USDA Natural Resources
Conservation Service

Ecological site R085AY188TX
Stony Clay Loam 30-38" PZ

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 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, stony clay loam soils on uplands. The reference plant community includes native tallgrasses and midgrasses with numerous forbs and scattered live oak mottes. In the absence of fire or other brush management, woody species may dominate the site. This site is often associated with the presence of "hitchrocks" protruding from the soil surface.

Associated sites

R085AY185TX	**Shallow 30-38" PZ** Shallow site has shallower soils and is located upslope of the Stony clay Loam site.

Similar sites

R085AY179TX	**Clayey Slope 30-38** Clay Slopes site has deeper soil, less surface rock, occurs in a lower landscape position, has similar production, fewer tallgrasses more midgrasses and more woody species.

Table 1. Dominant plant species

Tree	(1) *Quercus fusiformis*
Shrub	Not specified

Herbaceous	(1) *Sorghastrum nutans* (2) *Andropogon gerardii*

Physiographic features

This site occurs on linear to convex side slopes, nose slopes, and crests of hillslopes in the Grand Prairie. This site is characteristically a water distributing site. Slopes are typically less than 12 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope (2) Hills > Ridge
Runoff class	Low to medium
Elevation	152–579 m
Slope	2–12%
Aspect	Aspect is not a significant factor

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 3. 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

No water features influencing the site. These sites receive some additional runoff from adjacent sites uphill and also shed some water to sites downhill. The presence of tall and midgrasses helps to facilitate infiltration into the soil profile. These sites are not associated with wetlands.

Wetland description

NA

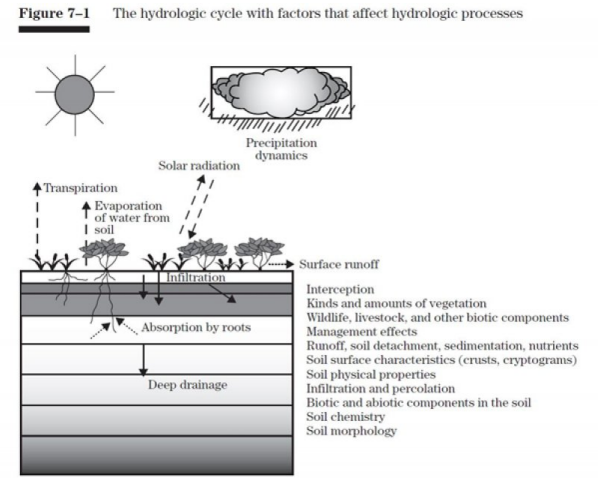

Figure 8.

Soil features

Representative soil components for this ecological site include: Nuff

The Nuff series are moderately deep to shale. They are well drained, moderately slowly permeable soils. These soils formed in interbedded marl, limestone, and shale. They are gently sloping to moderately sloping soils on uplands.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone (2) Residuum–mudstone
Surface texture	(1) Very stony silty clay loam (2) Very stony clay loam
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	51–102 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	3–40%
Available water capacity (0-101.6cm)	10.16–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	30–80%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm

Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	2–30%
Subsurface fragment volume >3" (Depth not specified)	5–40%

Ecological dynamics

The Stony Clay Loam 30-38” PZ ecological site is a prairie site with scatted live oak trees or mottes. The reference plant community of Stony Clay Loam was a fire-influenced prairie with a high diversity of tallgrasses, midgrasses, and perennial forbs. Improper grazing management will result in a reduction of tallgrasses offset by an increase in midgrasses, unpalatable forbs, and woody species. Abusive grazing, lack of fire, and the resulting encroachment of invasive shrubs and trees from adjacent sites eventually leads to the transition from a tallgrass and midgrass prairie state to a state dominated by early successional midgrasses, shortgrasses and annuals.

Continued degradation of the site will result in the site crossing a threshold to a mixed brush community characterized by invasive shrubs (primarily mesquite and juniper), early successional midgrasses, shortgrasses, unpalatable forbs, and annuals. Bare ground, erosion, and water flow patterns will increase. Forage production will decline. Over time the size and amount of eroded areas will increase as the A horizon erodes.

Precipitation patterns are highly variable. Long-term droughts, occurring three to four times per century, cause shifts in species composition by causing die-off of seedlings and less drought-tolerant species. Droughts also reduce biomass production and create open space, which is colonized by opportunistic species when precipitation increases. Wet periods allow tallgrasses to increase in dominance.

The Stony Clay Loam site was historically dominated by Indiangrass (*Sorghastrum nutans*) and little bluestem (*Schizachyrium scoparium*). Big bluestem (*Andropogon gerardii*) is a minor, but extremely important component of the original plant community. Midgrasses such as sideoats grama (*Bouteloua curtipendula*), meadow dropseed (Sporobolus asper), silver bluestem (*Bothriochloa saccharoides*), vine-mesquite (*Panicum obtusum*), seep muhly (*Muhlenbergia reverchonii*) and Texas wintergrass (*Nassella leucotricha*) make up about 20% of the production of this site. Shortgrasses make up a minor part of the community. A wide variety of forbs add to the diverse native plant community. Additionally, live oak (*Quercus fusiformis*) and scattered shrubs make up a very small amount of the prairie community.

Pre-settlement influences included grazing or browsing by endemic pronghorn antelope, deer and migratory bison, severe droughts, and frequent fires. Wright and Bailey (1982) reported that there are no reliable records of fire frequency in the Great Plains grasslands because there are no trees to carry fire scars from which to estimate fire frequency. A natural fire frequency of 7 to 10 years seems reasonable for this site.

Rangeland and pastureland are grazed primarily by beef cattle. Horse numbers are increasing rapidly in the region, and in recent years goat numbers have increased significantly. There are some areas where sheep are locally important. Whitetail deer, wild turkey, bobwhite quail, and dove are the major wildlife species, and hunting leases are a major source of income for many landowners in this area.

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 (ESDs).

Plant Communities and Transitional Pathways
A state and transition model for the Stony Clay Loam ecological site is depicted in Figure 1. Thorough descriptions of each state and transition and of each plant community and pathway follow the model. This model is based on available experimental research, field observations, and interpretations by experts. It is likely to change as knowledge increases.
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species

occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

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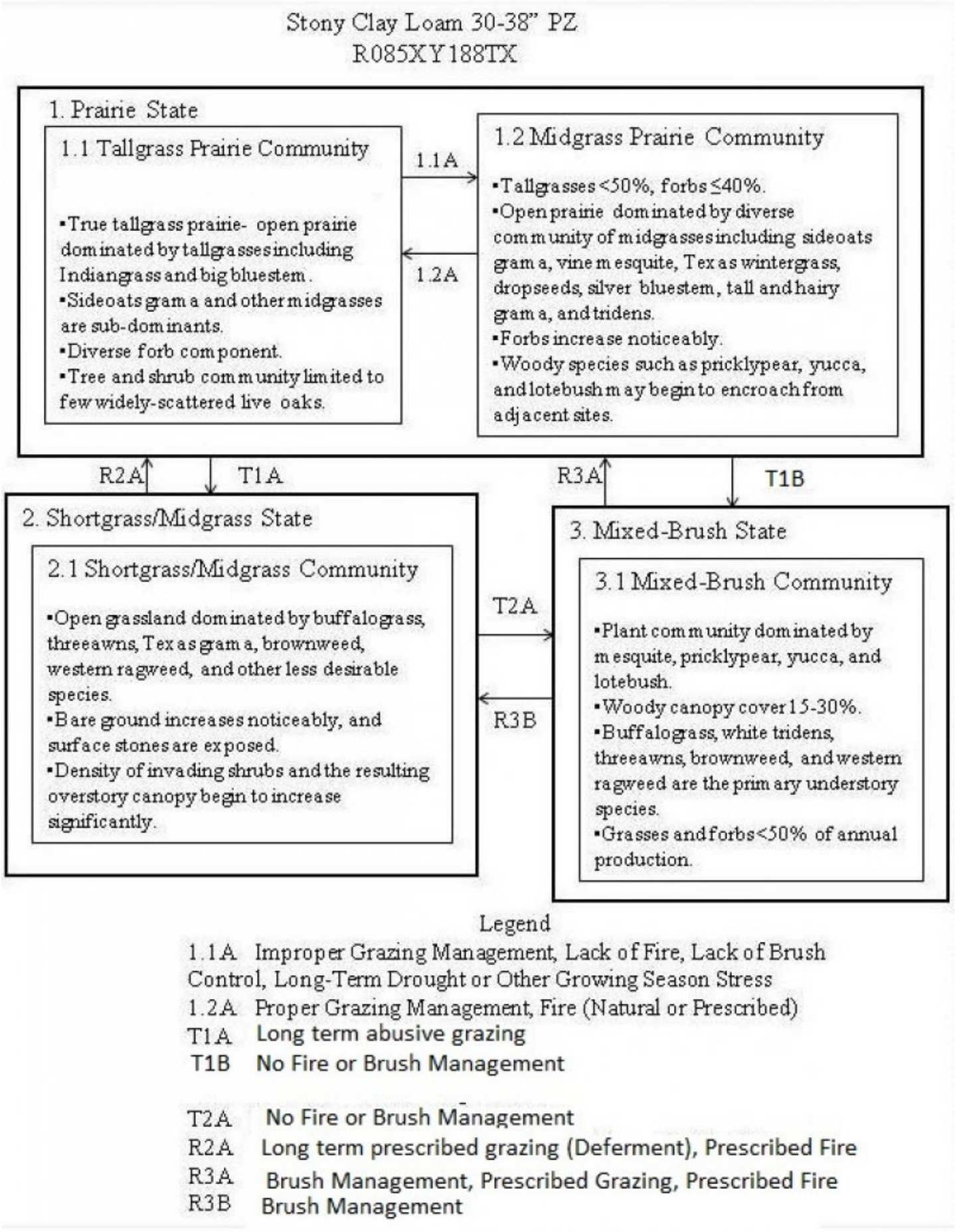
State and transition model



State 1
Prairie State - Reference

Dominant plant species

- Texas live oak (*Quercus fusiformis*), tree
- Indiangrass (*Sorghastrum nutans*), grass

Community 1.1
Tallgrass Prairie Community

Figure 9. 1.1 Tallgrass Prairie Community

The Tallgrass Prairie Community (1.1) is the reference community. It is characterized by moderately deep to deep, neutral to calcareous, stony or very stony, clay loams, silty clay loams, or loams. The soils are fertile and can store large amounts of water. Limestone fragments and rocks cover 5 to 20 percent of the soil surface, but do not inhibit plant growth. This site is dominated by warm-season, perennial tallgrasses, with warm-season, perennial midgrasses filling most of the remaining species composition. The warm-season, perennial forb component varies between 5 and 15 percent depending on climatic patterns and local precipitation. Woody species make up a minor component of the community, typically 2 percent or less. Indiangrass dominates the site. Indiangrass, little bluestem and big bluestem act as decreasers on this site and are the first species to be removed by improper grazing management. Important midgrasses include sideoats grama (*Bouteloua curtipendula*), meadow dropseed (*Sporobolus compositus*), silver bluestem (*Bothriochloa laguroides*), and Texas wintergrass. Forbs commonly found on the site include: Maximilian sunflower (*Helianthus maximiliani*), Engelmann daisy (*Engelmannia peristenia*), blacksamson (*Echinacea angustifolia*), scurfpea (Psoralidium), halfshrub sundrop (*Calylophus serrulatus*), sensitive-briar (Mimosa spp.), and yellow neptunia (*Neptunia lutea*). Tree species are limited to scattered live oaks which may grow in small mottes. The reference grassland community will transition to a midgrass-dominated community under the stresses of improper grazing management. The first species to decrease in dominance will be the most palatable and/or least grazing tolerant grasses and forbs (e.g., Indiangrass, big bluestem, and Engelmann daisy). If improper grazing management continues, little bluestem will decrease and midgrasses such as silver bluestem and sideoats grama will increase in composition. Forbs, particularly less palatable species, will increase at this stage. This site can have dramatic increases in forbs, particularly following a fire. This plant community has very little bare ground. Plant basal cover, litter, and rock fragments make up almost 100 percent ground cover. Infiltration and runoff are moderate. Soils are high in organic matter and the heavy plant cover contributes to increasing organic matter and soil building.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2914	4259	5380
Forb	224	448	673
Shrub/Vine	224	224	224
Total	**3362**	**4931**	**6277**

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
Midgrass Prairie Community

Figure 12. 1.2 Midgrass Prairie Community

The Midgrass Community Phase (1.2) is the result of improper cattle grazing management over a long period of time. Tallgrasses decrease in vigor and production, allowing midgrasses, shortgrasses and forbs to increase to the point that they make up more than 50 percent of species composition. Woody species may begin to encroach from adjacent sites depending on fire and brush control methods. Important grasses include: little bluestem, silver bluestem, sideoats grama, hairy grama, dropseeds, buffalograss, Texas wintergrass, and tridens species. Some of the perennial forbs persist, but less palatable forbs will increase. Forbs can increase to as high as 40 percent in this community, particularly following fire. Invasive shrub species encroach when overgrazing by livestock has reduced grass cover, exposed more soil, and reduced grass fuel for fire. Typical invaders include honey mesquite (*Prosopis glandulosa*) and juniper (*Juniperus ashei*). Aggressive, introduced grasses such as King Ranch bluestem (*Bothriochloa ischaemum*) may begin to invade the Midgrass Plant Community, particularly if they have been seeded in nearby pastures or fed in hay. Heavy continuous grazing will reduce plant cover, litter, and mulch. Bare ground will increase and expose the soil to crusting and erosion. Some mulch and litter movement may occur during rainstorms, but little soil movement occurs due to gentle slopes in this vegetation type. Litter and mulch will move off site as plant cover declines. Increasing woody species include honey mesquite, juniper, and lotebush. Once shrubs reach a height of about 3 feet, they become more resistant to being killed by fires. If improper grazing management continues Midgrass Plant Community will transition (1.2B) to the Shortgrass/Midgrass Prairie State. Tallgrasses will disappear and late successional midgrasses will decline noticeably. Grazing-resistant shortgrasses, early successional midgrasses, unpalatable forbs and annuals will become the representative plant community.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1821	2550	3278
Shrub/Vine	560	785	1009
Forb	420	588	757
Total	**2801**	**3923**	**5044**

Figure 14. Plant community growth curve (percent production by month). TX6017, Midgrass/Shortgrass Prairie Community. Midgrasses and Shortgrasses dominate the site with forbs and less than ten percent woody canopy..

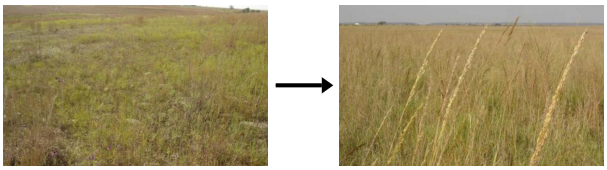
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	2	18	23	17	6	4	16	6	3	2

Pathway 1.1A
Community 1.1 to 1.2

Tallgrass Prairie Community | Midgrass Prairie Community

The Tallgrass Prairie State is comprised of two plant communities. The Tallgrass Prairie Community (1.1) will shift to the Midgrass Prairie Community (1.2) when there is continued growing season stress on the palatable tallgrass species. These stresses include excessive stocking rates, insufficient critical growing season deferment, excess defoliation intensity, repeated long-term growing season defoliation, and/or long-term drought. Increaser species (midgrasses, shortgrasses, and forbs) are frequently endemic species released from tallgrass competition. Woody species canopy is a very small part of the reference community (scattered trees or mottes making up less than 5% canopy cover). Dominance of tallgrasses falling below 50% of species composition indicates a transition to the Midgrass Prairie Community. The reference community can be maintained through the implementation of managed grazing that includes proper stocking rates, adequate growing season deferment to allow establishment of tallgrass propagules and/or the recovery of the vigor of stressed individual plants. Proper grazing management may be combined with fire to create a shift towards, or maintain the reference plant community. The driver for community shift 1.1A for the herbaceous component is improper grazing management.

Pathway 1.2A
Community 1.2 to 1.1



Midgrass Prairie Community | Tallgrass Prairie Community

The Midgrass Prairie Community (1.2) will return to the Tallgrass Prairie Community (1.1) under grazing management that includes proper stocking rates and sufficient critical growing season deferment in combination with proper grazing intensity. Favorable moisture conditions will facilitate or accelerate this transition. The understory component may return to dominance by tallgrasses in the absence of fire. The driver for community shift 1.2A for the herbaceous component is proper grazing management.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Shortgrass/Midgrass State

Dominant plant species

- Texas live oak (*Quercus fusiformis*), tree
- sideoats grama (*Bouteloua curtipendula*), grass
- buffalograss (*Bouteloua dactyloides*), grass

Community 2.1
Shortgrass/Midgrass Community

Figure 15. 2.1 Shortgrass/Midgrass Community

The Shortgrass/Midgrass Community (2.1) exists as a result of long-term abusive grazing and/or extended severe drought conditions. Sideoats grama and other late successional midgrasses decrease significantly and are replaced by shortgrasses and early successional midgrasses such as buffalograss (*Bouteloua dactyloides*), dropseeds (Sporobolus spp.), tumble windmillgrass (*Chloris verticillata*), tumblegrass (*Schedonnardus paniculatus*), Texas grama (*Bouteloua rigidiseta*), threeawns (Aristida spp.), annuals, western ragweed (*Ambrosia psilostachya*), and broomweed (*Amphiachyris dracunculoides*). Plant vigor and productivity of the grassland component is reduced due to competition for sunlight, nutrients, and water from “weedy” species. As the grassland vegetation declines, more soil is exposed, leading to crusting and erosion.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1009	1233	1765
Shrub/Vine	897	1384	1569
Forb	336	465	588
Total	**2242**	**3082**	**3922**

Figure 17. Plant community growth curve (percent production by month). TX6019, Shortgrass/Midgrass Community. This plant community has short and midgrasses with ten to fifteen percent canopy woody plants..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	8	20	25	20	5	3	10	4	1	1

State 3
Mixed-brush State

Dominant plant species

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

Community 3.1
Mixed Brush Community

Figure 18. 3.1 Mixed Brush Community

The Mixed-Brush Community (3.1) has 15-30 percent woody canopy cover and is the result of many years of improper grazing, lack of periodic fires, and/or a lack of proper brush management. Invading woody species such as honey mesquite and juniper dominate the Mixed Brush Community (3.1). The site can now have the appearance of a shrubland interspersed with open grassland areas. Common understory shrubs are pricklypear (Opuntia spp.), lotebush (*Ziziphus obtusifolia*), yucca (Yucca spp.), and sumac (Rhus spp.). Remnant midgrasses and opportunistic shortgrasses, annuals, and perennial forbs dominate the site. Texas wintergrass, sedges, and annuals are found in and around tree/shrub cover. Grasses and forbs make up 50 percent or less of the annual herbage production. Common forbs include dotted gayfeather, croton, western ragweed, verbena (Verbena spp.), snow-on-the-prairie (*Euphorbia bicolor*), Mexican sagewort (*Artemisia ludoviciana* ssp. mexicana), and sensitive-briar. The shrub canopy acts to intercept rainfall and increase evapotranspiration losses, creating a more xeric microclimate. Soil fauna and organic mulch are reduced, exposing more of the soil surface to erosion in interspaces. The exposed soil crusts readily. However, within the woody canopy, hydrologic processes stabilize and soil organic matter and mulch begin to increase and eventually stabilize under the shrub canopy. The Mixed Brush Community (3.1) can provide good cover habitat for wildlife, but only limited forage or browse is available for livestock or wildlife. At this stage, highly intensive restoration practices are needed to return the brushy community to grassland. Alternatives for restoration include: brush management and range planting, with proper stocking; prescribed grazing; and prescribed burning following restoration to maintain the desired community. Excessive cattle grazing tends to create a different response and structure to the community than does excessive deer or goat grazing. Excessive cattle grazing tends to accelerate invasion of shrubs because it creates conditions where young shrubs increase in vigor and size while palatable grasses decrease in vigor and abundance. Excess deer or goat grazing tends to create a dominance of large trees by removing both young shrubs and the young growth that grow below the browse line on larger shrubs and trees. While large trees will continue to increase in size, they will have very little production below the browse line. The site becomes dominated by large trees with little forage available for livestock or wildlife. Large trees with little understory provide much less soil protection than do dense stands of grass. As soils erode, understory species have reduced potential to revegetate the site. The bare area under the browse line creates a situation that provides poor forage conditions and poor visual cover for wildlife. If irreversible soil damage has occurred, it may be possible to remove brush and seed the site to a grassland community. The resulting grassland will not look or function like the reference community (1.1). Instead, it is likely to be dominated by few introduced midgrasses and produce less biomass than the community 1.1. However, it is very difficult and expensive to restore the site to reference (1.1) conditions due to the loss of organic matter, soil horizons, soil microbes, and soil structure necessary to maintain the reference community (1.1). Rangeland health functions will depart substantially from reference (1.1) conditions.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	841	1121	1401
Forb	420	560	757
Grass/Grasslike	420	560	757
Total	**1681**	**2241**	**2915**

Figure 20. Plant community growth curve (percent production by month). TX6022, Oak/Juniper/Midgrass Community. Consists of midgrasses with ten to twenty percent canopy of woody plants..

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

Transition T1A
State 1 to 2

Excessive grazing and/or extended severe drought will eventually result in almost complete loss of the tallgrass and a severe decline of higher successional midgrass species on this site. They are replaced by shortgrasses, lower successional midgrasses, less palatable forbs, and annuals. The driver for transition T1A for the herbaceous component is improper grazing management.

Transition T1B
State 1 to 3

The grassland states and plant communities are resistant to shrub dominance. However, shrubs are present in minor amounts in those states and communities, therefore propagules are present. Even with proper grazing and favorable climate conditions, lack of fire or brush control for over 25 years will allow woody species to encroach from adjacent sites and allow endemic woody species to increase in canopy to reach the 30% threshold level. Once canopy cover reaches 15% the transition to the mixed brush state has begun. Canopy cover of 30% indicates that the transition has occurred. Improper grazing management, prolonged drought, and a warming climate will provide a competitive advantage to shrubs which will accelerate this process. This transition can occur from any of the grassland states and plant communities. The drivers for this transition are excessive grazing as well as lack of fire and/or brush control. Introduction of aggressive woody invader species (i.e. mesquite or juniper) increase the risk that this state transition will occur and accelerate the rate at which it is likely to occur. The driver for this transition is lack of fire and/or brush control.

Restoration pathway R2A
State 2 to 1

The Shortgrass/Midgrass State will require range planting accompanied by return to the proper grazing management that includes proper stocking rates and sufficient critical growing season deferment in combination with proper grazing intensity in order to return to the Tallgrass State. Favorable moisture conditions will facilitate or accelerate this transition. The driver for the herbaceous component is proper grazing management.

Conservation practices

Prescribed Grazing

Transition T2A
State 2 to 3

The grassland states and plant communities are resistant to shrub dominance. However, shrubs are present in minor amounts in those states and communities, therefore propagules are present. Even with proper grazing and favorable climate conditions, lack of fire or brush control for over 25 years will allow woody species to encroach from adjacent sites and allow endemic woody species to increase in canopy to reach the 30% threshold level. Once canopy cover reaches 15% the transition to the mixed brush state has begun. Canopy cover of 30% indicates that the transition has occurred. Improper grazing management, prolonged drought, and a warming climate will provide a competitive advantage to shrubs which will accelerate this process. This transition can occur from any of the grassland states and plant communities. The drivers for this transition are excessive grazing as well as lack of fire and/or brush control. Introduction of aggressive woody invader species (i.e. mesquite or juniper) increase the risk that this state transition will occur and accelerate the rate at which it is likely to occur. The driver for this transition is improper grazing management as well as lack of fire and/or brush control. A system of brush management and fire can reduce the woody component below the transition level of 30% canopy. Managers may chose to leave some brush for wildlife habitat objectives. Continued fire and/or brush management will be required to maintain woody

density and canopy below the threshold. If the herbaceous component has transitioned to shortgrasses and low forbs, proper grazing management (combined with favorable moisture conditions and adequate seed source) will be necessary to facilitate the shift of the understory component to a midgrass-dominated plant community. Range planting may accelerate the transition of the herbaceous community, particularly when combined with favorable growing conditions.

Restoration pathway R3A
State 3 to 1

Restoration of the Mixed Brush State to the Tallgrass Prairie State requires substantial energy input. Mechanical or chemical brush control treatments can be used to remove woody species. A long-term prescribed fire program may sufficiently reduce brush density to a level below the threshold of the Mixed Brush State, particularly if the woody component is dominated by species that are not re-sprouters. However, fire may not be sufficient to remove mature trees. A mixed program consisting of mechanical, chemical, and fire measures may be used. Brush control in combination with prescribed fire, proper grazing management, and favorable growing conditions may be the most economical means of creating and maintaining the desired plant community. If remnant populations of tallgrasses, midgrasses, and desirable forbs are not present at sufficient levels, range planting will be necessary to restore the reference plant community. Depending on the understory community and inputs of seed, the restoration pathway can result in a return to any of the Grassland State Communities. The driver for Restoration Pathway R3A is fire and/or brush control combined with restoration of the herbaceous community and proper grazing management. Restoration may require aggressive treatment of invader species.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Restoration pathway R3B
State 3 to 2

Restoration of the Mixed Brush State to the Shortgrass/Midgrass Prairie State requires substantial energy input. Mechanical or herbicidal brush control treatments can be used to remove woody species. A long-term prescribed fire program may sufficiently reduce brush density to a level below the threshold of the Mixed Brush State, particularly if the woody component is dominated by species that are not re-sprouters. However, fire may not be sufficient to remove mature trees. A mixed program consisting of mechanical, chemical, and fire measures may be used. Brush control in combination with prescribed fire, proper grazing management, and favorable growing conditions may be the most economical means of creating and maintaining the desired plant community. The driver for Restoration Pathway R3B is fire and/or brush control combined with restoration of the herbaceous community and proper grazing management. Restoration may require aggressive treatment of invader species.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			1121–3811	
	Indiangrass	SONU2	*Sorghastrum nutans*	448–3811	–

	big bluestem	ANGE	*Andropogon gerardii*	0–3811	–
	little bluestem	SCSC	*Schizachyrium scoparium*	336–1905	–
2	**Midgrasses**			448–897	
	sideoats grama	BOCU	*Bouteloua curtipendula*	336–897	–
	tall grama	BOHIP	*Bouteloua hirsuta var. pectinata*	0–336	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	112–336	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	0–336	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	0–336	–
	seep muhly	MURE2	*Muhlenbergia reverchonii*	112–336	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	112–336	–
	vine mesquite	PAOB	*Panicum obtusum*	0–336	–
	Rio Grande bristlegrass	SERER	*Setaria reverchonii ssp. ramiseta*	0–336	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	112–336	–
3	**Mid/Shortgrasses**			336–673	
	buffalograss	BODA2	*Bouteloua dactyloides*	112–673	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	112–336	–
	Texas grama	BORI	*Bouteloua rigidiseta*	0–112	–
	sedge	CAREX	*Carex*	0–112	–
	tumble windmill grass	CHVE2	*Chloris verticillata*	0–112	–
	rosette grass	DICHA2	*Dichanthelium*	0–112	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–112	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–112	–
	panicgrass	PANIC	*Panicum*	0–112	–
	white tridens	TRAL2	*Tridens albescens*	0–112	–
	slim tridens	TRMU	*Tridens muticus*	0–112	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–112	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–112	–
Forb					
4	**Forbs**			336–673	
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–224	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–224	–
	prairie clover	DALEA	*Dalea*	0–224	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–224	–
	velvet bundleflower	DEVE2	*Desmanthus velutinus*	0–224	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–224	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–224	–
	yellow puff	NELU2	*Neptunia lutea*	0–224	–
	awnless bushsunflower	SICA7	*Simsia calva*	0–224	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–224	–
	slender greenthread	THSI	*Thelesperma simplicifolium*	0–112	–

	branched noseburn	TRRA5	*Tragia ramosa*	0–112	–
	Texas vervain	VEHA	*Verbena halei*	0–112	–
	ironweed	VERNO	*Vernonia*	0–112	–
	goldenrod	SOLID	*Solidago*	0–112	–
	diamond-flowers	STNI6	*Stenaria nigricans*	0–112	–
	fuzzybean	STROP	*Strophostyles*	0–112	–
	queen's-delight	STSYS2	*Stillingia sylvatica ssp. sylvatica*	0–112	–
	rosy palafox	PAROR	*Palafoxia rosea var. rosea*	0–112	–
	beardtongue	PENST	*Penstemon*	0–112	–
	turkey tangle fogfruit	PHNO2	*Phyla nodiflora*	0–112	–
	smartweed leaf-flower	PHPO3	*Phyllanthus polygonoides*	0–112	–
	Nuttall's prairie parsley	PONU4	*Polytaenia nuttallii*	0–112	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–112	–
	wild petunia	RUELL	*Ruellia*	0–112	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	0–112	–
	Texas sage	SATE3	*Salvia texana*	0–112	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–112	–
	Texas skeletonplant	LYTE	*Lygodesmia texana*	0–112	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–112	–
	buckwheat	ERIOG	*Eriogonum*	0–112	–
	Leavenworth's eryngo	ERLE11	*Eryngium leavenworthii*	0–112	–
	snow on the mountain	EUMA8	*Euphorbia marginata*	0–112	–
	Indian blanket	GAPU	*Gaillardia pulchella*	0–112	–
	beeblossom	GAURA	*Gaura*	0–112	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	0–112	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–112	–
	ticktrefoil	DESMO	*Desmodium*	0–112	–
	Berlandier's sundrops	CABE6	*Calylophus berlandieri*	0–112	–
	American star-thistle	CEAM2	*Centaurea americana*	0–112	–
	croton	CROTO	*Croton*	0–112	–
	pony beebalm	MOPE	*Monarda pectinata*	0–112	–
	prairie false foxglove	AGHE4	*Agalinis heterophylla*	0–112	–
Shrub/Vine					
5	**Shrubs/Vines/Trees**			0–224	
	Texas live oak	QUFU	*Quercus fusiformis*	0–224	–
	stretchberry	FOPU2	*Forestiera pubescens*	0–112	–
	pricklypear	OPUNT	*Opuntia*	0–56	–
	Texas yucca	YURU	*Yucca rupicola*	0–56	–
	black prairie clover	DAFR2	*Dalea frutescens*	0–56	–

Animal community

Dove and quail inhabit this site regularly. Deer from adjacent wooded sites graze the many palatable forbs and legumes on the fringes of the site.

Hydrological functions

Site-specific data indicated that no rills are present. Some gullies may be present on side drains into perennial and intermittent streams. Gullies are vegetated and stable. Water flow patterns are common and flow across and around large fragments. Deposition or erosion is uncommon for normal rainfall conditions but may occur during intense rainfall events. Pedestals or terracettes are uncommon for this site. Expect no more than 10% bare ground randomly distributed throughout in small and non-connected areas. Expect 25-50% ground cover from large fragments (stones and boulders). Under normal rainfall conditions, little litter movement should be expected; however, litter of all sizes may move long distances during severe storm events. The soil surface is resistant to erosion; the stability class range is expected to be 4-6. The savannah of tallgrasses, midgrasses, and forbs having adequate litter and little bare ground can provide for maximum infiltration and little runoff under normal rainfall events.

Recreational uses

Recreational uses include recreational hunting, hiking, camping, equestrian, and bird watching.

Wood products

Honey mesquite, juniper, and some oak are used for posts, firewood, charcoal, and other specialty wood products.

Other products

Jams and jellies are made from fruit bearing species. Seeds are harvested from many plants for commercial sale. Many grasses and forbs are harvested by the dried-plant industry for sale in dried flower arrangements. Honeybees are utilized to harvest honey from flowering plants, such as honey mesquite.

Other information

None.

Inventory data references

Information presented was derived from the revised Stony Clay Loam Range Site, NRCS clipping data, literature, field observations, and personal contacts with range-trained personnel.

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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, RMS, NRCS, Weatherford, Texas
Contact for lead author	817-596-2865
Date	05/01/2008
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:** Water flow patterns are common and follow old stream meanders. Deposition or erosion is uncommon for normal rainfall but may occur during intense rainfall events.

3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would have been uncommon for this site.

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 randomly distributed throughout.

5. **Number of gullies and erosion associated with gullies:** Some gullies may be present on side drains into perennial and intermittent streams. Gullies should be vegetated and stable.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Under normal rainfall, little litter movement should be expected; however, litter of all sizes may move long distances.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0-6 inche of Dark brown flaggy silty clay loam with subrounded to angular pebbles, cobbles, and stones. Has a strong fine granular structure. SOM is 1-4%. See soil survey for more information.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff: The savannah of tallgrasses, midgrasses, and forbs having adequate litter and little bare ground can provide for maximum infiltration and little runoff under normal rainfall events.

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

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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 grasses > Trees >

    Other: Warm-season shortgrasses > Forbs > Shrubs/Vines

    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 primarily herbaceous.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,200 to 4,500 pounds per acre.

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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, honey mesquite, pricklypear, bermudagrass, Johnsongrass, King Ranch bluestem.

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