USDA Natural Resources
Conservation Service

Ecological site R083AY009TX
Clayey Bottomland

Last updated: 9/19/2023
Accessed: 05/18/2024

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.

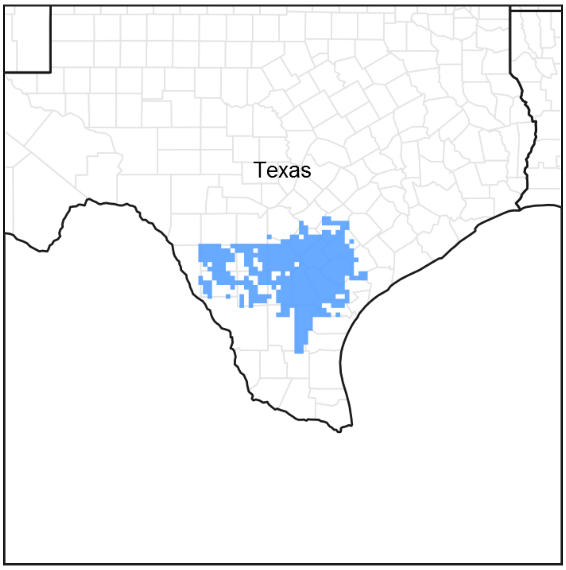


Figure 1. Mapped extent

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): 083A–Northern Rio Grande Plain

This area is entirely in Texas and south of San Antonio. It makes up about 11,115 square miles (28,805 square kilometers). The towns of Uvalde, Cotulla, and Hondo are in the western part of the area, and Beeville, Goliad, and Kenedy are in the eastern part. The town of Alice is just outside the southern edge of the area. Interstate Highways 35 and 37 cross this area. This area is comprised of inland, dissected coastal plains.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 83A

Ecological site concept

The Clayey Bottomland site is deep to very deep with clay surface textures occurring on flood plains. The soils are slightly alkaline and slightly saline.

Associated sites

R083AY013TX	**Loamy Bottomland**
R083AY019TX	**Gray Sandy Loam**
R083AY026TX	**Eastern Clay Loam**

Similar sites

R083BY009TX	**Clayey Bottomland**
R083DY009TX	**Clayey Bottomland**

Table 1. Dominant plant species

Tree	(1) *Quercus virginiana* (2) *Prosopis glandulosa*
Shrub	(1) *Opuntia*
Herbaceous	(1) *Trichloris pluriflora*

Physiographic features

This site occurs on low terraces of old flood plains. The setting is slightly depressed to nearly level areas that receive overflow. Slopes are generally less than one percent. Elevation ranges from 200 to 1,000 feet. This area is comprised of river valleys on inland, dissected coastal plains.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain
Runoff class	Low to high
Flooding duration	Very brief (4 to 48 hours) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Elevation	12–168 m
Slope	0–1%
Water table depth	0–135 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 83A is subtropical, subhumid on the western boundary and subtropical humid on the eastern boundary. Winters are dry and mild and the summers are hot and humid. Tropical maritime air masses predominate throughout spring, summer, and fall. Modified polar air masses exert considerable influence during winter, creating a continental climate characterized by large variations in temperature. Average precipitation for MLRA 83A is 20 inches on the western boundary and 35 inches on the eastern boundary. Peak rainfall, because of rain showers, occurs late in spring and a secondary peak occurs early in fall. Heavy thunderstorm activities increase in April, May, and June. July is hot and dry with little weather variations. Rainfall increases again in late August and September as tropical disturbances increase and become more frequent. Tropical air masses from the Gulf of Mexico dominate during the spring, summer, and fall. Prevailing winds are southerly to southeasterly throughout the year except in December when winds are predominately northerly.

Table 3. Representative climatic features

Frost-free period (characteristic range)	223-251 days
Freeze-free period (characteristic range)	263-365 days
Precipitation total (characteristic range)	635-813 mm

Frost-free period (actual range)	208-263 days
Freeze-free period (actual range)	254-365 days
Precipitation total (actual range)	610-940 mm
Frost-free period (average)	235 days
Freeze-free period (average)	314 days
Precipitation total (average)	737 mm

Climate stations used

- (1) FOWLERTON [USC00413299], Fowlerton, TX
- (2) HONDO [USC00414254], Hondo, TX
- (3) PEARSALL [USC00416879], Pearsall, TX
- (4) POTEET [USC00417215], Poteet, TX
- (5) CARRIZO SPRINGS 3W [USC00411486], Carrizo Springs, TX
- (6) CHARLOTTE 5 NNW [USC00411663], Charlotte, TX
- (7) KARNES CITY 2N [USC00414696], Karnes City, TX
- (8) MATHIS 4 SSW [USC00415661], Mathis, TX
- (9) TILDEN 4 SSE [USC00419031], Tilden, TX
- (10) UVALDE 3 SW [USC00419268], Uvalde, TX
- (11) BEEVILLE 5 NE [USC00410639], Beeville, TX
- (12) CROSS [USC00412125], Tilden, TX
- (13) DILLEY [USC00412458], Dilley, TX
- (14) FLORESVILLE [USC00413201], Floresville, TX
- (15) GOLIAD [USC00413618], Goliad, TX
- (16) LYTLE 3W [USC00415454], Natalia, TX
- (17) PLEASANTON [USC00417111], Pleasanton, TX
- (18) HONDO MUNI AP [USW00012962], Hondo, TX
- (19) CHEAPSIDE [USC00411671], Gonzales, TX
- (20) CUERO [USC00412173], Cuero, TX
- (21) NIXON [USC00416368], Stockdale, TX
- (22) CALLIHAM [USC00411337], Calliham, TX

Influencing water features

The Clayey Bottomlands occur on flood plains with overflow water. Flooding will occur occasionally to frequently lasting very brief to long durations.

Wetland description

Wetlands may lie within this delineated feature but onsite investigation is required to confirm when suspected.

Soil features

The soils are very deep, moderately well drained with very slow permeability. The soil reaction is slightly alkaline or moderately alkaline. Surface color is grayish brown. Soil series correlated to this site include: Aransas, Bigfoot, and Buchel.

Table 4. Representative soil features

Parent material	(1) Alluvium–shale
Surface texture	(1) Clay (2) Silty clay
Family particle size	(1) Fine (2) Very-fine

Drainage class	Moderately well drained
Permeability class	Very slow to slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

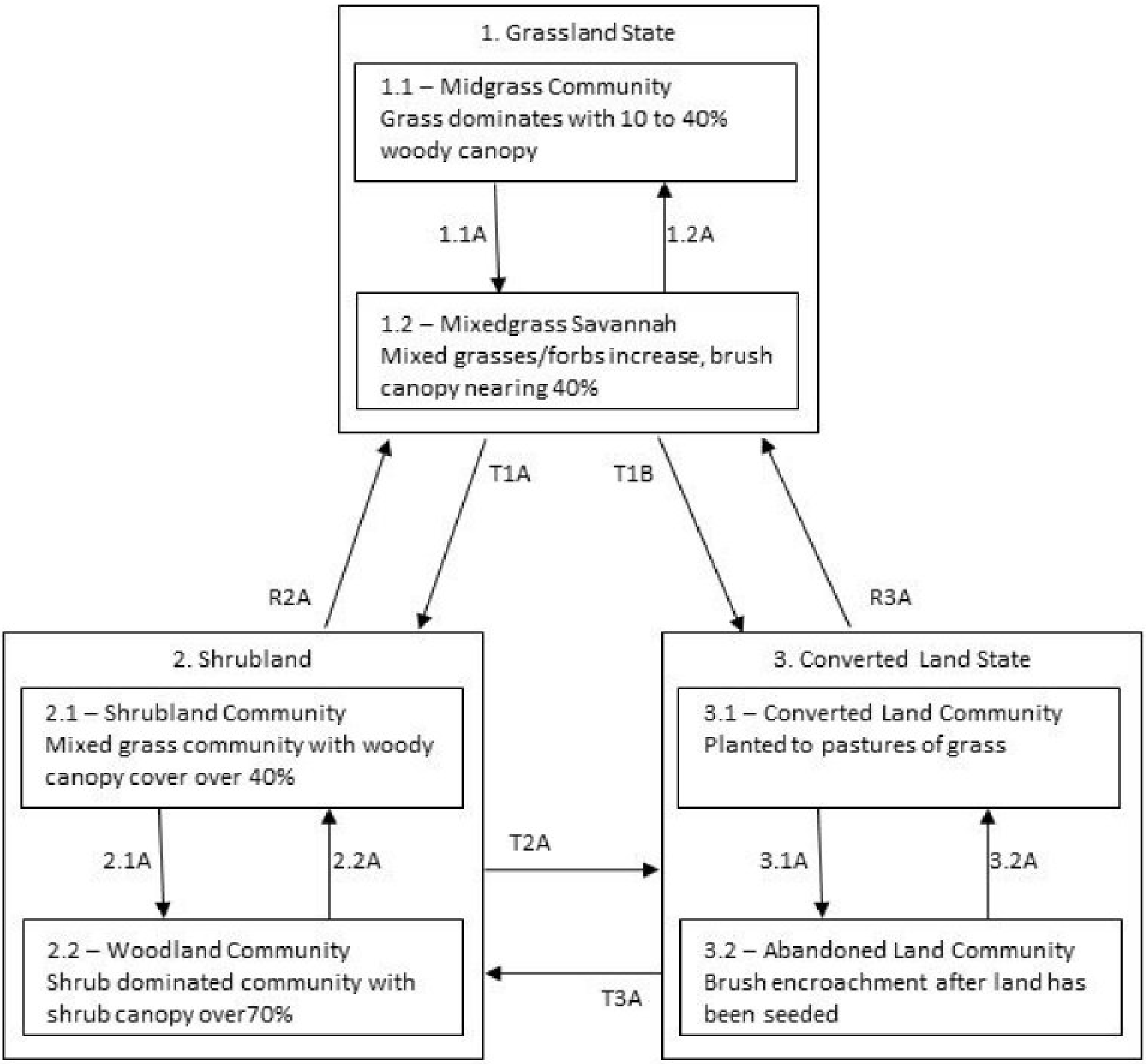
The Northern Rio Grande Plain MLRA was a disturbance-maintained system. Prior to European settlement (pre-1825), fire and grazing were the two primary forms of disturbance. Grazing by large herbivores included antelope, deer, and small herds of bison. The infrequent but intense, short-duration grazing by these species suppressed woody species and invigorated herbaceous species. The herbaceous savannah species adapted to fire and grazing disturbances by maintaining belowground tissues. Wright and Bailey (1982) report that there are no reliable records of fire frequency for the Rio Grande Plains because there are no trees to carry fire scars from which to estimate fire frequency. Because savannah grassland is typically of level or rolling topography, a natural fire frequency of three to seven years seems reasonable for this site.

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, less drought-tolerant species, and some woody species. Droughts also reduce biomass production and create open space, which is colonized by opportunistic species when precipitation increases. Wet periods allow midgrasses to increase in dominance.

Historical accounts prior to 1800 identify grazing by herds of wild horses, followed by heavy grazing by sheep and cattle as settlement progressed. Grazing on early ranches changed natural graze-rest cycles to continuous grazing and stocking rates exceeded the carrying capacity. These shifts in grazing intensity and the removal of rest from the system reduced plant vigor for the most palatable species, which on this site were mid-grasses and palatable forbs. Shortgrasses and less palatable forbs began to dominate the site. This shift resulted in lower fuel loads, which reduced fire frequency and intensity. The reduction in fires resulted in an increase in size and density of woody species.

Today, primarily beef cattle graze rangeland and pastureland. However, horse numbers are increasing rapidly on small acreage properties in the region. There are some areas where dairy cattle, poultry, goats, and 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. Introduced pasture has been established on many acres of old cropland and in areas with deeper soils. Buffelgrass is the most common introduced plant on the site and to a lesser extent bermudagrass, guineagrass (*Urochloa maxima*), and kleingrass, which are more commonly used for hay. Cropland is found in the valleys, bottomlands, and deeper upland soils. Wheat (Triticum spp.), oats Avena spp.), forage and grain sorghum (Sorghum spp.), cotton (Gossypium spp.), and corn (*Zea mays*) are major crops in the region.

State and transition model



Code	Practice
T1A, T3A, 1.1A, 2.1A, 3.1A	Heavy grazing, No fire, No brush management, Drought
T1B, T2A, 3.2A	Brush Management, Crop Cultivation, Pasture Planting
R2A, R3A, 1.2A, 2.2A	Prescribed grazing, Prescribed fire, Brush management

State 1
Savannah

The Savannah State consisted of approximately 70 percent grasses, 20 percent woody plants and a 10 percent composition of forbs by air-dry weight. For interpretive purposes, the woody crown canopy can be approximately 10 to 40 percent. Two community phases exist; the Tallgrass Savannah Community and the Mixedgrass Savannah Community.

Dominant plant species

- cedar elm (*Ulmus crassifolia*), tree
- multiflower false Rhodes grass (*Trichloris pluriflora*), grass

Community 1.1
Tallgrass Savannah

The reference community is a tallgrass savannah with some shrub. Bunchgrasses such as multiflowered false Rhodes grass (*Trichloris pluriflora*), southwestern bristlegrass (*Setaria scheelei*), big cenchrus (*Cenchrus myosuroides*), and big sacaton (*Sporobolus wrightii*) are the major species. Immediately adjacent to stream channels, large woody riparian plants are common such as cedar elm (*Ulmus crassifolia*), liveoak (*Quercus virginiana*), bumelia (*Sideroxylon lanuginosum*), anacua (*Ehretia anacua*), and mesquite (*Prosopis glandulosa*). Higher in the flood plain, large mesquites tend to dominate the woody canopy. Underneath heavily shaded areas, cool-season grasses such as Texas wintergrass (Nasella leucotricha) and Virginia wildrye (*Elymus virginicus*) ocuur. Occasional out-of-bank flow provides extra soil moisture and nutrients while also depositing sediments. This community was maintained by periodic grazing by wild populations and numerous fires; both natural and anthropogenic. Fire likely played more of a role on this site as distance from the primary stream channel increased. Fire frequency is perceived to be variable and to occur in above average years followed by drought and/or prolonged dormant periods. The site is productive and maintained a high percentage of ground cover most of the time. During extended droughts, this ground cover of perennial grasses and forbs was often greatly reduced but had the resiliency to recover when favorable climatic conditions returned. While periodic grazing was a natural component of the ecosystem, continuous abusive grazing has a strong negative impact on this site. Because of abusive grazing, the tallgrasses decrease and are replaced by less palatable, short-lived grasses. Droughts hasten the process. Major grass increasers are white tridens (*Tridens muticus*), vine mesquite (*Panicum obtusum*), buffalograss, curly mesquite (*Hilaria belangeri*) and pink pappusgrass (*Pappophorum bicolor*). Mesquite, twisted acacia (*Acacia schaffneri*), whitebrush (*Aloysia gratissima*), and prickly pear (Opuntia spp.) are the common woody plants that increase as abusive grazing persists. This site, because of the water afforded by landscape position, has the potential to recover much faster than adjacent uplands. However, it will still take several years for a satisfactory recovery. Any efforts to recover this plant community should also consider the proper management of the adjacent upland sites as they are interdependent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3363	5604	7846
Tree	673	897	1121
Shrub/Vine	112	224	336
Forb	56	168	280
Total	**4204**	**6893**	**9583**

Table 6. Ground cover

Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	75-95%
Forb foliar cover	5-15%
Non-vascular plants	0%
Biological crusts	0%
Litter	80-100%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-10%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0-2%	1-2%	70-100%	1-10%
>0.15 <= 0.3	0-2%	1-4%	70-100%	1-15%
>0.3 <= 0.6	0-2%	1-4%	60-80%	5-20%
>0.6 <= 1.4	1-4%	1-5%	30-50%	5-15%
>1.4 <= 4	2-5%	1-5%	–	–
>4 <= 12	5-10%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 9. Plant community growth curve (percent production by month). TX5125, Midgrass Grassland Community. Warm-season production from grass, forbs, and woody species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	5	15	20	20	5	5	10	10	5	3

Community 1.2
Mixedgrass Savannah

This community still exhibits a savannah plant structure dominated by trees, but with a shift to fewer tallgrasses such as multiflowered false Rhodes grass, southwestern bristlegrass, big cenchrus, and big sacaton. Cool-season grasses such as Texas wintergrass and Virginia wildrye increase with the shade from increasing canopy. Large woody plants like cedar elm, liveoak, bumelia, anacua, and mesquite have increased in height and canopy. In the understory, there is an increase of shrubs such as twisted acacia, whitebrush, granjeno and Texas persimmon. While periodic grazing was a natural component of the ecosystem, continuous abusive grazing has a strong negative impact on this site. Because of abusive grazing, the tallgrasses decrease and are of reduced vigor. Fire every three to five years will move this community back toward the Tallgrass Savannah Community as there are still enough remnant tallgrasses to respond. A significant role for prescribed grazing is to not only restore vigor to the tallgrasses, but also to build and maintain fine fuel amounts for effective prescribed burning. It will be increasingly difficult to use fire as canopy and cool-season plants increase. Integrated brush management treatment is needed to restore the community.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2242	3923	5604
Tree	673	897	1121
Forb	168	280	392
Shrub/Vine	112	224	336
Total	**3195**	**5324**	**7453**

Figure 11. Plant community growth curve (percent production by month). TX5128, Shortgrass Dominant Community. Shortgrass dominates the site with decreasing midgrasses and increasing shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	5	15	20	21	5	5	10	10	5	2

Pathway 1.1A
Community 1.1 to 1.2

A shift to the Mixedgrass Savannah Community occurs if the Tallgrass Savannah Community is weakened by excessive leaf removal. Drought hastens the process. A reduction in tall and midgrasses also corresponds in a reduction of fuel loading needed for fire to effectively suppress woody species.

Pathway 1.2A
Community 1.2 to 1.1

Managerial activities that restore the hydrologic cycle, the energy capture by tall grasses, and ground cover will move the 1.2 Mixedgrass Savannah Community toward the 1.1 Tallgrass Savannah Community. Utilizing historic ecological disturbances such as herbivory and fire in constructive amounts is needed. Selective brush management may also be needed. The time to shift back to the 1.1 Tallgrass Savannah Community certainly is dependent upon favorable growing conditions and could take 5 to 10 years. Landscape position with occasional flooding can increase recovery of this plant community quicker than adjacent upland sites.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Shrubland

The Woodland/Shrubland state consists of two communities; Tree/Shrubland Community (2.1) with a brush canopy of 40-70 percent, and the Tree/Shrubland Community (2.2) with a brush canopy of >70 percent. These communities are mixed grass communities with a shrub canopy of mixed brush and trees with some herbaceous plants throughout the interspaces.

Dominant plant species

- mesquite (*Prosopis*), shrub

Community 2.1
Shrubland

Shrubs increase significantly as has overstory canopy in the Shrubland Ccommunity. Once woody plants establish and increase on these fertile soils, competition is greatly reduced. At this point, prescribed grazing alone will not restore this community back to the Savanna State (1). Trees and shrubs are very competitive for sunlight, moisture, and nutrients. Flushes of annual forbs can occur throughout the entire year in response to episodic rainfall. Prescribed fire will be a limited option in this community because of a lack of fine fuel load, fuel continuity, and brush cover. Some pockets of the taller grasses such as big sacaton exist, especially where there are saline spots and grazing pressure is light. Unless brush management is done, shrub cover will increase to more than 50 percent canopy. In areas that tend to pond water on this site, spiny aster (*Chloracantha spinosa*) may establish and form dense colonies. Aggressive brush and grazing management is required to restore the system back to the Savannah State. Re-seeding of perennial warm-season grasses may be necessary and has potential to speed up the restoration process. Reseeding may also have potential to limit establishment of aggressive, introduced grasses such as Kleberg bluestem (Dichanthium annualatum).

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	560	1121	1681
Tree	673	897	1121
Forb	224	504	785
Shrub/Vine	224	392	560
Total	**1681**	**2914**	**4147**

Figure 13. Plant community growth curve (percent production by month). TX5130, Short/Midgrass Shrubland Complex 20-50% woody canopy. Shrubland Community with 20-50% woody canopy..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Community 2.2 Woodland

A lack of brush management of any kind has allowed this community to develop. At this point, prescribed grazing alone will not restore this community. The understory of shrubs provide a second layer of woody canopy that approaches and exceeds 70 percent. Trees and shrubs now harvest most of the sunlight, moisture, and nutrients. Flushes of annual forbs can occur throughout the entire year in response to episodic rainfall. Prescribed fire is not a viable option in this community because of a lack of fine fuel, fuel continuity, and brush cover. Unless brush management is done, shrub cover will increase to more than 50 percent. Aggressive brush and grazing management is required to restore the system back to the grassland state. Re-seeding of perennial warm-season grasses may be necessary and has potential to speed up the restoration process. Reseeding may also have potential to limit establishment of aggressive, introduced grasses such as Kleberg bluestem.

Table 10. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	224	673	1121
Shrub/Vine	448	785	1121
Tree	673	897	1121
Forb	224	392	560
Total	**1569**	**2747**	**3923**

Figure 15. Plant community growth curve (percent production by month). TX5130, Short/Midgrass Shrubland Complex 20-50% woody canopy. Shrubland Community with 20-50% woody canopy..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Pathway 2.1A Community 2.1 to 2.2

A shift to the Woodland Community (2.2) occurs if no brush management is done. Drought hastens the process. A lack of brush management allows existing brush to gain in stature. Seedlings are introduced through droppings of livestock and wildlife. A reduction in tall and midgrasses also corresponds to a reduction of fuel loading needed for fire to effectively suppress woody species. Although the potential of fire is questionable at this point.

Pathway 2.2A Community 2.2 to 2.1

Managerial activities that restore the hydrologic cycle, the energy capture by grasses, and restoring ground cover will tend to move the 2.2 Woodland Community toward the 2.1 Shrubland Community. Selective brush management is needed to accomplish the desired canopy level and spatial arrangement of woody species. Integrated brush management and utilizing historic ecological disturbances such as herbivory and fire in constructive amounts is needed to maintain the desired brush densities. The time to shift back to the 2.1 Shrubland Community is dependent upon favorable growing conditions and could take 3 to 5 years.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 3
Converted Land

The Converted Land State is the result of mechanical intervention along with range planting to either native or adapted introduced species.

Dominant plant species

- buffelgrass (*Pennisetum ciliare*), grass

Community 3.1
Converted Land

This plant community is developed by applying brush management and seeding. The conversion can actually come from any of the previously mentioned communities where brush needs to be reduced and a seed source added to establish a desired plant community. In some instances, an adequate seed source may already exist in the soil. When rootplowing is applied as brush management on this site, long term forb and woody plant diversity will be greatly reduced. Previous attempts at native seeding in this region were met with mixed results because of the seed source not being locally adapted to the region. Many of the grass species listed in the reference plant community are commercially available from collections made in south Texas. The locally adapted species are expected to be more successful in seeding efforts as compared to seed developed several hundred miles outside the region. However, proper seedbed preparation, planting techniques, and timely rainfall are essential for success. The most common introduced grass species seeded is buffelgrass (Cenchrus ciliare). Seeding this species should be cautiously considered due to its aggressive nature to dominate plant communities and reduce herbaceous diversity. Once planted, conversion of buffelgrass dominated areas back to native grass is extremely difficult and rarely successful. The decision of which species to seed is a management decision based on clearly defined goals for livestock and wildlife. Careful consideration should be taken prior to seeding introduced species. Once introduced species are seeded, it is often difficult or impractical to remove them should objectives change. Because of the residual seed source of woody plants, encroachment is inevitable. To help maintain this plant community, prescribed grazing along with fire and some integrated brush management will be needed.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3363	5044	6725
Tree	673	897	1121
Forb	112	280	448
Shrub/Vine	112	224	336
Total	**4260**	**6445**	**8630**

Figure 17. Plant community growth curve (percent production by month). TX5133, Converted Land Community - Native Grass Seeding. Developed by applying brush management, land clearing and seeding to any of the other

plant communities where brush needs to be reduced and a seed source added to establish the desired plant community. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Community 3.2
Abandoned Land

This community develops from the Converted Land Community (3.1) through neglect or abandonment. Without follow-up brush management, seedlings of shrubs establish and spread. Mesquite, twisted acacia, and pricklypear are the most common woody plants or shrubs found on this site following rootplowing. Maintaining healthy grass cover on the site through prescribed grazing might slow brush seedling encroachment however, brush encroachment at some rate is inevitable. If the seedlings are not managed, the plant community will cross a threshold to the Shrubland State (2) which will require application of chemical or mechanical brush management to reduce the canopy. If left untreated too long, reseeding might be needed to restore the grass. As the canopy of the shrubs expands, grass and forb production will be reduced.

Table 12. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	224	1513	2802
Shrub/Vine	448	785	1121
Tree	673	897	1121
Forb	224	392	560
Total	**1569**	**3587**	**5604**

Figure 19. Plant community growth curve (percent production by month). TX5138, Converted Land Community - Woody Seedling Encroachment. Abandoned croplands and land seeded with exotic or native grasses are prone to encroachment by woody plants and with heavy grazing or the absence of fire, can revert to shrublands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Pathway 3.1A
Community 3.1 to 3.2

If woody species are not managed by integrated methods such as brush management or fire, the woody species will increase. Once woody species exceed about 10 percent canopy, it will be difficult to manage them at economic levels.

Pathway 3.2A
Community 3.2 to 3.1

An integrated effort with fire and brush management is needed to restore this community to a grassland. Range planting may also be needed. Grazing management is essential to restore the competitiveness of the grasses and to maintain fuel load needed for effective burning.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Transition T1A
State 1 to 2

The Savannah State will cross a threshold to Shrubland State with abusive grazing, no brush management, or fire. Severe drought is also a significant factor to accelerate this transition. In State 2, more rainfall is being utilized by woody plants than the herbaceous plants. Because of the increased canopy, sunlight is being captured by the woody plants and converted to energy instead of the herbaceous plants.

Transition T1B
State 1 to 3

The transition to the Converted Land State is triggered by major ground disturbing mechanical treatment and planting to native or introduced forages. Planting is usually done following brush management.

Restoration pathway R2A
State 2 to 1

If the management goal is to restore to State 1, significant inputs of energy will be needed. An integrated approach to Brush Management (Scifres et. al. 1985) with mechanical treatment, herbicides and fire will initially reduce the woody species providing opportunity for at least partial recovery of the hydrologic cycle and the energy cycle. Seeding may be needed and can be done in conjunction with ground disturbance methods of brush management. A return to State 1 within a management time frame will be next to impossible when considering returning the trees to their original stature.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Transition T2A
State 2 to 3

The transition to the Converted Land State is triggered by major ground disturbing mechanical treatment and planting to native or introduced forages. Planting is usually done following brush management.

Transition T3A
State 3 to 2

The transition from the Converted Land State to the Shrubland State is triggered by neglect or no management over long periods of time. Shrubs re-establish from the seed bank and introduction from wildlife and livestock. A complete return to a previous state is not possible if adapted, non-native plants have been established or if the soil health has significantly deteriorated. It will also take 20 to 30 years for the large trees to return.

Additional community tables

Table 13. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm season bunchgrasses**			3138–5828	
	big sacaton	SPWR2	*Sporobolus wrightii*	0–5828	–
	switchgrass	PAVI2	*Panicum virgatum*	0–5604	–

	big sandbur	CEMY	*Cenchrus myosuroides*	0–5044	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	0–5044	–
	multiflower false Rhodes grass	TRPL3	*Trichloris pluriflora*	448–2690	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	0–1121	–
2	**Warm season mid/shortgrasses**			224–2018	
	pink pappusgrass	PABI2	*Pappophorum bicolor*	0–1121	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–897	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–897	–
	white tridens	TRAL2	*Tridens albescens*	0–336	–
	Madagascar dropseed	SPPY2	*Sporobolus pyramidatus*	0–224	–
3	**cool season bunch grasses**			224–2018	
	Texas wintergrass	NALE3	*Nassella leucotricha*	0–1121	–
	sedge	CAREX	*Carex*	0–336	–
Forb					
4	**Forbs**			56–280	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–56	–
	bluestem pricklypoppy	ARAL3	*Argemone albiflora*	0–56	–
	spiny chloracantha	CHSP11	*Chloracantha spinosa*	0–56	–
	bundleflower	DESMA	*Desmanthus*	0–45	–
	littleleaf sensitive-briar	MIMI22	*Mimosa microphylla*	0–34	–
	plains dozedaisy	APRA	*Aphanostephus ramosissimus*	0–34	–
	vervain	VERBE	*Verbena*	0–34	–
	wild petunia	RUELL	*Ruellia*	0–34	–
	annual bushsunflower	SILA11	*Simsia lagasceiformis*	0–34	–
	globemallow	SPHAE	*Sphaeralcea*	0–22	–
	fanpetals	SIDA	*Sida*	0–22	–
	sand phacelia	PHPA4	*Phacelia patuliflora*	0–22	–
	groundcherry	PHYSA	*Physalis*	0–22	–
	pepperweed	LEAP6	*Lepidium apetalum*	0–22	–
Shrub/Vine					
5	**Shrub/Vines**			112–336	
	whitebrush	ALGR2	*Aloysia gratissima*	0–224	–
	Texas persimmon	DITE3	*Diospyros texana*	0–168	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–112	–
	saltbush	ATRIP	*Atriplex*	0–56	–
	guajillo	ACBE	*Acacia berlandieri*	0–56	–
	blackbrush acacia	ACRI	*Acacia rigidula*	0–56	–
	stretchberry	FOPU2	*Forestiera pubescens*	0–56	–
	Texas lignum-vitae	GUAN	*Guaiacum angustifolium*	0–56	–
	Berlandier's wolfberry	LYBE	*Lycium berlandieri*	0–56	–
	pricklypear	OPUNT	*Opuntia*	11–56	–
	desert yaupon	SCCU4	*Schaefferia cuneifolia*	0–56	–

	lime pricklyash	ZAFA	*Zanthoxylum fagara*	0–56	–
Tree					
6	**Trees**			673–1121	
	live oak	QUVI	*Quercus virginiana*	224–673	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	168–448	–
	cedar elm	ULCR	*Ulmus crassifolia*	168–448	–
	knockaway	EHAN	*Ehretia anacua*	0–336	–
	Mexican ash	FRBE	*Fraxinus berlandieriana*	0–336	–
	common buttonbush	CEOC2	*Cephalanthus occidentalis*	0–224	–
	gum bully	SILA20	*Sideroxylon lanuginosum*	0–224	–

Animal community

As a historic tall/midgrass prairie, this site was occupied by bison, antelope, deer, quail, turkey, and dove. This site was also used by many species of grassland songbirds, migratory waterfowl, and coyotes. This site now provides forage for livestock and is still used by quail, dove, migratory waterfowl, grassland birds, coyotes, and deer.

Feral hogs (Sus scrofa) can be found on most ecological sites in Texas. Damage caused by feral hogs each year includes, crop damage by rutting up crops, destroyed fences, livestock watering areas, and predation on native wildlife, and ground-nesting birds. Feral hogs have few natural predators, thus allowing their population to grow to high numbers.

Wildlife habitat is a complex of many different plant communities and ecological sites across the landscape. Most animals use the landscape differently to find food, shelter, protection, and mates. Working on a conservation plan for the whole property, with a local professional, will help managers make the decisions that allow them to realize their goals for wildlife and livestock.

Grassland State (1): This state provides the maximum amount of forage for livestock such as cattle. It is also utilized by deer, quail and other birds as a source of food. When a site is in the reference plant community phase (1.1) it will also be used by some birds for nesting, if other habitat requirements like thermal and escape cover are near.

Tree/Shrubland Complex (2): This state can be maintained to meet the habitat requirements of cattle and wildlife. Land managers can find a balance that meets their goals and allows them flexibility to manage for livestock and wildlife. Forbs for deer and birds like quail will be more plentiful in this state. There will also be more trees and shrubs to provide thermal and escape cover for birds as well as cover for deer.

Converted Land State (3): The quality of wildlife habitat this site will produce is extremely variable and is influenced greatly by the timing of rain events. This state is often manipulated to meet landowner goals. If livestock production is the main goal, it can be converted to pastureland. It can also be planted to a mix of grasses and forbs that will benefit both livestock and wildlife. A mix of forbs in the pasture could attract pollinators, birds and other types of wildlife. Food plots can also be planted to provide extra nutrition for deer.

This rating system provides general guidance as to animal preference for plant species. It also indicates possible competition between kinds of herbivores for various plants. Grazing preference changes from time to time, especially between seasons, and between animal kinds and classes. Grazing preference does not necessarily reflect the ecological status of the plant within the plant community. For wildlife, plant preferences for food and plant suitability for cover are rated. Refer to habitat guides for a more complete description of a species habitat needs.

Hydrological functions

The water cycle on this site functions according to the management of not only the existing plant community but also of the surrounding plant communities. The water cycle is most functional when the site is dominated by tall bunchgrass and native trees as the site functions much the same as a sponge. Rapid rainfall infiltration, high soil organic matter, good soil structure, and good porosity are present with a good cover of bunchgrass. Quality of surface runoff will be high, while erosion and sedimentation rates will be low. With high rates of infiltration and periods of heavy rainfall, some water will move below the root zone of grasses. As this water moves downward it may contribute to the recharge of some aquifers.

When unmanaged grazing causes loss or reduction of bunchgrass and ground cover, the water cycle becomes impaired. Infiltration is decreased and runoff is increased because of poor ground cover, rainfall splash, soil capping, low organic matter, and poor structure. With a combination of a sparse ground cover and intensive rainfall, this site can contribute to an increased frequency and severity of flooding within a watershed. Soil erosion is accelerated, quality of surface runoff is poor, and sedimentation is increased.

As the site becomes dominated by woody species, especially oaks, mesquite, and shrubs, the water cycle is further altered. Interception of rainfall by tree canopies is increased which reduces the amount of rainfall reaching the surface (Thurow and Hester, 1997). Stem flow is increased, however, because of the funneling effect of the canopy by the oaks and mesquite. This increases soil moisture at the base of the tree. Increased transpiration, especially when evergreen species like live oak dominate and provide less chance for deep percolation into aquifers. As woody species increase, grass cover declines, which causes some of the same results as heavy grazing.

Various brush management components can help restore the natural hydrology of the site. Also, critical to the overall health of the Clayey Bottomland is the existence of healthy streamside or riparian vegetation. These small but very important vegetative communities exist in the transition zone between the upland portion of the site and the creeks or streams.

Many important functions come from a healthy riparian plant community. These communities protect the streambanks during flooding much the same as shingles protect a roof. They also trap sediments, deadfall, and nutrients fostering the building of soils and nutrients. Another function is that of a sponge, absorbing water and slowly releasing it over time leading to a more sustained flow. These small areas also provide diverse grazing for livestock.

If a mature woodland canopy develops, a buildup of leaf litter occurs which increases the organic matter of the soil, builds structure, improves infiltration, and retards erosion. Some, but not all values of a properly functioning water cycle are restored on this site when a woodland plant community persists.

Recreational uses

Hunting and bird watching are common activities.

Wood products

Cutting hardwoods for firewood is the main wood product on this site.

Inventory data references

Information presented was derived from the revised Range Site, literature, limited NRCS clipping data (417s), field observations, and personal contacts with range-trained personnel.

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Approval

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Vivian Garcia, RMS, NRCS, Corpus Christi, Texas
Contact for lead author	361-241-0609
Date	04/02/2015
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:** None.

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):** Small and non-connected areas.

5. **Number of gullies and erosion associated with gullies:** None.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Short, less than one foot except during overflow events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Stability Rating of 5 to 6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Subangular blocky, A-horizon 4 to 12 inches, three percent SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Tall and midgrasses reduce runoff to minimal amounts except in exceptional rainfall events.

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 tall grasses>>

    Sub-dominant: short warm season grasses (SD)> cool season grasses (SD)>perennial forbs(SD)> trees=shrubs (SD). Forbs make up 10 percent species composition, shrubs and trees compose up to 10 percent.

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** None.

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3,750 to 8,550 air-dry 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:** King Ranch bluestem, spiny aster, mesquite, twisted acacia, annual forbs, annual panicums, threeawns, and red grama.

17. **Perennial plant reproductive capability:** All plants should reproduce each year.