Ecological site HX074XY123
Sandy Floodplain

Last updated: 10/04/2019
Accessed: 04/26/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 074X–Central Kansas Sandstone Hills

Major Land Resource Area (MLRA) 74, Central Kansas Sandstone Hills, is entirely located in Kansas. It makes up about 8,365 square miles (21,675 square kilometers). The city of Salina and the towns of Concordia, Junction City, McPherson, and Newton are in this MLRA. Interstate Highways 70 and 135 meet in Salina, and Interstate 35 crosses the southern part of this area. Wilson and Kanopolis State Parks are in this area. McConnell Air Force Base is in the southern part of the area.

Following are the various kinds of land use in this MLRA: Cropland-private, 52 percent; Grassland-private, 38 percent, Federal, 2 percent; Forest--private, 3 percent; Urban development-private, 3 percent; Water-private, 1 percent; Other- private, 1 percent.

Most of MLRA 74 is in farms, with more than one-half of the area in cropland. Winter wheat is the principal crop. Other small grains, grain sorghum, hay, and corn also are important crops. Some areas along the large rivers are irrigated. The crops grown in nonirrigated areas also are grown in irrigated areas, but more corn and less wheat are grown in the irrigated areas. More than one-third of the area supports native grasses grazed by cattle.

The major soil resource concerns are water erosion, maintenance of the content of organic matter and tilth of the soils, and soil moisture management. The resource concerns on pasture and rangeland are the productivity, health, and vigor of plants and the spread of noxious and invasive species.

Conservation practices on cropland generally include high-residue crops in the cropping system; systems of crop residue management, such as no-till and mulch-till; a combination of terraces and grassed waterways; contour farming; contour stripcropping; conservation crop rotations; and nutrient management. Conservation practices on rangeland generally include prescribed grazing, brush management, management of upland wildlife habitat, proper distribution of watering facilities, and control of noxious and invasive plant species.

Classification relationships

Major Land Resource Area (MLRA): 074X–Central Kansas Sandstone Hills

Ecological site concept

The Sandy Floodplain (074XY123) ecological site was formerly named Sandy Lowland (R074XY023KS). This site occurs on nearly level to very gently undulating soils on floodplains in river valleys. The Sandy Floodplain has soils with generally more than 52 percent sand in the surface. The soil surface texture ranges from sand to fine sandy loam. The slopes range from 0 to 3 percent.

Associated sites

HX074XY130	**Shallow Sandstone** The Shallow Sandstone sites sits adjacent to and in conjunction with the Sandy Floodplain ecological site. This site is characterized by the Hedville soil which is shallow to very shallow. Many areas of exposed sandstone rock are evident on the higher elevations. This soil formed in residuum weathered from noncalcareous sandstone. This site is found on uplands that are moderately to strongly sloping with a loamy surface layer that may be cobbly.
HX074XY115	**Loamy Hills** The Loamy Hills ecological site sits adjacent to and in conjunction with the Sandy Floodplain ecological site. This site is made up of moderately deep to deep, moderately well to well drained upland soils. This site has a fine-silty and loamy surface texture and is non-calcareous to the surface. Generally, the Loamy Hills ecological site is located on uplands with a slope range of 0 to 16 percent.

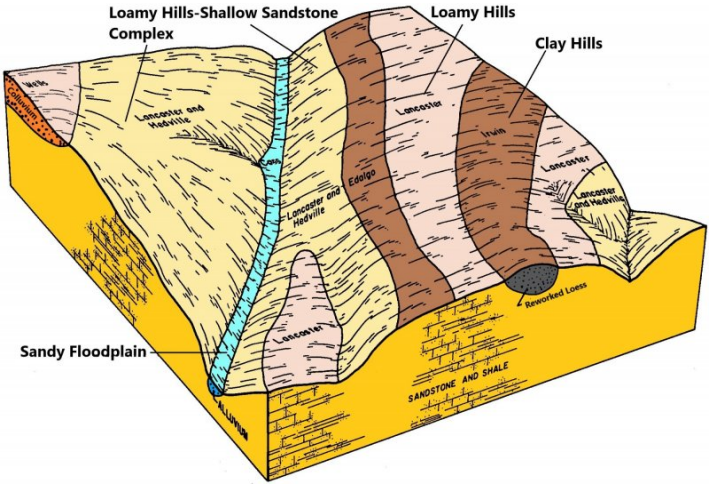


Figure 1. MLRA 74 ESD block diagram.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon hallii* (2) *Panicum virgatum*

Legacy ID

R074XY123KS

Physiographic features

The northwest half of MLRA 74 is in the Plains Border Section of the Great Plains Province of the Interior Plains. The northeast corner is in the Dissected Till Plains Section of the Central Lowland Province of the Interior Plains, and the rest of the area is in the Osage Plains Section of the same province and division. This area is an undulating to hilly, dissected plain. Wide flood plains and terraces are along the larger rivers, and narrow bottomland is along the small streams. Elevation is generally 1,310 to 1,640 feet (400 to 500 meters), increasing from east to west. Local relief is typically 65 to 130 feet (20 to 40 meters).

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Smoky Hill (1026), 47 percent; Middle Arkansas (1103), 22 percent; Kansas (1027), 11 percent; Republican (1025), 10 percent; and Neosho-Verdigris (1107), 10 percent. The Little Arkansas River forms the southwestern border of this area. From north to south, other rivers that cross the area include the Little Blue, Big Blue, Republican, Solomon, Salt, Saline, Cottonwood, Walnut, and Arkansas Rivers. The Solomon and Saline Rivers join the Smoky Hill River just south of Salina.

The Sandy Floodplain ecological site consists of very deep, moderately well drained to excessively drained soils formed in sandy alluvium. This site occurs on nearly level to very gently undulating floodplains. Runoff is negligible to very low and permeability is rapid.

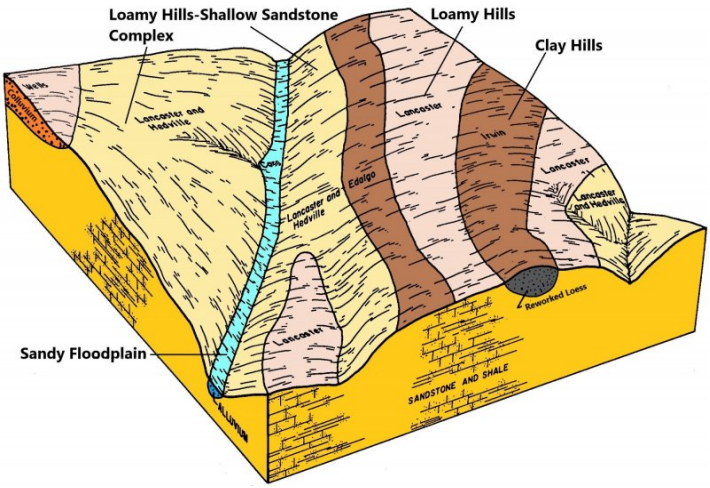


Figure 2. MLRA 74 ESD block diagram.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain
Runoff class	Negligible
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Rare to frequent
Elevation	1,100–1,968 ft
Slope	0–3%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in MLRA 74 is 27 to 34 inches (680 to 860 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 averages 20 inches (50 centimeters). The average annual temperature is 54 to 57 degrees F (12 to 14 degrees C). The freeze-free period averages 185 days. 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 from this narrative and from the tables below derives from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The dataset is from 1981-2010. The climate data from the geographical extent of the ecological site could be different from the MLRA 74 data. The following climate stations listed are used to calculate the data for this ecological site.

Table 3. Representative climatic features

Frost-free period (characteristic range)	148-153 days
Freeze-free period (characteristic range)	175-191 days
Precipitation total (characteristic range)	29-32 in
Frost-free period (actual range)	139-153 days
Freeze-free period (actual range)	170-193 days

Precipitation total (actual range)	28-33 in
Frost-free period (average)	149 days
Freeze-free period (average)	184 days
Precipitation total (average)	31 in

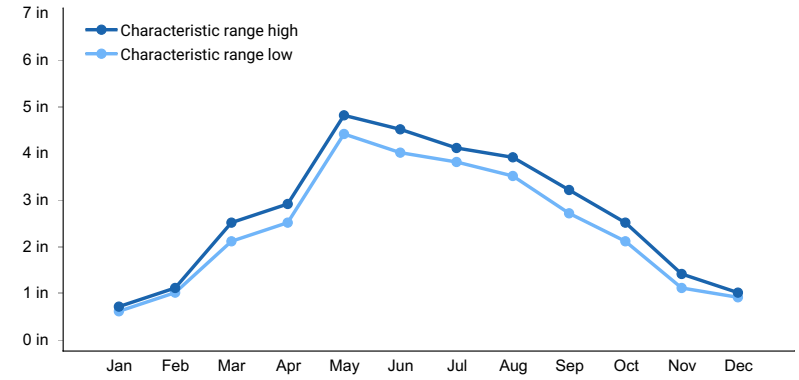


Figure 3. Monthly precipitation range

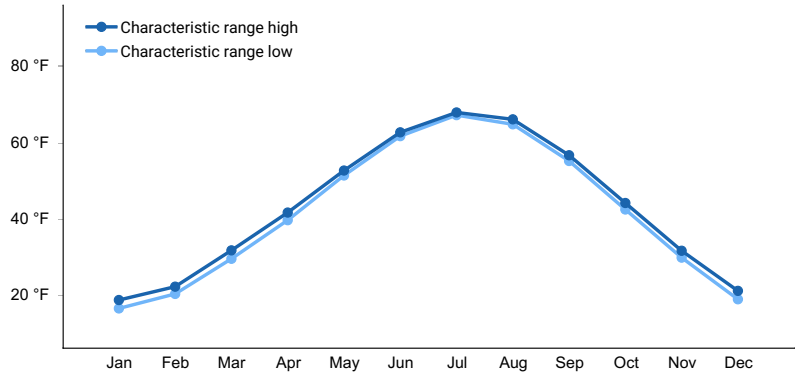


Figure 4. Monthly minimum temperature range

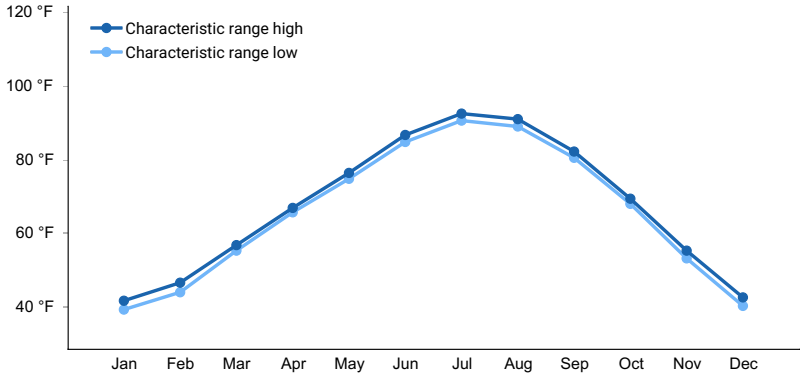


Figure 5. Monthly maximum temperature range

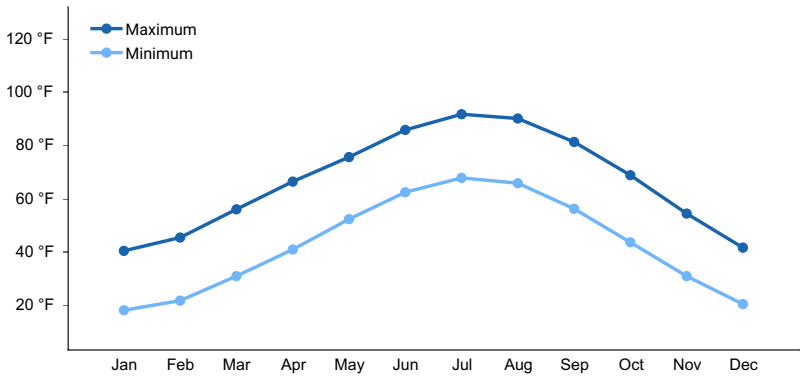


Figure 6. Monthly average minimum and maximum temperature

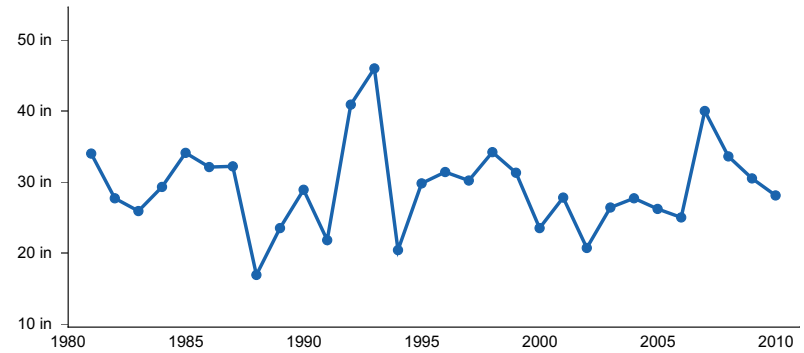


Figure 7. Annual precipitation pattern

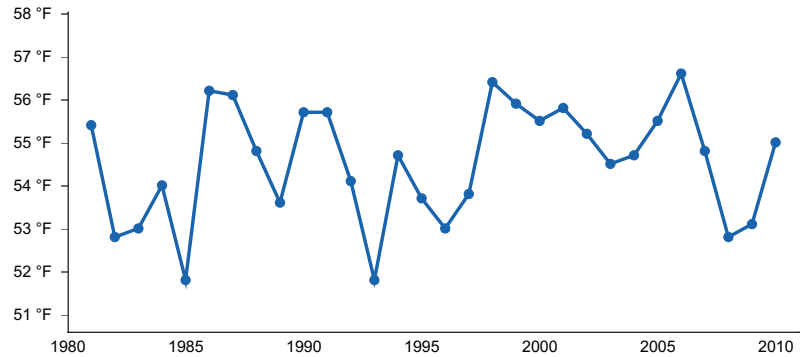


Figure 8. Annual average temperature pattern

Climate stations used

- (1) CONCORDIA MUNI AP [USW00013984], Concordia, KS
- (2) CONCORDIA 1 W [USC00141761], Concordia, KS
- (3) CLAY CTR [USC00141559], Clay Center, KS
- (4) ELLSWORTH [USC00142459], Ellsworth, KS
- (5) KANOPOLIS LAKE [USC00144178], Ellsworth, KS
- (6) SMOLAN 1NE [USC00147551], Lindsborg, KS
- (7) MILFORD LAKE [USC00145306], Junction City, KS
- (8) SALINA MUNI AP [USW00003919], Salina, KS
- (9) MCPHERSON [USC00145152], McPherson, KS

Influencing water features

The soils on this site are moderately deep to deep, well drained to excessively drained with moderately rapid to very rapid permeability. The water table may enter the root zone, but it is not the dominant factor controlling the growth of vegetation.

Wetland description

Soil inclusions with this wetland type may occur within this site.

Potential stream types found on this site include C5, E5, and occasionally D5. The C5 stream type is a slightly entrenched, meandering, sand dominated, riffle/pool channel with a well developed floodplain. Rates of lateral adjustment are strongly influenced by the presence and condition of riparian vegetation. E5 stream types are channel systems with low to moderately sinuosity, gentle to moderately steep channel gradients, and very low channel width/depth ratios. E5 stream channels are very stable. D5 stream types are multiple channel systems most often described as braided streams, found within broad alluvial valleys. D5 channel gradients are generally less than 2 percent, and have very high width/depth ratios.

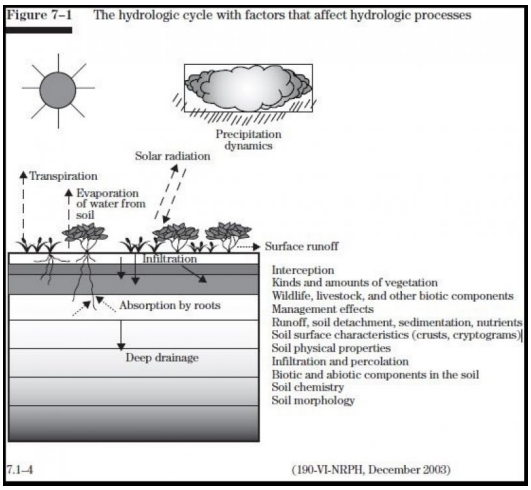


Figure 9. Fig.7-1 from National Range and Pasture Handbook.

Soil features

Cass, Inavale, and Munjor are the soil series that represent the Sandy Floodplain ecological site. These soils are formed in stratified, moderately coarse alluvium that are located on floodplains in river valleys. They have a loamy or sandy surface layer and are very deep. Flooding is a hazard and can cause scour damage and large deposits of silt and sand.

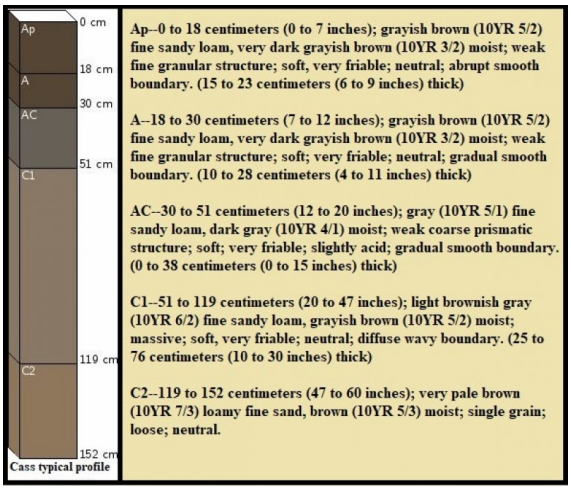


Figure 10. MLRA 74 Cass typical soil profile.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loamy fine sand (2) Loamy sand (3) Fine sandy loam

Family particle size	(1) Coarse-loamy (2) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	80 in
Available water capacity (0-40in)	2.8–6.6 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–8.4

Ecological dynamics

The Sandy Floodplain ecological site in MLRA 74 consists of dynamic plant communities resulting from the complex interaction of many ecological processes. The vegetation evolved on fragile soils on lowlands that were occasionally flooded, exposed to a diverse and fluctuating climate, grazed by herds of large herbivores, and subjected periodically to intense wildfires.

The deep sandy soils representative of this site absorb water rapidly. However, water-holding capacities are low and soil moisture tends to rapidly percolate through the profile. The tallgrasses that evolved and dominated the original plant community have deep, efficient root systems capable of utilizing moisture throughout most of the profile. There is almost no runoff from this site. Most of the precipitation that occurs enters the root profile. It may flood three or more times per year. The soil and plant moisture relationship is mutually proficient and the site can be productive. Seed heads of the major grasses often reach six to seven feet in height.

The original plant community developed with fires of various intensities and frequencies during different seasons of the year playing an important part in ecological processes. Historically, wildfires started by lightning often occurred in spring and early summer months when thunderstorms were prevalent, but also in late summer and fall during dry weather periods. It is also recognized that early Native Americans often used fire to attract herds of migratory herbivores,especially bison.

The dominant tallgrasses were rhizomatous, enabling them to survive the ravages of even intense wildfires and giving them competitive advantage in the plant community. Most trees and shrubs were suppressed by fire and occurred only sparsely on protected areas. Growth of forbs, especially legumes, was usually enhanced following a fire event. After a fire there was also usually a substantial, but temporary, increase in the abundance of annual forbs that may have lasted for one to two years.

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 was probably intense but of short duration. As herds moved to bordering areas, the vegetation was afforded a period of recovery. Other grazing and feeding animals such as deer, rabbits, insects, and numerous burrowing rodents had secondary influences on plant community development.

Variations in climate, especially drought cycles, also had a major impact upon the development of the plant community. Species composition fluctuated according to the duration and severity of droughts. During prolonged dry cycles many of the shallow-rooted plants died out and the production of deeper-rooted plants significantly decreased. When sufficient rainfall occurred following an extended dry period, annual forbs and grasses would temporarily occur in great abundance. As precipitation returned to normal or above normal, the deeper-rooted grasses responded quickly to production potentials. Poor plant cover can lead to scour erosion during floods. Also, sandy silt deposits can be heavy during flooding, especially coming from local small streams entering the site.

During early spring, the water table can be high enough to furnish extra water to the deeper-rooted plants.

Typically, growth of warm-season grasses in MLRA 74 begins during the period of May 1 to May 15 and continues until mid-September. Generally, 70 percent of total production is completed by mid-July. This varies only slightly from year to year depending upon temperature and precipitation patterns. Cool-season grasses generally have two short growing periods, one in the fall (September and October) and again in the spring (April, May, and June).

As European settlers began utilizing the area for production of domestic livestock within fenced pastures in place of roaming bison herds, the ecological dynamics and physical aspects were altered, and the plant community shifted from its original composition. These changes were usually in proportion to the season and intensity of the use by livestock and were accelerated by a combination of drought and overgrazing. Taller grasses and forbs more palatable to bison were similarly selected and consumed by cattle and horses. Those palatable species were repeatedly grazed throughout the growing season, thus weakening them. Over time, they were gradually replaced by the increase and spread of less palatable species. Where the history of overuse by domestic livestock was more intense, even the plants which initially increased were often replaced by less desirable and lower-producing plants. In some instances, production and plant diversity was reduced to a mixture of mid- and shortgrasses, annual grasses, and unpalatable forbs. In some areas plant cover was reduced to the point that flooding could result in scour erosion.

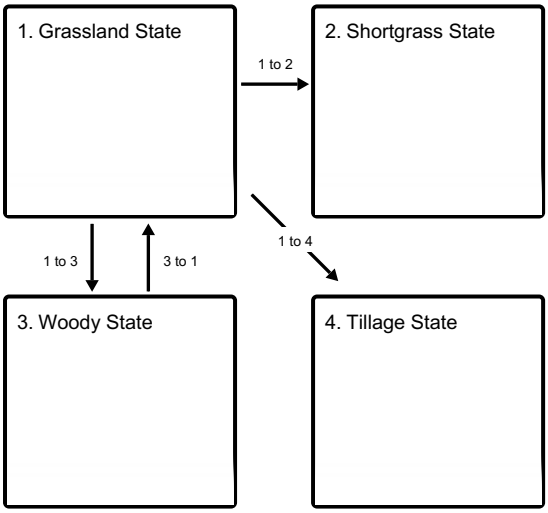
The frequency and role that fires played in maintaining the plant community was reduced with the advent of roads, cultivated fields, and fire suppression techniques developed by European settlers. Use of prescribed fire as a management tool has also diminished in some localities, especially surrounding population centers. In the absence of periodic, intense fire, there has often been a gradual increase in woody species. In some areas, shrubs and trees have encroached to the point of becoming the dominant influence in the plant community.

The gently rolling topography of this ecological site was attractive to European settlers who sought to create agrarian lifestyles. Some areas of this site were brought under cultivation and used to grow wheat, corn, sorghum, and other crops. Tillage and crop production caused the destruction of the original native plant community and often major degradation of the inherent structure and fertility of the surface soil layer. Many acres that were formerly used for cultivated crops have been reseeded or allowed to revegetate through natural succession.

The following diagram illustrates some of the pathways that the vegetation on this site may take from the Reference Plant Community as influencing ecological factors change. There may be other states or plant communities not shown on the diagram, as well as noticeable variations within those illustrated.

State and transition model

Ecosystem states



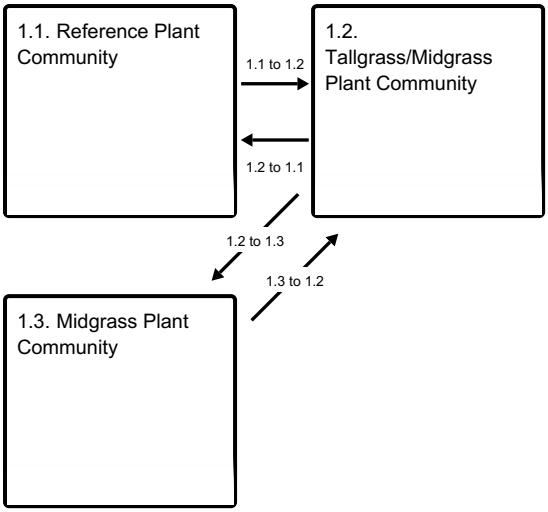
1 to 2 - Long-term, heavy, continuous overgrazing, no rest and recovery

1 to 3 - Lack of fire and brush control

1 to 4 - Tillage by machinery

3 to 1 - Prescribed grazing, brush management, and prescribed burning

State 1 submodel, plant communities



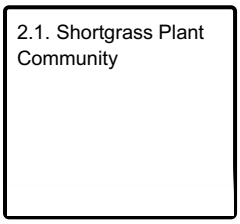
1.1 to 1.2 - Heavy, continuous grazing without adequate rest and recovery

1.2 to 1.1 - Prescribed grazing that incorporates periods of deferment during the growing season

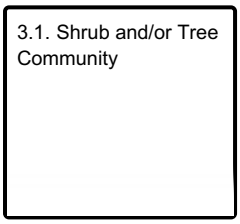
1.2 to 1.3 - Long-term (>20 years) continuous grazing with no rest and no recovery

1.3 to 1.2 - Prescribed grazing with adequate rest and recovery period during the growing season

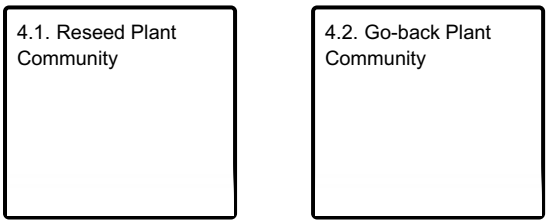
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Grassland State

The Grassland State defines the ecological potential and natural range of variability resulting from the natural disturbance regime of the Sandy 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 a result of periodic fire, drought, and grazing. These events are part of the natural disturbance regime and climatic process. The Reference Plant Community consists of warm-season tall- and midgrasses, cool-season and sod-forming grasses, forbs, and shrubs. The Midgrass/Tallgrass Plant 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.

Characteristics and indicators. Tallgrasses and midgrasses are dominant in the Grassland State.

Resilience management. Management strategies that will sustain this state include monitoring key forage species and providing a forage and animal balance.

Community 1.1
Reference Plant Community

Figure 11. MLRA 74 Reference Plant Community.

The interpretive plant community for this site is the Reference Plant Community, and represents the original plant community that existed prior to European settlement. The site is characterized as a grassland essentially free of trees and large shrubs. It is dominated by tall warm-season grasses including sand bluestem, switchgrass, Indiangrass, eastern gamagrass, and common reed. The major midgrass is little bluestem. Combined these grasses will account for 60 percent of vegetation produced annually. Other prevalent midgrasses are Canada wildrye, sand lovegrass, composite dropseed, sand dropseed, and purple lovegrass. Scattered throughout are minor amounts of shortgrasses consisting of blue grama, hairy grama, Scribner's rosette grass, thin paspalum, and Carolina crabgrass. The site supports a wide variety of legume species, which are interspersed throughout the grass sward. The most abundant are roundhead lespedeza, slender lespedeza, sessileleaf ticktrefoil, Maryland senna, and prairie bundleflower. Other important forbs include Maximilian sunflower, scaly blazing star, Canada goldenrod, Cuman ragweed, and pitcher sage. Leadplant and Jersey tea are low-growing shrubs that occur over the site. Unlike most shrubs, these plants are both quite tolerant to fire. A few large clumps of Chickasaw plum and skunkbush may also be found.

Resilience management. This can be maintained as a stable plant community when adequately managed. A prescribed grazing program that incorporates periods of rest and recovery during the growing season benefits the tallgrasses and even the more palatable forb species. Soils representative of this site are susceptible to wind erosion. Excessive grazing and trailing by livestock can have an impact on the soil and site stability. A lack of plant cover can lead to scour erosion during floods.

Dominant plant species

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

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3400	4675	5525
Forb	400	550	650
Shrub/Vine	200	275	325
Total	**4000**	**5500**	**6500**

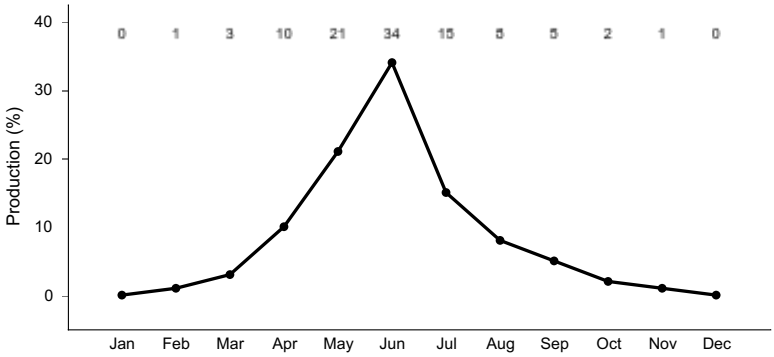


Figure 13. Plant community growth curve (percent production by month). KS7408, Sandy Floodplain.

Community 1.2
Tallgrass/Midgrass Plant Community

Figure 14. MLRA 74 Midgrass/Tallgrass Plant Community.

The composition of the Tallgrass/Midgrass Plant Community resembles that of the Reference Plant Community. Comparatively, there has been a slight decrease of the more palatable tallgrasses and forbs and a subsequent increase in midgrasses. The dominant grasses are sand bluestem and little bluestem with lesser amounts of switchgrass and Indiangrass. A number of midgrasses have increased in abundance as the taller grasses have been reduced by overgrazing. These include sand dropseed, sand lovegrass, thin paspalum, and composite dropseed. Other secondary grasses are Carolina crabgrass, red lovegrass, tumble windmillgrass, mat sandbur, buffalograss, blue grama, and Scribner's rosette grass. Sometimes Johnsongrass will invade this site. Combined, these secondary grasses comprise 20 to 30 percent of the total herbage produced annually. Forbs such as Maximilian sunflower, roundhead lespedeza, prairie bundleflower, and Maryland senna have been partially replaced by white sagebrush, Missouri goldenrod, Cuman ragweed, Fendler's aster, redroot buckwheat, and tenpetal blazingstar. Forbs produce 10 to 12 percent of the total herbage. This site supports a few shrubs. Leadplant and Jersey tea may be scattered throughout the site. Chickasaw plum and skunkbush sumac are common and usually found in small clumps or mottes. Shrubs usually will not comprise over ten percent of the total production.

Resilience management. Periods of rest and recovery are essential in maintaining this as a stable plant community. Sand bluestem is preferred and readily selected and grazed by cattle. When the site is grazed continuously throughout the growing season, sand bluestem is usually overgrazed and thus maintained in a state of

low vigor. This results in a gradual reduction of its abundance over time. Where this occurs, sand dropseed, thin paspalum, and mat sandbur replace the taller grasses. In some areas this has led to scour erosion following floods. Prescribed grazing that incorporates periods of rest and recovery during the growing season will improve the vigor and gradual recovery of the more palatable tallgrasses and forbs.

Dominant plant species

- sand bluestem (*Andropogon hallii*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.3
Midgrass Plant Community

Figure 15. MLRA 74 Midgrass Plant Community.

The Midgrass Plant Community developed as a result of many years of continuous overgrazing. Midgrasses dominate the site and comprise 50 to 60 percent of the annual production. Most abundant midgrasses include little bluestem, composite dropseed, sand lovegrass, and Florida paspalum. Shortgrasses such as Carolina crabgrass, red lovegrass, Scribner's rosette grass, tumble windmillgrass, purple threeawn, sand dropseed, buffalograss, and blue grama produce 10 to 15 percent of the vegetation. Remnant plants of sand bluestem, Indiangrass, and switchgrass, although sparse, are often found scattered throughout the site. These plants are usually grazed repeatedly and remain in a low state of vigor. Of these remnants, sand bluestem and switchgrass are generally the most abundant. When in this state, new growth consisting of three to five leaves will emerge in a prostrate position rather than upright. This allows the plants to partially escape grazing. These remnants respond favorably to periods of rest from grazing and may regain vigor in two to three years. Forb production is quite variable and may range from 10 to 30 percent of the total vegetation. This variability is dependent upon the amount and timing of rainfall and flooding events. Perennial forbs include Carruth's sagewort, white sagebrush, redroot buckwheat, tenpetal blazingstar, bush morning-glory, and Cuman ragweed. Annual forbs common on the site include prairie sunflower, fourpoint evening primrose, camphorweed, annual ragweed, and annual buckwheat. In some locations shrubs such as skunkbush sumac and Chickasaw plum comprise 5 to 15 percent of the vegetation.

Resilience management. Prescribed grazing with adequate rest and recovery periods during the growing season will shift this plant community to include more productive midgrasses. With continued management the taller grasses will gradually increase in abundance.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- composite dropseed (*Sporobolus compositus*), grass
- sand lovegrass (*Eragrostis trichodes*), grass
- Florida paspalum (*Paspalum floridanum*), grass

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Reference Plant Community

Tallgrass/Midgrass Plant Community

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 10 years will shift functional and structural plant group dominance toward a midgrass plant community.

Context dependence. Plant community composition shifts from tallgrass- to midgrass-dominant.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Tallgrass/Midgrass Plant Community

Reference Plant Community

Causes of plant community shift include management (10-15 years) with adequate rest and recovery of the key forage species (big bluestem, switchgrass, Indiangrass, and little bluestem) within the Reference Plant Community. If woody species are present, prescription fires every 6-8 years will be necessary for their removal and maintenance.

Conservation practices

Prescribed Grazing

Pathway 1.2 to 1.3
Community 1.2 to 1.3

Tallgrass/Midgrass Plant Community

Midgrass Plant Community

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 20 years will shift functional and structural plant group dominance toward a Midgrass/Shortgrass Plant Community.

Pathway 1.3 to 1.2
Community 1.3 to 1.2

Midgrass Plant Community

Tallgrass/Midgrass Plant Community

Causes of plant community shift include management (10-15 years) with adequate rest and recovery of the key forage species (little bluestem, sideoats grama, big bluestem, switchgrass, and Indiangrass) within the

Midgrass/Tallgrass Plant Community. If woody species are present, prescription fires every 6-8 years will be necessary for their removal and maintenance.

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. The Shortgrass State is characterized with specific dynamic soil property changes. Changes between the Grassland State and the Shortgrass State have been documented. As plant community cover decreases from bunchgrasses to more of the sodgrasses there is a decrease in infiltration and interception and an increase in surface runoff (Thurow T., 2003).

Resilience management. This is a resistant and resilient state. Grazing management practice should include a forage and animal balance.

Community 2.1
Shortgrass Plant Community

Figure 16. MLRA 74 Shortgrass Plant Community.

This plant community developed as a result of many years of continuous overgrazing. Shortgrasses dominate the site and comprise 30 to 60 percent of annual production. The most abundant shortgrasses include blue grama, sand dropseed, hairy grama, red lovegrass, and mat sandbur. Remnant plants of sand bluestem, Indiangrass and switchgrass are very sparse and scattered. They persist in a low state of vigor, often being semi-dormant or dormant. Forb production is variable and may range from 25 to 50 percent. Perennial forbs include Carruth's sagewort, white sagebrush, and Cuman ragweed. Annual forbs include prairie sunflower, camphorweed, sleepingplant, and annual ragweed. Trees and shrubs can add another 500 or more pounds. Where remnant tallgrasses persist, total rest from grazing or a prescribed grazing period will result in a dramatic increase in sand bluestem, with lesser increases in switchgrass and Indiangrass. Trees and shrubs can comprise up to 15 percent of this community. This annual yield is in current growth of tree leaves and twigs, which is not available to most grazers and browsers.

Resilience management. Recovery of the tallgrasses, midgrasses, and associated forb characteristics of the Reference Plant Community will require many years of careful management that includes prescribed grazing and extended periods of rest during the growing season. If remnant stands of the desired species are not present or located nearby as seed sources for reestablishment, interseeding measures may be necessary to create pioneer

colonies for seed dispersal throughout the community. Prescribed burning can be a useful tool if used strategically to benefit the desired species, especially in the later stages of the recovery process.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- hairy grama (*Bouteloua hirsuta*), grass
- red lovegrass (*Eragrostis secundiflora*), grass
- mat sandbur (*Cenchrus longispinus*), grass

State 3
Woody State

The Woody 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 from 1937 to 1969, in contrast to a 1 percent increase on burned areas (Bragg and Hulbert, 1976). Periodic burning will hinder the establishment of most woody species and favor forbs and grasses. However, it should be pointed out that not all unburned areas have a woody plant invasion. 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.

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.

Resilience management. 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.

Community 3.1
Shrub and/or Tree Community

This plant community is dominated by shrubs consisting primarily of Chickasaw plum, skunkbush sumac, and smooth sumac. Roughleaf dogwood, common buttonbush, and golden currant occur in some locations. Trees, primarily eastern redcedar (*Juniperus virginiana*), eastern cottonwood, and sandbar willow, have invaded and become established in isolated areas. Shrubs and trees combined may comprise 40 to 60 percent of the total vegetation. The spread of shrubs and trees results from the longtime absence of fire. Periodic burning tends to hinder the establishment of most of these woody species and favor forb and grass species. Birds and small mammals are instrumental in the distribution of seed and accelerating the spread of shrub and tree species over the site. Encroachment may be on areas subjected to longtime continuous overgrazing. In these situations the associated grasses will usually consist of sand dropseed, sand lovegrass, purple lovegrass, and Scribner's rosette grass. Shrubs also will invade and spread on areas where both grazing and fire have been excluded for many years. Heavy accumulations of plant mulch and litter retard herbage growth and provide a favorable habitat for seed germination and eventual establishment of many shrub species. The associated grasses in this situation are usually sand bluestem, little bluestem, Indiangrass, switchgrass, sedges, and Canada wildrye. Grass production is significantly reduced because of the shrub competition. Grass yields vary from 20 to 40 percent of the total vegetative production. Forbs generally produce 20 to 40 percent of the total. Major forbs include white sagebrush, Carruth's sagewort, redroot buckwheat, Cuman ragweed, camphorweed, and tenpetal blazingstar. Most of this annual yield is in current growth of tree leaves and twigs, which is not available to most grazers and browsers.

Many species of wildlife, especially bobwhite quail and whitetail deer, benefit from the growth of shrubs for both food and as cover. When higher wildlife populations are desired, this should be considered in any brush management plan.

Resilience management. The shrub and tree plant community is sustained by the absence of fire and brush control. Usually a prescribed burning program accompanied with prescribed grazing will gradually 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. Careful planning and execution of prescribed burning can result in brush control, reverse the grazing patterns, enhance animal performance, and increase browse availability for deer. In some locations use of chemicals as a brush management tool will be necessary to initiate and accelerate this transition.

Dominant plant species

- Chickasaw plum (*Prunus angustifolia*), shrub
- skunkbush sumac (*Rhus trilobata*), shrub
- smooth sumac (*Rhus glabra*), shrub

State 4
Tillage State

Extensive areas of the historic Sandy Floodplain plant communities were plowed and converted to production of cultivated crops by the early European settlers and subsequent generations. In addition to destroying the original plant community, repeated tillage commonly resulted in major changes in soil conditions. Reductions in organic matter, mineral levels, soil structure, oxygen levels, and water-holding capacity, along with increased runoff and erosion and shifts in the populations of soil-dwelling organisms, were common on these sites. The extent of these changes depended upon duration of cropping as well as crops grown and other management practices. The Tillage State consists of abandoned cropland that has been naturally revegetated (go-back) or planted or seeded to grassland. 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).

Characteristics and indicators. 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).

Resilience management. The Tillage State is a result of a land use management decision.

Community 4.1
Reseed Plant Community

This plant community occurs on areas that were formerly farmed and reseeded with a mixture of native species common in the Reference Plant Community. Most seeding mixtures consisted of a blend of grasses that include sand bluestem, Indiangrass, switchgrass, little bluestem, sideoats grama, blue grama, and western wheatgrass. In some locations, seed of legumes and forbs such as prairie bundleflower and Maximilian sunflower were included in the mixture. Once these areas become fully established, production is comparable to that of the Reference Plant Community. Total annual production varies according to the species planted, established plants, and years of establishment. 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 growing on the native rangeland areas. When feasible, reseeded plant communities should be managed as separate pastures or units. Some seeded areas are invaded by trees and shrubs during the establishment period of the desired plants. These invader species commonly include elm, common hackberry, eastern redcedar, and eastern cottonwood. Occasional burning is effective in controlling establishment of these woody plants.

Resilience management. Following termination of cultivation, total annual production is quite variable and full recovery of the original plant community, including forbs and legumes, may take many decades. Additions of

organic matter and minerals, deferred grazing, prescribed burning, and related management practices described for this ecological site can be beneficial to the rehabilitation.

Community 4.2
Go-back Plant Community

This plant community also occurs on areas that were formerly farmed. When tillage operations ceased, the areas were allowed to revegetate or “go back” naturally in contrast to artificial reseeding to a selected species or group of species. The go-back process is a slow, gradual transformation that requires many years and many successional changes or stages in the plant community. The speed and extent of revegetation depends on 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, slender snakecotton, Canadian horseweed, prairie sunflower, common sunflower, Mexican fireweed, camphorweed, and annual buckwheat. Gradually these are replaced by annual grasses including prairie threeawn, mat sandbur, tumblegrass, little barley, cheatgrass, and witchgrass. As plant succession progresses the plant community gradually becomes dominated by perennials. The major grasses include sand dropseed, composite dropseed, thin paspalum, purple lovegrass, red lovegrass, Scribner’s rosette grass, Carolina crabgrass, silver beardgrass, and tumble windmillgrass. Common forbs are Cuman ragweed, white sagebrush, Carruth’s sagewort, white heath aster, Missouri goldenrod, and sand milkweed. Combinations of these plants can form a stable community. In time with prescribed grazing management, other perennial grasses and forbs common in the Reference Plant Community will return to the site. Blue grama is a shortgrass that is very common to the native plant communities on this site. However, it seldom occurs in go-back communities, even after 40 to 50 years of plant succession. Some go-back areas are invaded by trees and shrubs. The more common include elm, common hackberry, eastern redcedar, eastern cottonwood, and roughleaf dogwood. Occasional burning is effective in controlling these woody plants. Total annual production varies by site. This depends upon seasonal precipitation and the stage of plant succession in the plant community.

Resilience management. Following termination of cultivation, total annual production is quite variable and full recovery of the original plant community, including forbs and legumes, may take many decades. Additions of organic matter and minerals, deferred grazing, prescribed burning, and related management practices described for this ecological site can be beneficial to the rehabilitation.

Transition 1 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.

Constraints to recovery. The ecological processes affected are the hydrologic and nutrient cycles. 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.

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 throughout interception and evaporation; therefore, less precipitation is available for producing herbaceous forage or for deep drainage or runoff (Thurow and Hester, 1997).

Constraints to recovery. Recovery is possible through management.

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 and 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 needed in order 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, to 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 be 16 percent of the total rainfall amount per year (Thurow and Hester, 1997).

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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses dominant 58%**			1225–3200	
	sand bluestem	ANHA	*Andropogon hallii*	700–1405	–
	switchgrass	PAVI2	*Panicum virgatum*	200–602	–
	Indiangrass	SONU2	*Sorghastrum nutans*	200–600	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	100–400	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	25–200	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–70	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–22	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–22	–
	purpletop tridens	TRFL2	*Tridens flavus*	0–22	–
2	**Midgrasses subdominant 16%**			500–865	

	little bluestem	SCSC	*Schizachyrium scoparium*	500–803	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–70	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–70	–
3	**Cool-season grasses minor 9%**			200–500	
	Canada wildrye	ELCA4	*Elymus canadensis*	70–120	–
	sedge	CAREX	*Carex*	60–100	–
	western wheatgrass	PASM	*Pascopyrum smithii*	20–80	–
	Virginia wildrye	ELVI3	*Elymus virginicus*	20–70	–
	Schweinitz's flatsedge	CYSC3	*Cyperus schweinitzii*	20–70	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	20–70	–
4	**Shortgrasses trace 2%**			0–110	
	blue grama	BOGR2	*Bouteloua gracilis*	0–25	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–25	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–25	–
Forb					
5	**Forbs minor 10%**			300–550	
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	30–100	–
	prairie sunflower	HEPE	*Helianthus petiolaris*	20–60	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	10–50	–
	wholeleaf rosinweed	SIIN2	*Silphium integrifolium*	5–30	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	5–30	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	5–30	–
	Canada goldenrod	SOCA6	*Solidago canadensis*	15–30	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	5–30	–
	downy ragged goldenrod	SOPE	*Solidago petiolaris*	5–30	–
	Fendler's aster	SYFE	*Symphyotrichum fendleri*	10–30	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	5–30	–
	hoary verbena	VEST	*Verbena stricta*	5–30	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	5–30	–
	white vervain	VEUR	*Verbena urticifolia*	5–30	–
	Texas croton	CRTE4	*Croton texensis*	5–30	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	5–30	–
	white heath aster	SYER	*Symphyotrichum ericoides*	5–30	–
	cup plant	SIPE2	*Silphium perfoliatum*	5–30	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	5–20	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–20	–
Shrub/Vine					
6	**Shrubs and/or Trees minor 5%**			60–275	
	soapweed yucca	YUGL	*Yucca glauca*	15–50	–
	American plum	PRAM	*Prunus americana*	10–50	–
	boxelder	ACNE2	*Acer negundo*	5–25	–

	Chickasaw plum	PRAN3	*Prunus angustifolia*	5–25	–
	chokecherry	PRVI	*Prunus virginiana*	5–25	–
	eastern cottonwood	PODE3	*Populus deltoides*	0–25	–
	green ash	FRPE	*Fraxinus pennsylvanica*	5–25	–
	common hackberry	CEOC	*Celtis occidentalis*	5–25	–
	honeylocust	GLTR	*Gleditsia triacanthos*	5–25	–
	American elm	ULAM	*Ulmus americana*	5–25	–
	sandbar willow	SAIN3	*Salix interior*	0–10	–

Animal community

The Sandy Floodplain ecological site provides wildlife habitat similar to the subirrigated ecological site except for the absence of free water most of the time. It is excellent habitat due to plant diversity and its location to a stream. The site is characterized by scattered willow and cottonwood trees and occasional mottes of low brush which create a preferred habitat for white-tail deer, wild turkey, quail, pheasant, squirrel, cottontail rabbit, migrant waterfowl, and mourning dove. Furbearers such as mink, raccoon, skunk, and opossum are common, as are predators such as the bobcat, coyotes, and red fox. The site is especially valuable as winter cover for many of these same species including deer, pheasant, quail, and rabbit.

Songbirds are common to the site and include scissortailed flycatchers, eastern and western kingbirds, brown thrasher, eastern bluebird, and redwinged blackbird. Hawks and owls commonly make use of this habitat while bald eagles occasionally use it.

Some animals are important because of their threatened and endangered status and require special consideration. Please check the Kansas Department of Wildlife and Parks and Tourism (KDWPT) 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, 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

Following are the estimated withdrawals of freshwater by use in MLRA 74:
Public supply—surface water, 6.6%; ground water, 5.7%; Livestock—surface water, 0.3%; ground water, 4.2%;

Irrigation— surface water, 70.8%; ground water, 0.5%; Other—surface water, 12.0%; ground water, 0.0%.

The total withdrawals average 210 million gallons per day (795 million liters per day). About 10 percent is from ground water sources, and 90 percent is from surface water sources. If moisture is carefully conserved, the moderate precipitation generally is adequate for crops and pasture. The surface water is generally suitable for most uses with appropriate treatment. Water is stored in reservoirs outside this area for public supply, industry, and irrigation within this area. Some in-stream diversions also are used.

Cass and Inavale soils are hydrologic group B soils and Sarpy is a hydrologic group A soil. These soils are moderately deep to deep, well drained to excessively drained soils. They have moderately rapid to very rapid 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

The Sandy Floodplain site is often used for outdoor recreational pursuits because of its plant and wildlife diversity. Big game, white-tail deer, and wild turkey are abundant and commonly hunted on this site 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 and 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.

Wood products

Sometimes eastern redcedar will reach logging size.

Other products

Two shrubs, Chickasaw plum and golden currant, are highly prized for making jellies and jams.

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, 10/04/2019

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Rangeland health reference sheet

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

Author(s)/participant(s)	Chris Tecklenburg/Revision 12-17-2018 David Kraft, John Henry, Doug Spencer and Dwayne Rice/original authors 1-15-2005
Contact for lead author	State Rangeland Management Specialist for Kansas
Date	10/03/2019
Approved by	Chris Tecklenburg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** No natural rill formation common or part of the Sandy Floodplain ecological site.

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2. **Presence of water flow patterns:** There are no water flow patterns evidenced by litter, soil, or gravel redistribution, or pedestalling of vegetation or stones that break the flow of water as a result of overland flow.

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3. **Number and height of erosional pedestals or terracettes:** There is no evidence of pedestals or terracettes that would indicate the movement of soil by water and/or by wind on this site.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Less than 5% bare ground is found on this site. It is the remaining ground cover after accounting for ground surface covered by vegetation (basal and canopy [foliar] cover), litter, standing dead vegetation, gravel/rock, and visible biological crust (e.g., lichen, mosses, algae).

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5. **Number of gullies and erosion associated with gullies:** No evidence of accelerated water flow resulting in downcutting of the soil.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** No wind-scoured or blowout areas where the finer particles of the topsoil have blown away, sometimes leaving residual gravel, rock, or exposed roots on the soil surface. Also, there are no areas of redeposited soil onto this site from another site due to the wind, i.e., depositional areas.

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7. **Amount of litter movement (describe size and distance expected to travel):** No evidence of litter movement (i.e., dead plant material that is in contact with the soil surface).

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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):** Soil surfaces may be stabilized by soil organic matter which has been fully incorporated into aggregates at the soil surface, adhesion of decomposing organic matter to the soil surface, and biological crusts. A soil stability kit will score a range from 5-6.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Cass OSD:

   Ap--0 to 18 centimeters (0 to 7 inches); grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary. (15 to 23 centimeters (6 to 9 inches) thick)

   A--18 to 30 centimeters (7 to 12 inches); grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft; very friable; neutral; gradual smooth boundary. (10 to 28 centimeters (4 to 11 inches) thick)

   AC--30 to 51 centimeters (12 to 20 inches); gray (10YR 5/1) fine sandy loam, dark gray (10YR 4/1) moist; weak coarse prismatic structure; soft; very friable; slightly acid; gradual smooth boundary. (0 to 38 centimeters (0 to 15 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:** Functional and structural groups have not changed that inhibits the capture and storage of precipitation.

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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 a compacted soil layer less than 6 inches from the soil surface. Soil structure is similar to that described in Indicator 9. Compacted physical features will include platy, blocky, dense soil structure over less dense soil layers, horizontal root growth, and increase bulk density (measured by weighing a known volume of oven-dry soil).

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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: Group 1 Tallgrass dominant 58% 3200 lbs.; sand bluestem 700-1405, switchgrass 200-600, Indiangrass 200-

600, eastern gamagrass 100-400, porcupinegrass 25-200, prairie sandreed 0-70, composite dropseed 0-22, sand dropseed 0-22, purpletop tridens 0-22

Sub-dominant: Group 2 Midgrasses subdominant 16% 865 lbs.; little bluestem 500-803, sideoats grama 0-70, sand lovegrass 0-70

Other: Group 3 Cool-season grasses 9% 500 lbs.; Canada wildrye 70-120, sedge 60-100, western wheatgrass 20-80, Scribner's rosette grass 20-70, Virginia wildrye 20-70, Schweinitz's flatsedge 20-70
Group 4 Shortgrasses Trace 2% 110 lbs. ; buffalograss 0-25, blue grama 0-25, hairy grama 0-25

Additional: Group 5 Forbs Minor 10% 550 lbs
Group 6 Trees/Shrubs Minor 5% 275 lbs.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Recruitment of plants is occurring and there is a mixture of many age classes of plants. The majority of the plants are alive and vigorous. Some mortality and decadence is expected for the site, 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):** All species (e.g., native, seeded, and weeds) alive in the year of the evaluation, are included in the determination of total above ground production. Site potential (total annual production) ranges from 4,000 lbs in a below-average rainfall year and 6,500 lbs in an above-average rainfall year. The representative value for this site is 5,500 lbs production per year.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** There are no noxious weeds present. Invasive plants make up a small percentage of plant community, and invasive brush species are < 5% canopy.

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17. **Perennial plant reproductive capability:** The number and distribution of tillers or rhizomes is assessed on perennial plants occupying the evaluation area. No reduction in vigor or capability to produce seed or vegetative tillers given the constraints of climate and herbivory.
