USDA Natural Resources Conservation Service

Ecological site R083BY013TX
Loamy Bottomland

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

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.

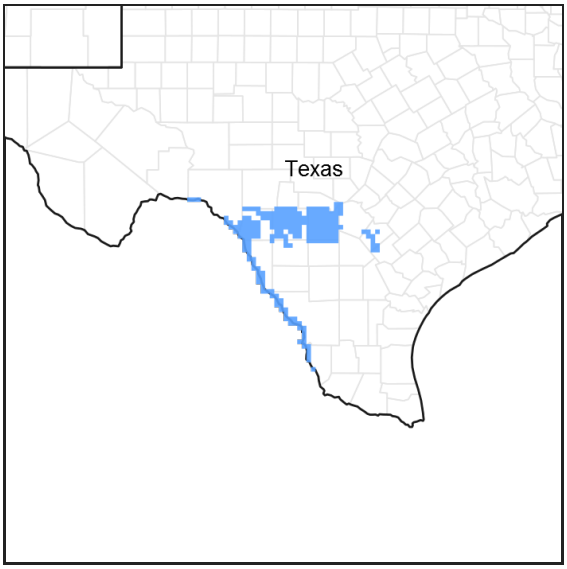

Figure 1. Mapped extent

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): 083B–Western Rio Grande Plain

Major Land Resource Area (MLRA) 83B It makes up about 9,285 square miles (24,060 square kilometers). The border towns of Del Rio, Eagle Pass, Laredo, and Zapata are in this MLRA. Interstate 35 crosses the area just north of Laredo. The Amistad National Recreation Area is just outside this MLRA, northwest of Del Rio, and the Falcon State Recreation Area is southeast of Laredo. Laughlin Air Force Base is just east of Del Rio. This area is comprised of inland, dissected coastal plains.

Classification relationships

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

Ecological site concept

Loamy Bottomlands occupy the lowest setting on the landscape. They are comprised of flood plains formed from loamy alluvium. Flooding can occur on these sites.

Associated sites

R083BY002TX	**Shallow Ridge**
R083BY003TX	**Gravelly Ridge**
R083BY023TX	**Sandy Loam**
R083BY010TX	**Vega**

Similar sites

R083AY013TX	**Loamy Bottomland**
R083CY013TX	**Loamy Bottomland**
R083DY013TX	**Loamy Bottomland**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Fraxinus* (2) *Platanus occidentalis*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Panicum anceps*

Physiographic features

Sites are nearly level to gently sloping on flood plains. Slope ranges from 0 to 3 percent. Flooding occurs frequently on some sites. Elevation ranges from 165 to 1,200 feet. This area is comprised of inland, dissected coastal plains.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain (2) Coastal plain > Stream terrace
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	61–183 m
Slope	0–3%
Water table depth	107–203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 83B mainly has a subtropical steppe climate along the Rio Grande River and subtropical subhumid climates in La Salle and McMullen counties. Winters are dry and mild and the summers are hot. 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. Peak rainfall occurs late in spring and a secondary peak occurs early in fall. Most heavy thunderstorm activities occur during the summer months. 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 as the storms dissipate. 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)	231-321 days
Freeze-free period (characteristic range)	313-365 days
Precipitation total (characteristic range)	508 mm
Frost-free period (actual range)	214-365 days
Freeze-free period (actual range)	260-365 days
Precipitation total (actual range)	483-533 mm
Frost-free period (average)	270 days
Freeze-free period (average)	340 days
Precipitation total (average)	508 mm

Climate stations used

- (1) EAGLE PASS 3N [USC00412679], Eagle Pass, TX
- (2) FALCON DAM [USC00413060], Roma, TX
- (3) LAREDO 2 [USC00415060], Laredo, TX
- (4) ZAPATA 1 S [USC00419976], Zapata, TX
- (5) DEL RIO INTL AP [USW00022010], Del Rio, TX
- (6) CATARINA [USC00411528], Asherton, TX
- (7) CRYSTAL CITY [USC00412160], Crystal City, TX
- (8) DEL RIO 2 NW [USC00412361], Del Rio, TX

Influencing water features

Flooding intervals vary in occurrence, primarily from May through September during the growing season.

Wetland description

Wetlands usually do not occur within this site however small low lying areas may contain hydric soils and/or wetlands. If wetlands are suspected an onsite investigation is needed to verify.

Soil features

The soils are very deep, somewhat poorly drained, and moderately to slowly permeable that formed in alluvial sediments. Soil series correlated to this site include: Divot, Lagloria, Laredo, Odem, Pintas, Reynosa, and Rio Grande.

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock
Surface texture	(1) Loam (2) Clay loam (3) Silty clay loam (4) Fine sandy loam
Family particle size	(1) Fine (2) Fine-silty (3) Coarse-silty
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	1–40%
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)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The accounts of early explorers and settlers suggest that the Rio Grande Plains was likely a vast mosaic of open grassland, savannah, and shrubland. While moving in 1691 out of Maverick County and into Zavala County, Don Domingo de Teran found after crossing the Nueces River “the country was level and covered with mesquites and cats’ claw.” In 1849, Michler described south Texas as “concerning the land both on the Frio and the Leona, from these rivers back, that it may be divided into four parallel strips-the first, next to the river, consisting of heavy timber, and a heavy black soil, the second, a mesquite flat, of small width, and the soil of a lighter nature, and very fertile; the third, a range of low hills, covered with loose stones, and thick chaparral; the fourth, a wide-open prairie.” Lehman indicates, “thus while it is quite true that the Rio Grande Plains once had fewer woody plants and more grass than now, it is also true that an ample seed stock of shrubs and trees has been widely distributed for as long as man has known.” The vegetation structure likely varied from place-to-place depending on topography, soil properties, and time since the last major disturbance.

Large numbers of domestic livestock grazed South Texas as early as the mid-1700’s. Formal deeds to properties from the Spanish and Mexican governments came in the late 1760’s with much larger blocks granted in the decades to follow. Lehman indicated, “in 1757, the official Spanish census showed residents of Camargo and Reynosa in the lower Rio Grande owning over 90,000 sheep and goats. By way of contrast, combined numbers of cattle, oxen, horses, mules and burros were less than 16,000.” By the mid-1800’s, according to Lehman’s figures from the U. S. Census of 1889, “there were a minimum of 1,644,268 sheep-fully 45 percent of Texas total population, grazing south of the Nueces River.” According to Inglis, “the Rio Grande Plains had the four-leading sheep producing counties in the state and ten of the top fifteen sheep producing counties were in South Texas. The peak decade was 1880 to 1890, at times exceeding two million head.” These domestic animals were in addition to bison, antelope, deer, and large herds of wild horses. It is obvious from early accounts, that much of the Rio Grande Plains was periodically grazed hard by both domestic animals and wild populations as early as the early to mid-1700’s. It may be that overgrazing by sheep and goats could have suppressed the many shrubs, reduced shrub canopy, and arrested shrub seedlings.

With the arrival of European man, the South Texas area was fenced and, in many instances, stocked beyond its capability to sustain forage. This overstocking led to a reduced fire frequency and intensity, creating an opportunity for woody shrubs to increase across the landscape. As the natural graze-rest cycles were altered and stocking rates continued to exceed the natural carrying capacity of the land, midgrasses were replaced by shortgrasses and the ground cover was opened so additional annual and perennial forbs also increased. Drought certainly enhanced this effect. As prolonged overgrazing continued, shrub cover increased. Shortgrasses became dominant and forage production decreased. This change in plant cover and structure further decreased fire frequency and intensity, favoring shrub establishment and dominance.

The plant communities of this site are dynamic varying in relation to fire, periodic drought, and wet cycles. Periodic fires were set by either Native Americans or started naturally by lightning. Fire did not play as important a role on this site as in deeper more productive sites due to lower production of grasses to burn. Because of large amounts of gravel in the soil, available water holding capacity is greatly reduced. This causes highly variable forage

production and minimal grass production during dry years. The historic community of this site was influenced to some extent by periodic grazing by herds of buffalo and wild horses. Herds of buffalo and wild horses would come into an area, graze it down, and then not come back for many months or even years depending upon the availability of water. This long deferment period allowed recovery of the grasses and forbs which served as fuel load. More than likely, fire occurred following years of good rainfall followed by a dry season. The fire frequency for this area is interpreted to be four to six years (Frost, 1998).

State and transition model

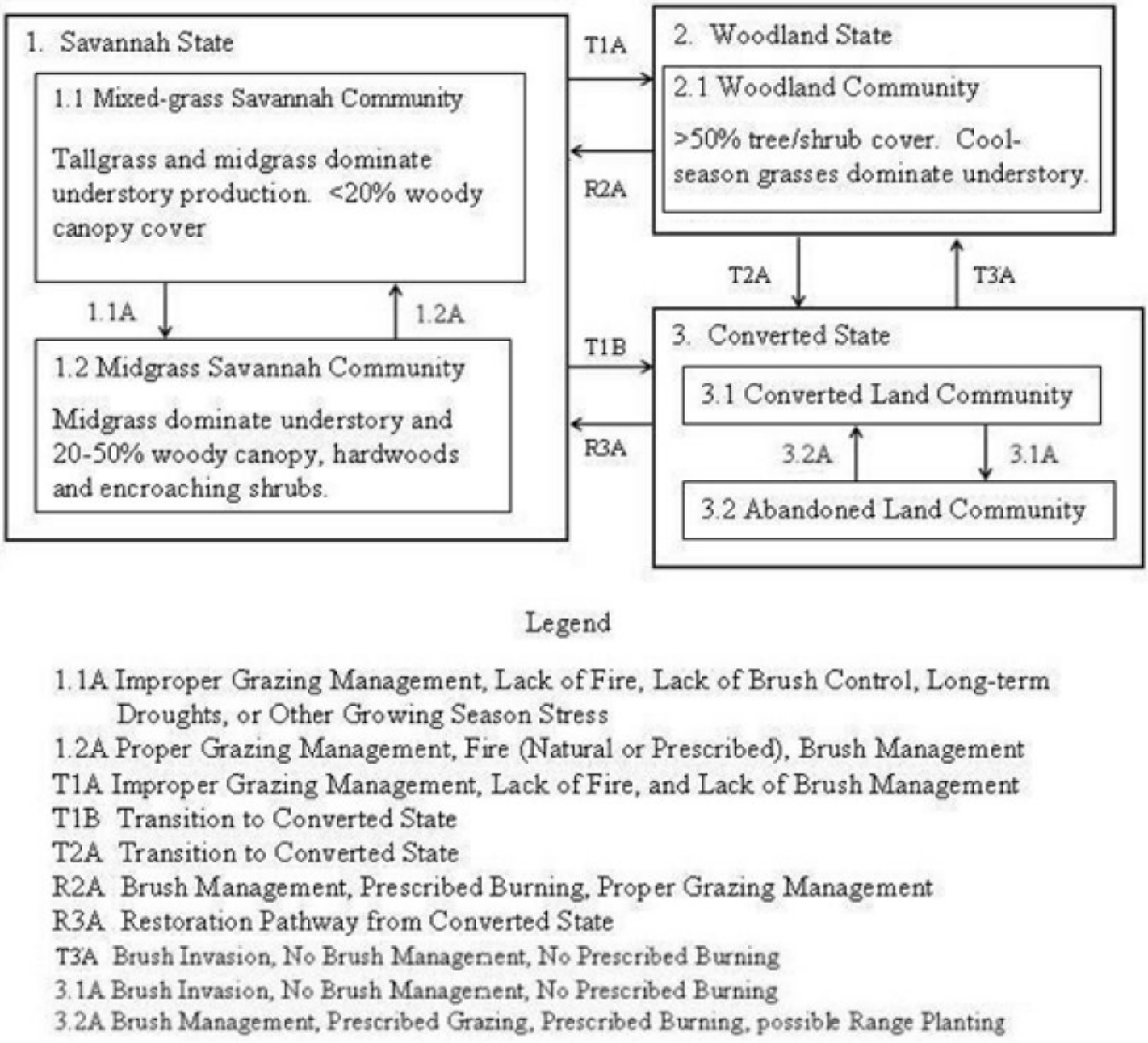

Figure 8. STM

State 1
Savannah

Dominant plant species

- oak (*Quercus*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- wildrye (*Elymus*), grass

Community 1.1
Mixed-grass Savannah

The Mixed-grass Savannah Community (1.1) is the reference community and is characterized as a hardwood savannah with up to 20 percent tree and shrub canopy cover. Historic records from the 1700's indicate that early settlers and explorers found portions of this site to be heavily wooded. Other reports (Mann 2004) discuss the importance of human caused fire as an important factor in keeping open grasslands prior to European settlement. It is assumed the Mixed-grass Savannah Community (1.1) occurred over the majority of this ecological site in a dynamically shifting mosaic over time with the other two communities in the Savannah State. Little bluestem, Virginia wildrye, Canada wildrye, sedges, switchgrass, Indiangrass, beaked panicum (*Panicum anceps*), and rustyseed paspalum (*Paspalum langei*) dominate the herbaceous component of the site. Forbs commonly found on the site include tickclover (Desmodium spp.), wildbeans (Strophostyles spp.), lespedezas (Lespedeza spp.), and partridge pea (*Chamaecrista fasciculata*). Shrub and tree species found in the Mixed-grass Savannah Community (1.1) include species of oaks, pecan, hackberry (Celtis spp.), and elm (Ulmus spp.). Vines include greenbrier (Smilax spp.), grape (Vitis spp.), honeysuckle (Lonicera spp.), and peppervine (Ampelopsis spp.). The reference savannah community will shift to the Midgrass Savannah Community (1.2) under the stresses of improper grazing. The first species to decrease in dominance will be the most palatable grasses and forbs. This will initially result in an increase in composition of little bluestem and paspalums. If improper grazing continues, little bluestem will decrease and midgrasses such as broomsedge bluestem (*Andropogon virginicus*), and Vasey's grass (*Paspalum urvillei*). Less palatable forbs will also increase at this stage. Without fire and/or brush control, woody species on the site will increase and transition the site to the Woodland State (2). This can occur with or without the understory transitioning to the Midgrass community. This transition can occur without degradation of the herbaceous community from dominance by tallgrasses and palatable midgrasses to dominance by midgrasses. Brown and Archer (1999) concluded that even with a healthy and dense stand of grasses, woody species will populate the site and eventually dominate the community. Because the dominant woody species in the Woodland State are native species that occur as part of the Savannah State, the transition to the Woodland State is a linear process, with shrubs increasing soon after fire or brush control ceases. Unless some form of brush control takes place, woody species will increase to the 50 percent canopy cover that indicates a state change. This is a continual process. Managers need to detect the increase in woody species when canopy is less than 50 percent and take management action before the state change occurs. There is not a 10-year window before shrubs begin to increase followed by a rapid transition to the Woodland State. The drivers of the transition (lack of fire and lack of brush control) constantly pressure the system towards the Woodland State. The soils of this site are deep, loamy textured, and moderately permeable. The site generally receives additional water from outside the site. Infiltration is moderate and runoff is low. There is essentially no bare soil in this community. Plant basal cover and litter comprise all of the ground cover. Soils are highly fertile and hold moderately large amounts of soil moisture. This is a very productive site with high yields of good quality forage.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2914	3699	5380
Shrub/Vine	392	504	729
Tree	392	504	729
Forb	196	252	364
Total	**3894**	**4959**	**7202**

Figure 10. Plant community growth curve (percent production by month). TX4527, Mixed-Grass Savannah with 5-20% Woodies. Mixed-Grass Savannah Community with the woody canopy cover may be as high as 20%..

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
Midgrass Savannah

The Midgrass Savannah Community (1.2) typically results from improper cattle grazing management over a long period of time combined with a lack of brush control. Indigenous or invading woody species increase on the site (with or without fire). Growing-season stress, usually from overgrazing, causes reduction in vigor and survival of tallgrasses and palatable midgrasses, which allows less palatable midgrasses and less palatable forbs to increase in the herbaceous community. Important grasses are bushy bluestem and Vasey's grass. Unpalatable, shade-tolerant grasses and forbs begin replacing the midgrasses. Examples of forbs include cocklebur (Xanthium spp.), sumpweed (*Iva annua*), and beebalm (Monarda spp.). Shaded conditions favor cool-season grasses such as Texas wintergrass (*Nassella leucotricha*) and woodoats (Chasmanthium spp.). Woody canopy varies between 20 and 50 percent, depending on the severity of grazing, fire interval, amount of brush control, and availability of increaser species. Numerous shrub and tree species will encroach because overgrazing by livestock has reduced grass cover, exposed more soil, and reduced grass fuel for fire. Typically, trees such as oaks and ash (Fraxinus spp.) will increase in size, while other tree and shrub species such as bumelia (Sideroxylon spp.), sumacs (Rhus spp.), honey locust (Robinia rusbyi), winged elm (*Ulmus alata*), and Osage orange (*Maclura pomifera*) will increase in density. To control woody species populations, prescribed grazing and/or browsing and fire can be used to control smaller shrubs and trees, and mechanical removal of larger shrubs and trees may be necessary in older stands. Until the Midgrass Savannah Community (1.2) crosses the threshold into the Woodland Community (2.1), this community can be managed back toward the Savannah State (1.1) using management practices including prescribed grazing, prescribed burning, and strategic brush control. It may take several years to achieve this state, depending upon the climate and the aggressiveness of the treatment. Once invasive woody species begin to establish, returning fully to the native community is difficult, though it is possible to return to a similar plant community. 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) is not sufficient to restore the site within a reasonable period.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1681	2690	3363
Shrub/Vine	841	1345	1681
Forb	280	448	560
Tree	–	–	–
Total	**2802**	**4483**	**5604**

Figure 12. Plant community growth curve (percent production by month). TX4541, Midgrass Dominant Community, 15-30% Canopy. Midgrasses dominate the site with 15-30% 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 1.2A
Community 1.2 to 1.1

The Midgrass Savannah Plant Community (1.2) will return to the Mixed Grass Savannah Plant 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. The understory component may return to dominance by tall grasses and desirable midgrasses in the absence of fire (at least until shrub canopy cover reaches 50 percent). 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 50 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
Woodland

Dominant plant species

- oak (*Quercus*), tree
- pecan (*Carya illinoinensis*), tree
- elm (*Ulmus*), tree

Community 2.1
Woodland

The Woodland Community (2.1) has an over 50 percent woody plant canopy, dominated by hardwoods such as pecan and oaks. 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. This community results from the lack of effective brush control. 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. Unpalatable woody species have increased in size and density. Common understory and midstory species that grow under a dense canopy include panicums, paspalums, tridens, woodoats, wildryes, Texas wintergrass, bristlegrass (Setaria), sedge, flatsedge (Cyperus spp.), rush (Juncus spp.), and fimbry (Fimbristylis spp.). Forbs include western ragweed (*Ambrosia psilostachya*), blood ragweed (*Ambrosia trifida* var. texana), sumpweed, cocklebur, mare's tail (Equisetum spp.), and cattail (*Typha latifolia*). Trees, shrubs, and vines include elm, bumelia sumacs, hawthorn, grape , greenbriar, and ivy treebine (Cissus incisa). Texas wintergrass, threeawns (Aristida spp.) and annuals increase in the shade of the trees. Unpalatable invaders may occupy the interspaces between trees and shrubs. Plant vigor and productivity of grass species is reduced due to shade. Shade is a driving factor for the understory plant community. Without brush control, tree canopy will continue to increase until canopy cover approaches 80 percent. In this plant community, 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. 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 Savannah State (1). Chemical brush control on a large scale may not a treatment option; however, individual plant treatment with herbicides on small acreages may be a viable option. Mechanical treatment of this site, along with seeding, is the most viable treatment option although it may not be economical. 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 Woodland Community (2.1) 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.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	2802	4259	5604
Forb	280	392	560
Grass/Grasslike	280	392	560
Tree	–	–	–
Total	**3362**	**5043**	**6724**

Figure 14. 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

State 3
Converted

Dominant plant species

- buffelgrass (*Pennisetum ciliare*), grass

Community 3.1
Converted Land

The Converted Land Community (3.1) occurs when the site, either the Savannah State (1) or Woodland State (2), is cleared and plowed for planting to cropland, hayland, native grasses, tame pasture, or use as non-agricultural land. The Converted State includes cropland, tame pasture, hayland, rangeland, and go-back land. Agronomic practices are used with non-native forages in the Converted State and to make changes between the communities in the Converted State. The native component of the prairie 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 Loamy Bottomland site is frequently converted to cropland or tame pasture sites because of its deep fertile soils, favorable soil/water/plant relationships, and level terrain. Hundreds of thousands of acres have been plowed up and converted to cropland, pastureland, or hayland. Small grains are the principal crop, and buffelgrass and bermudagrass are the primary introduced pasture species on loamy soils in this area. The Loamy Bottomland site can be an extremely productive forage producing site with the application of optimum amounts of fertilizer. Cropland, pastureland, and hayland are intensively managed with annual cultivation and/or frequent use of herbicides, pesticides, and commercial fertilizers to increase production. Both 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 (particularly bermudagrass) to perform well. Common introduced species include buffelgrass, coastal bermudagrass, 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 the major crop species. Cropland and tame pasture require repeated and continual inputs of fertilizer and weed control to maintain the Converted State. The site is considered go-back land during the period between active management for pasture or cropland and the return to a native state.

Figure 15. 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

Community 3.2
Abandoned Land

The Abandoned Land Community (3.2) occurs when the Converted Land Community (3.1) is abandoned or mismanaged. Mismanagement can include poor crop or haying management. Pastureland can transition to the Abandoned Land Community when subjected to improper grazing management (typically long-term overgrazing). Heavily disturbed soils allowed to go-back return to the Woodland State. Long-term cropping can create changes in soil chemistry and structure that make restoration to the reference state very difficult and/or expensive. Return to native prairie communities in the Savannah State is more likely to be successful if soil chemistry, microorganisms, and structure are not heavily disturbed. Preservation of favorable soil microbes increases the likelihood of a return to reference, or near reference conditions. Restoration to native prairie will require seedbed preparation and seeding of native species. Protocols and plant materials for restoring prairie communities is a developing portion of restoration science. Sites can be restored to the Savannah State 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 Mixed-grass 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. The native component of the prairie 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 16. 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 3.2A
Community 3.2 to 3.1

The Abandoned Land Community (3.2) will transition to the Converted Land Community (3.1) 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 and trees make up a portion of the plant community in the Savannah State (1), hence woody propagules are present. Therefore, the Savannah State is always at risk for shrub dominance and the transition to the Woodland State in the absence of fire. The driver for Transition T1A is lack of fire and/or brush control. Most fires will burn only the understory. Even with proper grazing and favorable climate conditions, lack of fire for years will allow trees and shrubs to increase in canopy to reach the 50 percent threshold level. The introduction of aggressive woody invader species increases the risk and accelerates the rate at which this transition state is likely to occur. This transition 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 brush control. Improper grazing and prolonged drought will provide a competitive advantage to shrubs, which will accelerate this process. Tallgrasses will decrease to less than five percent species composition.

Transition T1B
State 1 to 3

The transition to the Converted State from the Savannah State occurs when the site is cleared and plowed for planting to cropland or hayland. The threshold for this transition is the plowing of the prairie soil and removal of the woody plant community. The Converted State 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 and to make changes between the communities in the Converted State. The driver for these transitions is management’s decision to farm the site.

Restoration pathway R2A
State 2 to 1

Restoration of the Woodland State to the Savannah State requires substantial energy input. The driver for this restoration pathway is removal of woody species, restoration of native herbaceous species, and ongoing management of invasive species. Without maintenance, woody and invasive species are likely to return (probably rapidly) due to presence of propagules in the soil.

Transition T2A
State 2 to 3

The transition to the Converted State from the Woodland State (T2A) occurs when the site is cleared and plowed for planting to cropland or hayland. The size and density of brush in the Woodland State 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 prairie soil and removal of the woody plant community. The Converted State 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 and to make changes between the communities in the Converted State. The driver for these transitions is management’s decision to farm the site.

Restoration pathway R3A
State 3 to 1

Restoration from the Converted State 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. If the soil chemistry and structure have not been overly disturbed (which is likely to occur with tame pasture) the site can be restored to the Savannah State. The level of disturbance while in the Converted State determines whether the site restoration pathway is likely to be R3A (a return to the Savannah State) or T3A (a return to the Woodland State). Return to native prairie communities in the Savannah State is more likely to be successful if soil chemistry and structure are not heavily disturbed. 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 return to the Savannah State through active restoration, including seedbed preparation and seeding of native grass and forb species. Protocols and plant materials for restoring prairie communities is a developing part of restoration science. The driver for both of these restoration pathways is the cessation of agricultural disturbances.

Transition T3A
State 3 to 2

Transition from the Converted State can occur in the short-term through cessation of agronomic practices. Cropland and tame pasture require repeated and continual inputs of fertilizer and weed control to maintain the Converted State. If the soil chemistry and structure have not been overly disturbed (which is likely to occur with tame pasture) the site can be restored to the Savannah State. The level of disturbance while in the Converted State determines whether the site restoration pathway is likely to be R3A (a return to the Savannah State) or T3A (a return to the Woodland State).

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			981–2018	
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	981–1793	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	448–1681	–
	switchgrass	PAVI2	*Panicum virgatum*	448–1681	–
2	**Midgrasses**			981–2018	
	beaked panicgrass	PAAN	*Panicum anceps*	560–1345	–
	rustyseed paspalum	PALA11	*Paspalum langei*	560–1345	–
	panicgrass	PANIC	*Panicum*	560–1345	–
	vine mesquite	PAOB	*Panicum obtusum*	560–1345	–
	gaping grass	STHI3	*Steinchisma hians*	560–1345	–
	white tridens	TRAL2	*Tridens albescens*	560–1345	–
	purpletop tridens	TRFL2	*Tridens flavus*	560–1345	–
	longspike tridens	TRST2	*Tridens strictus*	560–1345	–
	nimblewill	MUSC	*Muhlenbergia schreberi*	336–757	–
	cylinder jointtail grass	COCY	*Coelorachis cylindrica*	112–420	–
3	**Cool-season grasses**			392–897	
	Canada wildrye	ELCA4	*Elymus canadensis*	392–729	–
	Virginia wildrye	ELVI3	*Elymus virginicus*	392–729	–

	Texas wintergrass	NALE3	*Nassella leucotricha*	392–729	–
	Indian woodoats	CHLA5	*Chasmanthium latifolium*	224–476	–
	longleaf woodoats	CHSE2	*Chasmanthium sessiliflorum*	224–476	–
4	**Grasslikes**			196–448	
	sedge	CAREX	*Carex*	196–364	–
	flatsedge	CYPER	*Cyperus*	196–364	–
Forb					
5	**Forbs**			196–364	
	Texan great ragweed	AMTRT	*Ambrosia trifida var. texana*	168–308	–
	partridge pea	CHFA2	*Chamaecrista fasciculata*	168–308	–
	ticktrefoil	DESMO	*Desmodium*	168–308	–
	lespedeza	LESPE	*Lespedeza*	168–308	–
	dotted blazing star	LIPU	*Liatris punctata*	168–308	–
	snoutbean	RHYNC2	*Rhynchosia*	168–308	–
	fuzzybean	STROP	*Strophostyles*	168–308	–
	ironweed	VERNO	*Vernonia*	168–308	–
	white crownbeard	VEVI3	*Verbesina virginica*	168–308	–
Shrub/Vine					
6	**Shrubs, Vines and Trees**			785–1457	
	ash	FRAXI	*Fraxinus*	560–1261	–
	American sycamore	PLOC	*Platanus occidentalis*	560–1261	–
	eastern cottonwood	PODE3	*Populus deltoides*	560–1261	–
	oak	QUERC	*Quercus*	560–1261	–
	black willow	SANI	*Salix nigra*	560–1261	–
	pecan	CAIL2	*Carya illinoinensis*	560–1261	–
	hackberry	CELTI	*Celtis*	560–1261	–
	elm	ULMUS	*Ulmus*	560–1261	–
	grape	VITIS	*Vitis*	224–420	–
	hawthorn	CRATA	*Crataegus*	224–420	–
	saw greenbrier	SMBO2	*Smilax bona-nox*	224–420	–
	peppervine	AMPEL3	*Ampelopsis*	224–420	–

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. 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.

Shrubland State (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

Under the Mixed Grass Savannah Community (1.1), site infiltration is rapid, soil organic matter is high, soil structure is good, sediments are trapped, and porosity is high. The site will have high quality surface runoff with low erosion and sedimentation rates. During periods of heavy rainfall, the high infiltration rates will allow water to fill the soil profile. Larger trees will dissipate flood energy and the root masses will bind the soil. The Mixed Grass Savannah Community should be absent of rills and gullies. Drainageways should be vegetated and stable. This site is often in a flood plain with occasional out-of-bank flow.

Under the Woodland Community (2.1) leaf litter can build up to the point that herbaceous vegetation can be suppressed. Shading also suppresses warm-season grasses. The large wood can dissipate flood energy, trap sediments, and the root masses bind the soil. This is a stable community with no rills or gullies.

Improper grazing management reduces composition of bunchgrasses and reduces ground cover (resulting in a transition to the Midgrass Savannah Plant Community, 1.2). This decreases the function of the water cycle: infiltration declines and runoff increases due to poor ground cover, rainfall splash, soil capping, low organic matter and poor structure. Combining sparse ground cover with intensive rainfall creates conditions that increase the frequency and severity of flooding. The decline in the quality of the understory component and the increase in shrub canopy cover cause soil erosion to accelerate, surface runoff quality to decline, and sedimentation to increase. Streambank stability will decline and erosion of waterways will increase.

Under domination by woody species, especially oaks and pecan, interception of rainfall by tree canopies increases. This reduces the amount of rainfall reaching the soil surface. The funneling effect of the canopy increases stemflow and soil moisture at tree bases. Trees have increased transpiration compared to grasses, especially evergreen species such as live oak. The increased transpiration reduces the amount of water available for other plants to use. An increase in woody canopy creates a decline in grass cover, which has similar impacts as those described for improper grazing above.

Recreational uses

Hunting and bird watching are common activities.

Wood products

Hardwoods are used for posts, firewood, charcoal, and other specialty wood products.

Other products

Jams and jellies are made from many fruit bearing species, such as wild grape. 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. This is a very good site for pecan production.

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.

Author(s)/participant(s)	Vivian Garcia, RMS, NRCS, Corpus Christi, Texas
Contact for lead author	361-241-0609

Date	05/06/2009
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:** Large water flow patterns are expected as this is a bottomland site. Large volume of water can occur during high rainfall events.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 5 percent bare ground. Small and non-connected areas due to highly productive site.

5. **Number of gullies and erosion associated with gullies:** Gullies can occur in areas along stream banks where poor vegetative cover occurs.

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 long 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):** Soil surface is resistant to erosion. Stability class anticipated to be 5 to 6 at the surface. These values need to be verified.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Dark grayish brown clay loam; moderate, fine, subangular blocky/medium granular structure; hard/slightly firm; common fine roots; few fine calcium carbonate concretions; few snail shells; calcareous; moderately alkaline; Soil organic matter is three to five percent.

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 0 to 1 percent slopes should not have detrimental runoff and erosion.

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

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: Cool-season midgrasses > Warm-season tallgrasses > Trees >

    Other: Forbs

    Additional: Forbs make up 5 percent of species composition, shrubs and trees compose up to 15 percent species composition.

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

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3,500 to 6,500 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:** Huisache, buffelgrass, King Ranch bluestem, bermudagrass, and Old World bluestems.

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