Ecological site R083AY026TX
Eastern Clay Loam

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Accessed: 05/09/2024

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.

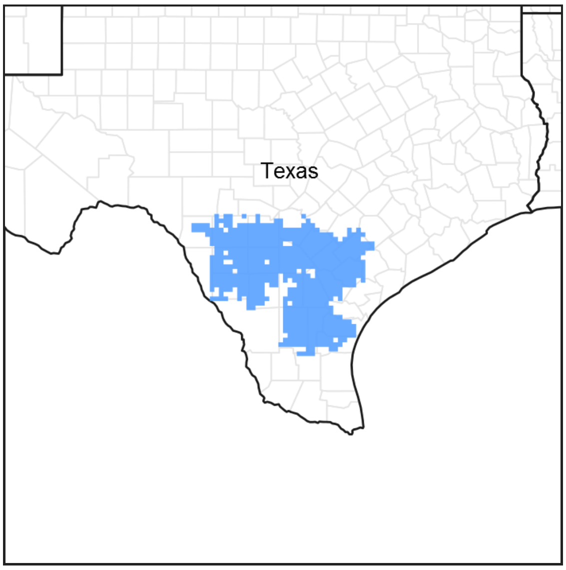


Figure 1. Mapped extent

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 Clay Loam ecological site has deep to very deep clay loam soils and has high vegetative production. The Eastern Clay Loams are more productive than the Western Clay Loam sites, with the separation line occurring in Atascosa County.

Associated sites

R083AY004TX	**Shallow Sandy Loam**
R083AY012TX	**Loamy Draw**
R083AY013TX	**Loamy Bottomland**
R083AY009TX	**Clayey Bottomland**

Similar sites

R083BY025TX	**Clay Loam**
R083CY025TX	**Clay Loam**
R083DY025TX	**Clay Loam**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Aloysia gratissima* (2) *Celtis ehrenbergiana*
Herbaceous	(1) *Bothriochloa barbinodis* (2) *Bouteloua dactyloides*

Physiographic features

These nearly level to gently sloping soils of the Clay Loam ecological site are on interfluves and draws on the Coastal Plains. Surfaces are typically slightly concave or linear. Grades are from 0 to 5 percent, but are mainly gradients less than 2 percent. This area is comprised of inland, dissected coastal plains.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Interfluve (2) Coastal plain > Draw (3) Coastal plain > Stream terrace
Runoff class	Negligible to very high
Elevation	15–457 m
Slope	0–5%
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)	217-241 days

Freeze-free period (characteristic range)	263-365 days
Precipitation total (characteristic range)	711-914 mm
Frost-free period (actual range)	212-248 days
Freeze-free period (actual range)	257-365 days
Precipitation total (actual range)	635-940 mm
Frost-free period (average)	230 days
Freeze-free period (average)	313 days
Precipitation total (average)	813 mm

Climate stations used

- (1) CHEAPSIDE [USC00411671], Gonzales, TX
- (2) CUERO [USC00412173], Cuero, TX
- (3) NIXON [USC00416368], Stockdale, TX
- (4) BEEVILLE 5 NE [USC00410639], Beeville, TX
- (5) CROSS [USC00412125], Tilden, TX
- (6) GOLIAD [USC00413618], Goliad, TX
- (7) FLORESVILLE [USC00413201], Floresville, TX
- (8) KARNES CITY 2N [USC00414696], Karnes City, TX
- (9) PLEASANTON [USC00417111], Pleasanton, TX
- (10) TILDEN 4 SSE [USC00419031], Tilden, TX

Influencing water features

Runoff is low to medium.

Wetland description

N/A.

Soil features

The soils in the Eastern Clay Loam ecological site are deep to very deep, well drained, and have moderate to very slow permeability. The soils formed in loamy alluvium of Pleistocene and Holocene age. A typical pedon will have a mollic epipedon, an argillic horizon starting within 10 inches of the surface, and secondary calcium carbonate beginning at about 30 inches. Soil reaction will typically range from neutral to moderately alkaline with percent calcium carbonate increasing with depth. Soil series correlated to this site include: Clareville, Coy, Cuero, Marcelinas, and San Antonio.

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock (2) Residuum–sedimentary rock
Surface texture	(1) Clay loam (2) Sandy clay loam (3) Loam
Family particle size	(1) Fine (2) Fine-loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0%

Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	17.78–25.4 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–6%
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.

The Clay Loam is a savannah ecological site of the Northern Rio Grande Plain MLRA. It is a fire-influenced midgrass plant community, interspersed with perennial forbs and shrubby woody species. Improper grazing management results in a reduction of midgrass dominance and an increase in composition of shortgrasses, unpalatable forbs, and woody species. Lack of brush control results in a shift in composition until shrubs and trees dominate and reach a near closed canopy woodland.

Continued degradation of the site results in crossing a threshold to the Shortgrass Community (1.2) characterized by shortgrasses, unpalatable grasses, and shrubs. Bare ground, erosion, and water flow patterns will increase, and forage production will decline. Over time, the size and amount of eroded areas will increase as the A-horizon erodes until the site transitions to a Sparsely Vegetated Community (3.1).

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.

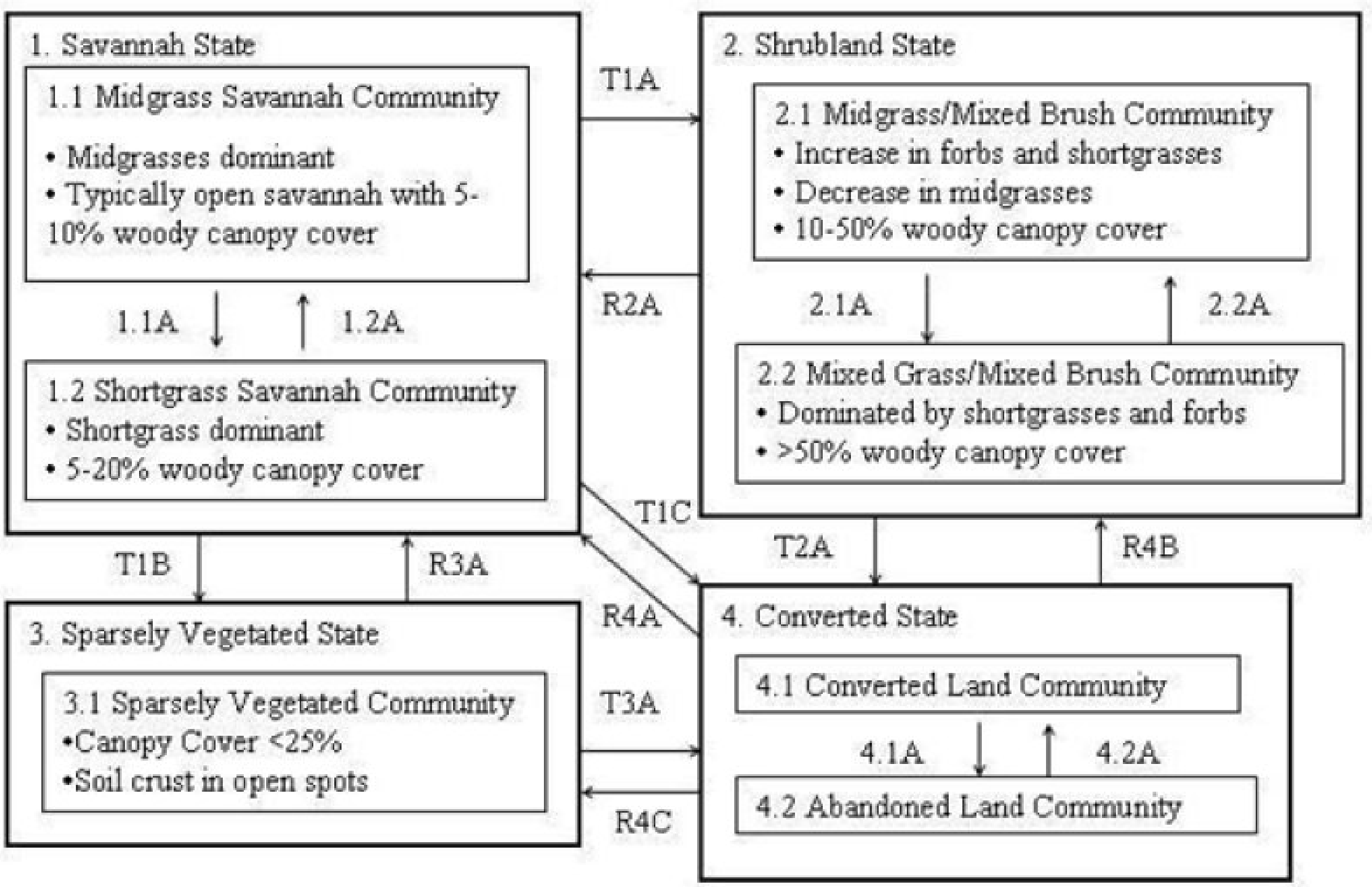
Historical accounts prior to 1800 identify grazing by herds of wild horses, followed by heavy grazing by sheep and cattle as settlement progressed. Grazing on early ranches changed natural graze-rest cycles to continuous grazing and stocking rates exceeded the carrying capacity. These shifts in grazing 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.

During the late 1800's, settlers plowed small areas of this site due to its fertile, productive soils. 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.

Introduced, invasive grass species are common on this site. Some of the common species include buffelgrass, guineagrass, Old World bluestem, and bermudagrass. These plants are highly adapted to this area and are highly productive. However, these invasive plants become a monoculture and reduce the native vegetation component of a site. The site is still able to function from a production standpoint, but once a herbaceous invasive plant has established or naturalized to a site controlling it becomes highly unlikely.

State and transition model



Legend
1.1A Improper Grazing Management, Lack of Fire, Lack of Brush Control, Long-Term Drought
1.2A Proper Grazing Management, Fire (Natural or Prescribed), Brush Management
2.1A Improper Grazing Management, Lack of Fire and Brush Management
2.2A Brush Management, Prescribed Burning, Proper Grazing Management
4.1A Cessation of Farming Practices
4.2A Return to Farming Practices
T1A Improper Grazing Management, Lack of Fire and Brush Management
T1B Improper Grazing Management, Long-Term Drought
T1C, T2A, T3A Land Clearing, Brush Management, Seeding/Cropping
R2A Brush Management, Prescribed Burning, Proper Grazing Management
R3A, R4A, R4B, R4C Range Seeding, Proper Grazing Management, Fire (Natural or Prescribed)

Figure 8. STM

State 1
Savannah

Dominant plant species

- false Rhodes grass (*Trichloris crinita*), grass
- multiflower false Rhodes grass (*Trichloris pluriflora*), grass

Community 1.1
Midgrass Savannah

This community represents the reference plant community. It is a fire-climax, midgrass plant community with less than a five percent canopy of shrubby woody plants. Modern reports (Mann 2004) discuss the importance of human caused fire as an important factor in keeping open grasslands and savannahs prior to European settlement. It is assumed that prior to European settlement, the Midgrass Savannah Community (1.1) occurred over the majority of this ecological site in a dynamically shifting mosaic over time with the Mixedgrass/Mixedbrush Community (2.2) in the Shrubland State (2). Dominant grasses include false Rhodesgrass (Chloris crinita), multiflower Rhodesgrass (*Trichloris pluriflora*), little bluestem, Arizona cottontop, pink pappusgrass, sideoats grama, buffalograss (*Bouteloua dactyloides*), curly-mesquite (*Hilaria belangeri*), perennial threeawn (Aristida spp.), plains bristlegrass (Setaria spp.), Texas wintergrass (*Nassella leucotricha*), and hooded windmillgrass (*Chloris cucullata*). Forbs are Engelmann's daisy (*Engelmannia peristenia*), bundleflower (Desmanthus spp.), sensitive briar (Schrankia spp.), orange zexmenia (Wedelia hispida), Mexican sagewort (*Artemisia ludoviciana*), bushsunflower (Simsia lagasceformis), lazy daisy (Aphanostephus spp.), and annual forbs. The woody species are mesquite, whitebrush, snakewood, spiny hackberry (Celtis pallida), cacti, wolfberry, vine jointfir (Ephedra spp.), desert yaupon (*Schaefferia cuneifolia*), and guayacan (Guaiacum augustifolium). Because the woody species that dominate the Shrubland State (2) are native species that occur as part of the Savannah State (1), the transition is a linear process with shrubs starting to increase soon after fire or brush control ceases. Unless some form of brush control takes place, woody species will gain in stature and increase to the 20 percent canopy cover level that indicates a state change. This is a continual process. Managers need to detect the increase in woody species when canopy is less than 20 percent and take management action before the threshold is crossed. There is not a five-year window before shrubs begin to increase followed by a rapid transition to the Shrubland State. The drivers of the transition (lack of fire and lack of brush control) constantly pressure the system to cross threshold T1A. Once woody canopy exceeds approximately 20 percent and is taller than three feet (an indication of reproduction capability), threshold T1A has been crossed to the Shrubland State (2). Energy in the form of heavy equipment and/or herbicides will be required along with prescribed grazing to shift the plant community back to the Savannah State (1). The Savannah State (1) can be converted to the Converted State (4) by controlling brush while seeding to native or introduced grasses. It may also be plowed and converted to cropland (T1C). There is essentially no bare soil in this community. Plant basal cover and litter comprise all of the ground cover.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3026	4652	5828
Shrub/Vine	168	280	729
Forb	168	280	729
Tree	–	–	–
Total	**3362**	**5212**	**7286**

Figure 10. Plant community growth curve (percent production by month). TX4525, Midgrass Dominant, 5% woodies. Midgrass plant community with less than a 5 percent canopy of woody plants. Growth occurs with peak in spring and fall seasons..

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 1.2
Shortgrass Savannah

The Shortgrass Savannah Community (1.2) of the Savannah State (1) retains the savannah plant structure with the woody species canopy being as high as 20 percent, but the majority are less than three feet tall and not yet capable of reproduction. The increase in woody canopy results from lack of fire or effective brush control. The shift in the herbaceous component typically results from heavy continuous grazing which removed many midgrasses, which are replaced by shortgrasses such as buffalograss, curlymesquite, threeawn, tumblegrass (*Schedonnardus paniculatus*), and red grama (*Bouteloua trifida*). Other common increasers to the site are leatherstem (*Jatropha dioica*), huisache (*Acacia farnesiana*), ragweed (Ambrosia spp.) guajillo (*Acacia berlandieri*), and tasajillo (*Cylindropuntia leptocaulis*). Implementation of proper grazing management in combination with brush management will transition (1.2A) the Shortgrass Savannah Community (1.2) back to the Midgrass Savannah Community (1.1) Since most shrubs and trees are younger than reproductive age in this state, use of fire can be effective in maintaining the open portions of the savannah. A sound grazing management plan will be essential to reverse the trend toward shortgrass dominance. Continued abusive grazing can reduce vigor, cover of mid, and shortgrasses, which will result in increased bare soil. This increases risk of soil erosion and indicates risk of crossing the threshold (T1B) to the Sparsely Vegetated State (3). Heavy continuous grazing will reduce plant cover, litter, and mulch. Bare ground will increase and expose the soil to erosion. Litter and mulch will move off-site as plant cover declines. The Shortgrass Savannah Community (1.2) will cross the threshold to the Shrubland State (2) without effective brush control. Important shortgrasses are buffalograss, curly mesquite, three awns, red grama and Texas wintergrass. Unpalatable, shade-tolerant grasses and forbs begin replacing midgrasses. Examples include ragweed and annual forbs. Shaded conditions favor cool-season grasses such as Texas wintergrass (*Nassella leucotricha*). Woody canopy varies between 5 and 20 percent, depending on the severity of grazing, fire interval, amount of brush control, and availability of woody increaser species. Numerous shrub and tree species will encroach if overgrazing has reduced grass cover, exposed more soil, and reduced fine fuels (grasses). Typically, trees such as mesquite and whitebrush increase in size, while other shrub species such as spiny hackberry, wolfberry, yaupon, and cacti increase in density.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1317	2046	2774
Forb	392	616	841
Shrub/Vine	308	476	644
Tree	–	–	–
Total	**2017**	**3138**	**4259**

Figure 12. Plant community growth curve (percent production by month). TX4526, Shortgrass Dominant with 5-10% woodies. Shortgrass savannah plant structure with the woody species canopy being as much as 10%, but being less than 3 feet tall..

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 1.1A
Community 1.1 to 1.2

The Midgrass Savannah Community (1.1) requires fire and/or brush control to maintain woody species cover below five percent. This community will shift to the Shortgrass Savannah Community (1.2) when there is continued growing-season stress on midgrasses. These stresses include improper grazing management that creates insufficient critical growing-season deferment, excess intensity of defoliation, repeated, long-term growing-season defoliation, and long-term drought. Increaser species (shortgrasses and woody species) are generally endemic species released by disturbance. Native woody species canopy exceeding 10 percent and/or dominance of midgrasses falling below 50 percent of species composition indicate a transition to the Shortgrass Savannah Community. The Midgrass Savannah Community (1.1) can be maintained through the implementation of brush management combined with properly managed grazing that provides adequate growing-season deferment to allow establishment of midgrass propagules and/or the recovery of vigor of stressed plants. The driver for community shift 1.1A for the herbaceous component is improper grazing management, while the driver for the woody component is lack of fire and/or brush control.

Pathway 1.2A
Community 1.2 to 1.1

The Shortgrass Savannah Community (1.2) will return to the Midgrass Savannah Community (1.1) with brush control and proper grazing management that provides sufficient critical growing-season deferment in combination with proper grazing intensity. Favorable moisture conditions will facilitate or accelerate this transition. Reduction of the woody component will require inputs of fire and/or brush control. The understory and overstory components can act independently when canopy cover is less than 20 percent, meaning an increase in shrub canopy cover can occur while proper grazing management creates an increase in desirable herbaceous species. The driver for community shift 1.2A for the herbaceous component is proper grazing management, while the driver for the woody component is fire and/or brush control.

State 2
Shrubland

Dominant plant species

- Christmas cactus (*Cylindropuntia leptocaulis*), shrub
- pricklypear (*Opuntia*), shrub
- yucca (*Yucca*), shrub

Community 2.1
Midgrass/Mixed Brush

This Midgrass/Mixed Brush Community (2.1) is a result of a transition from the Savannah State (1) to the Shrubland State (2). This threshold is passed when the woody canopy shades the ground to the point where insufficient fuels are produced to carry a fire that will control the woody canopy and when shrubs reach three feet in height, meaning they reach reproductive age. The understory is very limited in production due to the competition for sunlight, water and nutrients. There is an increase in tasajillo, prickly pear (Opuntia spp.), yucca (Yucca spp.), annual grasses, and forbs. Shortgrasses produce less fuel load than midgrasses, therefore fire frequency and intensity is decreased when shortgrasses dominate the site. When fires are no longer hot enough to kill woody species, woody plants proliferate and eventually dominate the site. Once woody canopy cover exceeds 20 percent, the community has crossed a threshold that will require some form of management to reduce the brush back to its original state. The area will probably need to be seeded with natives and a good grazing management program established to maintain the health and vigor of the forage component.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1121	1681	2186
Shrub/Vine	897	1289	1681
Forb	504	729	953
Tree	–	–	–
Total	**2522**	**3699**	**4820**

Figure 14. Plant community growth curve (percent production by month). TX4535, Shortgrass/Shrubland Community, 20-50% woodies. Shortgrasses and Shrubs dominate the 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 2.2
Mixed Brush

This Mixed Brush Community (2.2) is a phase of the Shrubland State (2) characterized by over 50 percent woody plant canopy. It is the culmination of continued heavy grazing and a lack of effective brush control (fire or brush management). Woody species dominate the site with little understory production. The community loses its savannah appearance with native shrubs beginning to fill the open grassland portion of the savannah. Shade from overstory is the driving factor. Annual herbage production decreases due to a decline in soil structure and organic matter. Production of the overstory canopy has increased by a similar amount to the decrease in herbaceous production. All unpalatable woody species have increased in size and density. Bare ground may be present that has crusted to the point that there is little water infiltration and little seedling emergence. Water infiltration does occur directly under some of the woody species, such as mesquite as it moves down the trunk of the tree to the base. During the growing season, light showers are captured in the canopy of the trees and evaporate. Energy flow and nutrient use is predominantly through the shrubs. Winter rains can produce understory forage from cool-season annual forbs and grasses and perennials such as Texas wintergrass. This community is highly resilient. Intensive treatment is required to return to communities with less woody cover. Brush treatment tends to be short-lived. Treated areas rapidly return to the Mixed Brush Community (2.2) due to the presence of propagules on and adjacent to treated areas. Observation shows that even effective treatment will require constant maintenance to suppress brush reestablishment. Without maintenance, canopy cover may exceed 50 percent in three to five years. Annual production is dominated by woody species. Browsing animals such as goats and deer can find fair food value if browse plants have not been grazed excessively and created browse lines. Forage quantity and quality for cattle is low. Prescribed fire is not a viable treatment option for conversion of this site back to a semblance of the Midgrass Savannah Community (1.1). Chemical brush control may be necessary for large-scale treatments. Individual plant treatment with herbicides on small patches may be a viable economical option and may help restore the savannah appearance. Mechanical treatment combined with seeding of native species may have the greatest chance of success in returning the reference community, although it may not be economical.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	2242	3026	4035
Grass/Grasslike	560	785	953
Forb	560	673	897
Tree	–	–	–
Total	**3362**	**4484**	**5885**

Figure 16. Plant community growth curve (percent production by month). TX4529, Shrub Woodland Community with >50% Woodies. Shrub Woodland Community with >50% Woodies.

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

Without some form of brush control, woody density and canopy cover will increase in the Midgrass/Mixed-Brush Community (2.1) until it converts into the Mixed-Brush Community (2.2). Improper grazing management and/or long-term drought (or other growing-season stress) will accelerate this transition. Woody canopy cover exceeding 50 percent indicates this community shift. Midgrasses will further decrease as the result of the increase in shade thus resulting in an increase in shortgrasses. Improper grazing or other long-term growing-season stress can increase the composition of less productive grasses and low-growing (or unpalatable) forbs in the herbaceous component. Even with proper grazing, in the absence of fire the woody component will increase to the point that the herbaceous component will decline in production and shift in composition toward sedges, grasses, and forbs suited to growing in shaded conditions with reduced available soil moisture. The driver for community shift 2.1A is lack of fire and/or brush control.

Pathway 2.2A
Community 2.2 to 2.1

Brush management and/or fire can reduce the woody component of the Mixed-Brush Community (2.2) to below the community shift level of 50 percent woody canopy cover. Continued fire and/or brush management will be required to maintain the woody canopy cover level below 50 percent. It may be difficult to shift back to the Grass/Mixed-Brush Community (2.1) with fire alone. The canopy reduces understory growth to carry intense fires. Once woody species become tall enough to not be killed by understory fires, fire is likely to only remove small woody plants. Large trees will dominate over an herbaceous understory. This is amplified if the understory transitions to cool-season grasses, which further reduce opportunity for prescribed fire. If the woody component has been invaded, fire remains an option to create transition 2.2A. 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 in the Mixedgrass/Brush Community (2.2) to the Midgrass/ Mixed-Brush Community (2.1). Range planting may accelerate the transition of the herbaceous community, particularly when combined with favorable growing conditions. Range planting is more commonly associated with restoration efforts associated with Restoration Pathway R2A. The driver for community shift 2.2A is fire and/or brush control. Transition 2.2A is difficult to create with management. Due to the large size of trees present, brush control may require selective removal of large trees along with brush control aimed at smaller trees and saplings.

State 3
Sparsely Vegetated

Dominant plant species

- mesquite (*Prosopis*), shrub

Community 3.1
Sparsely Vegetated

Continued lack of fire and brush management along with abusive grazing results vegetation loss and increase of bare ground. If the fertile A-horizon erodes, the site transitions to the Sparsely Vegetated Community (3.1), dominated by low producing annual forbs and grasses. The decline may be exacerbated by extended drought conditions. Annual forbs such as broomweed are abundant. Stunted mesquite, lotebush, and pricklypear are scattered across the site. In the lowest stages of degradation, there is a significant amount of bare ground, and scalded areas are obvious. Some of the scalds are the result of geologic erosion while others are the result of long-term abuse and mismanagement. This plant community is a terminal state that will not return to reference plant communities because of total degradation of the soil, and complete loss of most of the higher successional native plant species. Potential exists for soils to erode to the point that irreversible damage may occur. If soil-holding herbaceous cover decreases to the point that soils are no longer stable, the shrub overstory will not prevent erosion of the A and B soil horizons. This is a critical shift in the ecology of the site. Once the A-horizon has eroded, the hydrology, soil chemistry, soil microorganisms, and soil physics are altered to the point where intensive restoration is required to restore the site to another state or community. Simply changing management (improving grazing management or controlling brush) cannot create sufficient change to restore the site within a reasonable period.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Forb	224	336	448
Grass/Grasslike	224	336	448
Shrub/Vine	112	168	224
Tree	–	–	–
Total	**560**	**840**	**1120**

Figure 18. Plant community growth curve (percent production by month). TX4536, Sparsely Vegetated Community. Vegetation loss and increase of

bare ground..

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

State 4
Converted

Dominant plant species

- buffelgrass (*Pennisetum ciliare*), grass
- kleingrass (*Panicum coloratum*), grass

Community 4.1
Converted Land

The Converted Land Community (4.1) occurs when the site, is cleared and plowed for planting to cropland, hayland, native grasses, tame pasture, or use as non-agricultural land. The Converted State (4) includes cropland, tame pasture, hayland, rangeland, and go-back land. Agronomic practices are used with non-native forages in the Converted State (4) and to make changes between the communities in the Converted State (4). The native component of the savannah is usually lost when seeding non-natives. Even when reseeding with natives, the ecological processes defining the past states of the site can be permanently changed. The site is frequently converted to cropland or tame pasture sites because of its deep fertile soils, favorable soil/water/plant relationship, and level terrain. Hundreds of thousands of acres have been plowed up and converted to cropland, pastureland, or hayland. The Clay Loam site can be an extremely productive forage producing site with the application of optimum amounts of fertilizer. Crop and pasturelands require weed and shrub control because seeds remain present on the site, either by remaining in the soil or being transported to the site. Converted sites require continual fertilization for crops or tame pasture to perform well. Common introduced species include coastal bermudagrass, buffelgrass, kleingrass, and Old World bluestems (Bothriochloa spp.) which are used in hayland and tame pastures. Wheat, oats, forage sorghum, grain sorghum, cotton, and corn are major crop species. Cropland and tame pasture require repeated and continual inputs of fertilizer and weed control to maintain the Converted State. Without agronomic inputs, the site will shift to the Abandoned Land Community (4.2).

Figure 19. Plant community growth curve (percent production by month). TX4530, Converted Land Community. Community converted into warm-season grass seed mixtures..

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

Figure 20. Plant community growth curve (percent production by month). TX4531, Converted Land - Introduced Grass Seeding. Seeding Coverted Land into Introduced grass species..

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

Figure 21. Plant community growth curve (percent production by month). TX4532, Cropland - Cool-season. Cool-season crops such as wheat and oats are planted..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
14	18	21	22	6	0	0	0	0	0	9	10

Figure 22. Plant community growth curve (percent production by month). TX4533, Cropland - Warm-season. Crops such as cotton, corn, and grain and forage sorghum are planted..

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

Community 4.2
Abandoned Land

The Abandoned Land Community (4.2) occurs when the Converted Land Community (4.1) is abandoned or mismanaged. Mismanagement can include poor crop or haying management. Pastureland can transition to the Abandoned Land Community (4.2) when subjected to lack of brush management, fire and improper grazing management (typically long-term overgrazing). Long-term cropping can create changes in soil chemistry and structure that make restoration to the reference state (1) very difficult and/or expensive. Return to a near native savannah community on the Clay Loam Site is more likely to be successful if soil chemistry, microorganisms, and structure are not heavily disturbed and if aggressive invasive plants are not present. Preservation of favorable soil microbes increases the likelihood of a return to reference, or near reference, conditions. Restoration to native savannah will require seedbed preparation and seeding of native species. Protocols and plant materials for restoring savannah communities are a developing portion of restoration science. Sites can be restored to the Savannah State (1) in the short-term by seeding mixtures of commercially available native grasses. With proper management (prescribed grazing, weed control, brush control), these sites can come close to the diversity and complexity of Midgrass Savannah Community (1.1). It is unlikely that abandoned farmland will return to the Savannah State (1) without active brush management because the rate of shrub increase will exceed the rate of recovery by desirable grass species. Without active restoration, the site is not likely to return to reference conditions due to the presence of introduced forbs and grasses. The native component of the savannah is usually lost when seeding non-natives. Even when reseeding with natives, the ecological processes defining the past states of the site can be permanently changed.

Figure 23. Plant community growth curve (percent production by month). TX4534, Converted Land - Woody Seedlings Encroachment. Woody seedling encroachment on converted lands such as abandoned cropland, native seeded land, and introduced seeding lands..

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 4.1A
Community 4.1 to 4.2

The Converted Land Community (4.1) will transition to the Abandoned Land Community (4.2) if improperly managed as cropland, hayland, or pastureland. Each of these types of converted land is unstable and requires constant management input for maintenance or improvement. This community requires inputs of tillage, weed management, brush control, fertilizer, and reseeding of annual crops. The driver of this transition is the lack of management inputs necessary to maintain cropland, hayland, or pastureland.

Pathway 4.2A
Community 4.2 to 4.1

The Abandoned Land Community (4.2) will transition to the Converted Land Community (4.1) with proper management inputs. The drivers for this transition are weed control, brush control, tillage, proper grazing management, and range or pasture planting.

Transition T1A
State 1 to 2

Shrubs make up a portion of the community in the Savannah State (1), hence woody propagules are present. Regardless of grazing management, without some form of brush control, the Midgrass Savannah Community (1.1) will transition to the Shrubland State (2) even if the understory component does not shift to dominance by shortgrasses. Therefore, the Savannah State (1) is always at risk for shrub and tree dominance and the transition to the Shrubland State (2) in the absence of fire and brush management. The driver for Transition T1A is lack of fire and/or brush control. The mean fire return interval in the Savannah State (1) is three to seven years. Most fires will burn only the understory. Even with proper grazing and favorable climate conditions, lack of fire for 5 to 10 years will allow trees and shrubs to increase in canopy to reach the 20 percent threshold level. The introduction of aggressive woody invader species increases the risk and accelerates the rate at which this transition is likely to occur.

Transition to the Shrubland State (2) can occur from any community within the Savannah State (1), it is not dependent on degradation of the herbaceous community, but on the lack of some form of brush control. Improper grazing, prolonged drought, and a warming climate will provide a competitive advantage to shrubs which will accelerate this process.

Transition T1B
State 1 to 3

The Savannah State (1) transitions to the Sparsely Vegetated State (3) if soil loss continues or increases to the point that total plant canopy cover is less than 25 percent or total annual aboveground biomass production is less than 1,000 pounds per acre. This could occur due to overgrazing (failure to adjust stocking rate to declining forage production due to increased dominance of unpalatable forbs or inaccessible shrubs), long-term lack of fire, warming climate, or extensive drought. The trigger for this transition is the loss of vegetation. This creates open spots with bare soil. If the A-horizon erodes, the soil fertility decreases sharply and the site transitions to the Sparsely Vegetated State (3). Other key factors signaling approach of transition T1B are increases in soil physical crusting, decreases in cover of cryptogamic crusts, decreases in soil surface aggregate stability, and/or evidence of erosion including water flow patterns, development of plant pedestals, and litter movement. The driver for this transition is improper grazing management in combination with long-term drought.

Transition T1C
State 1 to 4

The transition to the Converted State from the Savannah State occurs when the savannah is plowed for planting to cropland or hayland. The threshold for this transition is the plowing of the savannah soil and removal of the woody plant community. The Converted State (4) includes cropland, tame pasture, and go-back land. The site is considered “go-back land” during the period between cessation of active cropping, fertilization, and weed control and the return to the “native” states. Agronomic practices are used to convert rangeland to the Converted State (4) and to make changes between the communities in the Converted State (4). The driver for these transitions is management’s decision to farm the site.

Restoration pathway R2A
State 2 to 1

Restoration of the Shrubland State (2) to the Savannah State (1) requires substantial energy input. The driver for this restoration pathway is removal of woody species, restoration of native herbaceous species, and ongoing management of woody species. Without maintenance, woody species are likely to increase again.

Transition T2A
State 2 to 4

The transition to the Converted State from the Shrubland State occurs when the site is plowed for planting to cropland or hayland. The size and density of brush in the Shrubland State (2) will require heavy equipment and energy-intensive practices (i.e. rootplowing, raking, rollerchopping, or heavy disking) to prepare a seedbed. The threshold for this transition is the plowing of the savannah soil and removal of the woody plant community. The Converted State (4) includes cropland, tame pasture, and go-back land. The site is considered “go-back land” during the period between cessation of active cropping, fertilization, and weed control and the return to the “native” states. Agronomic practices are used to convert rangeland to the Converted State (4) and to make changes between the communities in the Converted State (4). The driver for these transitions is management’s decision to farm the site.

Restoration pathway R3A
State 3 to 1

This state has lost soil or vegetation attributes to the point that recovery to the Savannah State (1) will require reclamation efforts, such as soil rebuilding, intensive mechanical treatments, and/or reseeding in recommended areas only. The driver for this restoration pathway is reclamation efforts.

Transition T3A
State 3 to 4

The transition to the Converted State from the Sparsely Vegetated State occurs when the site is plowed for planting to cropland or hayland. The threshold for this transition is the plowing of the savannah soil and removal of the woody plant community. The Converted State (4) includes cropland, tame pasture, and go-back land. The site is considered "go-back land" during the period between cessation of active cropping, fertilization, and weed control and the return to the "native" states. Agronomic practices are used to convert rangeland to the Converted State (4) and to make changes between the communities in the Converted State (4). The driver for these transitions is management's decision to farm the site.

Restoration pathway R4A
State 4 to 1

Restoration from the Converted State (4) can occur in the short term through active restoration or over the long-term due to cessation of agronomic practices. Cropland and tame pasture require repeated and continual inputs of fertilizer and weed control to maintain the Converted State (4). If the soil chemistry and structure have not been overly disturbed (which is most likely to occur with tame pasture) the site can be restored to the Savannah State (1). The level of disturbance while in the converted state determines whether the site restoration pathway is likely to be (R4A, R4B, or R4C). Return to native savannah communities in the Savannah State (1) is more likely to be successful if soil chemistry and structure are not heavily disturbed. The presence of residual introduced forage plants may preclude a full return to native grasses. Preservation of favorable soil microbes increases the likelihood of a return to reference, or near reference, conditions as does remnant seed sources. Converted sites can be returned to the Savannah State (1) through active restoration, including seedbed preparation and seeding of native grass and forb species. Protocols and plant materials for restoring savannah communities is a developing part of restoration science. The driver for both of these restoration pathways is the cessation of agricultural disturbances.

Transition T41
State 4 to 2

Restoration from the Converted State (4) can occur in the short term through active restoration or over the long-term due to cessation of agronomic practices. Cropland and tame pasture require repeated and continual inputs of fertilizer and weed control to maintain the Converted State (4). Heavily disturbed soils are more likely to return to the Shrubland State (2) or the Sparsely Vegetated State (3). Without continued disturbance from agriculture, the site can eventually return to either the Savannah (1) or Shrubland State (2). The level of disturbance while in the converted state determines whether the site restoration pathway is likely to be (R4A, R4B, or R4C).

Restoration pathway R4C
State 4 to 3

Restoration from the Converted State (4) can occur in the short term through active restoration or over the long-term due to cessation of agronomic practices. Cropland and tame pasture require repeated and continual inputs of fertilizer and weed control to maintain the Converted State (4). Heavily disturbed soils are more likely to return to the Shrubland State (2) or the Sparsely Vegetated State (3). Without continued disturbance from agriculture, the site can eventually return to either the Savannah (1) or Shrubland State (2). The level of disturbance while in the converted state determines whether the site restoration pathway is likely to be (R4A, R4B, or R4C).

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrasses**			2018–4371	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	1681–3082	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	1681–3082	–

	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	841–3082	–
	false Rhodes grass	TRCR9	*Trichloris crinita*	1681–3082	–
	multiflower false Rhodes grass	TRPL3	*Trichloris pluriflora*	1681–3082	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	1121–2018	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	1121–2018	–
	pink pappusgrass	PABI2	*Pappophorum bicolor*	841–1401	–
	hooded windmill grass	CHCU2	*Chloris cucullata*	841–1401	–
	Arizona cottontop	DICA8	*Digitaria californica*	841–1401	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	841–1401	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	448–841	–
	big sandbur	CEMY	*Cenchrus myosuroides*	448–841	–
2	**Shortgrasses**			504–1093	
	buffalograss	BODA2	*Bouteloua dactyloides*	448–841	–
	curly-mesquite	HIBE	*Hilaria belangeri*	448–841	–
	red grama	BOTR2	*Bouteloua trifida*	224–392	–
	threeawn	ARIST	*Aristida*	224–392	–
3	**Cool-season grasses**			101–219	
	Texas wintergrass	NALE3	*Nassella leucotricha*	67–196	–
	Canada wildrye	ELCA4	*Elymus canadensis*	11–112	–
	Virginia wildrye	ELVI3	*Elymus virginicus*	11–112	–
4	**Grasslikes**			67–146	
	sedge	CAREX	*Carex*	11–129	–
	flatsedge	CYPER	*Cyperus*	11–129	–
Forb					
5	**Forbs**			168–729	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	84–168	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	84–168	–
	croton	CROTO	*Croton*	84–168	–
	bundleflower	DESMA	*Desmanthus*	84–168	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	84–168	–
	sensitive plant	MIMOS	*Mimosa*	84–168	–
	awnless bushsunflower	SICA7	*Simsia calva*	84–168	–
	threeawn	ARIST	*Aristida*	56–112	–
	Forb, annual	2FA	*Forb, annual*	56–112	–
Shrub/Vine					
6	**Shrubs/Vines**			168–729	
	mesquite	PROSO	*Prosopis*	0–336	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	0–224	–
	whitebrush	ALGR2	*Aloysia gratissima*	84–168	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	84–168	–
	snakewood	CONDA	*Condalia*	84–168	–

	Texan hogplum	COTE6	*Colubrina texensis*	84–168	–
	Texas persimmon	DITE3	*Diospyros texana*	84–168	–
	vine jointfir	EPPE	*Ephedra pedunculata*	84–168	–
	Texas lignum-vitae	GUAN	*Guaiacum angustifolium*	84–168	–
	Berlandier's wolfberry	LYBE	*Lycium berlandieri*	84–168	–
	pricklypear	OPUNT	*Opuntia*	84–168	–
	oak	QUERC	*Quercus*	84–168	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	84–168	–
	desert yaupon	SCCU4	*Schaefferia cuneifolia*	84–168	–

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.

Savannah State: 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.

Shrubland State: 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: 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 Midgrass Community (1.1) water cycle functions well with good infiltration and deep percolation of rainfall. The water cycle functions best in the Midgrass Savannah Community (1.1) and changes as the vegetation community changes. Rapid rainfall infiltration, high soil organic matter, good soil structure and good porosity accompany high bunchgrass cover. Surface runoff quality will be high and erosion and sedimentation rates will be low.

A shift to the Shortgrass Community (1.2) means reduced plant and litter cover, which impairs the water cycle. Infiltration will decrease and runoff will increase due to reduced ground cover, rainfall splash, soil capping, reduced 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 increases.

Domination of the site by woody species, especially oaks, further changes the water cycle in the Shrubland State (2). Under the dense canopy of the shrubland, leaf litter builds up. This increases soil organic matter, builds structure, improves infiltration, and reduces surface erosion. These conditions improve the function of the water cycle compared to lower levels of canopy cover.

Interception of rainfall by tree canopies increases, which reduces the amount of rainfall reaching the surface and being available to understory plants. However, increased stemflow, due to the funneling effect of the canopy, will increases soil moisture at the base of trees, especially on mesquite. Evergreen species, such as live oak, create increased transpiration, which provides less water for deep percolation. Moreover, as woody species increase, they sometimes have root systems that reach deeper in to the soil than do the grasses. Therefore, they can utilize soil moisture below the rooting depth of grasses, particularly those with grazing induced dwarf root systems.

Increases in woody canopy create declines in grass cover, which creates similar impacts as those described for improper grazing above. Return of the Shrubland State (2) to the Midgrass Community (1.1) through brush management and good grazing management can help improve hydrologic function of the site. In the Sparsely Vegetated State (3), there is much less vegetation to intercept rainfall and that which strikes the ground may cause erosion due to increase in bare soil. Evaporation losses are higher in the Sparsely Vegetated State (3), which when combined with increased runoff and eroded soils, results in less moisture reaching the rooting zone.

Recreational uses

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

Wood products

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

Other products

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

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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Rangeland health reference sheet

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

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Date	06/04/2009
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, except following extremely high intensity storms when short flow patterns may appear.

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 with zero to three percent bare ground.

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):** Minimal and short under normal rainfall intensity.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Very dark grayish brown clay loam from zero to five inches, moderate fine and medium subangular blocky structure, hard, friable, many fine roots, neutral, abrupt smooth boundary.

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

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 midgrasses >>

    Sub-dominant: Warm-season shortgrasses >

    Other: Forbs > Shrubs/Vines > Trees

Additional: Forbs make up five percent species composition while shrubs and trees make up five5 percent.

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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):** 3,000 to 5,750 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:** Huisache is the primary invader.

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17. **Perennial plant reproductive capability:** All species should be capable of reproduction except for periods of prolonged drought conditions, heavy natural herbivory, and wildfires.
