

# Ecological site R084AY050OK Loamy Bottomland

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Accessed: 05/04/2024

## 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.

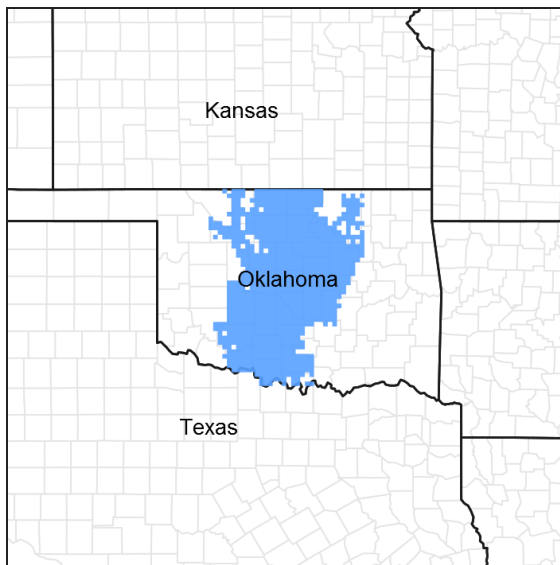


Figure 1. Mapped extent

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): 084A–North Cross Timbers

MLRA 84A “North Cross Timbers” is characterized by rolling to hilly uplands dominated by Oak trees with bedrock outcrops and narrow stream valleys. It is believed that the Cross Timbers ecosystem is one the least disturbed forest types remaining in the Eastern US. Major rivers in this MLRA include the Verdigris River in Kansas and the Arkansas, Cimarron, and South Canadian Rivers in Oklahoma. The western parts of this MLRA are underlain by sandstone and shale of Permian age, while the eastern parts are underlain by sandstone and shale of Pennsylvanian age. There are also occurrences of Pleistocene age stream terraces along the rivers.

## Classification relationships

This MLRA overlaps other land classifications systems including:

Level IV EPA Ecoregions 27o “Crosstimbers Transition”, 29a “Northern Crosstimbers”, and 29h “Northwestern Crosstimbers”.

Duck & Fletcher game types within MLRA 84A include “Tallgrass Prairie”, and “Post Oak-Blackjack Oak Forests”.

This particular ecological site may be part of alternative vegetation descriptions including:

Landfire: Crosstimbers Oak Forest & Woodland / Western Great Plains Floodplains Systems

Grasslands of OK(Harland): Crosstimbers

FGDC code: I.B.2.N.d. *Populus deltoides* - *Ulmus americana* - *Celtis laevigata* forest association

### Ecological site concept

The Loamy Bottomland ecological site occurs in low areas along small drains, creek, and tributaries within the Northern Crosstimbers MLRA (84A). The site occurs on deep, loamy, alluvial soils. The reference state for this site is a bottomland savannah with native tallgrasses dominating the plant community. Historically, the primary woody species on these sites were mature Pecan, Sycamore, and Cottonwood averaging less than 30% canopy coverage. These, and other woody species, were kept in check by periodic fire and very few seedlings were able to survive. If fire is removed from the ecosystem, woody species will dominate this bottomland site. Under pressure from long term abusive grazing, the tallgrass species will decline in vigor and be replaced by less palatable midgrasses, annual grass, and annual forbs.

The site is periodically flooded for brief durations.

### Associated sites

R084AY095OK	<b>Subirrigated Bottomland</b> Similar soil textures. Different vegetative components. Free water present within 60 inches of soil surface.
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Table 1. Dominant plant species

Tree	(1) <i>Carya illinoensis</i> (2) <i>Platanus occidentalis</i>
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Panicum virgatum</i>

### Physiographic features

This site occurs on nearly level to very gently sloping flood plains of small tributaries in the Northern Cross Timbers MLRA. Slopes range from 0 to 3 percent.

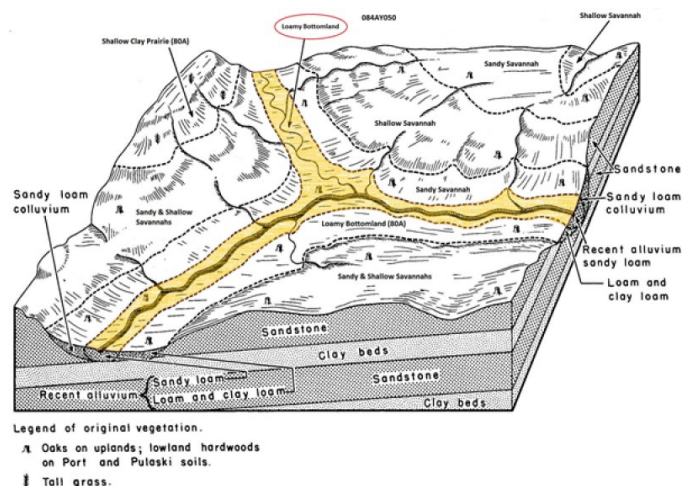


Figure 2. 084AY050 Loamy Bottomland

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Flood plain (2) Alluvial plain > Alluvial flat
Runoff class	Very low to low
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Occasional to frequent
Elevation	213–396 m
Slope	0–3%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

### Climatic features

Climate is moist sub-humid with annual precipitation ranging from 30 to 45 inches. There will be noticeable differences in precipitation and temperatures from north to south and east to west. The most intense rainfall occurs in late spring and early summer while warm season vegetation is growing rapidly. Frost free and freeze free days increase from north to south. Precipitation increases from west to east.

Table 3. Representative climatic features

Frost-free period (characteristic range)	170-192 days
Freeze-free period (characteristic range)	204-210 days
Precipitation total (characteristic range)	940-1,067 mm
Frost-free period (actual range)	167-193 days
Freeze-free period (actual range)	202-210 days
Precipitation total (actual range)	940-1,067 mm
Frost-free period (average)	181 days
Freeze-free period (average)	207 days
Precipitation total (average)	991 mm

### Climate stations used

- (1) BRISTOW [USC00341144], Bristow, OK
- (2) CHANDLER [USC00341684], Chandler, OK
- (3) SEMINOLE [USC00348042], Seminole, OK
- (4) BLANCHARD 2 SSW [USC00340830], Blanchard, OK

### Influencing water features

These sites act as a filter for overland flow and can easily become briefly saturated during heavy periods of rainfall especially during the spring. Evaporation is minimized by tall and dense plant growth that shades the soil surface. The site contributes to the stability of the overall riparian system that occurs along major streams and rivers. Water from adjacent uplands may flow over and through these soils contributing to recharge of the streams and creeks. These bottomland sites may be flooded from time to time. This inundation is brief and typically does not have a negative impact on the plant communities. However, these flood events can alter the distribution of herbaceous and woody litter and may cause some surface scouring as flood waters recede.

### Wetland description

Figure 7-1 The hydrologic cycle with factors that affect hydrologic processes

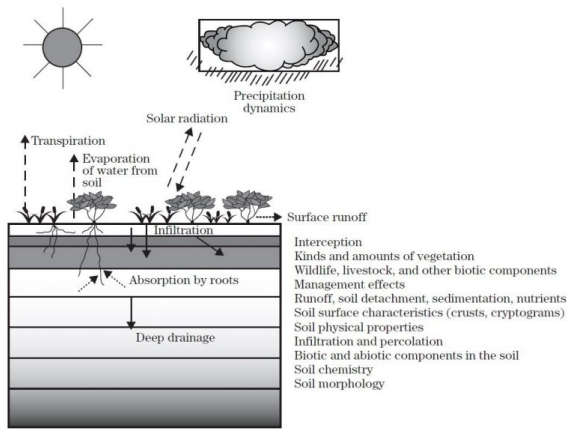


Figure 9.

### Soil features

Representative soils for this site include:

Pulaski fine sandy loam

The Pulaski series consists of very deep, well drained, moderately rapidly permeable flood plain soils that formed in loamy alluvial sediments of recent age. These nearly level to very gently sloping flood plain soils are on small tributaries in the Cross Timbers (MLRA-84A).

Note: There may be inclusions of other soils that because of mapping scale are not divided out. These may include some areas of the Tribbey series (Subirrigated Bottomland 084AY095OK) and the Port or Ashport series (Loamy Bottomland 080AY050OK).

Soils are mapped for each county within the MLRA. Mapunits are representations of the major soil series component(s) and named accordingly. Each Mapunit is spatially represented on a digital soils map as polygons of different shapes and sizes. Within these Mapunits, there are often minor soil series components included. These minor components are soils that occur within a Mapunit polygon but are of small extent (15% or less of the Mapunit area). However, it is difficult to separate these minor soils spatially due to the scale of soil mapping.

Ecological sites are correlated at the component level of the soil survey. Therefore, a single Mapunit may contain multiple Ecological Sites just as it may contain multiple soil components. This is important to understand when investigating soils and Ecological Sites. A soil survey Mapunit may be correlated to a single Ecological Site based on the major component; however, there may be inclusional areas of additional Ecological Sites which are correlated to the minor components of that particular soil Mapunit.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–1%

Available water capacity (0-101.6cm)	12.7–27.94 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	6–7.5
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0–1%

**Table 5. Representative soil features (actual values)**

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

## Ecological dynamics

The information in this ecological site description (ESD), including the state-and-transition model (STM), was developed using archeological and historical data, professional experience, and scientific studies. The information is representative of a complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals, and ecological processes are described to inform land management decisions.

The reference state for the Loamy Bottomland site is a tallgrass dominated bottomland savannah. This site occurs on floodplains adjacent to streams and rivers and along narrow upland drainage ways. Soils have deep, fertile, loamy surfaces that often receive extra moisture from overflow or run-in from adjacent slopes. Plant community dominance in the plains usually depends on the fire and grazing histories of the site. The plant community is usually dominated by deep rooted, warm season, perennial, tallgrasses. Many of the major grasses are rhizomatous. The rhizomes of grasses saturate the upper four to five inches of soil and are usually tightly intertwined and intermixed with numerous deep rooted perennial warm season forbs. Because of this site's deep soils and favorable precipitation, the plant community is very productive. For centuries, the plants of this community have withstood excessive moisture from rainfall and flooding, as well as extended droughts. Some narrow areas located adjacent to

streams and rivers, are somewhat protected from fire. These protected areas develop a woodland type plant community dominated by an overstory of large hardwood trees and understory of predominately cool season grasses and other shade tolerant plants. Due to this change in fire frequency and intensity, often there is a "feathered" effect of woody species across the site, with woody species being sparse further away from the water course and denser adjacent to these protected drainages.

In addition to the reference community, several other communities can exist on the Loamy Bottomland site. These communities usually reflect historical management practices. There are various recognizable stages of departure from the reference community on this site. Each stage may result in a plant community that may, or may not, remain stable for many years.

Long term abusive grazing by domestic animals usually results in a gradual decrease of the tallgrasses and preferred forbs. As these preferred species decline, they are replaced by less palatable midgrasses and forbs. This abusive grazing is the result of overstocking above the carrying capacity of the site without allowing adequate growing season rest that is required for plant recovery.

Many of these sites have been broken out for farming purposes. The deep, fertile soils and relatively flat landscapes make these sites well suited for cultivation. In fact, many of these Loamy Bottomland sites are still in crop production today. Some areas that have been taken out of crop production have been reseeded to tame pasture species such as Bermudagrass and Tall Fescue.

The estimated historical fire return is 2-5 years (Frost 1998). With the suppression of fire, over time, shrubs and trees usually increase on the grassland portions of the area and may eventually become the dominant species, transitioning into closed canopy woodlands. This woody increase can occur, regardless of the grazing regime in the absence of fire.

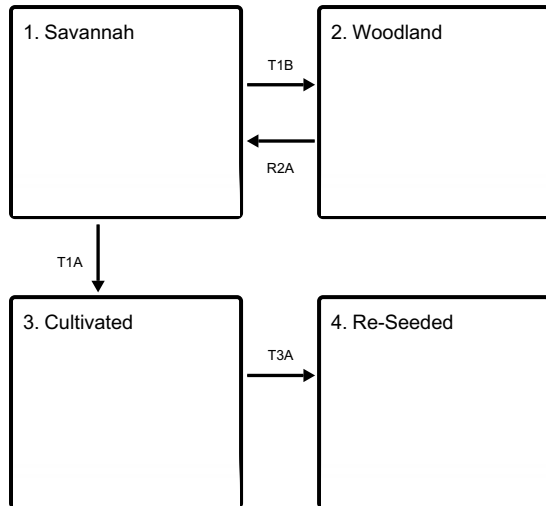
A State and Transition Model for the Loamy Bottomland Ecological Site (084AY050) is depicted below. Thorough descriptions of each state, transition, plant community, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Community is not necessarily the management goal; other vegetative states may be desired plant communities as long as the Range Health assessments are in the moderate and above category. The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Both percent species composition by weight and percent canopy cover are described as are other metrics. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs). Canopy cover can drive the transitions between communities and states because of the influence of shade and interception of rainfall. Species composition by dry weight is used for describing the herbaceous community and the community as a whole. Woody species are included in species composition for the site. Calculating similarity index requires use of species composition by dry weight.

## **State and transition model**

### Ecosystem states



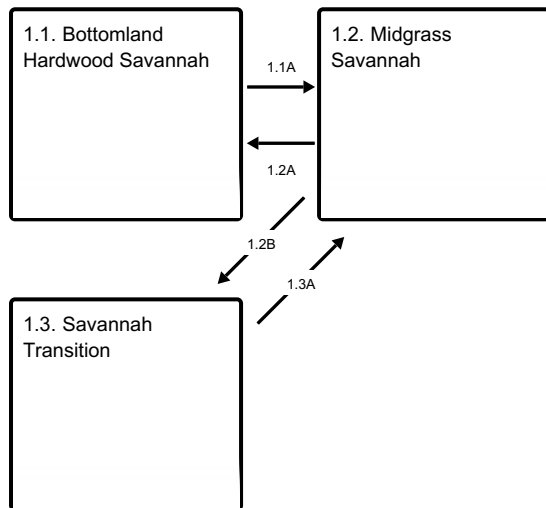
**T1B** - No fire, No brush management

**T1A** - Cultivation, Seeding

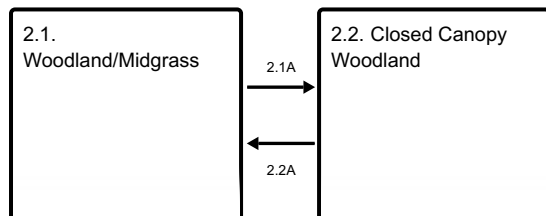
**R2A** - Selective thinning, Prescribed fire, Prescribed grazing

**T3A** - Range planting

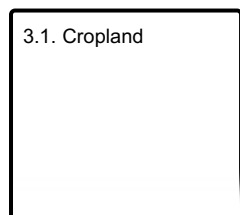
### State 1 submodel, plant communities



### State 2 submodel, plant communities



### State 3 submodel, plant communities



#### State 4 submodel, plant communities

4.1. Go Back/Range Seeding

4.2. Tame Pasture

### State 1 Savannah

This is the Reference state for this ecological site. It represents the historical variability of communities on this site under the natural disturbance regime.

**Characteristics and indicators.** The plant communities within this state are dominated primarily by herbaceous species. The woody species average 30% canopy or less across the landscape. This canopy may vary substantially as areas adjacent to creeks and streams are more protected from fire. This often leads to a feathered effect of low canopy further from the the water course and higher canopy adjacent to it.

**Resilience management.** Most of the variation can come from time since last fire. Without fire or alternative brush management, the site may transition to the woodland state.

#### Dominant plant species

- pecan (*Carya illinoensis*), tree
- American sycamore (*Platanus occidentalis*), tree
- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- sunflower (*Helianthus*), other herbaceous
- Baldwin's ironweed (*Vernonia baldwinii*), other herbaceous

### Community 1.1 Bottomland Hardwood Savannah



Figure 10. Pulaski Soils with Pecan overstory, site has been hayed earlier in season. Payne County, Oklahoma

This biotic community is dominated by native warm season grasses that thrive under periodic grazing and fire. While this site is well suited for woody plant growth, periodic fires restrict the growth and reproduction of most of the woody species. The reference community for the Loamy Bottomland ecological site is the Bottomland Hardwood Savannah community (1.1). This plant community is predominately tallgrass prairie species with a savannah overstory of Pecan (*Carya illenoensis*), Sycamore (*Platanus occidentalis*), and Cottonwood (*Populus deltoides*). Warm season tallgrass species include Big Bluestem (*Andropogon gerardii*), Switchgrass (*Panicum Virgatum*), Indiangrass (*Sorghastrum nutans*), Florida Paspalum (*Paspalum floridanum*) and Eastern Gamagrass (*Tripsacum*



*dactyloides*). There are also a variety of native forbs and legumes including numerous sunflowers (*Helianthus* spp.), Baldwin's Ironweed (*Vernonia baldwinii*), Pitcher's Sage (*Salvia azurea*), Goldenrods (*Solidago* spp.), Illinois Bundleflower (*Desmanthus illinoensis*), Wild Indigo (*Baptisia australis*), and Tick-clovers (*Desmodium* spp.). Some important cool season grasses include Canada Wildrye (*Elymus canadensis*), Texas Bluegrass (*Poa arachnifera*), and a variety of grasslike sedges (*Carex* spp.) This biotic community provides adequate ground cover to prevent soil loss, limit runoff, and enhance water infiltration into the soil profile. It provides good habitat for many wildlife species and adequate forage plants for domestic grazing animals. Although these sites are subjected to periodic flooding, the community phase is quite resilient. There may be some scouring after flood events, yet the majority of the plant communities will recover. The following species cover, structure, and production tables have been developed using collected data and professional knowledge. As with anything in nature, there is a large amount of variability from year to year even within a relatively stable plant community. This is true for both vegetative production as well as foliar cover produced by a plant species. The following figures are to be viewed only as a representation of the estimated potential for a given species. As more data is collected and measurement methods are refined some values may be updated through future revisions.

**Table 6. Annual production by plant type**

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	4808	6120	7431
Forb	616	785	953
Tree	616	785	953
Shrub/Vine	123	157	191
<b>Total</b>	<b>6163</b>	<b>7847</b>	<b>9528</b>

**Table 7. Ground cover**

Tree foliar cover	10-30%
Shrub/vine/liana foliar cover	0-5%
Grass/grasslike foliar cover	60-80%
Forb foliar cover	10-30%
Non-vascular plants	0%
Biological crusts	0%
Litter	50-75%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-5%

**Table 8. Soil surface cover**

Tree basal cover	5%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	20%
Forb basal cover	5%
Non-vascular plants	0%
Biological crusts	0%
Litter	50%
Surface fragments >0.25" and <=3"	0%

Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-5%

Figure 12. Plant community growth curve (percent production by month). OK0020, Native Grass with Savannah Overstory.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	7	25	30	15	4	2	1	3	4	2

## Community 1.2 Midgrass Savannah



Figure 13. 1.2 Pulaski soils. Payne County, OK.

The dominant herbaceous plants within this community are Little Bluestem (*Schizachyrium scoparium*), Tall Dropseed (*Sporobolus compositus*), Silver Bluestem (*Bothriochloa laguroides*), and Western Ragweed (*Ambrosia psilostachya*). The dominant tallgrasses from the reference community (1.1) have declined due to excessive grazing pressure and have been replaced by less palatable species. These midgrass species have received less pressure from grazing animals and have been able to thrive. The more palatable legumes and forbs have also decreased. This community phase will most often still contain the fine fuel loads required to implement prescribed burning, however, proper planning and evaluation will be necessary to implement this practice.

## Community 1.3 Savannah Transition

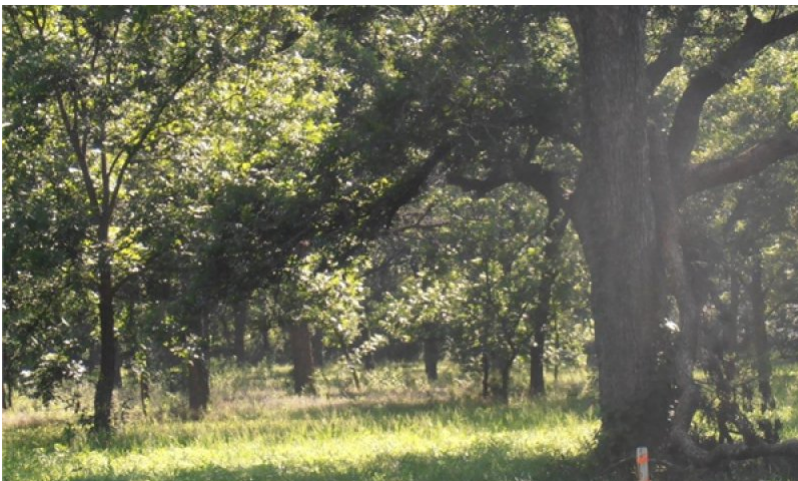


Figure 14. Pulaski soils, savannah transition

This community is usually the end result of excessive defoliation of palatable grasses and lack of fire. The desirable herbaceous species have been heavily grazed for long periods of time without being allowed to recover. The remaining undesirable grasses and forbs will not produce the fuel loads necessary to implement prescribed fire to control woody species encroachment. These woody species will begin to encroach into open areas and grow unrestricted. This community is considered “at risk” of transitioning to a woody dominated ecological state (2). The woody canopy coverage is 30-40%.

### **Pathway 1.1A** **Community 1.1 to 1.2**

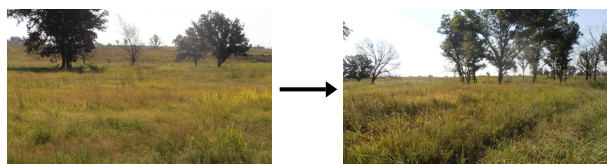


**Bottomland Hardwood Savannah**

**Midgrass Savannah**

If the reference plant community (1.1) is subjected to abusive grazing for long periods of time, it may begin to shift to a Midgrass Savannah plant community (1.2). With heavy grazing pressure, preferred tallgrass species, will decrease in vigor and eventually be replaced by less palatable midgrasses. This shift can be avoided by following proper stocking rates and allowing periodic rests between grazing events. This shift may also be the result of a long term drought as the tallgrass species tend to be less drought tolerant than some midgrasses. While the soils of this site are not considered excessively droughty, long dry periods can begin to have an impact on the plant community. These impacts are compounded with improper grazing management (inadequate rest). The removal of fire from the ecosystem can also negatively affect the reference plant community (1.1).

### **Pathway 1.2A** **Community 1.2 to 1.1**



**Midgrass Savannah**

**Bottomland Hardwood Savannah**

With the implementation of a prescribed grazing system that involves periodic growing season rest (deferment), this plant community may shift back to the reference plant community (1.1). It is important to remember that adequate precipitation during these rest periods is required in order to allow the plants to recover and regain vigor.

### **Pathway 1.2B** **Community 1.2 to 1.3**



**Midgrass Savannah**

**Savannah Transition**

If this site is continually subjected to abusive grazing without adequate rest, the more desirable plants will continue to decline. These plants will be replaced by less palatable midgrasses and annuals. As this plant community is shifted to the transitional community (1.3), the fine fuel loads are decreased and it becomes very difficult to implement prescribed fire. Woody species will be able to grow unrestricted and compete for resources.

### **Pathway 1.3A** **Community 1.3 to 1.2**



Savannah Transition



Midgrass Savannah

With the implementation of a prescribed grazing system that involves periodic growing season rest (deferment), and the reintroduction of fire, this plant community may shift back to the reference plant community (1.2). It is important to remember that adequate precipitation during these rest periods is required in order to allow the plants to recover, regain vigor and produce fuel loads necessary to control the encroaching woody species. At this stage, the community is at risk of crossing a threshold because canopy is approaching 40 percent. Once this happens, changes in grazing management will have little effect on the return of warm season grasses as there is not enough sunlight to sustain them.

## State 2 Woodland

This ecological state is the result of long term exclusion of fire from the ecosystem.

**Characteristics and indicators.** Woody species that were historically reduced by periodic fire the savannah ecosystem of the reference state (1) may now increase in abundance. The ecological function (energy flow, hydrology, nutrient cycling) of the site has been altered and is now dominated by woody species.

**Resilience management.** While sites in this state may be grazed by cattle, the production of palatable herbaceous species is diminished. Thus, the production value of grazing is greatly reduced. Some species of wildlife will find use of site in this state; however, other species will not persist as the site becomes dominated by woody plants.

### Dominant plant species

- pecan (*Carya illinoensis*), tree
- American sycamore (*Platanus occidentalis*), tree
- sugarberry (*Celtis laevigata*), tree
- American elm (*Ulmus americana*), tree
- eastern redcedar (*Juniperus virginiana*), tree
- Canada wildrye (*Elymus canadensis*), grass
- sedge (*Carex*), grass
- Indian woodoats (*Chasmanthium latifolium*), grass

## Community 2.1 Woodland/Midgrass



Figure 15. Pulaski soils. Transitional community from 2.1 to 2.2. Cleveland County, OK

The woodland/midgrass plant community is dominated by woody species including American Elm, Hackberry,

Pecan, Persimmon, Green Ash, and Sumac. Invasives such as Eastern Redcedar and Honeylocust are common and may take over some sites. The woody canopy may average around 50 – 60%. Some herbaceous species still occupy canopy interspaces. The herbaceous community may include remnants of Little Bluestem, Purpletop, Dropseeds, Broomsedge Bluestem, and a variety of Sedge species depending on current and prior grazing management. Shrub species including Poison Ivy, Greenbriar, and Buckbrush are also common. Overall herbaceous vegetative productivity is significantly lower than the reference community. While there is still some value for wildlife in this community, the value for grazing livestock is diminished. (With the exception of browsing goats.)

## Community 2.2 Closed Canopy Woodland

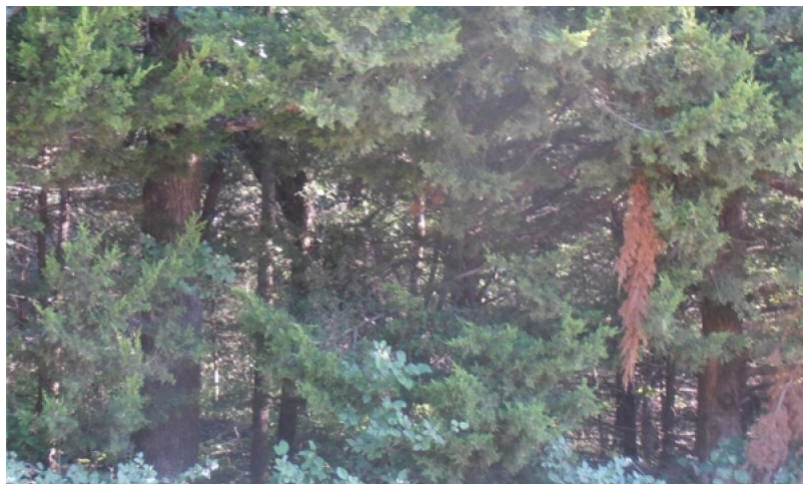


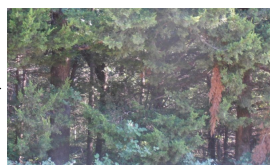
Figure 16. Pulaski soils invaded by Eastern Redcedar

This plant community is the result of fire exclusion from the ecosystem. In the absence of fire, woody species have encroached and now completely dominate the site. The fertile, coarse bottomland soils and close proximity to groundwater are favorable for woody plant growth. Major woody increasers include American Elm (*Ulmus Americana*), Hackberry (*Celtis laevigata*), Green Ash (*Fraxinus pennsylvanica*), and Eastern Redcedar (*Juniperus virginiana*). Some understory woody species include Saw Greenbriar (*Smilax bona-nox*), Eastern Poison Ivy (*Toxicodendron radicans*), and Virginia Creeper (*Parthenocissus quinquefolia*). Some of these woody species occur in small amounts within the reference state (1), however, most have been limited by periodic fires. Once the species are fully mature they are very difficult to control with fire alone (except for wildfires). The closed canopy created by these woody species creates a mesophytic microclimate in the understory that favors woody species and a few shade tolerant herbaceous species. This plant community may provide some benefits to wildlife species that use it for browse and cover, but the value of the site for cattle grazing has severely deteriorated. There is potential for use of this plant community by goats due to the amount of understory woody species.

### Pathway 2.1A Community 2.1 to 2.2



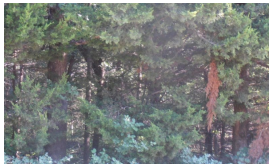
Woodland/Midgrass



Closed Canopy Woodland

Without periodic fire, the woodland/midgrass plant community will be susceptible to woody encroachment and may shift to a closed canopy woodland plant community.

### Pathway 2.2A Community 2.2 to 2.1



Closed Canopy Woodland



Woodland/Midgrass

Through some selective thinning of woody species and re-introduction of fire through prescribed burning, the closed canopy plant community may be shifted to a woodland/midgrass community.

### State 3 Cultivated

Many loamy bottomland sites have been cultivated over the past century in order to produce crops.

**Characteristics and indicators.** Due to the level, deep, sandy loam soils, these sites are well suited for Ag production. Within this state, most woody species have been cleared in order to facilitate the access of farm machinery.

**Resilience management.** Upon cultivation, the physical and chemical properties of the soil have been altered. The degree of this change is very site specific depending on cultivation type and duration.

#### Dominant plant species

- wheat (*Triticum*), grass

### Community 3.1 Cropland



Figure 17. Pulaski soils in current cultivation

This plant community is the result of farming practices for the production of commodity crops. Common crops include Wheat, Sorghum, Soybeans, and sometimes Corn. Refer to Ag extension publication, web soil survey, or soil survey manuscripts for site specific crop yield data.

### State 4 Re-Seeded

This ecological state is the result of reseeding herbaceous plant species or abandonment following a period of cultivation.

**Characteristics and indicators.** The plant communities within this state are highly variable in both species composition and production. Under carefully planned management strategies, this state may be restored to a plant community that appears similar to the reference state (1).

**Resilience management.** However, the species composition, ecological function, and soil health may never be

restored to reference conditions. Therefore, careful consideration should be taken when evaluating a loamy bottomland site that may have been broken out for cultivation in the past.

### Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- big bluestem (*Andropogon gerardii*), grass

## Community 4.1 Go Back/Range Seeding



Figure 18. Pulaski Soils, formerly cultivated, go back community with johnsongrass. Payne County, OK

This plant community is the result of abandonment or range seeding after cultivation. The pioneer species of a “go back” plant community might include Purpletop (*Tridens flavus*), Broomsedge Bluestem (*Andropogon virginicus*), Giant Ragweed (*Ambrosia trifida*), and often times Johnsongrass (*Sorghum halepense*). There is often a large amount of variability within both species composition and production within this community. Most often, early successional trees, grasses, and forbs will begin to encroach on the site. Without fire or brush management, this state may develop into something that resembles state 2 (Woodland). However, since the site has been cultivated, the soil health, organic matter, and potential plant communities may be different. Site specific ecological evaluations will be necessary in order to develop management strategies. Some sites may be seeded to a diverse mixture of native grasses, forbs, and legumes, while other sites were seeded with very few species or simply abandoned. It is important to remember that without periodic fire or other brush management, the site may be invaded by woody species, regardless of the establishment methods of herbaceous plants.

## Community 4.2 Tame Pasture



Figure 19. Pulaski Soils w/Tall Fescue and Pecan Trees

When this site is taken out of crop production, it is often planted to an introduced perennial grass. The most

common species are Bermudagrass (*Cynodon dactylon*) and Tall Fescue (*Schedonorus arundinaceus*). Many of these sites are used for grazing, cut for hay, or both. The productivity of these perennial grasses is greatly dependent upon nutrient inputs (fertilizer). Nutrient management is key to the establishment and management of these introduced species. Additionally, the addition of nutrients may help to expedite the buildup of soil microorganisms and potentially soil organic matter. For more information about suitable pasture species, planting specifications, and yield data, refer to ag extension publications, web soil survey, and forage suitability group descriptions (if available).

### Transition T1B

#### State 1 to 2

In the absence of fire, many woody species increase across the landscape. Once these woodies are abundant enough, they begin to drive the ecological functions of the site.

**Constraints to recovery.** Shading negatively affects the herbaceous plants, as well as, hydrologic changes limiting available water. As the woody species begin to dominate the site, it will transition to a woodland ecological state (2).

### Transition T1A

#### State 1 to 3

A majority of these sites have been plowed for farming purposes over the last century. Once the site is cultivated, it transitions to an alternative state (3).

**Constraints to recovery.** The soils structure, organic matter, and biota have been altered and will no longer function the same as the soils in the reference state.

### Restoration pathway R2A

#### State 2 to 1

Through an integrated program of Brush Management (selective thinning), Grazing Management (deferment), and Prescribed Fire, the Woodland State may be restored to the Reference Savannah State (1).

**Context dependence.** Selective thinning will be required to remove undesirable woody species while leaving the large bottomland trees that occur in the Reference State. Prescribed grazing will be required in order to allow the tallgrasses, forbs, and legumes recover and re-establish once the canopy is thinned. This will also be required in order to establish proper fuel loads in order to successfully implement a prescribed fire program. Prescribed fire will be necessary in order to clean up remaining understory species and can be used as a management tool to prevent future woody encroachment.

#### Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

### Transition T3A

#### State 3 to 4

Once cultivation of this site is stopped, the Cultivated State will transition to the Reseeded State.

### Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	Tallgrasses			2802–5044	



	big bluestem	ANGE	<i>Andropogon gerardii</i>	785–1345	–
	eastern gamagrass	TRDA3	<i>Tripsacum dactyloides</i>	560–1009	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	504–841	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	504–841	–
	Florida paspalum	PAFL4	<i>Paspalum floridanum</i>	280–504	–
	purpletop tridens	TRFL2	<i>Tridens flavus</i>	112–280	–
	Grass, native	2GN	<i>Grass, native</i>	112–280	–
2	<b>Cool Season Grasses</b>			560–897	
	deertongue	DICL	<i>Dichanthelium clandestinum</i>	84–196	–
	Heller's rosette grass	DIOL	<i>Dichanthelium oligosanthes</i>	84–196	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	84–196	–
	Virginia wildrye	ELVI3	<i>Elymus virginicus</i>	56–140	–
	Indian woodoats	CHLA5	<i>Chasmanthium latifolium</i>	56–140	–
	Grass, native	2GN	<i>Grass, native</i>	0–112	–
	Texas bluegrass	POAR	<i>Poa arachnifera</i>	28–112	–
3	<b>Other Perennial Grasses</b>			897–1513	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	224–392	–
	beaked panicgrass	PAAN	<i>Panicum anceps</i>	90–157	–
	Grass, native	2GN	<i>Grass, native</i>	90–157	–
	longspike tridens	TRST2	<i>Tridens strictus</i>	90–157	–
	broomsedge bluestem	ANVI2	<i>Andropogon virginicus</i>	34–78	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	34–78	–
	silver beardgrass	BOLA2	<i>Bothriochloa laguroides</i>	34–78	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	34–78	–
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	34–78	–
	nimblewill	MUSC	<i>Muhlenbergia schreberi</i>	34–78	–
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	34–78	–
	marsh bristlegrass	SEPA10	<i>Setaria parviflora</i>	34–78	–
	dropseed	SPORO	<i>Sporobolus</i>	34–78	–
4	<b>Grasslike species</b>			90–157	
	sedge	CAREX	<i>Carex</i>	56–123	–
	flatsedge	CYPER	<i>Cyperus</i>	0–34	–
<b>Forb</b>					
5	<b>Forbs and Legumes</b>			560–1009	
	sunflower	HELIA3	<i>Helianthus</i>	56–112	–
	goldenrod	SOLID	<i>Solidago</i>	56–112	–
	vervain	VERBE	<i>Verbena</i>	28–84	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	28–84	–
	thoroughwort	EUPAT	<i>Eupatorium</i>	28–84	–
	azure blue sage	SAAZ	<i>Salvia azurea</i>	28–56	–
	aster	SYMPH4	<i>Symphotrichum</i>	17–34	–
	ticktrefoil	DESMO	<i>Desmodium</i>	11–34	–
	tickseed	COREO2	<i>Coreopsis</i>	11–28	–
	Queen Anne's lace	DACA6	<i>Daucus carota</i>	0–22	–

	prairie clover	DALEA	<i>Dalea</i>	0–22	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	0–22	–
	Carolina elephantsfoot	ELCA3	<i>Elephantopus carolinianus</i>	0–22	–
	prairie fleabane	ERST3	<i>Erigeron strigosus</i>	11–22	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–22	–
	wild indigo	BAPT1	<i>Baptisia</i>	0–22	–
	smallspike false nettle	BOCY	<i>Boehmeria cylindrica</i>	0–22	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–22	–
	prairie acacia	ACAN	<i>Acacia angustissima</i>	0–22	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	11–22	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	11–22	–
	milkweed	ASCLE	<i>Asclepias</i>	11–22	–
	stinging nettle	URDI	<i>Urtica dioica</i>	0–22	–
	Baldwin's ironweed	VEBA	<i>Vernonia baldwinii</i>	11–22	–
	roundhead lespedeza	LECA8	<i>Lespedeza capitata</i>	11–22	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–22	–
	blackeyed Susan	RUHI2	<i>Rudbeckia hirta</i>	11–22	–
	Texas star	SACA3	<i>Sabatia campestris</i>	0–22	–
	crownbeard	VERBE2	<i>Verbesina</i>	0–22	–
	copperleaf	ACALY	<i>Acalypha</i>	0–17	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–11	–

#### Shrub/Vine

6	<b>Shrub</b>			112–224	
	leadplant	AMCA6	<i>Amorpha canescens</i>	22–45	–
	winged sumac	RHCO	<i>Rhus copallinum</i>	11–22	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	11–22	–
	Oklahoma blackberry	RUOK	<i>Rubus oklahomus</i>	11–22	–
	saw greenbrier	SMBO2	<i>Smilax bona-nox</i>	11–22	–
	coralberry	SYOR	<i>Symphoricarpos orbiculatus</i>	11–22	–
	eastern poison ivy	TORA2	<i>Toxicodendron radicans</i>	11–22	–
	grape	VITIS	<i>Vitis</i>	11–22	–
	Shrub, other	2S	<i>Shrub, other</i>	0–22	–

#### Tree

7	<b>Trees</b>			560–1009	
	pecan	CAIL2	<i>Carya illinoensis</i>	280–504	–
	American sycamore	PLOC	<i>Platanus occidentalis</i>	112–202	–
	eastern cottonwood	PODE3	<i>Populus deltoides</i>	112–202	–
	oak	QUERC	<i>Quercus</i>	0–22	–
	gum bully	SILA20	<i>Sideroxylon lanuginosum</i>	0–22	–
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0–22	–
	northern catalpa	CASP8	<i>Catalpa speciosa</i>	0–22	–
	Tree, deciduous, broadleaf	2TDB	<i>Tree, deciduous, broadleaf</i>	0–22	–
	American elm	ULAM	<i>Ulmus americana</i>	0–11	–

sugarberry	CELA	<i>Celtis laevigata</i>	U-6	-
common hackberry	CEOC	<i>Celtis occidentalis</i>	0-6	-

## Animal community

This site is suited for the production of domestic livestock and provides habitat for native wildlife and certain species of exotic wildlife. Cow-calf operations are the primary livestock enterprise although stocker cattle are also common. Sustainable stocking rates have declined drastically over the past 100 years because of deterioration of the Reference condition. Initial starting stocking rates should be determined with the landowner or decision maker based on the merits of the existing plants for the desired animals.

Many species will utilize the Loamy Bottomland site for at least a portion of their habitat needs but rely on a more extensive landscape to meet all their needs. Some animals may only utilize one plant community of the Loamy Bottomland site to fulfill their habitat needs.

Smaller mammals include many kinds of rodents, jackrabbit, cottontail rabbit, raccoon, skunks, opossum, and armadillo. Mammalian predators include coyote, fox, and bobcat. Many species of snakes and lizards are native to the site.

Many species of birds are found on this site including game birds, songbirds, and birds of prey. Major game birds that are economically important are Rio Grande turkey, bobwhite quail, and mourning dove. Turkey prefers plant communities with substantial amounts of shrubs and trees interspersed with grassland. Quail prefer plant communities with a combination of low shrubs, bunch grass, bare ground, and low successional forbs. The different species of songbirds vary in their habitat preferences. In general, habitat that provides a diversity of grasses, forbs, shrubs, vines and trees, and a complex of grassland, savannah, shrubland, and woodland will support a variety and abundance of songbirds. Birds of prey are important to keep the numbers of rodents, rabbits, and snakes in balance. The different plant communities of the site will sustain different species of raptors.

## Hydrological functions

### State 1

In the Savannah state, the mixture of grasses and forbs, along with the relatively flat landscape, allow for rapid infiltrating of rainfall and drainage from overland flow. Due the landscape position and proximity to water courses, some of these sites are subjected to periodic flood events. However, these flood are brief and normally do not have much effect on species composition and production.

### State 2

Once the site has transitioned to a Woodland State, the overall hydrology of the site will be altered. While the site will still receive runoff from overland flow, much of the rainfall is intercepted in tree canopies and does not make it into the herbaceous understory. However, the shading created by the overstory of woody species can create a more mesophytic microclimate and offset the reduction in rainfall passage to the understory. This allows certain shade tolerant species to thrive within this state.

### State 3

Under cultivation, the hydrology, soil health, and soil structure have been altered. The degree of infiltration varies from site to site and can still be relatively high due to the coarse textured soils.

### State 4

With the re-establishment of perennial grasses to the site, the hydrology may be somewhat restored to that of the grassland state. This may take a significant amount of time depending on the prior cultivation practices and species of grass used in re-establishment.

## Recreational uses

These sites are often used for recreational hunting, bird watching, and many other outdoor activities.

## Wood products

Some tree species associated with the Loamy Bottomland ecological site are preferred for use as firewood, smoking wood, and other non-commercial uses.

## Other products

Many of these sites have been converted to Pecan orchards for commercial Pecan harvesting. Yields vary by site, management, and seasonal weather patterns.

## Other information

Contact your local or state NRCS rangeland specialist with specific questions, comments, or more information regarding this ecological site.

## Inventory data references

Clipping data and other observations on file in the Oklahoma NRCS State Office:

Suite 206

100 USDA

Stillwater, Oklahoma 74074

The original information for this site was derived from field observations of Dr. Jack Eckroat, in the summer of 2007, correlated to office files and old Rangesite Technical Descriptions (1961 USDA/SCS). Species compositions are as complete as possible. Production will vary by species from within years, from year to year, and from site to site.

This ESD development was part of a FY 2014 project originating out of the Stillwater, OK Soil Survey Office in collaboration with Oklahoma NRCS Ecological Sciences staff.

## Type locality

Location 1: Lincoln County, OK	
General legal description	Lincoln County, Oklahoma; about 6 miles north and 1 mile east of Chandler; 1,135 feet north and 200 feet east of the southwest corner of sec. 2, T. 15 N., R. 4 E

## References

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Brandon Reavis, State RMS, Stillwater, OK

## Approval

Bryan Christensen, 9/21/2023

## Acknowledgments

Site Development and Testing Plan:

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

## Rangeland health reference sheet

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

Author(s)/participant(s)	Jack Eckroat, Steve Glasgow, Harry Fritzler (edits by C Walden, Brandon Reavis 2014)
Contact for lead author	100 USDA Suite 206 Stillwater, OK 74074

Date	04/01/2005
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** This site has flatter slopes. There are few, if any, rills (only in lowest area where flooding occurs) and there is no active headcutting and sides are covered with vegetation.  

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2. **Presence of water flow patterns:** There is little evidence of soil deposition or erosion (only after a flood event). Water generally flows evenly over the entire landscape.  

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3. **Number and height of erosional pedestals or terracettes:** There should not be any evidence of erosional pedestals or terracettes on this site.  

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** There is 0-5% bare ground on this site. Bare areas are small and not connected.  

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5. **Number of gullies and erosion associated with gullies:** None. Drainages are represented as natural, stable, vegetated channels.  

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Uniform distribution of litter. Litter rarely moves >12 inches only during high intensity storms or flood events.  

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Average of scores 5 or higher. Stability scores based on a minimum of 6 samples tested.  

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Ap horizon: 0 to 7 inches; dark grayish brown silt loam, weak fine granular structure. A horizon: 7 to 21 inches; dark grayish brown silt loam, moderate fine and medium granular structure.  

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration is moderate and uniform. Runoff is very low. Reference plant community composition and distribution is intact. (Tallgrass dominated)

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** There is no compaction layer.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Tallgrasses

Sub-dominant: Midgrasses, Forbs, Cool-Season Perennial Grasses, Bottomland Hardwood Trees

Other: Shrubs

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There may be some plant mortality and decadence on the perennial grasses, especially in the absence of fire and herbivory, but usually <5% depending on recent precipitation patterns.

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14. **Average percent litter cover (%) and depth ( in):** Litter should cover >95% of the area between plants with accumulations of 1-3 inches deep depending on time since fire.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Normal production is 4500 - 8500 pounds per year.

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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:** Invasives might include: eastern redcedar, locust, salt cedar, sericea lespedeza

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17. **Perennial plant reproductive capability:** All plants capable of reproducing at least every year. Both seedheads and vegetative rhizomes/tillers should be evaluated.

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