear from the plant community replaced by midgrasses such as seep muhly, sideoats grama, Wright's and purple threeawn, slim (*Tridens muticus*) and rough tridens (*Tridens muticus* var. muticus) which will increase. Invader brush species such as Ashe juniper (*Juniperus ashei*) appears and becomes established. Greenbriar (*Smilax bona-nox*), bumelia (*Sideroxylon lanuginosum*), sumac (Rhus spp.) and hackberry (Celtis spp.) also start to increase. Texas wintergrass (*Nassella leucotricha*) increases as brush canopy increases. Continuous heavy grazing by domestic livestock and fire suppression has accelerated the shift towards the Woodland Community (2.1). The Mid/Tallgrass Community (1.2) can revert back to the Tallgrass Prairie Community (1.1) with prescribed burning and/or prescribed grazing. Without prescribed burning and/or prescribed grazing, this plant community would continue to shift toward the Woodland Community (2.1). The Tallgrass Prairie Community (1.1) or the Mid/Tallgrass Community (1.2) can be converted to an open grassland community by eliminating all brush and applying range planting. This state then is an Open Grassland Community (3.1) that could also become invaded with woody species in the absence fire or brush management and with heavy yearlong grazing. Then the Woodland Community (3.2) becomes established. The seeded state with prescribed burning and prescribed grazing could not revert back to the tallgrass prairie state within a reasonable time, because the oaks and other higher successional plants have been eliminated.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1412	1687	1961
Forb	303	359	420
Shrub/Vine	202	241	280
Tree	101	123	140
Total	**2018**	**2410**	**2801**

Figure 14. Plant community growth curve (percent production by month). TX6025, Midgrass/Tallgrass Prairie Community. The tallgrasses and forbs are starting to be replaced by midgrasses and invader brush species (less than fifteen percent canopy)..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	2	18	23	17	6	4	16	6	3	2

Pathway 1.1A
Community 1.1 to 1.2

Tallgrass Prairie Community **Mid/Tallgrass Community**

The Tallgrass Prairie Community will shift to the Mid/Tallgrass Prairie Community due to heavy continuous grazing, no fires, and brush invasion.

Pathway 1.2A
Community 1.2 to 1.1

Mid/Tallgrass Community **Tallgrass Prairie Community**

The Mid/Tallgrass Community (1.2) can revert back to the Tallgrass Prairie Community (1.1) with prescribed burning and/or prescribed grazing.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Brushland State

This State only has one community: the Woodland Community (2.1) which is recognized in having greater than 20% woody canopy dominated by Ashe juniper, redberry juniper, prickly pear, and honey mesquite. Other species present in small amounts are hackberry, Texas oak, and live oak. The herbaceous understory is almost nonexistent. Shade-tolerant species such as Texas wintergrass and cedar sedge tends to dominate the site where mesquite is dominant. When the canopy of juniper increases toward a cedar breaks community, most grasses have almost disappeared. Due to the presence of shade, the amount of total grass cover is greatly reduced which in turn reduces herbaceous production. Annual production ranges from 1000 to 2000 pounds per acre.

Dominant plant species

- Texas live oak (*Quercus fusiformis*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- Texas wintergrass (*Nassella leucotricha*), other herbaceous

Community 2.1
Woodland Community

Figure 15. 2.1 Woodland Community

This plant community is a Woodland Community (2.1) having greater than 20% woody canopy dominated by Ashe juniper, redberry juniper (Juniperus pinchotti), prickly pear (Opuntia spp.) and honey mesquite (*Prosopis glandulosa*). Other species present in small amounts are hackberry, Texas oak and live oak. The herbaceous understory is almost nonexistent. Shade tolerant species such as Texas wintergrass and cedar sedge (*Carex planostachys*) tends to dominate the site where mesquite is the major woody plant. When the canopy of juniper increases toward a cedar breaks community most grasses have almost disappeared. Due to the presence of shade, the amount of total grass cover is greatly reduced which in turn reduces herbaceous production. Continuous heavy grazing by domestic livestock has accelerated the shift. The tallgrass prairie can be restored by prescribed burning but will require many years of burning and prudent grazing management due to low production of fine fuel and the absence of a seed source for the tall grasses. Chemical control alone is a choice for treatment on a large scale especially where a seed source is present. Mechanical treatment of this site along with range planting is a good option when seeding is needed.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	673	1009	1345
Forb	224	336	448
Shrub/Vine	112	168	224
Tree	112	168	224
Total	**1121**	**1681**	**2241**

Figure 17. Plant community growth curve (percent production by month). TX6024, Woodland Community. Woodland community having greater than twenty percent woody canopy dominated by Ashe and redberry juniper, prickly pear and honey mesquite. Shade tolerant grasses also begins to increase..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	8	20	25	19	5	3	10	4	1	1

State 3

Open Grassland State

Open Grassland Community (3.1) by eliminating all woody species and applying range planting using native or introduced species such as Kleingrass or old world bluestems such as WW Spar and WW B Dahl. This community can also become invaded with woody species in the absence of fire, brush management and with heavy yearlong grazing. Annual production ranges from 2000 to 4000 pounds per acre. Thus the Woodland Community (3.2) becomes established with Ashe juniper, redberry juniper, pricklypear, honey mesquite and other woody shrubs or trees since the oaks and other higher successional plants have been virtually eliminated. Annual production ranges from 800 to 1800 pounds per acre.

Dominant plant species

- yellow bluestem (*Bothriochloa ischaemum*), grass

Community 3.1
Open Grassland Community

The Tallgrass Prairie Community (1.1) or the Mid/Tallgrass Community (1.2) can be converted to an Open Grassland Community (3.1) by eliminating all woody species and applying range planting using native or introduced species such as Kleingrass (*Panicum coloratum*), or old world bluestems (*Bothriochloa ischaemum* var.) such as WW Spar and WW B Dahl. This state can also become invaded with woody species in the absence of fire, brush management and with heavy yearlong grazing. Then the Woodland Community (3.2) becomes established. The seeded state with prescribed burning and prescribed grazing could not revert back to the tallgrass prairie state because the oaks and other higher successional plants have been virtually eliminated.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1905	2858	3811
Forb	224	336	448
Shrub/Vine	67	101	135
Tree	45	67	90
Total	**2241**	**3362**	**4484**

Figure 19. Plant community growth curve (percent production by month). TX6015, Open Seeded Grassland Community. This state is usually the result of mechanical brush control and reseeding using one or more native grass species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	2	18	23	17	6	4	16	6	3	2

Community 3.2
Woodland Community

Figure 20. 3.2 Woodland Community

The Open Grassland Community (3.1) which is established to native and or introduced grasses can also become invaded with woody species without fire and/or brush management to suppress their spread. Thus the Woodland Community (3.2) becomes established with Ashe juniper, redberry juniper, pricklypear, honey mesquite and other woody shrubs or trees since the oaks and other higher successional plants have been virtually eliminated. The seeded state (3.1) with prescribed burning and prescribed grazing could not revert back to the tallgrass prairie state within any reasonable time because of the loss of original plants and the invasive nature of the introduced plants.

Table 10. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	538	874	1211
Forb	179	291	404
Shrub/Vine	90	146	202
Tree	90	146	202
Total	**897**	**1457**	**2019**

Figure 22. Plant community growth curve (percent production by month). TX6024, Woodland Community. Woodland community having greater than twenty percent woody canopy dominated by Ashe and redberry juniper, prickly pear and honey mesquite. Shade tolerant grasses also begins to increase..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	8	20	25	19	5	3	10	4	1	1

Pathway 3.1A
Community 3.1 to 3.2

With heavy continuous grazing, no fires, no brush management, and brush invasion, the Open Grassland Community will shift to the Woodland Community.

Pathway 3.2A
Community 3.2 to 3.1

The Woodland Community can be shifted back to the Open Grassland Community through the use of Prescribed Grazing, Prescribed Burning, and Brush Management.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Transition T1A
State 1 to 2

Without prescribed burning and/or prescribed grazing, the Tallgrass Prairie State would continue to shift toward the Brushland State.

Transition T1B
State 1 to 2

The Tallgrass Prairie State can be converted to an Open Grassland State by eliminating all brush and applying range planting.

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 Brushland State can be restored to the Tallgrass Prairie State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A
State 2 to 3

With Brush Management and Range Planting conservation practices, the Brushland State can be converted into the Open Grassland State.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass**			897–2018	
	little bluestem	SCSC	*Schizachyrium scoparium*	897–2018	–
2	**Tallgrasses**			112–252	

2	**Tallgrasses**			112–252	
	big bluestem	ANGE	*Andropogon gerardii*	28–252	–
	switchgrass	PAVI2	*Panicum virgatum*	28–252	–
	Indiangrass	SONU2	*Sorghastrum nutans*	28–252	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	28–252	–
3	**Midgrasses**			336–757	
	sideoats grama	BOCU	*Bouteloua curtipendula*	168–757	–
	tall grama	BOHIP	*Bouteloua hirsuta var. pectinata*	168–757	–
4	**Midgrasses**			224–448	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	74–504	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	74–504	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	74–504	–
5	**Midgrasses/Shortgrasses**			196–448	
	purple threeawn	ARPUP9	*Aristida purpurea var. perplexa*	0–448	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–448	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–448	–
	green sprangletop	LEDU	*Leptochloa dubia*	0–448	–
	muhly	MUIN	*Muhlenbergia ×involuta*	0–448	–
	Lindheimer's muhly	MULI	*Muhlenbergia lindheimeri*	0–448	–
	seep muhly	MURE2	*Muhlenbergia reverchonii*	0–448	–
	panicgrass	PANIC	*Panicum*	0–448	–
	vine mesquite	PAOB	*Panicum obtusum*	0–448	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	0–448	–
	white tridens	TRAL2	*Tridens albescens*	0–448	–
	slim tridens	TRMU	*Tridens muticus*	0–448	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–448	–
6	**Midgrass/Shortgrasses**			28–56	
	buffalograss	BODA2	*Bouteloua dactyloides*	0–56	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–56	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	0–56	–
Forb					
7	**Forbs**			213–482	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–482	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–482	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–482	–
	whitemouth dayflower	COER	*Commelina erecta*	0–482	–
	prairie clover	DALEA	*Dalea*	0–482	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–482	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–482	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–482	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–482	–
	beeblossom	GAURA	*Gaura*	0–482	–

	beeblossom	GAURA	*Gaura*	0–482	
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–482	–
	bluet	HOUST	*Houstonia*	0–482	–
	coastal indigo	INMI	*Indigofera miniata*	0–482	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–482	–
	dotted blazing star	LIPU	*Liatris punctata*	0–482	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–482	–
	yellow puff	NELU2	*Neptunia lutea*	0–482	–
	beardtongue	PENST	*Penstemon*	0–482	–
	groundcherry	PHYSA	*Physalis*	0–482	–
	scurfpea	PSORA2	*Psoralidium*	0–482	–
	snoutbean	RHYNC2	*Rhynchosia*	0–482	–
	wild petunia	RUELL	*Ruellia*	0–482	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	0–482	–
	fanpetals	SIDA	*Sida*	0–482	–
	false gaura	STLI2	*Stenosiphon linifolius*	0–482	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–482	–
8	**Forbs**			11–22	
	American star-thistle	CEAM2	*Centaurea americana*	0–22	–
	croton	CROTO	*Croton*	0–22	–
	Leavenworth's eryngo	ERLE11	*Eryngium leavenworthii*	0–22	–
	snow on the mountain	EUMA8	*Euphorbia marginata*	0–22	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	0–22	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–22	–
	Texas star	SACA3	*Sabatia campestris*	0–22	–
	white rosinweed	SIAL	*Silphium albiflorum*	0–22	–
	compassplant	SILA3	*Silphium laciniatum*	0–22	–
Shrub/Vine					
9	**Shrubs/Vines**			140–314	
	catclaw acacia	ACGR	*Acacia greggii*	0–314	–
	Texas redbud	CECAT	*Cercis canadensis var. texensis*	0–314	–
	black prairie clover	DAFR2	*Dalea frutescens*	0–314	–
	Texas kidneywood	EYTE	*Eysenhardtia texana*	0–314	–
	stretchberry	FOPU2	*Forestiera pubescens*	0–314	–
	algerita	MATR3	*Mahonia trifoliolata*	0–314	–
	plum	PRUNU	*Prunus*	0–314	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–314	–
	winged sumac	RHCO	*Rhus copallinum*	0–314	–
	saw greenbrier	SMBO2	*Smilax bona-nox*	0–314	–
Tree					
10	**Trees**			84–191	
	hackberry	CELTI	*Celtis*	0–191	–
	Texas red oak	QUBU2	*Quercus buckleyi*	0–191	–

	Texas live oak	QUFU	*Quercus fusiformis*	0–191	–
	bastard oak	QUSI	*Quercus sinuata*	0–191	–
	bully	SIDER2	*Sideroxylon*	0–191	–

Animal community

The Tallgrass Prairie Community was habitat to migratory bison herds. Forage grown on this site is usually low in nutritive value and must be supplemented, especially with phosphorus. Deer and turkey were mostly found along wooded streams adjacent to this site occasionally feeding on the open prairie. Large predators such as wolves, coyotes, mountain lions and black bear roamed throughout the area. White-tailed deer, turkey, bobcats and coyotes along with resident and migratory birds and small mammals find suitable habitat today. Domestic livestock such as cattle, sheep and goats are the dominant grazers of the site. As the prairie passes through various vegetative states towards the Brushland, the quality of habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species.

Hydrological functions

Peak rainfall periods occur in April, May, June, September and October. Rainfall amounts may be high (3 to 10 inches per event) and events may be intense. The soils of this site are mainly shallow. Runoff is rapid, even under good plant cover. Periods of 60 plus days of little or no rainfall during the growing season are common. During periods of good rainfall with good grass cover water infiltrates to the limestone rock below and moves to lower elevations to emerge as seeps and springs. The hydrology of this site may be manipulated with management to yield higher runoff volumes or greater infiltration to groundwater. Management for less herbaceous cover will favor higher surface runoff while dense herbaceous cover favors infiltration. Potential movement of soil (erosion), pesticides and both organic and inorganic nutrients (fertilizer) should always be considered when managing for higher volumes of surface runoff.

Recreational uses

Hunting, hiking, camping, equestrian, bird watching and off road vehicle use.

Wood products

None.

Other products

None.

Other information

None.

Inventory data references

Information presented here has been derived from NRCS clipping data and field observations of range trained personnel: James Luton RMS, Montague; William Donham, DC, Weatherford; Kent Ferguson RMS, Weatherford; Dan Caudle, Fort Worth

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Approval

Bryan Christensen, 9/21/2023

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	817-596-2685
Date	02/20/2006

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

Indicators

1. **Number and extent of rills:** None. This site does not usually develop rills due to shallow depths and surface rocks.

2. **Presence of water flow patterns:** None. This site rarely has flow patterns, due to shallow soil depth and surface rocks. Some are expected to be around surface obstacles.

3. **Number and height of erosional pedestals or terracettes:** None. Some very minor pedestalling may occur in the shallow, lower production portions of the site. Rarely should they be over 1/4 inch height.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 10 percent. Small and non-connected areas.

5. **Number of gullies and erosion associated with gullies:** This site does not develop gullies due to shallow soils and rock outcrops.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Minimal and short. Less than 6 inches. Only associated with water flow patterns following extremely high intensity rainfall.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface is stabilized by organic matter, decomposition products and/or a biological crust. Stability class 6 for both canopy and ground cover.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Pale to dark brown loamy surface with sub surface rounded to angular pebbles, cobbles and stones. Soil Organic Matter is 1 to 4 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High canopy and basal cover and density with small interspaces make rainfall impact negligible. This site has well drained soils, slowly permeable with 1 to 12% (some short steep slopes up to 20%) slopes which allow negligible runoff and erosion.

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

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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 tallgrases >>

    Sub-dominant: Warm-season midgrasses > Warm-season shortgrasses >

    Other: Forbs = Shrubs > Trees

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Grasses due to their growth habit will exhibit some mortality and decadence, though very slight.

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14. **Average percent litter cover (%) and depth (in):** Litter is dominantly herbaceous and covers most plant and rock interspaces.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2000 - 4500 #/acre. 2000# in below average moisture years, 3250# in "normal" years, and 4500# in above average moisture years.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Ashe juniper, pricklypear, and mesquite are the primary invaders. Also baccharis, persimmon, old world bluestems, and agrito.

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17. **Perennial plant reproductive capability:** All plants should be capable of reproduction except during periods of prolonged drought conditions, heavy natural herbivory or intense wildfires.
