USDA Natural Resources Conservation Service

Ecological site R079XY113KS
Loamy Floodplain

Last updated: 9/21/2018
Accessed: 05/13/2025

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

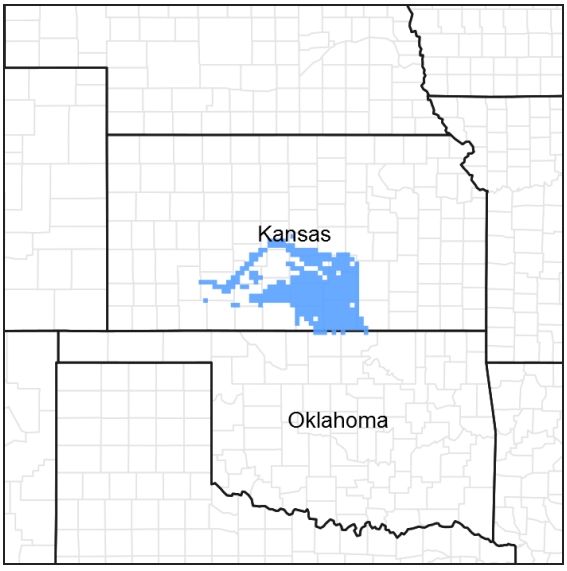


Figure 1. Mapped extent

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): 079X–Great Bend Sand Plains

MLRA 79 is located entirely in Kansas. It makes up about 7,405 square miles (19,185 square kilometers). Great Bend, Hutchinson, and Wichita are in this MLRA. U.S. Highways 50, 54, and 56 cross the area. The western part of McConnell Air Force Base and the Quivira National Wildlife Refuge are in this area.

Following are the various kinds of land use in this MLRA: Cropland-private, 67%; Grassland-private, 23%; Federal, 1%; Forest-private, 1%; Urban development-private, 5%; Water-private, 1%; Other-private, 2%.

Nearly all of this area is in farms or ranches. Most of the area is cropland. Cash-grain farming is the principal enterprise. Hard winter wheat is the major crop, but grain sorghum and alfalfa also are grown. The grassland in the area consists of sandy soils and steeply sloping areas. It supports native grasses grazed by beef cattle.

The major soil resource concerns are the hazards of wind and water erosion, maintenance of the content of organic matter in the soils, and soil moisture management. The major management concerns on grassland are plant health and vigor, and control of noxious and invasive weeds.

Conservation practices on cropland generally include high residue crops in the cropping system; systems of crop

residue management, such as no-till and strip-till systems; conservation crop rotations; wind stripcropping; and nutrient and pest management. Conservation practices on rangeland generally include brush management, prescribed burning, control of noxious weeds, pest management, watering facilities, and proper grazing use.

Classification relationships

Major land resource area (MLRA): 079-Great Bend Sand Plains

Ecological site concept

The Loamy Floodplain (R079XY113KS) ecological site was formerly named Loamy Lowland (R079XY013KS). This site is formed from loamy alluvium and located on floodplains. Soils representing this site do not have a seasonal or perennial high water table (less than five feet from the soil surface). The Loamy Floodplain ecological site is well drained with slopes ranging from 0 to 3 percent.

Associated sites

R079XY115KS	**Loamy Plains** The Loamy Plains ecological site sits adjacent to and in conjunction with the Loamy Floodplain site. This ecological site was formerly known as Loamy Upland R079XY015KS. The Loamy Plains ecological site is made up of moderately deep to deep, moderately well to well drained upland soils. This site has a silty or loamy surface texture and is non-calcareous to the surface. Generally, the Loamy Plains ecological site is located on paleoterraces and/or uplands with a slope range of 0 to 12 percent.
R079XY132KS	**Subirrigated** This site sits adjacent to and in conjunction with the Loamy Floodplain ecological site. The Subirrigated ecological site is characterized by somewhat poorly drained soils that have a seasonal or perennial high water table greater than 2 feet and less than 6 feet from the surface. This site is located on floodplains and interdunes. The Subirrigated site occurs on level to nearly level eolian and alluvial lands usually adjacent to major streams.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Sorghastrum nutans*

Physiographic features

Most of MLRA 79 is located in the Plains Border Section of the Great Plains Province of the Interior Plains. The eastern third is in the Osage Plains Section of the Central Lowland Province of the Interior Plains. The undulating to rolling plains in this area generally have narrow valleys, but broad flood plains and terraces are along the Arkansas River and its larger tributaries. Elevation ranges from 1,650 to 2,600 feet (505 to 795 meters), increasing from east to west.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Middle Arkansas (1103), 82 percent, and Arkansas-Keystone
(1106), 18 percent. The Arkansas River bisects the northern part of this MLRA, and the Ninnescah River crosses the southern part. In this MLRA, Rattlesnake Creek flows north and the Little Arkansas River flows south into the Arkansas River.

This site occurs in floodplains on nearly level lands that are subject to rare to frequent flooding. The deep alluvial soils have loamy to silty surface layers and subsoils.

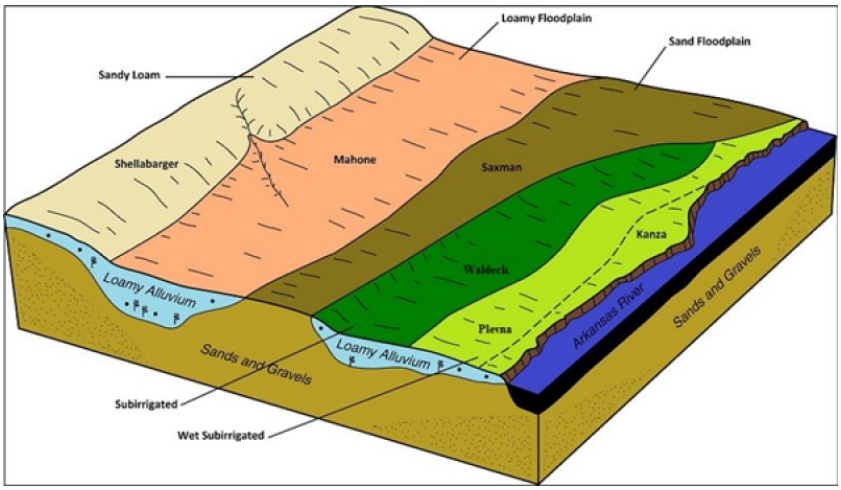


Figure 2.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain
Runoff class	Negligible to low
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	503–792 m
Slope	0–3%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in MLRA 79 is 25 to 33 inches (635 to 840 millimeters). Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from the middle of spring to early in autumn. The annual snowfall ranges from about 14 inches (35 centimeters) in the southern part of the area to 20 inches (50 centimeters) in the northern part. The average annual temperature is 55 to 57 degrees F (13 to 14 degrees C). The freeze-free period averages 197 days, increasing in length from northwest to southeast. Precipitation is usually evenly distributed throughout the year, with the exception of November through February as the driest months and May and June as the wettest months. Summer precipitation occurs during intense summer thunderstorms. The following weather data originated from weather stations chosen across the geographical extent of the ecological site, and will likely vary from the data for the entire MLRA. The climate data derives from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The dataset is from 1981-2010.

Table 3. Representative climatic features

Frost-free period (characteristic range)	147-163 days
Freeze-free period (characteristic range)	186-198 days
Precipitation total (characteristic range)	711-813 mm
Frost-free period (actual range)	146-179 days
Freeze-free period (actual range)	184-204 days
Precipitation total (actual range)	686-864 mm
Frost-free period (average)	159 days
Freeze-free period (average)	193 days

Precipitation total (average)	787 mm

Climate stations used

- (1) WELLINGTON [USC00148670], Wellington, KS
- (2) KINGMAN [USC00144313], Kingman, KS
- (3) PRATT [USC00146549], Pratt, KS
- (4) STERLING [USC00147796], Sterling, KS
- (5) HUTCHINSON 10 SW [USC00143930], Hutchinson, KS
- (6) KINSLEY 2E [USC00144333], Kinsley, KS
- (7) WICHITA [USW00003928], Wichita, KS
- (8) NORWICH [USC00145870], Norwich, KS

Influencing water features

A distinguishing feature of the Loamy Floodplain ecological site is that all soils on this site are occasionally or frequently flooded. Plant growth is enhanced when water tables occasionally reach into the root zone during wetter periods. Soils are well drained and with moderately to moderately rapid permeability. Available water capacity is high.

Stream Types:
(Rosgen System) C6, F6, and E6 are potential stream types found on this site. The C6 stream type is slightly entrenched, meandering, silt-clay dominated, riffle-pool channel with a well developed floodplain. The C6 stream type can be found in low relief basins typical of interior lowlands such as the Great Plains area. F6 stream types are entrenched, meandering, gentle gradient streams deeply incised in cohesive sediments of silt and clay. Characteristics of F6 streams include very high width/depth ratios, moderate sinuosity, and low to moderate meander width ratios. E6 stream types have channels with low to moderate sinuosity, gentle to moderately steep gradients, and very low width/depth ratios. E6 stream systems are very stable. Streambank disturbance through abuse or other disturbances within the watershed can lead to stream degradation, and eventually to a change in the stream type to a less stable system.

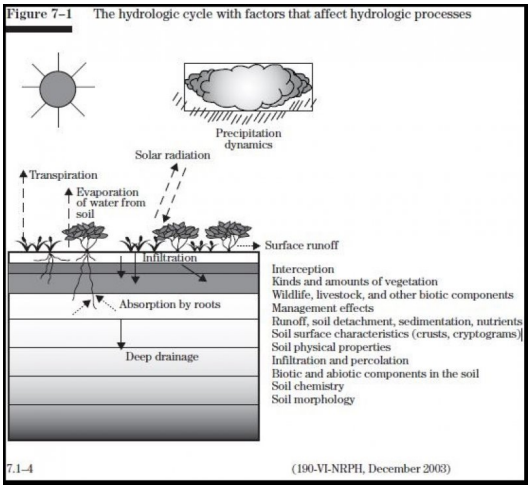


Figure 9.

Soil features

The soils on this site are alluvial soils occurring in the floodplain. They are deep with loamy to silty surface layers and subsoils. The soils are subject to recurrent flooding, channeling, and deposition as site considerations.

Major soils associated with this site are Elandco, Canadian, Kaskan, Kaski, and Mahone.

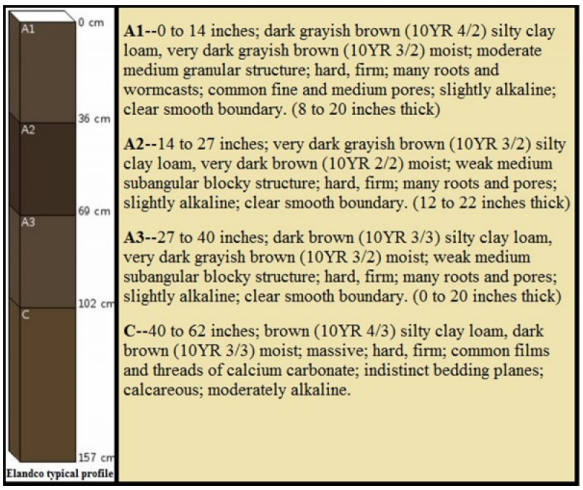


Figure 10.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Soil depth	203 cm
Available water capacity (0-101.6cm)	20.83–28.96 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–20%

Ecological dynamics

The Loamy Floodplain ecological site is a dynamic plant community due to the complex interaction of many ecological processes. The vegetation evolved on deep, fertile soils on lowlands that were occasionally flooded, exposed to a diverse and fluctuating climate, grazed by herds of large herbivores, and periodically subjected to intense wildfires. The plants that evolved were dominant on the original plant community and well adapted to the floodplain soils, climatic, and biological conditions.

The deep, fertile soils representative of this site have loamy surfaces and often receive extra moisture from overflow or from run-in sites located on adjacent slopes. Some locations have water tables that are within reach of the deep-rooted tallgrasses, while other areas have seasonal water tables that only benefit plant growth during portions of the year. These soils generally occur on broad, nearly level bottomlands that are usually adjacent to rivers or streams. A large portion of the Loamy Floodplain site is located along the major rivers, including the Arkansas, Little Arkansas, Rattlesnake, Chikaskia, and the North and South Forks of the Ninnescah. This site may also occur along narrow upland drainageways. Occasional flooding and siltation may occur in some locations from

stream overflow. Due to landscape position and the availability of water, the Loamy Floodplain ecological site is productive.

The plant community developed with occasional fires as an important part of the site's ecological processes. Historically, fires were infrequent and were usually started by lightning during spring and early summer thunderstorms. It is also recognized that early Native Americans often used fire to attract herds of migratory herbivores, especially bison. These intentional fires probably occurred more frequently, even annually in some locations. Because all of the dominant tallgrasses were rhizomatous, they were able to survive the ravages of even intense wildfires and gain a competitive advantage in the plant community. Trees and shrubs were suppressed by fire over most of the site. However, trees historically occurred in varying amounts on protected areas, generally along stream- and riverbanks and in oxbows.

Grazing history had a major impact on the dynamics of the site. The vegetative community developed under a grazing regime that consisted primarily of periodic grazing by large herds of bison. As the herds moved through an area, grazing could be intense but was usually of short duration. As herds moved to adjacent areas, vegetation was typically given time for recovery. This grazing regime was altered during extended periods of drought. Because of its proximity to streams, grazing animals were attracted to the site and utilization was much more concentrated than during normal periods. Other grazing and feeding animals such as elk, deer, rabbits, rodents, and insects had secondary influences on the development of the plant community.

Variations in climate alone had only minor impacts on the plant community. Even though fluctuations in precipitation directly influenced site productivity from year to year, plant community composition usually remained stable. Available water capacity was high and the deep-rooted tallgrasses benefited from moisture stored throughout the soil profile and, in some cases, from seasonal water tables.

Occasional flooding resulting from intense thunderstorms was usually of brief duration, and the periods of inundation only temporarily affected the major plants. All of the major plants had rhizomes, which facilitated in their recovery from occasional siltation deposited during flood events.

State and Transition Diagram

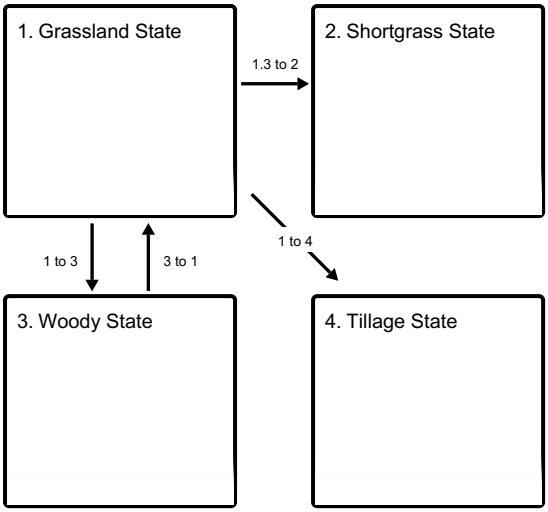
As utilization of the area for production of domestic livestock replaced roaming bison herds, the ecological dynamics of the site were altered and the plant community often changed from its original composition. Fencing enabled continuous grazing and, in many areas, this led to overgrazing and substantial changes in the vegetation. Alterations in the plant community were usually in proportion to the season and intensity of grazing. With few exceptions, taller grasses and forbs palatable to bison were equally relished and selected by cattle and other domestic livestock. When repeatedly overgrazed, these grasses were weakened and gradually reduced in size and numbers. They were replaced in the plant community by the increase and spread of less palatable midgrasses and forbs. Where the history of overgrazing by domestic livestock was more intense, even the plants that initially increased were often replaced by even less desirable and usually lower-producing plants.

The occurrences of wildfire and the impact that fire played in maintaining the plant community were diminished with the advent of roads and cultivated fields. Use of prescribed fire as a management tool, often not an option in modern communities, also decreased. In the absence of fire, a rapid increase of shrub and tree species often occurs. In some locations they have spread to the point where they have become a major influence in the plant community.

Some areas of the site that were formerly "broken out" and farmed for many years have since been returned to the production of native plant communities. Portions of these areas were reseeded and established to a prescribed mixture of plants. Other areas were allowed to reestablish naturally without the benefit of seeding, and are in various stages of plant succession.

State and transition model

Ecosystem states



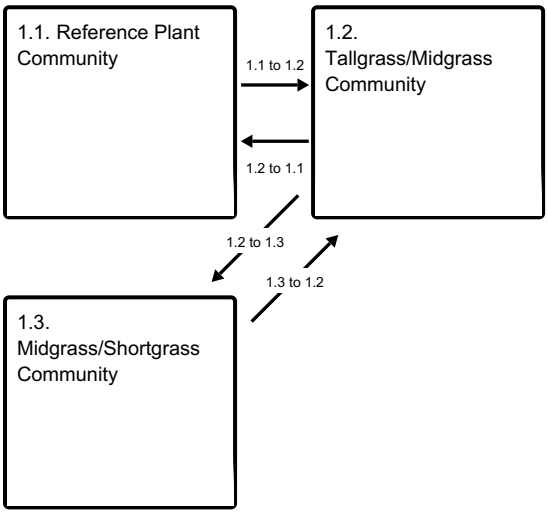
1.3 to 2 - Long-term, heavy, continuous grazing, no forage and animal balance.

1 to 3 - No prescribed fires or brush management.

1 to 4 - Mechanical tillage

3 to 1 - Brush management, prescribed burning, and prescribed grazing.

State 1 submodel, plant communities



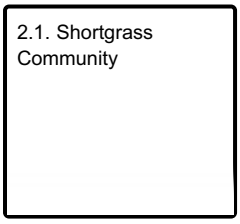
1.1 to 1.2 - repetitive heavy use and no rest of the key forage species.

1.2 to 1.1 - Prescribed grazing and burning.

1.2 to 1.3 - Continuous, heavy use, no forage and animal balance, and inadequate rest and recovery.

1.3 to 1.2 - Prescribed grazing and burning.

State 2 submodel, plant communities



State 3 submodel, plant communities

3.1. Shrub/Tree Community

State 4 submodel, plant communities

4.1. Reseed Community

4.2. Go-back Community

State 1
Grassland State

The Grassland State defines the ecological potential and natural range of variability resulting from the natural disturbance regime of the Loamy Floodplain ecological site. This state is supported by empirical data, historical data, local expertise, and photographs. It is defined by a suite of native plant communities that are the result of periodic fire, drought, and grazing. These events are part of the natural disturbance regime and climatic process.

Characteristics and indicators. The Grassland State is defined by 3 plant communities. The Reference Plant Community consists of warm-season tall- and midgrasses, cool-season and sod-forming grasses, forbs, and shrubs. The Tallgrass/Midgrass Community is made up primarily of warm-season midgrasses, with an interspersed cool-season component and decreasing amounts of forbs and tallgrasses. The Midgrass-Shortgrass Plant Community is dominated by midgrasses, shortgrasses, and cool-season midgrasses.

Resilience management. Management strategies that will maintain this state include prescribed grazing and prescribed burning.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass

Community 1.1
Reference Plant Community

Figure 11. Reference Plant Community

The interpretive plant community for this site is the Reference Plant Community. This represents the original plant

community that existed prior to European settlement. The Loamy Floodplain site is characterized as a grassland, essentially free of trees and large shrubs. It is dominated by tall, warm-season grasses including big bluestem, Indiangrass, switchgrass, eastern gamagrass, and prairie cordgrass. All of these grasses, and most of the dominant forbs, have extensive rhizomes. These underground stems often form a dense, intertwined mass throughout the upper four or five inches of the soil surface. Combined these tallgrasses will account for 75 to 85 percent of the total vegetation produced annually. Other prevalent grasses and grasslike plants are Canada wildrye, Virginia wildrye, western wheatgrass, little bluestem, marsh bristlegrass, composite dropseed, and several species of sedges and rushes. A number of forbs are found interspersed throughout the grass sward and include Maximilian sunflower, pitcher sage, blacksamson echinacea, wholeleaf rosinweed, and prairie bundleflower. Other important forbs are Canada goldenrod, white heath aster, tall blazingstar, white sagebrush, American licorice, roundhead lespedeza, and white prairie clover. Desert false indigo and common buttonbush are shrubs that commonly occur on this site, especially along upland drainageways. Eastern cottonwood and black willow are the major trees in the broad bottomlands and are generally located along streambanks. Although the major portion of the site is dominated by herbaceous plants, isolated areas support groves of trees. Protected by streams and rivers, some areas historically escaped the intensity of wildfires. These areas often developed a savannah plant community with an overstory of hardwood trees that may have included eastern cottonwood, black willow, American elm, green ash, bur oak, and black walnut. Eastern cottonwood was usually the dominant tree and often formed large, single-species groves. The understory in these situations usually supported shade-tolerant cool-season plants such as Canada wildrye, Virginia wildrye, Texas bluegrass, and sedges.

Resilience management. This is a stable, resilient, and very productive plant community when adequately managed. A prescribed grazing program that incorporates periods of deferment during the growing season perpetuates the more palatable tallgrasses and forb species. In a number of locations this plant community is managed exclusively for hay production. Mowing tends to reduce the amount of switchgrass and prairie cordgrass plants and favor big bluestem, Indiangrass, and eastern gamagrass. Growth of warm-season grasses on this site typically begins during the period of April 25 to May 10 and continues until late September. As a general rule, 75 percent of total production is completed by mid-July. This varies only slightly from year to year depending upon temperature and precipitation patterns. There are exceptions as big bluestem, eastern gamagrass, and prairie cordgrass will occasionally initiate spring growth as early as April 1 following mild winter temperatures. Also, it is not unusual for other warm-season grasses such as Indiangrass and little bluestem to have some new leaf growth arising from basal buds in late October following moderate fall temperatures. Cool-season grasses, sedges, and rushes generally have two primary growth periods, one in the fall (September and October) and again in the spring (April, May, and June). Some growth may occur in winter months during periods of unseasonably warm temperatures (Indian summers).

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass
- eastern gamagrass (*Tripsacum dactyloides*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3805	4562	5851
Forb	303	460	639
Shrub/Vine	230	303	325
Total	**4338**	**5325**	**6815**

Community 1.2
Tallgrass/Midgrass Community

The composition of this plant community is dominated by a mixture of tall- and midgrasses. Compared with the Reference Plant Community, the more palatable tallgrasses and forbs have decreased and the midgrasses subsequently increased. Although reduced by overgrazing, tallgrasses such as big bluestem, Indiangrass, and

switchgrass remain dominant. The proportion of midgrasses, sedges, and rushes in the overall production of the site has increased. These include composite dropseed, little bluestem, western wheatgrass, marsh bristlegrass, and sideoats grama. Other secondary grasses that have increased are Texas bluegrass, Kentucky bluegrass, vine mesquite, and sedges. Combined these secondary plants now comprise 30 to 40 percent of the total herbage produced annually. Forbs such as Maximilian sunflower, wholeleaf rosinweed, and prairie bundleflower have decreased and largely been replaced by white heath aster, white sagebrush, Cuman ragweed, interior ironweed, and Canada goldenrod. Forbs produce 8 to 10 percent of the total herbage. In some locations the site supports an increasing amount of shrubs and trees. The most abundant shrubs are desert false indigo, common buttonbush, roughleaf dogwood, Great Plains false willow, and coralberry. Eastern cottonwood, black willow, and American elm are the major trees found on the site. Shrubs and trees usually may comprise 5 to 10 percent of the total production.

Resilience management. Periods of deferment from grazing are essential to maintaining the production of some of the major grasses found in this plant community. Eastern gamagrass and big bluestem are especially preferred and selectively grazed by cattle. When the site is grazed continuously throughout the growing season, these grasses are usually overgrazed and thus maintained in a lower state of plant vigor. When continued for many years, overgrazing results in a gradual reduction in the abundance of these grasses. However, prescribed grazing that incorporates periods of deferment during the growing season will improve the vigor and gradual recovery of the more palatable tallgrasses and forbs.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- sedge (*Carex*), grass

Community 1.3
Midgrass/Shortgrass Community

Figure 13. Midgrass/Shortgrass Plant Community

This plant community results from many years of overgrazing. The amount of tallgrasses has decreased significantly and the site is dominated by mid- and shortgrasses. Major midgrasses are composite dropseed, sand dropseed, silver beardgrass, purpletop tridens, sideoats grama, western wheatgrass, and marsh bristlegrass. Shortgrasses include Kentucky bluegrass, Texas bluegrass, Texas dropseed, buffalograss, and blue grama. Major forbs on the site are Cuman ragweed, Canada goldenrod, Missouri goldenrod, white sagebrush, Carruth’s sagewort, white heath aster, annual marshelder, and annual ragweed. In some locations the site supports an increasing amount of shrubs and trees. The most common shrubs along upland drainways are desert false indigo, common buttonbush, roughleaf dogwood, and coralberry. Eastern cottonwood, black willow, peachleaf willow, American elm, eastern redcedar, (*Juniperus virginiana*) and osage orange (*Maclura pomifera*) are the major trees found on the site. Shrubs and trees usually will not comprise over ten percent of the total production.

Resilience management. Remnant plants of big bluestem, Indiangrass, switchgrass, prairie cordgrass, eastern gamagrass, and Maximilian sunflower are often found scattered throughout the site. These plants are usually grazed repeatedly and maintained in a low state of vigor. These remnants respond favorably to periods of rest from grazing during the growing season and often regain vigor in a few years.

Dominant plant species

- composite dropseed (*Sporobolus compositus var. compositus*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- silver beardgrass (*Bothriochloa laguroides*), grass
- purpletop tridens (*Tridens flavus var. flavus*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- blue grama (*Bouteloua gracilis*), grass

Pathway 1.1 to 1.2
Community 1.1 to 1.2

The following describes the mechanisms of change from Plant Community 1.1 to Plant Community 1.2. These mechanisms include management controlled by repetitive heavy use, no rest or recovery of the key forage species, and no forage and animal balance for many extended grazing seasons. This type of management lasting for periods greater than ten years will shift functional and structural plant group dominance towards Plant Community 1.2.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

The following describes the mechanisms of change from Plant Community 1.2 to Plant Community 1.1: management (10-15 years) that includes adequate rest and recovery of the key forage species (sand bluestem, switchgrass, and Indiangrass) within the Reference Plant Community. If woody species are present, prescription fires every 6-8 years will be necessary for their removal and/or maintenance.

Context dependence. The time that is takes for a community shift is estimated to take 10-15 years. This will vary depending upon many variables.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.2 to 1.3
Community 1.2 to 1.3

The following describes the mechanisms of change from Plant Community 1.2 to Plant Community 1.3: long-term (>10 years) management that includes continuous, heavy use of the native vegetation; management that is void of a forage and animal balance; and inadequate rest and recovery of native grasses during the growing season.

Pathway 1.3 to 1.2
Community 1.3 to 1.2

The following describes the mechanisms of change from Plant Community 1.3 to Plant Community 1.2. Management (approximately 10 years) that includes adequate rest and recovery of the key forage species in the Midgrass Community 1.2 (big bluestem, Indiangrass, switchgrass, little bluestem, composite dropseed, western wheatgrass, and sedges). Implement prescription fires at a frequency of 6-8 years. Depending upon the level of woody vegetation encroachment, the fire return interval might require an adjustment to two consecutive years of prescribed fires.

Context dependence. Timing of this pathway is estimated to take 10 years. This temporal scale is an approximate due to many variables.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shortgrass State

With heavy, continuous grazing, blue grama and buffalograss will become the dominant species and have a sod-bound appearance. Unable to withstand the grazing pressure, only a remnant population of western wheatgrass remains.

Characteristics and indicators. Species diversity has been reduced further. Water infiltration is reduced and runoff is increased due to the sod nature of the blue grama and buffalograss. Specific dynamic soil property changes between the Grassland State and the Sod-bound State have been documented. As plant community cover decreases from bunchgrasses to more of the sodgrasses, infiltration and interception decrease and surface runoff increases (Thurow T., 2003).

Resilience management. This is a stable state and recovery to the Grassland State has not been recorded.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass

Community 2.1
Shortgrass Community

This plant community is dominated by a mixture of shortgrasses and midgrasses. It occurs following many years of continuous overgrazing. Usually pastures are small and associated with farming enterprises. In the past they were often used as holding areas in anticipation of seasonal wheat pasture or other cropland forages. Dominant grasses are blue grama, buffalograss, Carolina crabgrass, thin paspalum, sideoats grama, composite dropseed, silver beardgrass, western wheatgrass, and vine mesquite. Annual grasses including sixweeks fescue, Japanese brome (Bromus japonicus), cheatgrass (*Bromus tectorum*), little barley (*Hordeum pusillum*), tumblegrass, prairie threeawn, purple threeawn, and fall panicgrass are common during seasons of normal or above-normal precipitation. Major forbs are Cuman ragweed, Missouri goldenrod, crested prickly poppy, hoary verbena, annual marshelder, prairie broomweed, interior ironweed, white sagebrush, and wavyleaf thistle. The most common shrub in the Shortgrass Community is coralberry. Areas where sediment has been deposited during recent flood events will generally support a large number of annual forbs. These may include snow on the mountain (*Euphorbia marginata*), cocklebur (*Xanthium strumarium*), annual ragweed, giant ragweed, common sunflower (*Helianthus annuus*), marijuana (*Cannabis sativa*), and poison hemlock (*Conium maculatum*).

Resilience management. Although productivity is significantly reduced when compared to the Reference Plant Community, this plant community can be managed as a stable community. Restoration to a Midgrass/Shortgrass Plant Community within the Grassland State is not documented nor typical and known to occur in Major Land Resource Area (MLRA) 79.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass

State 3
Woody State

This state is dominated by a shrub and/or tree plant community. The increase and spread of shrubs and trees results from an absence of fire. Woody plants can increase up to 34 percent from a lack of fire according to a study in 1937 to 1969, in contrast to a 1 percent increase on burned areas (Bragg and Hulbert, 1976). Periodic burning tends to hinder the establishment of most woody species and favors forbs and grasses. However, it should be pointed out that not all unburned areas have a woody plant invasion.

Characteristics and indicators. Hydrologic function is affected by the amount of vegetative cover. Canopy interception loss can vary from 25.4 percent to 36.7 percent (Thurow and Hester, 1997). A small rainfall event is usually retained in the foliage and does not reach the litter layer at the base of the tree. Only when canopy storage is reached and exceeded does precipitation fall to the soil surface. Interception losses associated with the accumulation of leaves, twigs, and branches at the bases of trees are considerably higher than losses associated with the canopy. The decomposed material retains approximately 40 percent of the water that is not retained in the canopy (Thurow and Hester, 1997). Soil properties affected include biological activity, infiltration rates, and soil fertility. Special planning will be necessary to assure that sufficient amounts of fine fuel are available to carry fires with enough intensity to control woody species. In some locations the use of chemicals as a brush management tool may be desirable to initiate and accelerate this transition. Birds, small mammals, and livestock are instrumental in the distribution of seed and accelerating the spread of most trees and shrubs common to this site. The speed of encroachment varies considerably and can occur on both grazed and non-grazed pastures. Many species of wildlife, especially bobwhite quail, turkey, and white-tailed deer, benefit from the growth of trees and shrubs for both food and cover. When management for specific wildlife populations is desirable, these options should be considered in any brush management plan.

Resilience management. Without fire, or some other means of woody removal, this state will remain very stable.

Dominant plant species

- eastern cottonwood (*Populus deltoides*), tree
- black willow (*Salix nigra*), tree
- peachleaf willow (*Salix amygdaloides*), tree
- American elm (*Ulmus americana*), tree
- eastern redcedar (*Juniperus virginiana*), tree

Community 3.1
Shrub/Tree Community

Trees and shrubs dominate this plant community and may produce 40 to 50 percent of the total vegetation. Major trees include eastern cottonwood, black willow, peachleaf willow, American elm, Siberian elm (*Ulmus pumila*), common hackberry, osage orange, eastern redcedar, and Russian olive (*Elaeagnus angustifolia*). More abundant shrubs are roughleaf dogwood, coralberry, smooth sumac, desert false indigo, and common buttonbush. The spread of these woody plants results in the absence of fire and may occur on the site regardless of grazing management. However, not all unburned areas have a woody plant problem. Encroachment may occur on areas that have been overgrazed for years as well as on areas where both grazing and fire have been excluded. The speed and method of encroachment varies considerably but, under favorable conditions, can happen within a 20 to 30 year period. Cottonwood and willow produce an abundance of seed that is distributed by wind over long distances. Russian olive, common hackberry, and eastern redcedar are generally spread by birds. Periodic burning tends to hinder the establishment of most of these woody species and favor forbs and grasses. Where woody plants have invaded overgrazed areas, understory vegetation is generally dominated by plants such as Texas bluegrass, Kentucky bluegrass, composite dropseed, purpletop tridens, marsh bristlegrass, sedges, white sagebrush, interior ironweed, and white heath aster. Where woody plants have encroached onto areas essentially ungrazed for many years, the understory consists largely of big bluestem, Indiangrass, little bluestem, Virginia wildrye, Canada wildrye, sedges, prairie bundleflower, Canada goldenrod, and Maximilian sunflower.

Resilience management. Because of tree and shrub competition for light and moisture, herbage production is significantly reduced. Grass yields vary from 30 to 40 percent of the total vegetative production, and forbs generally produce only 5 to 10 percent of the total. Usually a prescribed burning program, accompanied by a prescribed grazing plan, will return the plant community to one dominated by grasses and forbs. Special planning will be necessary to assure that sufficient amounts of fine fuel are available to carry fires with enough intensity to control woody species. Use of additional brush management tools such as chemicals or mechanical methods may be

necessary to initiate and accelerate this transition in some locations.

Dominant plant species

- eastern cottonwood (*Populus deltoides*), tree
- black willow (*Salix nigra*), tree
- peachleaf willow (*Salix amygdaloides*), tree
- American elm (*Ulmus americana*), tree
- eastern redcedar (*Juniperus virginiana*), tree

State 4
Tillage State

The Tillage State consists of abandoned cropland that has been naturally revegetated (go-back) or planted/seeded to grassland.

Characteristics and indicators. Many reseeded plant communities were planted with a local seeding mix under the Conservation Reserve Program (CRP) or were planted to a monoculture of sideoats grama. Go-back communities are difficult to define due to the variability of plant communities that can exist. Many of these communities are represented by the genus Aristida (threeawns).

Resilience management. This is an alternative state since the energy, hydrologic, and nutrient cycles are altered to that of the Reference State in its natural disturbance regime. Bulk density, aggregate stability, soil structure, and plant functional and structural groups are not fully restored to that of the Reference State. Mechanical tillage can destroy soil aggregation. Soil aggregates are an example of dynamic soil property change. Aggregate stability is critical for infiltration, root growth, and resistance to water and wind erosion (Brady and Weil, 2008).

Community 4.1
Reseed Community

This plant community occurs on areas that were formerly farmed. When farming operations ended, the area was seeded and established to a mixture of plants. These were usually native species commonly found in the Reference Plant Community. Most seeding mixtures consisted of a blend of grasses that included big bluestem, Indiangrass, switchgrass, and little bluestem. In some locations seed of additional plants such as eastern gamagrass, prairie bundleflower, and Maximilian sunflower were included in the mixture.

Resilience management. When reseeded areas and areas supporting native rangeland exist in the same pasture, they seldom are utilized at the same intensity. Because domestic livestock usually prefer plants on the native rangeland areas, reseeded plant communities should be managed as separate pastures or units when feasible. Reseeded areas are also generally productive when managed for hay production. Some seeded areas are invaded by trees and shrubs during the establishment period of the desired plants. These invader species commonly include Siberian elm, common hackberry , eastern redcedar, eastern cottonwood, black willow, roughleaf dogwood, and Great Plains false willow. Occasional burning is effective in controlling their establishment.

Community 4.2
Go-back Community

This plant community occurs on formerly farmed areas. When tillage operations were discontinued, the areas were allowed to revegetate or “go-back” naturally in contrast to artificial reseeding with a selected species or group of species. This is a slow, gradual process that entails many years and many successional changes or stages in the plant community.

Resilience management. The speed and extent of revegetation depends upon the size of the area, level of grazing management, and the proximity of the area to existing seed sources. In the initial stages of revegetation, the site is usually dominated by annual forbs such as annual ragweed, Canadian horseweed (*Conyza canadensis*), common sunflower, annual marshelder, and golden tickseed. Gradually these are replaced by annual grasses including prairie threeawn, prairie cupgrass (*Eriochloa contracta*), little barley, cheatgrass, and bearded sprangletop (*Leptochloa fusca* ssp. fascecularis). Usually plant succession will progress until the plant community is dominated

by perennial grasses and grasslike plants including composite dropseed, foxtail barley, marsh bristlegrass, silver beardgrass, buffalograss, Torrey's rush, and sand dropseed. These plants can form a stable community. In time and with prescribed grazing management, other perennial grasses and forbs common in the Reference Plant Community return to the site. Some go-back areas are invaded by trees and shrubs such as Siberian elm, common hackberry, eastern redcedar, eastern cottonwood, black willow, roughleaf dogwood, and Great Plains false willow. Occasional burning will effectively control these woody plants.

Transition 1.3 to 2
State 1 to 2

Long-term management (approximately 30 years) without a forage and animal balance and heavy, continuous grazing without adequate recovery periods between grazing events will convert the Grassland State to a Shortgrass State made up of blue grama and buffalograss sod. Drought, in combination with this type of management, will quicken the rate at which this transition occurs. Ecological processes affected are the hydrologic and nutrient cycles.

Constraints to recovery. There is an increase in evaporation rate, runoff, and in bulk density. There is a decrease in infiltration, a change in plant composition, and the functional and structural groups have changed dominance. These are all examples of the soil and vegetation properties that have compromised the resilience of the Grassland State and therefore transitioned to a Shortgrass State.

Context dependence. It is estimated this transition can occur in a 30 year time frame. The variability of the situation will dictate the temporal scale among the many variables involved.

Transition 1 to 3
State 1 to 3

Changes from a Grassland State to a Woody State lead to changes in hydrologic function, forage production, dominant functional and structural groups, and wildlife habitat. Understory plants may be negatively affected by trees and shrubs by reductions in light, soil moisture, and soil nutrients. Increases in tree and shrub density and size have the effects of reducing understory plant cover and productivity, and desirable forage grasses often are most severely reduced (Eddleman, 1983). As vegetation cover changes from grasses to trees, a greater proportion of precipitation is lost through interception and evaporation; therefore, less precipitation is available for producing herbaceous forage, or for deep drainage or runoff (Thurow and Hester, 1997). Tree and shrub establishment increases while fine fuel loads decrease. As trees and shrubs increase at levels of greater than 20 percent canopy cover, the processes and functions that allow the Woody State to become resilient are active and dominant over the processes and systems inherent to the Grassland State. Due to a lack of fine fuel loads, using prescribed fire as a standalone management tool is unsuccessful to eradicate the trees and shrubs.

Constraints to recovery. Canopy percentages above 45 percent need further investigation in recovery efforts to a Grassland State.

Transition 1 to 4
State 1 to 4

This transition is triggered by a management action as opposed to a natural event. Tillage, or breaking the ground with machinery for crop production, will move the Grassland State to a Tillage State.

Constraints to recovery. The resilience of the Reference State has been compromised by the fracturing and blending of the native virgin sod. The energy, hydrologic, and nutrient cycles are altered and vary from that of the Grassland State.

Restoration pathway 3 to 1
State 3 to 1

Restoration efforts will be costly, labor-intensive, and can take many years, if not decades, to return to a Grassland State. Once canopy levels reach greater than 20 percent, estimated cost to remove trees is very expensive and includes high energy inputs. The technologies necessary to go from an invaded Woody State to a Grassland State

include but are not limited to: prescribed burning—the use of fire as a tool to achieve a management objective on a predetermined area under conditions where the intensity and extent of the fire are controlled; brush management—manipulating woody plant cover to obtain desired quantities and types of woody cover and/or to reduce competition with herbaceous understory vegetation, in accordance with overall resource management objectives; and prescribed grazing—the controlled harvest of vegetation with grazing or browsing animals managed with the intent to achieve a specified objective. In addition, manage grazing at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation. When a juniper tree is cut and removed, the soil structure and the associated high infiltration rate may be maintained for over a decade (Hester, 1996). This explains why the area near the dripline usually has substantially greater forage production for many years after the tree has been cut. It also explains why runoff will not necessarily dramatically increase once juniper is removed. Rather, the water continues to infiltrate at high rates into soils previously ameliorated by junipers, thereby increasing deep drainage potential. In rangeland, deep drainage amounts can equal 16 percent of the total rainfall amount per year (Thurow and Hester, 1997).

Context dependence. Restoration is dependent upon the canopy percentage.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses Dominant 68%**			2802–3620	
	big bluestem	ANGE	*Andropogon gerardii*	1681–2959	–
	Indiangrass	SONU2	*Sorghastrum nutans*	280–801	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	168–532	–
	switchgrass	PAVI2	*Panicum virgatum*	168–532	–
	little bluestem	SCSC	*Schizachyrium scoparium*	56–269	–
2	**Grasses Subdominant 15%**			280–796	
	western wheatgrass	PASM	*Pascopyrum smithii*	168–532	–
	Canada wildrye	ELCA4	*Elymus canadensis*	56–224	–
	vine mesquite	PAOB	*Panicum obtusum*	56–168	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	56–168	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	56–168	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–112	–
	sedge	CAREX	*Carex*	0–112	–
3	**Grasses Trace 2%**			0–106	
	prairie cordgrass	SPPE	*Spartina pectinata*	0–112	–
	prairie threeawn	AROL	*Aristida oligantha*	0–28	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–28	–
Forb					
4	**Forbs Minor 10%**			280–532	
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	28–56	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	17–45	–

	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	11–34	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	11–34	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	11–34	–
	stiff goldenrod	OLRIR	*Oligoneuron rigidum var. rigidum*	6–22	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	6–22	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	6–22	–
	ashy sunflower	HEMO2	*Helianthus mollis*	6–22	–
	oldplainsman	HYARA	*Hymenopappus artemisiifolius var. artemisiifolius*	6–22	–
	tall blazing star	LIAS	*Liatris aspera*	6–22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	6–22	–
	butterfly milkweed	ASTU	*Asclepias tuberosa*	6–22	–
	yellowspine thistle	CIOC2	*Cirsium ochrocentrum*	6–22	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	6–22	–
	purple prairie clover	DAPU5	*Dalea purpurea*	6–22	–
	compassplant	SILA3	*Silphium laciniatum*	6–22	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	6–22	–
	white heath aster	SYER	*Symphyotrichum ericoides*	6–22	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	6–22	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	0–11	–
	showy milkweed	ASSP	*Asclepias speciosa*	0–11	–
	common milkweed	ASSY	*Asclepias syriaca*	0–11	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–11	–
	common yarrow	ACMI2	*Achillea millefolium*	0–6	–
	hoary verbena	VEST	*Verbena stricta*	0–6	–
Shrub/Vine					
5	**Trees and Shrubs Minor 5%**			168–269	
	leadplant	AMCA6	*Amorpha canescens*	0–62	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–62	–
	eastern cottonwood	PODE3	*Populus deltoides*	0–39	–
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–39	–
	American plum	PRAM	*Prunus americana*	0–28	–
	prairie rose	ROAR3	*Rosa arkansana*	0–22	–
	common hackberry	CEOC	*Celtis occidentalis*	0–22	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–22	–

Animal community

Wildlife

The plant diversity associated with this site and the fact that it is commonly part of a riparian area makes it excellent wildlife habitat. The site often has scattered cottonwood and willow trees and occasional mottes of low brush, which create a preferred habitat for white-tail deer, wild turkey, bobwhite quail, pheasant, the fox squirrel, and eastern

cottontail. Furbearers such as mink, raccoon, skunk, and opossum are common as are predators such as bobcats, coyotes, and the red fox. When in good to excellent condition, this site is especially valuable as winter cover for many wildlife species including white-tailed deer, pheasant, quail, and cottontail.

Because of the variety of woody plant species present, birds such as the scissor-tailed flycatcher, eastern and western kingbirds, brown thrasher, morning dove, and red-winged blackbird are common to the site. During the spring and fall, migrating waterfowl are common. Avian predators such as hawks and owls commonly use this habitat, as do bald eagles on an occasional basis.

Some animals are important because of their threatened and endangered status and require special consideration. Please check the Kansas Department of Wildlife and Parks (KDWP&T) website at www.ksoutdoors.com for the most current listing for your county.

Grazing Interpretations

Calculating Safe Stocking Rates: Proper stocking rates should be incorporated into a grazing management strategy that protects the resource, maintains or improves rangeland health, and is consistent with management objectives. In addition to usable forage, safe stocking rates should consider ecological condition, trend of the site, past grazing use history, season of use, stock density, kind and class of livestock, forage digestibility, forage nutritional value, variation of harvest efficiency based on preference of plant species and/or grazing system, and site grazeability factors (such as steep slopes, site inaccessibility, or distance to drinking water).

Often the current plant community does not entirely match any particular Community Phase as described in this Ecological Site Description. Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of inventory data will permit the establishment of a safe initial stocking rate.

No two years have exactly the same weather conditions. For this reason, year-to-year and season-to-season fluctuations in forage production are to be expected on grazing lands. Livestock producers must make timely adjustments in the numbers of animals or in the length of grazing periods to avoid overuse of forage plants when production is unfavorable, and to make advantageous adjustments when forage supplies are above average.

Initial stocking rates should be improved through the use of vegetation monitoring and actual use records that include number and type of livestock, the timing and duration of grazing, and utilization levels. Actual use records over time will assist in making stocking rate adjustments based on the variability factors.

Average annual production must be measured or estimated to properly assess useable forage production and stocking rates.

Hydrological functions

Water is the primary factor limiting forage production on this site.

Following are the estimated withdrawals of freshwater by use in MLRA 79:
Public supply—surface water, 6.8% and ground water, 4.0%; Livestock—surface water, 0.4% and ground water, 1.2%; Irrigation—surface water, 0.7% and ground water, 80.6%; Other—surface water, 2.0% and ground water, 4.3%.

The total withdrawals average 740 million gallons per day (2,800 million liters per day). About 90 percent is from ground water sources, and 10 percent is from surface water sources. The source of water for crops and pasture is the moderate, somewhat erratic precipitation. In the northern part of the area, the Arkansas River is a potential source of irrigation water, but it currently is little used for this purpose. The Ninnescah River is another potential source of surface water in the area. Deep sand in the High Plains or Ogallala aquifer yields an abundance of good-quality ground water. This aquifer provides water primarily for irrigation, but also for domestic supply and livestock in rural areas, and for industry and public supply in Wichita and in other towns and cities in the MLRA. The ground water in this aquifer has the lowest levels of total dissolved solids of any aquifer in Kansas: 340 parts per million (milligrams per liter).

Hydrologic group B soils on this site include Elandco, Kaskan, and Kaski. Mahone soil is in hydrologic group C.

These soils have deep loamy to silty surface layers and subsoils. They are well drained and have moderately slow to moderate permeability. Please refer to the NRCS National Engineering Handbook Section 4 (NEH-4) for runoff quantities and hydrologic curves when making hydrology determinations.

Recreational uses

This site is often used for outdoor recreational pursuits because of the plant and wildlife diversity. Big game such as white-tailed deer and wild turkey are abundant and commonly hunted, along with a wide variety of small game such as pheasant, quail, rabbits, squirrels, and raccoons. In addition, this site provides opportunities for bird watching, hiking, outdoor/wildlife photography, and a variety of other outdoor activities. There are a wide variety of plants in bloom throughout the growing season that provide much aesthetic appeal to the landscape. Recurrent flooding and sediment deposition are a site hazard.

Wood products

In some locations there have been commercial harvests of eastern cottonwood. Some hardwoods are cut for firewood.

Other products

None.

Other information

Site Development and Testing Plan

This site went through the approval process.

Inventory data references

Information presented here has been derived from NRCS clipping data, numerous ocular estimates, and other inventory data. Field observations from experienced range-trained personnel were used extensively to develop this ecological site description.

NRCS contracted the development of MLRA 79 ESDs in 2005. Extensive review and improvements were made to those foundational ESDs in 2017-2018, which provided an approved product.

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Contributors

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Approval

David Kraft, 9/21/2018

Acknowledgments

The ecological site development process is a collaborative effort, conceptual in nature, dynamic, and is never considered complete. I thank all those who set the foundational work in the mid-2000s in regard to this ESD. I thank all those who contributed to the development of this site. In advance, I thank those who would provide insight, comments, and questions about this ESD in the future.

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Rangeland health reference sheet

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

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Date	05/15/2018
Approved by	
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:** There is little, if any, evidence of soil deposition or erosion. Water generally flows evenly over the entire landscape.

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3. **Number and height of erosional pedestals or terracettes:** There is no evidence of pedestaled plants or terracettes or the 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):** Less than 10% bare ground is found on this site. Cover can be defined as live plants, litter, rocks, moss, lichens, etc.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** There is no evidence of wind erosion creating bare areas or denuding vegetation.

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7. **Amount of litter movement (describe size and distance expected to travel):** Plant litter is distributed evenly throughout the site. During major flooding events, this site slows water flow and captures litter and sediment.

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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):** Plant canopy is large enough to intercept the majority of raindrops. A soil fragment will not “melt” or lose its structure when immersed in water for 30 seconds. There is no evidence of pedestaled plants or terracettes. Soil stability scores will range from 4-6.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** From Elandco series description:

   A1--0 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, firm; many roots and wormcasts; common fine and medium pores; slightly alkaline; clear smooth boundary. (8 to 20 inches thick)

   A2--14 to 27 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; hard, firm; many roots and pores; slightly alkaline; clear smooth boundary. (12 to 22 inches thick)

   A3--27 to 40 inches; dark brown (10YR 3/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, firm; many roots and pores; slightly alkaline; clear smooth boundary. (0 to 20 inches thick)

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** There is no negative effect on water infiltration and/or runoff due to plant composition or distribution. Plant composition and distribution are adequate to prevent any rill formation and/or pedastalling. Interspacial distribution is consistent with expectation for the site.

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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 evidence of compacted soil layers due to cultural practices. Soil structure is conducive to water movement and root penetration.

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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: Grasses dominant 68% or 3230 lbs.: big bluestem 1500-2640, Indiangrass 250-715, eastern gamagrass 150-475, switchgrass 150-475, little bluestem 50-240

    Sub-dominant: Grasses subdominant 15% or 710 lbs.: western wheatgrass 150-475, Canada wildrye 50-200, sideoats grama 50-150, composite dropseed 50-150, vine mesquite 50-150

    Other: Grasses trace 2% or 95 lbs.: prairie cordgrass 0-100, prairie threeawn 0-25, purple threeawn 0-25

    Additional: Forbs Minor 10% or 475 lbs.
    Trees and Shrubs Minor 5% or 240 lbs.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** The majority of plants are alive and vigorous. Some mortality and decadence is expected for the site. This in part is due to drought, unexpected wildfire, or a combination of the two events. This would be expected for both dominant and subdominant groups.

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14. **Average percent litter cover (%) and depth (in):** Plant litter is distributed evenly throughout the site. There is no restriction to plant regeneration due to depth of litter. When prescribed burning is practiced there will be little litter the first half of the growing season.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3870-6080 lbs/acre. Representative value is 4750 lbs/forage/acre. Below-normal precipitation during the growing season expect 3870 lbs/forage/acre; and above-normal precipitation during the growing season expect 6080 lbs/forage/acre. If utilization has occurred, estimate the annual production removed or expected and include this amount when making the total site production estimate.

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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:** None.

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17. **Perennial plant reproductive capability:** The number and distribution of tillers or rhizomes is assessed relative to the expected production of the perennial, warm-season midgrasses and shortgrasses.
