USDA Natural Resources
Conservation Service

Ecological site R084BY170TX
Loamy Bottomland 29-33" PZ

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General information

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

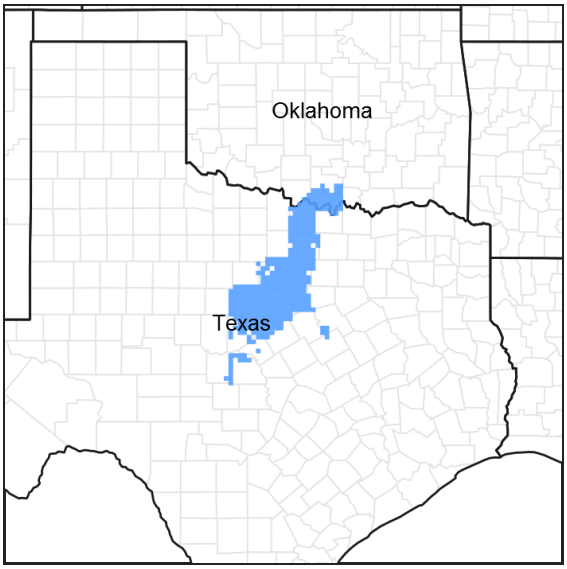


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 084B–West Cross Timbers

MLRA 84B is characterized by nearly level to strongly sloping, dissected plains with narrow valleys that deepen eastward. Soils are generally deep and formed in sediments of Cretaceous age. Average annual precipitation is 25 to 35 inches, and elevation ranges from 1000 to 1300 feet.

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

Ecological site concept

This site occurs on loamy alluvial soils on floodplains. The reference vegetation consists of native tallgrasses with numerous forbs and scattered bottomland hardwood trees. In the absence of fire or other brush management, woody species may increase and dominate the site. Many of these sites were cultivated for crop production. Some are still in crops and others were planted back to introduced species.

Associated sites

R084BY174TX	**Sandy Loam 29-33" PZ** Sandy loam soils on uplands.

Similar sites

R084BY173TX	**Sandy Bottomland 29-33" PZ** Coarse alluvial soils.

Table 1. Dominant plant species

Tree	(1) *Carya illinoinensis* (2) *Quercus macrocarpa*
Shrub	Not specified
Herbaceous	(1) *Panicum virgatum* (2) *Andropogon gerardii*

Physiographic features

This site occurs on flood plains and flood-plain steps in the West Cross Timbers. Slopes are typically less than 2 percent.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Flood plain (2) Alluvial plain > Flood-plain step
Runoff class	Negligible to low
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to frequent
Elevation	183–640 m
Slope	0–2%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is subtropical. Precipitation varies from an average of 33 inches in the eastern part of the Cross Timbers to 29 inches in the western part. Winters are dry and summers are hot and humid. Tropical maritime air masses control the weather during the spring , summer and fall. Large variations in temperature sometimes accompany polar air masses in winter.

Table 3. Representative climatic features

Frost-free period (characteristic range)	193-200 days
Freeze-free period (characteristic range)	220-225 days
Precipitation total (characteristic range)	787-838 mm
Frost-free period (actual range)	192-204 days
Freeze-free period (actual range)	216-226 days
Precipitation total (actual range)	711-864 mm
Frost-free period (average)	197 days
Freeze-free period (average)	222 days

Precipitation total (average)	813 mm

Climate stations used

- (1) PUTNAM [USC00417327], Baird, TX
- (2) RISING STAR 1S [USC00417633], Rising Star, TX
- (3) PROCTOR RSVR [USC00417300], Comanche, TX
- (4) MINERAL WELLS AP [USW00093985], Millsap, TX
- (5) BRIDGEPORT [USC00411063], Bridgeport, TX

Influencing water features

This site is adjacent to rivers and streams. It receives water from overflow from watercourses and runoff from higher adjacent sites. Some soils in this site are hydric and may be wetlands or the soils may contain inclusions of other hydric soils that usually occur as oxbows or stream meanders.

Wetland description

Site specific evaluations are required to determine wetland status.

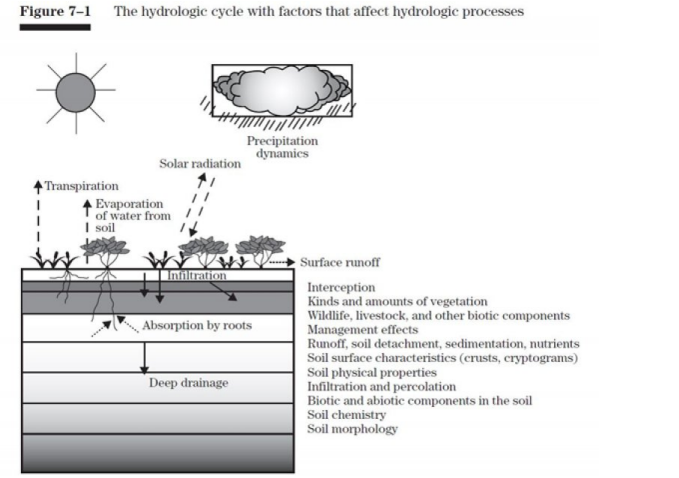


Figure 8.

Soil features

Representative soil components for this ecological site include: Balsora, Bunyan, and Energy

The site is characterized by very deep loamy soils on flood plains.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Loam (2) Silt loam (3) Fine sandy loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	183 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–2%

Available water capacity (0-101.6cm)	22.86–27.94 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The reference plant community for the Loamy Bottomland site is a hardwoods savannah with tall and midgrass understory. The grasses are primarily little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*). Big bluestem and Indiangrass are the most commonly occurring grass species. Smaller amounts of little bluestem, switchgrass (*Panicum virgatum*), sideoats grama (*Bouteloua curtipendula*), Canada wildrye (*Elymus canadensis*), meadow dropseed (*Sporobolus compositus* var drummondii), Texas wintergrass (*Nassella leucotricha*), vine mesquite (*Panicum obtusum*), and tall dropseed (*Sporobolus compositus* var compositus) occur as well. Shrubs and trees consist of pecan (*Carya illinoinensis*), bur oak (*Quercus macrocarpa*), liveoak (*Quercus fusiformis*), hackberry (*Celtis occidentalis*), elms (Ulmus spp) and grapes (Vitis spp). Woody plants have increased on virtually all of the loamy bottomland sites over the past 100 to 150 years. Where the site was once cultivated, mesquite (*Prosopis glandulosa*) tends to be one of the first woody plants to appear. Where there is a seed source close by, juniper (*Juniperus ashei* and *Juniperus virginiana*) will invade the site. In certain areas juniper has become a significant problem species along with mesquite. The production potential of the site is high. Pre-settlement grazers included bison and deer. The grasses are fairly palatable and nutritious and the site provides year round grazing. Generally speaking, the soils on this site are the most fertile of the Major Land Resource Area (MLRA). When good rainfall is received, the site produces well.

Fire played a role in the ecology of the site as is true for most of the grasslands. The main effect of fire on this site was to hold woody shrubs in check. The grass species are considered fire neutral as far as their response to fire. Climate is the most important and limiting factors affecting grass vegetation on the site. Fire stimulated forbs growth if the timing was right and the fires of pre-settlement days were probably more severe due to more fuel being available which could have been more damaging to woody plants. Fire usually creates more diversity in this site for a year or two post-burn. Fire will usually not produce much mortality in older woody plants. After brush has been controlled with herbicides or mechanically, fire can sometimes be used effectively to suppress regrowth. Small juniper can be killed by fire. Fuel loads are often the most limiting factor for the effective use of prescribed fire on this site. In general, the uses of fire on mature (larger) or dense stands of woody plants does not result in the same positive effects that burning has in tall/mid-grass communities.

With abusive grazing practices, the vigorous Indiangrass and big bluestem will become lower in vigor while little bluestem will increase then secondary successional species such as sideoats grama, tall and meadow dropseed, Texas wintergrass, vine mesquite and white tridens (*Tridens albescens*) will begin to increase along with an increase of woody plants such as mesquite, sumacs (Rhus spp) and persimmon (*Diospyros virginiana*). Western ragweed (*Ambrosia psilostachya*), crotons (*Croton setigerus*), nightshades (Solanum spp.) and cool-season annuals will quickly invade if the principal species are in a weakened condition.

The greatest contributor to the increase of mesquite is the domestic cow. The seed is consumed by animals after the seed pods ripen in late summer and when passed through the digestive system and excreted in the manure. The seed finds an excellent seedbed complete with moisture and nutrients. Some wildlife species rely heavily on mesquite beans and juniper berries for food and contribute to the spread of these species. It is possible for

mesquite beans to lay dormant in the soil for many years and then germinate when ideal conditions occur. Grazing management probably has minimal effect on the proliferation of woody plants, but a good cover of perennial grasses likely minimizes the seed to soil contact the needed to establish. Prescribed fire where it can be safely carried out provides a much better method to control the spread of woody plants. Selective individual removal of woody plants is easy and economical when a few plants begin to show up on the site, but the increase may be fairly rapid and the number of woody plants per acre will soon become too numerous for individual control to be feasible.

Prescribed grazing with a reasonable stocking rate can sustain the grass species composition and production at a near reference level until the brush canopy is so dense that the shade starts to interfere with photosynthesis. The loamy bottomland site can be abused to the point that the perennial warm season grasses thin out and lower succession grasses along with annual forbs begin to dominate. This process of degradation usually takes many years and is further exacerbated by summer drought and above average winter moisture.

Long-term droughts that occur only three to four times in a century can effect some change in plant communities. Short-term droughts are common and usually do not have a lasting effect in changing stable plant communities, although production will be affected. When a brush canopy becomes established which shades the ground sufficiently it tends to favor cool-season annual species. Once a state of brush and cool-season annuals is reached, recovery to a good perennial grass cover is unlikely without major input with brush management and reseeding. In summary, the change in states of vegetation depend on the type of grazing management applied over many years, and the rate of invasion and establishment of woody species. After the site crosses the threshold to a lower ecological condition, the effects of seasonal moisture and short-term dry spells become more pronounced. Plant communities that consist of warm-season perennial grasses such as little bluestem are able to persist and withstand climatic extremes with only minor shifts in the overall plant community.

This site was inhabited by grassland wildlife species such as bison, grassland birds and small mammals. Over the years, as the site has changed to a more mixed grass and shrub community, more wildlife species have come to utilize it for habitat. Woody plants provide cover for white-tailed deer and bob-white quail. These wildlife species have both increased along with the brushy plants due to the cover that these plants provide. More forbs are needed to meet these species food requirements and woody plants for browse are important for deer. It is often the objective of many land owners to strike a balance in plant community so that these wildlife species can exist along with domestic livestock. This can be accomplished by a carefully thought out grazing and brush management program. It must be realized that managing at a lower successional level may meet some wildlife species requirements very well, but may not be nearly as productive for grazing purposes, and may not be as capable of satisfying functions such as nutrient cycling, hydrologic protection, plant community stability or soil protection. A proper balance can be achieved with careful planning that considers all resources.

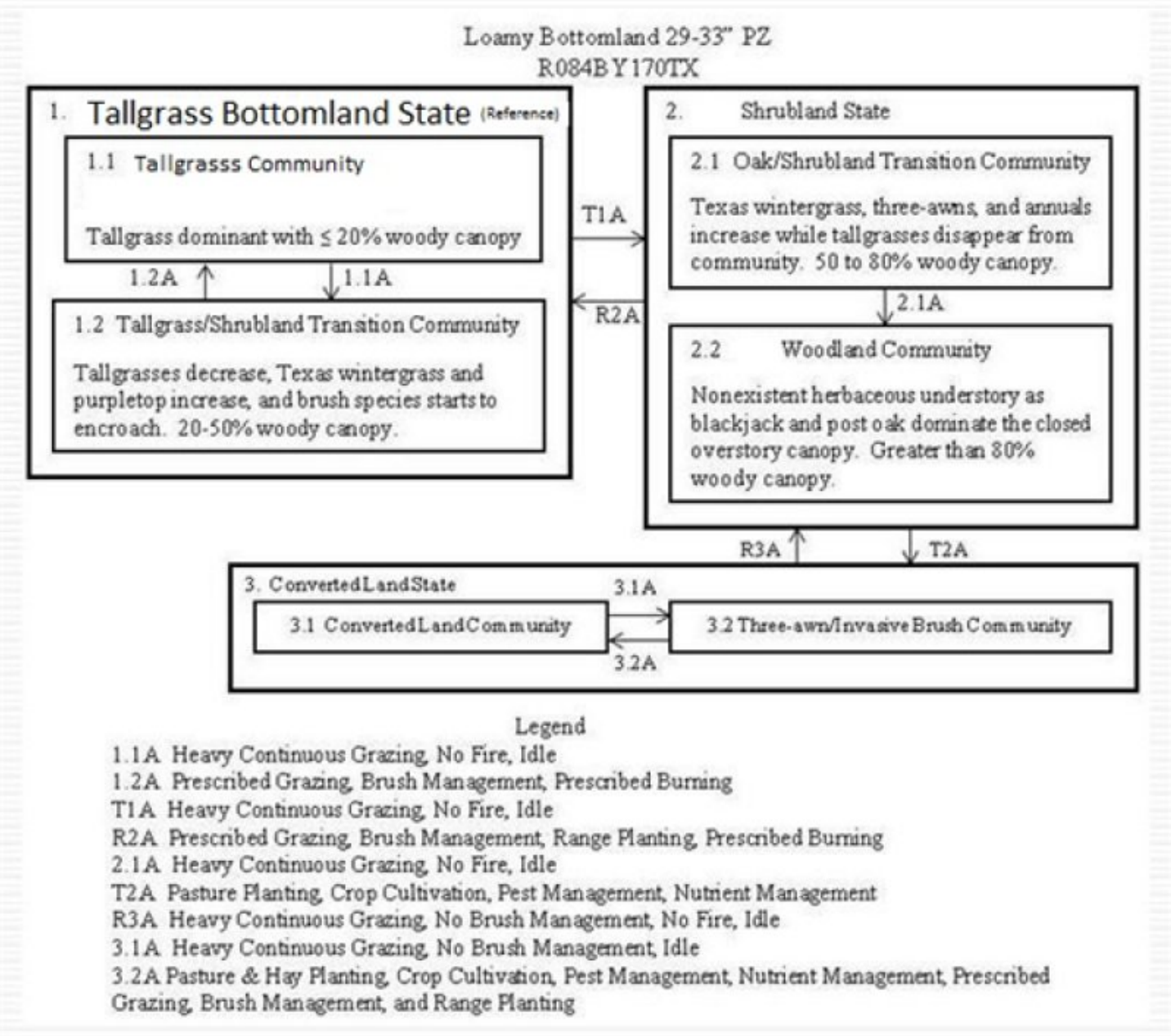
Hydrologically, the site contributes runoff to the various draws, creeks, and streams that are common in the MLRA. If the perennial grass cover is maintained in good vigor, then maximum infiltration occurs and runoff is reduced. More water getting into the ground means a healthier, more productive plant community. If infiltration is minimal, then the effect is an artificially shallow soil with plant roots retreating to near the soil surface. More perennial grass cover means less runoff may result but the runoff that does occur is less laden with sediment. Overall watershed protection is enhanced by a healthy grassland community, as is nutrient cycling.

State and Transitional Pathways: Narrative
The following diagram suggests some pathways that the vegetation on this site might take in response to various treatment or natural stimuli over time. There may be other states that are not shown on this diagram. This information is to show that changes in plant community do occur as a result of management and natural factors; and can be changed by implementing certain practices. The plant communities described are commonly observed on this site. Before making plans for plant community manipulation for specific purposes, consult local professionals.

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

amount of energy required to effect change in community would depend on the present vegetative state and the desired change.

State and transition model



State 1
Tallgrass Bottomland State - Reference

The interpretive plant community for this site is plant community 1.1. The community is dominated by warm-season perennial tallgrasses with mixed hardwoods. The major perennial grass species are well dispersed through the community. Perennial forbs and shrubs are well represented throughout the community. Annual production ranges from 4000 to 8000 pounds per acre. Grasses make up about 85% species composition and trees/shrubs make up 10% species composition. The Tallgrass/Shrubland Transition Community occurs when elm starts regeneration and the tallgrasses will start to disappear from the plant community. Invader brush (mesquite, juniper, yaupon, etc.) appears and becomes established. Cedar elm, bumelia, and hackberry also start to increase. Texas wintergrass increases as brush canopy increases. The plant community consists of about a 15 percent canopy of mature trees with an understory canopy of shrubs and young elm and pecan. Annual production ranges from 4000 to 8000 pounds per acre. Grasses consist of 65% species composition while woody species consist of 25% species composition.

Dominant plant species

- pecan (*Carya illinoinensis*), tree
- switchgrass (*Panicum virgatum*), grass

Community 1.1
Tallgrass Bottomland Community

Figure 9. 1.1 Tallgrass/Oak Savannah Community

The interpretive plant community for this site is dominated by warm-season perennial tallgrasses with mixed hardwoods. The major perennial grass species are well dispersed through the community. Perennial forbs and shrubs are well represented throughout the community. This plant community evolved with a short duration of heavy use by large herbivores followed by long rest periods due to herd migration along with occasional fire. Annual production ranges from 4000 to 8000 pounds per acre. Grasses make up about 85% species composition and trees/shrubs make up 10% species composition.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3811	5716	7622
Tree	359	538	717
Forb	224	336	448
Shrub/Vine	90	135	179
Total	**4484**	**6725**	**8966**

Figure 11. Plant community growth curve (percent production by month). TX5514, Post oak/Blackjack Oak Savannah. Post oak and blackjack oak savannah with tall grasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	8	10	20	23	5	3	10	10	5	2

Community 1.2
Tallgrass/Shrubland Transition Community

This transition state occurs with yearlong grazing or no grazing without fire or brush management. Elm starts regeneration and the tallgrasses will start to disappear from the plant community. Invader brush (mesquite, juniper, yaupon, etc.) appears and becomes established. Cedar elm, bumelia, and hackberry also start to increase. Texas wintergrass increases as brush canopy increases. The plant community consists of about a 15 percent canopy of mature trees with an understory canopy of shrubs and young elm and pecan. Annual production ranges from 4000 to 8000 pounds per acre. Grasses consist of 65% species composition while woody species consist of 25% species composition. This transition state can revert back to the tallgrass savannah with prescribed burning and/or

prescribed grazing. With out prescribed burning and/or prescribed grazing this transition state will continue to shift toward the Oak/Shrubland Transition State (2.1).

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2914	4371	5828
Shrub/Vine	673	1009	1345
Tree	448	673	897
Forb	448	673	897
Total	**4483**	**6726**	**8967**

Figure 13. Plant community growth curve (percent production by month). TX5511, Shrubland Transition. Increasing percentage of shrubs invading site (20-50 % canopy).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	10	30	25	8	5	10	5	2	1

Pathway 1.1A
Community 1.1 to 1.2

With heavy continuous grazing, no fires, and idle land, the Tallgrass/Oak Savannah Community will shift to the Tallgrass/Shrubland Transition Community.

Pathway 1.2A
Community 1.2 to 1.1

With the use of various conservation practices including Prescribed Grazing, Brush Management, and Prescribed Burning, the Tallgrass/Shrubland Transition Community can be reverted back to the Tallgrass/Oak Savannah Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

The Shrubland Transition Community (2.1) consists of 50 to 80% canopy of maturing woody plants. As the shrubland community ages, pecan and elms mature and the invader species increase. Warm-season perennial tallgrasses such as Indiangrass and switchgrass have all but disappeared. As the brush canopy continues to increase, Texas wintergrass, three-awns (Aristida spp) and annuals continue to increase. Where cropland has been abandoned mesquite and/or juniper may dominate the site. Annual production ranges from 4000 to 8000 pounds per acre and grasses comprise of 25% species composition while woody species comprise of nearly 55% species composition. The Woodland Community is a closed overstory (greater than 80% canopy) woodland dominated by pecan and elms. Other overstory and understory woody species are present in small amounts The herbaceous understory is almost nonexistent except for remnants of shade-tolerant species occurring in small amounts. Small isolated clearings will contain little bluestem, perennial threeawns, Texas wintergrass and small amounts of other grasses. Due to the presence of shade the amount of grass cover is greatly reduced which in turn reduces forage production from the historic state. Annual production ranges from 4000 to 8000 pounds, with grasses making up 10% species composition and woody species making up 65% species composition.

Dominant plant species

- pecan (*Carya illinoinensis*), tree
- elm (*Ulmus*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- Texas wintergrass (*Nassella leucotricha*), grass

Community 2.1
Shrubland Transition Community

The Shrubland Transition Community (2.1) consists of 50 to 80% canopy of maturing woody plants. As the shrubland community ages, pecan and elms mature and the invader species increase. Warm-season perennial tallgrasses such as Indiangrass and switchgrass have all but disappeared. As the brush canopy continues to increase, Texas wintergrass, three-awns (Aristida spp) and annuals continue to increase. Where cropland has been abandoned mesquite and/or juniper may dominate the site. Continuous grazing by domestic livestock has accelerated the shift. Annual production ranges from 4000 to 8000 pounds per acre and grasses comprise of 25% species composition while woody species comprise of nearly 55% species composition. The shift to this state has occurred due to the absence of fire or other means of brush suppression. Where this state has been reached from cropland or pasture, mesquite and/or juniper dominate the woody vegetation, but elms and pecan are beginning to occur. The grass species that dominate the site are silver bluestem (*Bothriochloa laguroides*), Texas wintergrass and three-awns along with the seeded introduced grass species. This state can be reverted back to near reference condition by some means of brush suppression and good grazing management. Without this treatment the site will continue to shift toward the Oak/Woodland Community (2.2).

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	1345	2018	2690
Tree	1345	1681	2690
Grass/Grasslike	1121	1681	2242
Forb	673	1009	1345
Total	**4484**	**6389**	**8967**

Figure 15. Plant community growth curve (percent production by month). TX5512, Oak Shrubland Transition. Continued increase of invader species and post oaks maturity. Approximately 50-80 percent canopy cover..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	3	10	30	30	5	5	8	5	1	1

Community 2.2
Oak/Woodland Community

Figure 16. 2.2 Oak/Woodland Community

This plant community is a closed overstory (greater than 80% canopy) woodland dominated by pecan and elms. Other species present in small amounts are hackberry, bois d àrc (*Maclura pomifera*). Understory shrubs and sub-shrubs include yaupon, hawthorns, American beautyberry (*Callicarpa americana*). Woody vines are also present and include greenbriars, poisonoak (Toxicodendron spp), Virginia creeper (*Parthenocissus quinquefolia*) and grapes. The herbaceous understory is almost nonexistent. Shade tolerant species such as Canada wildrye (*Elymus canadensis*) occur in small amounts. Small isolated clearings will contain little bluestem, perennial threeawns, Texas wintergrass and small amounts of other grasses. Continuous grazing by domestic livestock has accelerated the shift. This Woodland Community (2.2) has developed due to the absence of fire (or some other method of brush suppression). Livestock grazing yearlong accelerates the shift. The tallgrass savannah can be restored by prescribed burning but will require many years of burning due to light fuel load of fine fuel and the absence of a seed source for the tall grasses. Chemical control alone is usually not a good option for treatment on a large scale due to the resistance of some of the woody plant species to herbicides. Mechanical treatment of this site along with seeding is generally the best method for conversion back to a tallgrass savannah. The cost of doing this type of treatment is usually so expensive as to be not economically feasible so in most instances it is planted to introduced grass species and converted to pastureland. At the Woodland Community (2.2), the amount of litter cover is similar to State 1 but this cover is now mostly leaves. The leaves of the trees and underbrush intercept rainfall from lighter intensity rainfall which evaporates before reaching the ground resulting in less water reaching the soil surface. When runoff does occur there are more tendencies for the litter to drift until it catches on the stems of dense underbrush or what little grass is present. When the woodland is grazed the amount of litter decreases along with a decrease of surface vegetation which increases the drifting of the litter with runoff. Due to the presence of shade the amount of grass cover is greatly reduced which in turn reduces forage production from the historic state. Annual production ranges from 4000 to 8000 pounds, with grasses making up 10% species composition and woody species making up 65% species composition.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	1569	2354	3138
Tree	1345	2018	2690
Forb	1121	1681	2242
Grass/Grasslike	448	673	897
Total	**4483**	**6726**	**8967**

Figure 18. Plant community growth curve (percent production by month). TX5513, Postoak Woodland. Postoak dominated closed overstory with over 80 percent canopy cover..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	2	10	50	14	5	5	5	5	1	1

Pathway 2.1A
Community 2.1 to 2.2

With heavy continuous grazing, no fires, and idled land, the Shrub Transition Community will shift to the Woodland Community.

State 3
Converted Land State

The Converted Land Community occurred from first settlement by European settlers during the middle 1800's and continued until early 1900's. Some remains in cropland today. The early cropping with little regard for erosion control leads to severe erosion by water. Erosion changes fertility, soil structure and moisture holding capacity of the soil. In recent years if cropping is abandoned the land is usually planted to introduced grass and manages as pastureland. This site is often planted to introduced grasses following crop production or brush control. Typical species planted include bermudagrass varieties, yellow bluestems and switchgrass. Many of these species are invasive and once established they are difficult to remove and hinders the establishment of native species. The Three-awn/Invasive Brush Community occurs when pastureland of introduced is no longer fertilized annually and fertility decreases three-awns and forbs start to appear on the site. As this change continues invasive brush of primarily mesquite appears followed closely with elms, primarily cedar elm. This site is most often planted to introduced grasses following crop production or brush control.

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

Community 3.1
Converted Land Community

Conversion of the tallgrass bottomland community(1.1) to converted land community (3.1) occurred from first settlement by European settlers during the middle 1800's and continued until early 1900's. Some remains in cropland today. The early cropping with little regard for erosion control leads to severe erosion by water. While restoration of this site to some resemblance of the tallgrass savannah is possible with seeding, prescribed grazing and prescribed burning; a complete restoration of the reference plant community in a reasonable time is very unlikely. In recent years if cropping is abandoned the land is usually planted to introduced grass and manages as pastureland. Refer to cropland capability classes for production potentials and limitations. This site is often planted to introduced grasses following crop production or brush control. These grasses are planted mostly for livestock grazing and some hay production. Typical species planted include bermudagrass varieties, yellow bluestems and switchgrass. Many of these species are invasive and once established they are difficult to remove and hinders the establishment of native species. The establishment and maintenance of these species requires fertilization, weed control and prescribed grazing management. Without the annual application of these cultural practices the plant community will move toward a transition of invasive brush species such as mesquite and/or juniper, silver bluestem, three-awns, triden species, western ragweed and other various herbaceous plant species. Refer to pastureland suitability groups for species suitability, production potentials and limitations.

Figure 19. Plant community growth curve (percent production by month). TX5520, Pastureland. Coastal Bermudagrass or Introduced Species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	10	21	22	10	5	14	10	8	0

Community 3.2
Three-awn/Invasive Brush Community

Figure 20. 3.2 Threeawn/Invasive Brush Community

When pastureland of introduced species is no longer fertilized annually and fertility decreases three-awns and forbs start to appear on the site. As this change continues invasive brush of primarily mesquite appears followed closely with elms, primarily cedar elm. This site is most often planted to introduced grasses following crop production or brush control. Without the continued annual fertilization and weed control, the shift will continue until the woodland state is reached.

Figure 21. Plant community growth curve (percent production by month). TX5516, Threeawn Transition Community. Warm season introduced grasses that have low fertility levels due to no fertilizer treatments..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	3	10	30	30	5	5	8	5	1	1

Pathway 3.1A
Community 3.1 to 3.2

With heavy continuous grazing, no brush management, no pest management, no nutrient management, and land in idle conditions, the Converted Land Community will shift to the Three-awn/Invasive Brush Community.

Pathway 3.2A
Community 3.2 to 3.1

The Three-awn/Invasive Brush Community will transition into the Converted Land Community with the use of various conservation practices including Pasture & Hay Planting, Crop Cultivation, Pest Management, Nutrient Management, Prescribed Grazing, Brush Management, and Range Planting.

Conservation practices

Brush Management
Conservation Crop Rotation
Prescribed Burning
Forage and Biomass Planting
Prescribed Grazing
Range Planting
Nutrient Management
Integrated Pest Management (IPM)

Transition T1A
State 1 to 2

With the continued heavy grazing pressure, no fires, and idled land conditions, the Tallgrass/oak Savannah State transitions into the Oak/Shrubland State.

Restoration pathway R2A
State 2 to 1

The Shrubland State can be restored into the Tallgrass Bottomland State with the use of various conservation practices including Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Transition T2A
State 2 to 3

With the application of Pasture/Hayland Planting, Crop Cultivation, Pest Management, and Nutrient Management conservation practices, the Shrubland State can be converted into the Converted Land State.

Restoration pathway R3A
State 3 to 2

With heavy continuous grazing, no brush management, no fires, no pest management, no nutrient management, and land continues to be in idled conditions, the Converted Land State will revert back to the Shrubland State.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass**			673–1345	
	little bluestem	SCSC	*Schizachyrium scoparium*	673–1345	–
2	**Tallgrass**			1121–2242	
	big bluestem	ANGE	*Andropogon gerardii*	0–2242	–
	switchgrass	PAVI2	*Panicum virgatum*	0–2242	–
3	**Tallgrass**			897–1793	
	Indiangrass	SONU2	*Sorghastrum nutans*	897–1793	–
4	**Midgrass**			224–448	
	sideoats grama	BOCU	*Bouteloua curtipendula*	224–448	–
5	**Midgrasses**			224–448	
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	0–448	–
6	**Cool Season**			224–448	
	Canada wildrye	ELCA4	*Elymus canadensis*	224–448	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	224–448	–
7	**Midgrass**			224–448	
	vine mesquite	PAOB	*Panicum obtusum*	224–448	–

8	**Midgrass**			224–448	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	224–448	–
Forb					
9	**Forbs**			224–448	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–56	–
	aster	ASTER	*Aster*	0–56	–
	prairie clover	DALEA	*Dalea*	0–56	–
	Engelmann's daisy	ENGEL	*Engelmannia*	0–56	–
	beeblossom	GAURA	*Gaura*	0–56	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–56	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–56	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–56	–
	awnless bushsunflower	SICA7	*Simsia calva*	0–56	–
	amberique-bean	STHE9	*Strophostyles helvola*	0–56	–
	false gaura	STLI2	*Stenosiphon linifolius*	0–56	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	0–56	–
Shrub/Vine					
10	**Shrubs/Vines**			90–179	
	stretchberry	FOPU2	*Forestiera pubescens*	0–67	–
	roundleaf greenbrier	SMRO	*Smilax rotundifolia*	0–67	–
	grape	VITIS	*Vitis*	0–67	–
Tree					
11	**Trees**			359–717	
	pecan	CAIL2	*Carya illinoinensis*	0–179	–
	eastern redbud	CECA4	*Cercis canadensis*	0–179	–
	hackberry	CELTI	*Celtis*	0–179	–
	downy hawthorn	CRMO2	*Crataegus mollis*	0–179	–
	Texas live oak	QUFU	*Quercus fusiformis*	0–179	–
	bur oak	QUMA2	*Quercus macrocarpa*	0–179	–
	bully	SIDER2	*Sideroxylon*	0–179	–
	winged elm	ULAL	*Ulmus alata*	0–179	–
	American elm	ULAM	*Ulmus americana*	0–179	–
	cedar elm	ULCR	*Ulmus crassifolia*	0–179	–
	slippery elm	ULRU	*Ulmus rubra*	0–179	–

Animal community

The historic Tallgrass bottomland was habitat to migratory bison herds, deer, turkey, migratory birds and large predators such as wolves, coyotes, mountain lions and black bear. White-tail deer, turkey, bobcats and coyotes along with resident and migratory birds and small mammals find suitable habitat today. Domestic livestock and white-tail deer are the dominant grazers and browsers of the site. As the savannah changes through the various vegetative states towards the Woodland, the quality of the habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species.

Hydrological functions

Peak rainfall periods occur in April, May, June, September and October. Rainfall amounts may be high (3 to 10 inches per event) and events may be intense. Periods of 60 plus days of little or no rainfall during the growing season are common. The hydrology of this site may be manipulated with management to yield higher runoff volumes or greater infiltration to groundwater. Management for less herbaceous cover will favor higher surface runoff while dense herbaceous cover favors ground water recharge. Potential movement of soil (erosion), pesticides and both organic and inorganic nutrients(fertilizer) should always be considered when managing for higher volumes of surface runoff.

Recreational uses

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

Wood products

Mesquite and culled pecan used for firewood. Mesquite is also used for barbecue wood.

Other products

None.

Other information

None.

Inventory data references

Information presented here has been derived from limited NRCS clipping data and field observations of range trained personnel: Lem Creswell RMS, Comanche; Earl V. Hogan RMS, James Luton RMS, Montague; William Donham, Agron, Granbury; Kent Ferguson RMS, Weatherford.

The following counties had the ESI data base reviewed: Parker, Hood, and Montague.

References

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Other references

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Acknowledgments

Site Development and Testing Plan:

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Rangeland health reference sheet

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

Author(s)/participant(s)	Colin Walden, Range Management Specialist, Soil Survey Region 9.
Contact for lead author	colin.walden@ok.usda.gov
Date	01/25/2018
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Minimal evidence of current or past rill formation.

2. **Presence of water flow patterns:** Minimal evidence of any water flow patterns due to very low slopes.

3. **Number and height of erosional pedestals or terracettes:** No pedestals terracettes present.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 10 percent. Bare areas small and not connected.

5. **Number of gullies and erosion associated with gullies:** No gullies present.

6. **Extent of wind scoured, blowouts and/or depositional areas:** No wind scoured areas.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement less than 3 feet. Vegetative cover should restrict litter movement over long distances. Only herbaceous litter less than .25 inches expected to move. Note: This does not account for flood events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability scores of 5 or greater expected.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Bosque - Ap--0 to 13 cm (0 to 5 in); dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak very fine subangular blocky and fine granular structure;
Bunyan - Ap--0 to 10 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive
Pulexas - A--0 to 5 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Presence of perennial tall and midgrasses help to facilitate percolation into the soil. Very litter runoff as slopes are typically 0-1%

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction under reference conditions.

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: Native tallgrasses (groups 1-3)

    Sub-dominant: Forbs (9)
    Trees (11)

    Other: All other groups

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Possible mortality only during prolonged drought. Less than 5%.

14. **Average percent litter cover (%) and depth (in):** Litter expected to be at 75% cover at average .25 inch depth.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production 600 lbs/acre. Ranging from 4000 to 8000 lbs.

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:** Juniper(ashe juniper/eastern redcedar) most common invader. Also greenbriar, poison ivy, and other woodies will increase
without fire.

17. **Perennial plant reproductive capability:** Plants should be capable of reproducing every year with exception of prolonged growing season drought.