USDA Natural Resources Conservation Service

Ecological site R078CY068OK
Sandy Bottomland

Last updated: 9/15/2023
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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.

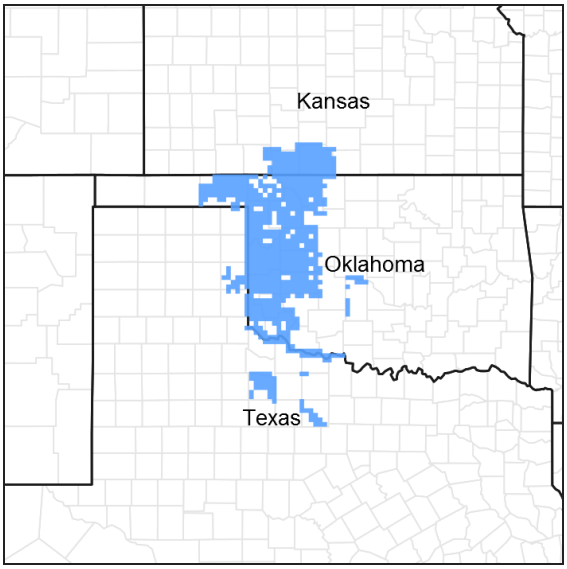


Figure 1. Mapped extent

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): 078C–Central Rolling Red Plains, Eastern Part

MLRA 78C is characterized by moderately dissected, rolling plains with prominent ridges and valleys and numerous terraces adjacent to dissecting streams. Loamy and clayey soils are generally deep, well drained, and developed in soft, calcareous sandstones, siltstones, and shales in red beds of Permian age. Characteristic red soils have formed in most of the area because of the underlying Permian red-bed sedimentary rocks.

LRU notes

NA

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

These sites occur on flood plains with coarse textured soils. Unlike the Subirrigated Bottomland ecological site, the

Sandy Bottomland sites lack subsurface water with 60 inches. The dominate reference vegetation is tallgrasses intermixed with forbs and some woody species. These woody species include sandplum, sumac, and cottonwood. In the absence of fire, woody species can begin to dominate the site. Long term abusive grazing practices can damage the productive tallgrass species and lead to plant community with an abundance of less palatable species.

Similar sites

R078CY094TX	**Clayey Bottomland 23-30" PZ** Clayey Bottomland is found on similar physiographic position, but with clayey soils.
R078CY103TX	**Loamy Bottomland 23-31" PZ** Sometimes adjacent on river bottoms: similar vegetation but with loamy soils.

Table 1. Dominant plant species

Tree	(1) *Populus deltoides*
Shrub	Not specified
Herbaceous	(1) *Panicum virgatum* (2) *Andropogon gerardii*

Physiographic features

These soils are on nearly level to broad flood plains of the Central Rolling Red Plains. Slopes are 0 to 2 percent. Elevation ranges from 700 to 2500 feet. These soils frequently to rarely flood; duration is brief or very brief during months of March to October.

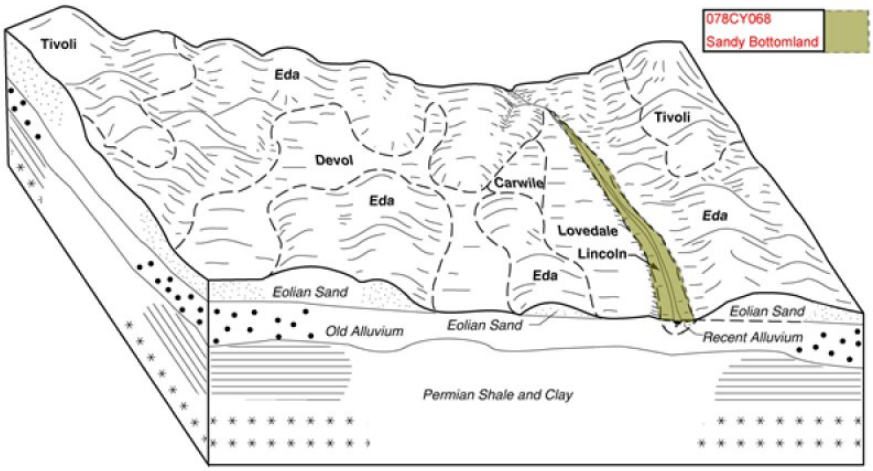


Figure 2. Sandy Bottomland

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain (2) River valley > Draw (3) River valley > Valley floor
Runoff class	Negligible
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	213–762 m
Slope	0–2%
Water table depth	152–183 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 78C lies within the subtropical sub-humid climate regime. This regime is characterized by rapid changes in temperature; marked extremes, both daily and annual; and rather erratic rainfall. The weather is alternately influenced by cold dry air from the Arctic Circle, and warm moist air from the Gulf of Mexico.

Seasonal changes are gradual. Spring is a season of variable weather and relatively high precipitation with prevailing winds from the southwest. Summers are generally hot with low humidity. Fall has long periods of pleasant weather interspersed with moderate to heavy rains. Winter is open and moderate to cold with winds from the north and infrequent snows.

Wind speeds average more than eleven miles an hour with prevailing southern winds. Rather strong winds can occur in all months of the year. While strong gusty winds occur, severe dust storms are rare.

Approximately 75 percent of the rainfall occurs during the warm season, and much of it comes in storms of high intensity and short duration in May and June. These rains can be particularly erosive on sites where vegetation is sparse. Occasional droughts are to be expected. Lack of rainfall and hot, dry winds often curtail forage production during July and August.

Table 3. Representative climatic features

Frost-free period (characteristic range)	144-181 days
Freeze-free period (characteristic range)	180-202 days
Precipitation total (characteristic range)	660-737 mm
Frost-free period (actual range)	142-191 days
Freeze-free period (actual range)	168-211 days
Precipitation total (actual range)	610-813 mm
Frost-free period (average)	162 days
Freeze-free period (average)	192 days
Precipitation total (average)	686 mm

Climate stations used

- (1) ASHLAND [USC00140365], Ashland, KS
- (2) WAYNOKA [USC00349404], Waynoka, OK
- (3) VERNON [USC00419346], Vernon, TX
- (4) FORT SUPPLY 3SE [USC00343304], Fort Supply, OK
- (5) REYDON 2SSE [USC00347579], Reydon, OK
- (6) CARNEGIE 5 NE [USC00341504], Carnegie, OK
- (7) CHATTANOOGA [USC00341706], Chattanooga, OK
- (8) WILMORE 16SE [USC00148914], Coldwater, KS
- (9) MANGUM [USC00345509], Mangum, OK

Influencing water features

These sites occur on flood plains and are subjected to periodic flooding and run off water from adjacent uplands.

Wetland description

NA

Soil features

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.

Representative soil components for this site include:
Lincoln

Table 4. Representative soil features

Parent material	(1) Alluvium–quartzite
Surface texture	(1) Fine sandy loam (2) Loamy fine sand (3) Fine sand
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.79–18.29 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–6%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The information contained in the State and Transition Diagram (STD) and the Ecological Site Description was developed using archeological and historical data, professional experience, and scientific studies. The information presented is representative of a very 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 Sandy Bottomland Ecological Site developed on sandy fluvial alluvium of Recent Age adjacent to rivers and streams. The reference plant community of the site developed under the prevailing subtropical, sub-humid climate over time along with the soils defining the site. Occasional severe flooding events also influenced the ecological development of the site by disrupting vegetation and depositing sand and silt bars. The topographic position

adjacent to the stream, sandy soil, shallow water table and occasional flooding encouraged the development of tall grass vegetation. The reference community is assumed to have been a Tallgrass Community (1.1) characterized by tall grasses, some midgrasses, abundant forbs and scattered woody species . The trees and shrubs occupied locations protected from frequent and intense fires that occurred throughout the region before European settlement (Frost 1994). It is believed that the endemic woody plants historically provided less than five percent canopy cover.

The demise of the Native American Indians, expansion of the livestock industry and cessation of periodic intense fires changed the ecological dynamics of the vegetation on the Sandy Bottomland site. After European settlement in the mid 1800's, the frequency and intensity of fire diminished and continuous overgrazing by cattle and sheep began a transition of the reference plant community towards a woodland plant state. Although recent climatic warming trends and increases in atmospheric carbon dioxide may be enhancing vegetation change (Morgan, et. al. 2008) the major forces influencing transition from the historic climax plant community to a woodland state are continuous overgrazing by livestock and the decrease in frequency and intensity of fire (Archer1998).

Overstocking and continuous yearlong grazing causes changes in the plant community structure and function of the Tallgrass Community (1.1). When defoliation by livestock exceeds the ability of the vegetation to sustain optimum growth, the more palatable, and generally more productive, species decline in productivity and density. The more palatable and accessible tall grasses and forbs give way to more grazing resistant species. As regression occurs, the tall grasses such as big bluestem, switchgrass, eastern gamagrass and Indiangrass are replaced initially by little bluestem, purpletop, Virginia wildrye, tall dropseed, giant sandreed, Texas wintergrass and vine mesquite. The better quality forbs, such as Illinois bundleflower and Engelmann daisy, are replaced by less palatable species. Cottonwood and will are major tree species found. The woody species that had been kept in check by fire and grass competition increase in size and density. The site also becomes open to invasion of species from adjacent sites. The change in structure of the grassland vegetation brings about a new plant community, the Tallgrass/Midgrass Community (1.2).

The Tallgrass/Midgrass Community (1.2) is characterized by a mixture of tall grasses and Midgrasses being encroached by endemic or invading woody and weedy plants. Little bluestem and giant sandreed increase initially. Little bluestem may persist on recent sand deposits until woody plants become dominant. Common bermudagrass is also common on sandy deposits. Baccharis, salt cedar and mesquite invade and can produce 10 to 20 percent of the annual production. Most climax forb species are still present, but weedy species are invading.

If the combination of heavy continuous grazing by livestock and wildlife continues, as it did on most areas of this site through the middle of the twentieth century, less palatable grasses, forbs, shrubs and trees become dominant to the detriment of taller and more palatable species. Tall dropseed, purpletop tridens, sand lovegrass and knot-root bristlegrass replace switchgrass, Indiangrass, eastern gamagrass, and big/sand bluestem. Alkali sacaton, inland saltgrass, salt cedar and baccharis invade salty areas. Loss of herbaceous cover and increased bare ground precludes effective burning and encourages accelerated erosion. Salty areas and silt deposits from floods increase. Soil and litter movement will occur during floods and water infiltration into the soil decreases.

When woody plant canopy exceeds 20 percent and the woody plants are old enough or large enough to resist control by prescribed burning, the transition into a woodland state is complete. Woodland ecological processes begin to compete with grassland ecological processes. Once this threshold is crossed, proper grazing management and prescribed burning alone cannot return the Mixed-grass/Mixed-brush Community (2.1) to a grassland state.

The endemic trees, such as pecan, cottonwood and hackberry can, but seldom do, dominate the overstory in the Mixed-grass/Mixed-brush Community (2.1). The overstory trees, especially cottonwood, often decline because of man's activities. However, native invasive species such as mesquite, western soapberry and invader species such as Siberian elm and salt cedar often become pests. Once established, the shrubs can become dominant, even without grazing, if they are not controlled. Occasionally more saline conditions are produced, resulting in increased amounts of alkali sacaton and inland saltgrass. Salt cedar is particularly invasive where saline conditions develop. Midgrass and forb diversity and production continues to decline while shrubs, cool-season species, shade tolerant grasses and weedy annuals increase as the canopy becomes denser. The herbaceous component is further reduced through shading and competition from woody vegetation.

Continued overgrazing by livestock and deer, along with periodic droughts, eventually brings about a plant community dominated by woody plants. Baccharis, mesquite and salt cedar completely take over the sandiest portions of the site, forming dense jungles of brush. Alkali sacaton, inland saltgrass, seep muhly and annuals

become the primary grasses of the deteriorated state. This plant community type is identifiable as a Mixed-brush/Mixed-grass/Annuals Community (2.2). Open sandy and salty areas are often interspersed within the plant community. The understory and interspaces support only remnants of climax vegetation, generally in low vigor and productivity due to shading and competition for water and nutrients. Summer grazing followed by winter rest frequently encourages cool-season species such as Texas wintergrass. The woodland plant community is so well established that it cannot be returned to a grassland state without extensive energy and management inputs.

Restoring the Mixed-brush/Mixed-grass/Annuals Community (2.2) to the grassland state requires extensive accelerated management practices, such as brush control, range planting, prescribed grazing and prescribed burning. The unique characteristics of the Sandy Bottomland Site and the great differences from adjacent sites make special management necessary. It also is important as part of the regions riparian system. Its condition and management can influence downstream water quantity and quality. Often it may be beneficial to fence this site to manage or limit access by grazing animals. Haying of the tall grasses found in the Grassland State (1.0), or planted after brush control, is an alternative to grazing. With extensive accelerated practices, time and proper management, this plant community can again resemble the reference community in productivity and functioning of ecological processes. Generally, the Tallgrass/Midgrass (1.2) or Mixed-grass/Mixed-brush (2.1) Communities will provide excellent habitat for livestock and wildlife.

State and Transition Diagram:
A State and Transition Diagram for the Sandy Bottomland (R078CY068OK) site is depicted below. Thorough descriptions of each state, transition, 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 natural variability in weather, soils, and aspect. The Reference Plant 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.

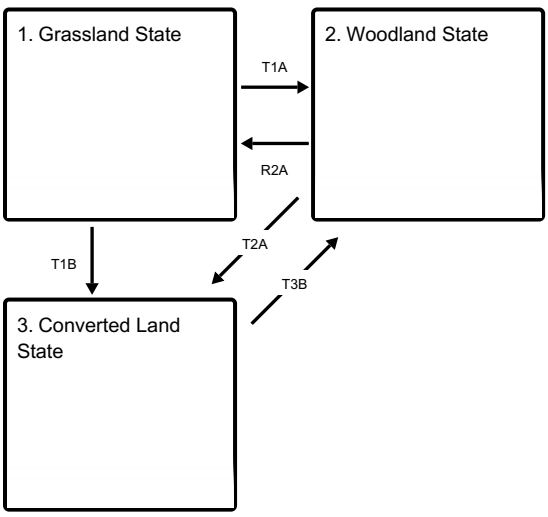
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Composition by dry weight and percent canopy cover are provided to describing the functional groups. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs).

The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances. It does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

Ecosystem states



T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

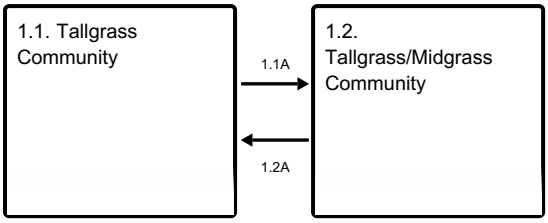
T1B - Extensive soil disturbance followed by seeding

R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

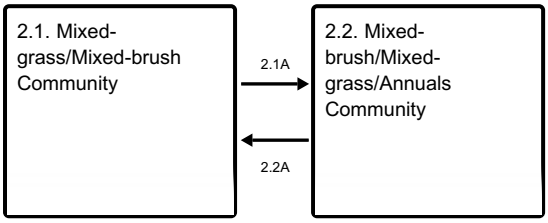
T2A - Extensive soil disturbance followed by seeding

T3B - Absence of disturbance and natural regeneration over time

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Grassland State

Community 1.1
Tallgrass Community

Figure 9. Community Phase 1.1

This is the reference or diagnostic community for the site. The description is based on early range site descriptions, clipping data, professional consensus of experienced range specialists, and analysis of field work. The Tallgrass Community (1.1) is the interpretive plant community for the Sandy Bottomland Ecological Site. The Tallgrass Community evolved under the influence of periodic flooding, grazing, periodic fire and a dry sub-humid climate. Occasional flooding and a fluctuating water table influenced the plant community. Woody plants, primarily cottonwood, hackberry, pecan and American elm were widely scattered along the stream edges and draws. Shrubs and vines such as bumelia, plum, prickly ash, greenbriar, skunkbush sumac, elbowbush, baccharis, Carolina snailseed and grape were present but kept suppressed by climatic conditions, periodic fires and grass competition. The herbaceous component accounted for up to 90 percent of the site's primary annual production, with tall grasses such as switchgrass, Indiangrass, big sandreed, big/sand bluestem, eastern gamagrass and little bluestem accounting for 60 to 70 percent of the herbage production. Secondary grasses were purpletop tridens, sand lovegrass, Texas cupgrass, vine mesquite, Arizona cottontop, plains bristlegrass, sideoats grama and dropseed.

Canada and Virginia wildrye, Texas wintergrass and western wheatgrass were common cool-season grasses. Common forbs included Maximilian sunflower, Illinois bundleflower, catclaw sensitivebriar, heath aster, gaura, lespedeza, tickclover, mentzelia, and bush morning glory. (See Plant Community Composition and Annual Production table below). The Tallgrass Community (1.1) was productive due to good soil and water relationships, although soil fertility is low. Herbage production ranged from 2,500 to 6,500 pounds per acre per year. Soil erosion was low due to the abundant plant cover, litter, and slow runoff. Runoff from the was reduced due to the dense tallgrass cover. The tallgrass ground cover helped disperse and slow down runoff thus holding soil in place and enhancing infiltration into the rapidly permeable soils. Concentrated water flow patterns were probably rare. Generally, the Sandy Bottomland is a preferred habitat for both livestock and wildlife so most areas of this site have received overgrazing by livestock and wildlife and have regressed to a lesser plant community type. Without proper livestock grazing management that adjusts animal numbers to annual forage production and judicious prescribed burning, the Tallgrass Community (1.1) will transition (regress) to a Tallgrass/Midgrass Community (1.2).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2522	4539	6557
Forb	140	252	364
Shrub/Vine	84	151	219
Tree	56	101	146
Total	**2802**	**5043**	**7286**

Figure 11. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Community 1.2
Tallgrass/Midgrass Community

The Tall/Midgrass Community (1.2) reflects the results of the suppression of fires and the effects of overgrazing on the more palatable species. An occasional severe flooding event may also cause damage to the grassland. Indigenous and invading woody plants have increased in density and stature. Mesquite, western soapberry, salt cedar and baccharis are the more common woody invaders. Little bluestem, sideoats grama, vine mesquite, are generally persistent in this phase, but most of the more palatable tall and midgrasses are being replaced by subdominants such as tall dropseed, purpletop tridens, sand lovegrass, knotroot bristlegrass, Texas wintergrass and less palatable forbs and annuals. Western ragweed, heath aster, mentzelia and Louisiana sagewort are common forbs. Common bermudagrass often invades the sandy areas near the stream edge. Forage production is not significantly affected but primary production is shifting to the less palatable or more grazing resistant species. Annual primary production ranges from 2,000 to 6,000 pounds with approximately 80 percent being produced by the grassland component. Nutrient cycling and water use is shifting toward the deeper-rooted woody perennials. Soil organic matter, litter and ground cover are slightly less than were present in the reference community. In the Tall/Midgrass Community (1.2) ecological processes have changed little and the pathway back to the HCPC can be accomplished without major energy inputs. Good grazing management alone will not reverse the trend towards the woodland state, however. Some form of woody plant control, such as prescribed burning and selective, mechanical brush control must accompany it. The transition of the Tall/Midgrass Community (1.2) toward a woodland state is reversible with prescribed grazing management and prescribed burning practices until the woody canopy exceeds 15 to 20 percent. Once woody plant canopy exceeds 20 percent, the plant community crosses a threshold to a shrub influenced woodland state represented by a Mixed-grass/Mixed-brush Community (2.1). Once the threshold into a woodland state is crossed, the transition is irreversible without considerable energy input in the form of mechanical or chemical brush control.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1793	3587	5380
Shrub/Vine	224	448	673
Tree	112	224	336
Forb	112	224	336
Total	**2241**	**4483**	**6725**

Figure 13. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Pathway 1.1A
Community 1.1 to 1.2

Without proper livestock grazing management that adjusts animal numbers to annual forage production and judicious prescribed burning, the Tallgrass Community (HCPC) will transition (regress) to a Tallgrass/Midgrass Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

With the implementation of various conservation practices such as Prescribed Grazing and Prescribed Burning, the shift from the Tall/Midgrass Community to the Tallgrass Community may be possible.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Woodland State

The Mixed-grass/Mixed-brush Community (2.1) supports a 20 to 35 percent woody plant cover dominated by various bottomland hardwoods, although their numbers are often diminished. Mixed-brush areas form within the grassland particularly on recent sand deposits. Grassland vegetation still dominates herbage production. Midgrasses, shortgrasses and a variety of forbs dominate the herbaceous layer. All, but the more palatable woody species, have increased in size and density. The typical woody plant cover is dominated by mesquite, willow baccharis, salt cedar, ephedra and greenbriar. Pecan, cottonwood, western soapberry, hackberry and elm persist near the stream edge. Little bluestem often remains the dominant grass, but as regression progresses under heavy grazing pressure, it gives way to sand dropseed, silver bluestem, red lovegrass, and other less palatable shortgrasses and forbs. Alkali sacaton is abundant where saline soil conditions occur. Salt cedar may also invade these areas. Eastern redcedar is a common invader in the northern portion of this site. Annual herbage production ranges from 1,800 to 5,800 pounds per acre. The Mixed-brush/Mixed-grass/Annuals Community (2.2) is composed of brush species including cottonwood, pecan, hackberry and western soapberry. Mesquite, willow baccharis and salt cedar have increased tremendously in the past few decades. The shrubs often form dense thickets where grazing has been heavy and continuous and fires have been excluded. Salt cedar and baccharis are particularly problematic where salinity has increased. Common understory shrubs are elbowbush, bumelia, plum and pricklyash. Midgrasses, shortgrasses, cool-season grasses and low quality annual and perennial forbs occupy the

tree interspaces. Alkali sacaton, inland saltgrass and seep muhly become the primary grasses in deteriorated salty areas. The woody overstory can reach 75 percent ground cover with less than 25 percent of the herbage being produced by the grassland component.

Community 2.1
Mixed-grass/Mixed-brush Community

The Mixed-grass/Mixed-brush Community (2.1) supports a 20 to 35 percent woody plant cover dominated by various bottomland hardwoods, although their numbers are often diminished. Mixed-brush areas form within the grassland particularly on recent sand deposits. Grassland vegetation still dominates herbage production. Midgrasses, shortgrasses and a variety of forbs dominate the herbaceous layer. This community is the result of selective grazing by livestock, suppression of fire and the differential response of plants to defoliation. The diversity of the grassland component declines while unpalatable woody plants and forbs increase. All, but the more palatable woody species, have increased in size and density. The typical woody plant cover is dominated by mesquite, willow baccharis, salt cedar, ephedra and greenbriar. Pecan, cottonwood, western soapberry, hackberry and elm persist near the stream edge. Little bluestem often remains the dominant grass, but as regression progresses under heavy grazing pressure, it gives way to sand dropseed, silver bluestem, red lovegrass, and other less palatable shortgrasses and forbs. Gaura, western ragweed, verbena, thread leaf groundsel, heath aster, bush morning glory, Mexican sagewort, mentzelia and tickclover are commonly found in this community. Cool-season grasses, such as Texas wintergrass and Texas bluegrass are persistent under and around woody plants where shading occurs. Alkali sacaton is abundant where saline soil conditions occur. Salt cedar may also invade these areas. Eastern redcedar is a common invader in the northern portion of this site. Annual herbage production ranges from 1,800 to 5,800 pounds per acre, depending on precipitation events, flooding events and dry cycles. Annual herbage production is less than in the Mixed-grass/Mixed-brush Community (1.2) due to decline in soil structure and organic matter. Herbage production is balanced between the grassland component and woody species. As the grassland component declines, more soil is exposed to erosion. During the middle and end of this plant community phase, considerable soil becomes exposed. Water erosion is not a serious problem because of shallow slopes on the site. Higher interception loss of water by the increasing woody canopy combined with evaporation losses reduces the effectiveness of rainfall. Litter, soil organic matter and structure decline in the interspaces, but hydrologic conditions improve under the woody plant cover. When the woody plant cover reaches 35 to 40 percent and the herbaceous component contributes less than 50 percent of the herbage production, the Mixed-grass/Mixed-brush Community (2.1) transitions into a Mixed-brush/Mixed-grass/Annuals Community (2.2). Prior to reaching this threshold, the Mixed-brush/Mixed-grass Community can be converted to a grassland state with judicious use of broadcast or individual brush control, prescribed burning and prescribed grazing.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1311	2550	4226
Shrub/Vine	404	785	1300
Forb	202	392	650
Tree	101	196	325
Total	**2018**	**3923**	**6501**

Figure 15. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Community 2.2
Mixed-brush/Mixed-grass/Annuals Community

The Mixed-brush/Mixed-grass/Annuals Community (2.2) is the result of long-term continued overgrazing by livestock and no control of woody species. Several woody species may dominate the site. Cottonwood, pecan, hackberry and western soapberry were the early dominants. Mesquite, willow baccharis and salt cedar have increased tremendously in the past few decades. The shrubs often form dense thickets where grazing has been heavy and continuous and fires have been excluded. Salt cedar and baccharis are particularly problematic where salinity has increased. Common understory shrubs are elbowbush, bumelia, plum and pricklyash. Midgrasses, shortgrasses, cool-season grasses and low quality annual and perennial forbs occupy the tree interspaces. Characteristic grasses found in this plant community are Texas wintergrass, threeawns, sand dropseed, giant dropseed, big sandreed, annual panicum, silver bluestem and sedges. Representative forbs include heath aster, western ragweed, mentzelia, Mexican sagewort, annual broomweed and verbena. Texas wintergrass persists where mesquite is dominant and can become abundant following above normal rainfall. Alkali sacaton, inland saltgrass and seep muhly become the primary grasses in deteriorated salty areas. The woody species will continue to thicken until the community stabilizes with the climate and soil. The woody overstory can reach 75 percent ground cover with less than 25 percent of the herbage being produced by the grassland component. An understory of eastern redcedar can develop in the northern portion of this site, especially if fire is not used. The mature phase of the Mixed-brush/Mixed-grass/Annuals Community provides cover for wildlife, but only limited amounts of preferred forage or browse is available for livestock or wildlife. Returning the Mixed-brush/Mixed-grass/Annuals Community (2.2) back to a grassland state requires extensive and expensive reclamation practices. Range planting, prescribed grazing and prescribed burning, must follow intensive mechanical brush control. Land use other than livestock production might dictate alternative reclamation approaches to create the plant community that best fits the intended use.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	807	1569	2600
Grass/Grasslike	706	1373	2275
Tree	303	588	975
Forb	202	392	650
Total	**2018**	**3922**	**6500**

Figure 17. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Pathway 2.1A
Community 2.1 to 2.2

With heavy continuous grazing, no fires, and no brush management, the Mixed-grass/Mixed-brush Community will shift to the Mixed-brush/Mixed-grass/Annuals Community.

Pathway 2.2A
Community 2.2 to 2.1

With Brush Management and Prescribed Grazing conservation practices, the Mixed-brush/Mixed-grass/Annuals Community can be shifted to the Mixed-grass/Mixed-brush Community.

Conservation practices

Brush Management

Prescribed Grazing

State 3
Converted Land State

This site, due to flooding and sandy soil is not recommended for cultivation. However, some sites in the past were farmed and planted to crops or planted to permanent pasture. Some are maintained in orchards. The permanent pasture could include bermudagrass, old world bluestems or other perennial plants. Even though a Sandy Bottomland site may have been cultivated for a substantial period of time, the site can return to something resembling the reference state. The return of a cultivated field to the reference state depends on the soil integrity. Many things affect soil integrity, such as the amount of A horizon remaining, erosion, loss of organic matter, soil type, and others. There are many examples of idled cultivated fields that closely resemble the reference state. Remnant terraces usually reveal the fact that the fields were cultivated at some time in the past although terraces are not as common on bottomlands. It is sometimes difficult to determine if fields were cultivated others were not if successfully reseeded. The most obvious clue is the lack of native forb diversity. If the cultivated land is abandoned, woody plants and early successional herbaceous herbaceous plants will establish. Without brush management, prescribed grazing or prescribed fires, the plant community will revert back to the Mixed brush/Mixed grass/Annuals Community (2.2) Annual Production by Plant Type Table: The plant production in the Converted Land is highly variable. If planted to permanent pasture and not fertilized, production will resemble the reference state. If fertilized, the plant community will produce more than the reference state depending upon level of fertility and rainfall. Total production and composition of an abandon land is very difficult to predict and should be determined on-site.

Transition T1A
State 1 to 2

The Grassland State will transition into the Woodland State with the presence of heavy continuous grazing, no brush management, and no fires.

Transition T1B
State 1 to 3

The Grassland State will transition into the Converted Land State with the use of Crop Cultivation, Plowing, Range Planting, Pasture Planting, Pest Management, Nutrient Management, and Brush Management.

Transition T1B
State 1 to 3

The Grassland State will transition into the Converted Land State with the use of Crop Cultivation, Plowing, Range Planting, Pasture Planting, Pest Management, Nutrient Management, and Brush Management.

Restoration pathway R2A
State 2 to 1

Returning the Woodland State back to a Grassland State requires extensive and expensive reclamation practices. Range planting, prescribed grazing and prescribed burning, must follow intensive mechanical brush control.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Integrated Pest Management (IPM)
Prescribed Grazing

Transition T2A
State 2 to 3

The Shrubland State will transition into the Converted Land State with the use of Crop Cultivation, Plowing, Range Planting, Pasture Planting, Pest Management, Nutrient Management, and Brush Management.

Transition T3B
State 3 to 2

Without brush management, prescribed grazing or prescribed fires, along with the invasion of brush species and abandonment, the Converted Land State will revert back to the Woodland 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					
0	**Tallgrass**			280–729	
1	**Tallgrass**			1681–4371	
	switchgrass	PAVI2	*Panicum virgatum*	280–673	–
	Indiangrass	SONU2	*Sorghastrum nutans*	252–616	–
	giant dropseed	SPGI	*Sporobolus giganteus*	252–616	–
	big bluestem	ANGE	*Andropogon gerardii*	252–616	–
	giant sandreed	CAGI3	*Calamovilfa gigantea*	0–616	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	252–616	–
	purpletop tridens	TRFL2	*Tridens flavus*	196–616	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–112	–
2	**Midgrass**			280–729	
	sideoats grama	BOCU	*Bouteloua curtipendula*	50–123	–
	Arizona cottontop	DICA8	*Digitaria californica*	45–123	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	0–123	–
	vine mesquite	PAOB	*Panicum obtusum*	50–123	–
	alkali sacaton	SPAI	*Sporobolus airoides*	45–118	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	45–118	–
	Indian woodoats	CHLA5	*Chasmanthium latifolium*	56–112	–
	splitbeard bluestem	ANTE2	*Andropogon ternarius*	0–56	–
3	**Shortgrass**			0–11	
	blue grama	BOGR2	*Bouteloua gracilis*	0–11	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–11	–
	saltgrass	DISP	*Distichlis spicata*	0–11	–
4	**Cool Season**			280–729	
	Canada wildrye	ELCA4	*Elymus canadensis*	78–191	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	67–179	–
	western wheatgrass	PASM	*Pascopyrum smithii*	67–179	–
	Texas bluegrass	POAR	*Poa arachnifera*	67–179	–
	sedge	CAREX	*Carex*	22–112	–
	Scribner's rosette	DIOL5	*Dichanthelium oligosanthes var*	0–11	–

	Scribner's rosette grass	DICLE	*Dichanthelium oligosanthes var. scribnerianum*	0–11	
Forb					
5	**Forb**			140–364	
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	6–22	–
	partridge pea	CHFA2	*Chamaecrista fasciculata*	6–22	–
	whitemouth dayflower	COER	*Commelina erecta*	6–22	–
	bundleflower	DESMA	*Desmanthus*	6–22	–
	ticktrefoil	DESMO	*Desmodium*	6–22	–
	beeblossom	GAURA	*Gaura*	6–22	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	6–22	–
	coastal indigo	INMI	*Indigofera miniata*	6–22	–
	dotted blazing star	LIPU	*Liatris punctata*	6–22	–
	blazingstar	MENTZ	*Mentzelia*	6–22	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	6–22	–
	fogfruit	PHYLA	*Phyla*	6–22	–
	senna	SENNA	*Senna*	6–22	–
	awnless bushsunflower	SICA7	*Simsia calva*	6–22	–
	Canada goldenrod	SOAL6	*Solidago altissima*	6–22	–
	false gaura	STLI2	*Stenosiphon linifolius*	6–22	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	6–22	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	6–22	–
	vervain	VERBE	*Verbena*	6–22	–
Shrub/Vine					
6	**Shrub/Vine**			84–219	
	sand sagebrush	ARFI2	*Artemisia filifolia*	0–28	–
	grape	VITIS	*Vitis*	6–28	–
	Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	6–22	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	6–22	–
	bundleflower	DESMA	*Desmanthus*	6–22	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	6–22	–
	awnless bushsunflower	SICA7	*Simsia calva*	6–22	–
	jointfir	EPHED	*Ephedra*	0–20	–
	stretchberry	FOPU2	*Forestiera pubescens*	8–20	–
	pricklypear	OPUNT	*Opuntia*	8–20	–
	plum	PRUNU	*Prunus*	8–20	–
	sumac	RHUS	*Rhus*	8–20	–
	bully	SIDER2	*Sideroxylon*	8–20	–
	greenbrier	SMILA2	*Smilax*	8–20	–
	yucca	YUCCA	*Yucca*	8–20	–
	Texas Hercules' club	ZAHI2	*Zanthoxylum hirsutum*	0–20	–
	willow baccharis	BASA	*Baccharis salicina*	8–20	–

	Carolina coralbead	COCA	*Cocculus carolinus*	6–17	–
Tree					
7	**Tree**			56–146	
	cottonwood	POPUL	*Populus*	11–34	–
	black willow	SANI	*Salix nigra*	11–28	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	11–28	–
	elm	ULMUS	*Ulmus*	11–28	–
	pecan	CAIL2	*Carya illinoinensis*	11–28	–
	hackberry	CELTI	*Celtis*	11–28	–

Animal community

Many types of wildlife used the Sandy Bottomland Ecological Site. Being associated with flood plains and water courses, it probably received concentrated animal use at times. Bison probably utilized the site heavily during migrations prior to European settlement. Grassland insects, reptiles, birds and mammals frequent the site, either as their base habitat or from the adjacent sites. Small mammals include many kinds of rodents, jackrabbit, cottontail rabbit, raccoon, skunk, opossum and armadillo. Predators include coyote, fox and bobcat. Game birds, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison and pronghorn antelope, however, are no longer present. White-tailed deer utilize the Sandy Bottomland site in its various states. Deer, turkey and quail particularly favor the habitat provided by the Mixed-grass/Mixed-brush (2.1) plant community. In addition of food, cover and water, the trees along the stream provide important roost sites for turkey. The site is very suited to primary grass eaters such as cattle. As retrogression occurs and woody plants invade it becomes better habitat for a mixture of cattle, sheep, goats, deer and other wildlife because of the browse and cool season grasses. Sheep and goats are seldom pastured in the MLRA, however. Any livestock should be stocked in proportion to the available grass, forb and browse forage, keeping deer competition for forbs and browse in mind. If the animal numbers are not kept in balance with herbage and browse production through grazing management and good wildlife population management, the late Mixed-brush/Mixed-grass/Annuals phase will have little to offer as wildlife habitat except cover.

Hydrological functions

The Sandy Bottomland Ecological Site is found on nearly level flood plains. It may receive water from surrounding soils and the site may be briefly covered by water during flooding events. Soil moisture holding capacity is low and percolation is generally rapid contributing to downstream flow. The deep sandy soils are not highly fertile, but because the water table is close to the surface, they are conducive to tall grass vegetation, and high herbage production during above average moisture years.

Under reference condition, the grassland vegetation probably intercepted and utilized much of the incoming rainfall in the soil profile. Litter and soil movement was slight. Standing plant cover, duff and organic matter decrease as the Tallgrass Community (1.1) transitions to the Tallgrass/Midgrass Community (1.2). These processes continue in the spaces between woody plants in the Mixed-grass/Mixed-brush Community (2.1) and the Mixed-brush/Mixed-grass/Annuals Community (2.2). Once the woodland matures, the hydrologic and ecological processes, nutrient cycling and energy flow stabilize within the woody plant canopy.

Recreational uses

The Sandy Bottomland site, in conjunction with surrounding sites, is well suited for many outdoor recreational uses including recreational hunting, hiking, camping, equestrian and bird watching. This site along with adjacent upland sites provides diverse scenic beauty and many opportunities for recreation and hunting. Fall colors are especially noteworthy on this site.

Wood products

Mesquite is sometimes used for posts and charcoal. Wood from all the trees can be used for firewood or specialty products.

Other products

Jams and jellies are made from fruit bearing species, such as plum. Seeds are harvested from many HCPC plants for commercial sale. Grasses and forbs may be harvested by the dried-plant industry for sale in dried flower arrangements. Honeybees are utilized to harvest honey from the many flowering plants, such as mesquite.

Inventory data references

Information presented has been derived from RSD's for Sandy Bottomland PE 26-46 (3-1-74) and PE 26-44 (11-2-71) , an undated NRCS draft Ecological Site Description for Sandy Bottomland PE 31-44, 78C, literature, personal experience, field observations and personal contacts with range-trained personnel. Photos by: J.L. Schuster. Photo taken 8-20-07 Wilbarger County, TX

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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)	Lem Creswell, RMS, NRCS, Weatherford, Texas Steve Glasgow, GLS, NRCS, Stillwater, OK
Contact for lead author	100 USDA Suite 206 Stillwater, Ok 74074 405.742.1235
Date	07/09/2004
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

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2. **Presence of water flow patterns:** Water flow patterns are common and follow old stream meanders. Deposition or erosion is uncommon for normal rainfall but may occur during intense rainfall events

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3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would have been uncommon for 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):** Expect no more than 10% bare ground randomly distributed throughout.

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5. **Number of gullies and erosion associated with gullies:** Some gullies may be present on side drains into perennial and intermitttent streams. Gullies should be vegetated and stable.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Little or no litter movement or deposition during normal rainfall events; however, litter of all sizes may move long distances depending on obstructions under intense storm events.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Ap: 0 to 9 inches; brown silt loam, weak fine and medium granular structure. A1: 9 to 14 inches; reddish brown silt loam, weak fine and medium granular structure. A2: 14 to 30 inches; reddish brown silt loam, weak fine and medium granular structure.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Under HCPC, the bottomland of warm season tall and midgrasses with trees and forbs with adequate litter and little bare ground provides for maximum infiltration and little runoff under normal rainfall events.

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

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

    Dominant: Warm-season tallgrasses

    Sub-dominant: Warm-season midgrasses

    Other: Cool-season grasses > Forbs > Trees

    Additional:

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

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2500 to 6500 pounds per acre.

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Honey mesquite, eastern redcedar, Prickly pear, Bermudagrass, Johnsongrass and King Ranch

bluestem.

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