USDA Natural Resources Conservation Service

Ecological site HX074XY113
Loamy Floodplain

Last updated: 10/04/2019
Accessed: 05/17/2024

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. More than one-half of the area is 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 the hazard of 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 Loamy Floodplain ecological site was formerly known as Loamy Upland R074XY013KS. This site is made up of alluvial soils which occur on the floodplains of drainageways or river valleys. The Loamy Floodplain site has very deep soils with loamy to silty surface and subsurfaces. This site is occasionally or frequently flooded.

Associated sites

HX074XY115	**Loamy Hills** The Loamy Hills ecological site sits adjacent to and in conjunction with the Loamy 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.

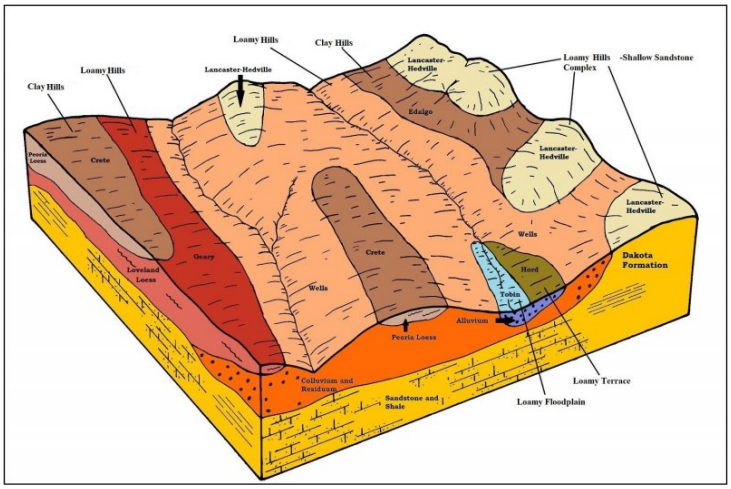


Figure 1. MLRA 74 ESD block diagram.

Table 1. Dominant plant species

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

Legacy ID

R074XY113KS

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 bottom land is along the small streams.
The elevation generally ranges from 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 Loamy Floodplain ecological site occurs on nearly level lands that are subject to flooding. The soils are deep alluvial soils with loamy to silty surface and subsurface textures.

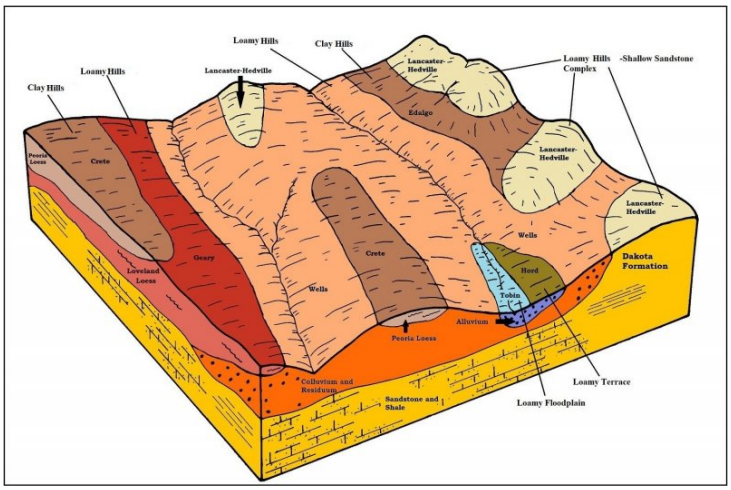


Figure 2. MLRA 74 ESD block diagram.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Drainageway
Runoff class	Low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Elevation	300–600 m
Slope	0–3%
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)	149-154 days
Freeze-free period (characteristic range)	178-191 days
Precipitation total (characteristic range)	737-813 mm
Frost-free period (actual range)	145-157 days
Freeze-free period (actual range)	175-193 days
Precipitation total (actual range)	711-838 mm
Frost-free period (average)	152 days
Freeze-free period (average)	185 days

Precipitation total (average)	787 mm

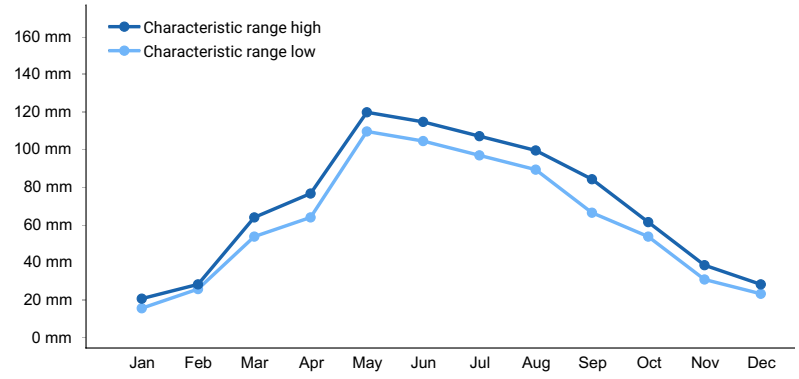


Figure 3. Monthly precipitation range

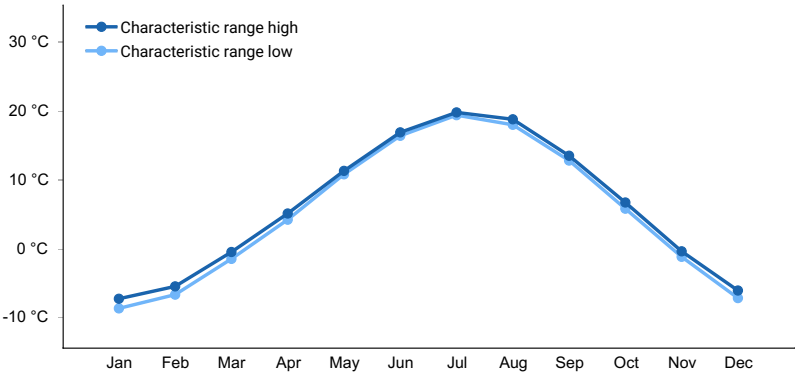


Figure 4. Monthly minimum temperature range

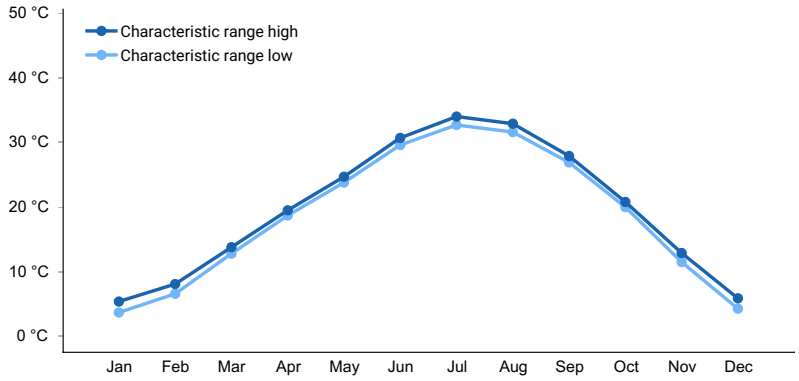


Figure 5. Monthly maximum temperature range

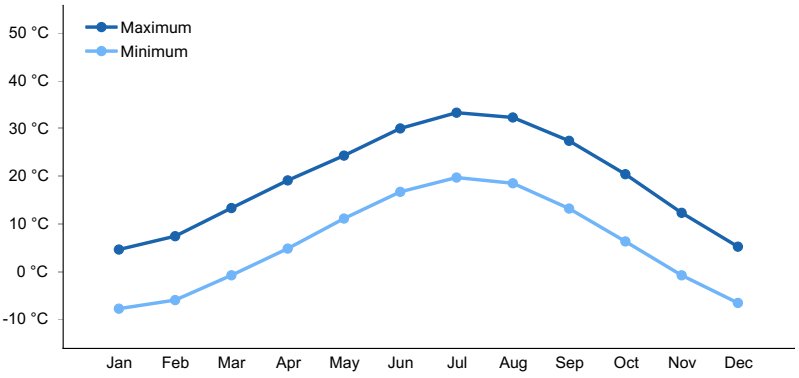


Figure 6. Monthly average minimum and maximum temperature

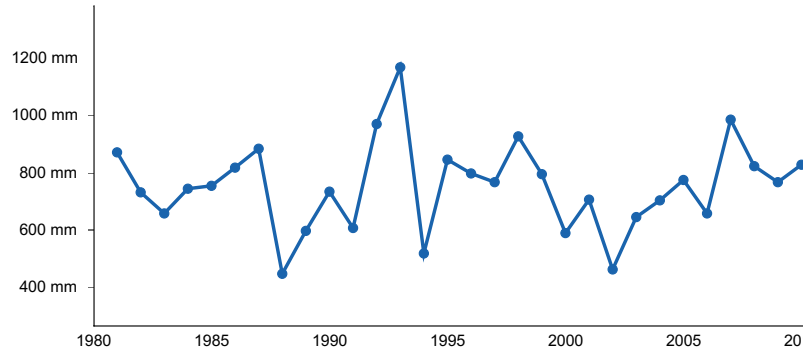


Figure 7. Annual precipitation pattern

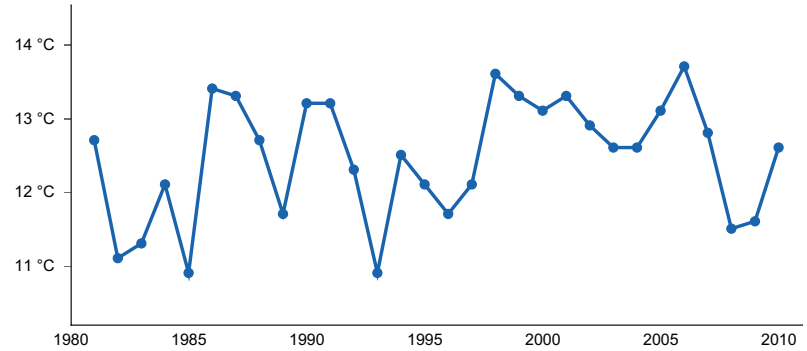


Figure 8. Annual average temperature pattern

Climate stations used

- (1) WASHINGTON [USC00148578], Washington, KS
- (2) CONCORDIA MUNI AP [USW00013984], Concordia, KS
- (3) CONCORDIA 1 W [USC00141761], Concordia, KS
- (4) CLAY CTR [USC00141559], Clay Center, KS
- (5) MINNEAPOLIS [USC00145363], Minneapolis, KS
- (6) SALINA MUNI AP [USW00003919], Salina, KS
- (7) SMOLAN 1NE [USC00147551], Lindsborg, KS
- (8) KANOPOLIS LAKE [USC00144178], Ellsworth, KS
- (9) MCPHERSON [USC00145152], McPherson, KS

Influencing water features

All soils representing the Loamy Floodplain ecological site are subject to flooding. Water tables may reach into the root zone during wetter periods. A high water table is usually not the dominant factor controlling plant growth unless it remains wet for an extended period of time. The soils are typically well drained and moderate permeability. The available water capacity of this site is high.

Wetland description

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

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 an eventual change in the stream type to a less stable system.

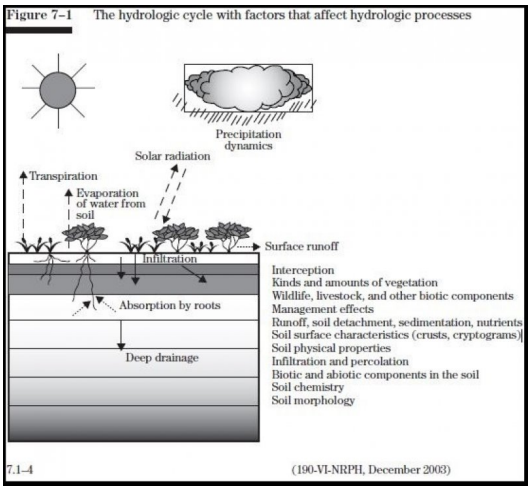


Figure 9. Fig. 7-1 from the National Range and Pasture Handbook.

Soil features

Soils found on this site are Grigston, Hobbs, Huscher, McCook, and Tobin. The soils on this site are alluvial soils occurring in the floodplain and are well drained. They are very deep soils with loamy to silty surface and subsurface textures. Permeability is moderate and the available water capacity is high. Locally, water tables may rise into the root zone during wetter periods on this site. These soils have occasional to frequent flooding.

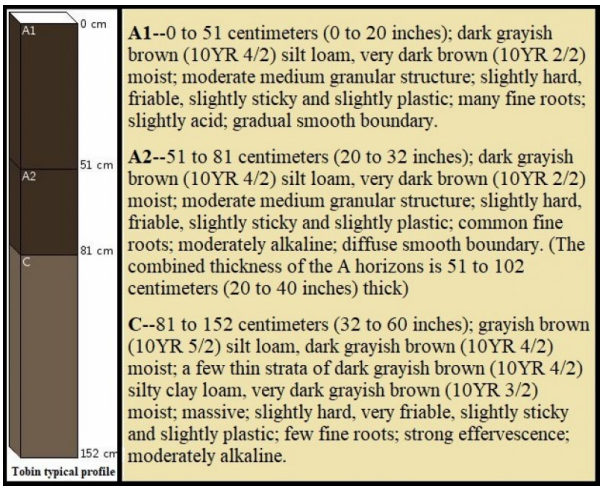


Figure 10. MLRA 74 typical soil profile and description of Tobin.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam
Family particle size	(1) Coarse-silty (2) Fine-silty
Drainage class	Well drained
Permeability class	Moderate
Soil depth	203 cm
Available water capacity (0-101.6cm)	22.86–34.29 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%

Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4

Ecological dynamics

The Loamy Floodplain ecological site in MLRA 74 consists of dynamic plant communities resulting from 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 subjected periodically to intense wildfires. The plants that evolved and dominated the original plant community were well adapted to these climatic, soil, and biological conditions.

The deep, fertile soils representative of this site have loamy surfaces and often receive extra moisture from overflow or run-in on adjacent slopes. Some locations have water tables that are within reach of the deep rooted tall grasses 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 floodplains, usually adjacent to rivers or streams. A large portion is located along the major drainages that includes the Smokey Hill, Saline, Solomon, and Republican Rivers and tributaries. The Loamy Floodplain ecological site may also occur along narrow drainageways on upland locations. Frequent to occasional flooding and siltation may occur in some locations as a result of stream overflow. The soil and plant moisture relationship is effective and the site is very productive.

The plant community developed with occasional fires as an important part of the ecological processes. Historically fires were usually started by lightning, typically during spring and early summer months when thunderstorms were most prevalent. It is also recognized that native inhabitants often used fire to attract herds of migratory herbivores, especially bison. These intentional fires probably occurred more frequently, even on an annual basis 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 river banks 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 was probably intense. When herds moved to adjacent areas, grazed vegetation was afforded an extended period of rest and recovery during the growing season. However, this grazing regime was altered during extended drought periods. Due to the proximity to streams, grazing animals are attracted to the Loamy Floodplain site. Utilization could be much more concentrated in dry times versus during normal periods of precipitation. 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. Fluctuations in precipitation directly influenced site productivity from year to year, but composition of the plant community usually remained stable. Available water capacity is high and the deep-rooted tallgrasses benefit from moisture stored throughout the soil profile and in some cases from seasonal water tables.

Flooding that results from intense thunderstorms is usually brief and inundation is temporary. All major plants have rhizomes which facilitate in their recovery from occasional siltation deposited during flood events.

As utilization of the area for production of domestic livestock replaced roaming herds of bison, the ecological dynamics of the site were altered. Often the plant community 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. The 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 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.

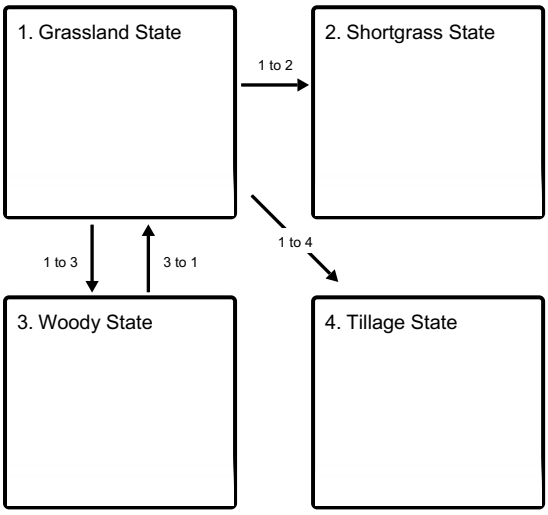
The frequency and role that fires played in maintaining the plant community was reduced with the advent of roads, cultivated fields, and fire suppression techniques developed by European settlers. Use of prescribed fire as a management tool has also diminished in some localities, especially surrounding 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 being 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



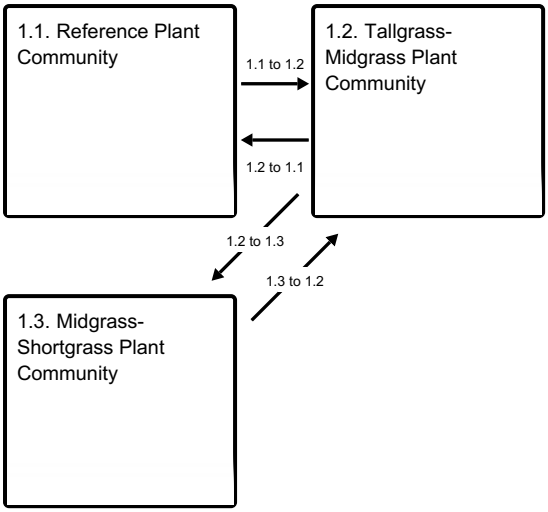
1 to 2 - Long-term, heavy, continuous overgrazing, no rest and recovery

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



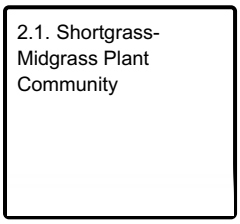
1.1 to 1.2 - Heavy, continuous grazing without adequate rest and recovery

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

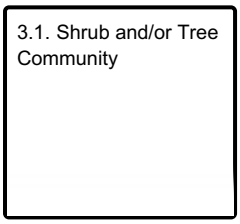
1.2 to 1.3 - Long-term (>20 years) continuous grazing with no rest and no recovery

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

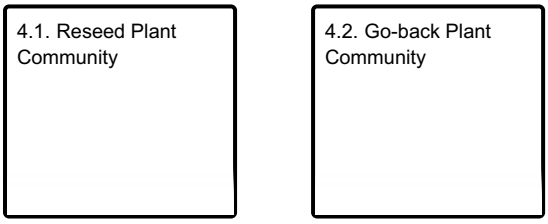
State 2 submodel, plant communities



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 Clay Hills 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 Loamy Floodplain 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 big bluestem, Indiangrass, switchgrass, eastern gamagrass, and prairie cordgrass. All of these grasses and most of the dominant forbs are strongly rhizomatous. These underground stems often form a dense, intertwined mass throughout the upper four or five inches of the soil profile. Combined these tall grasses will account for 75 to 85 percent of the total vegetation produced annually. Little bluestem is the major midgrass. Other prevalent midgrasses and grasslike plants are Canada wildrye, Virginia wildrye, western wheatgrass, 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, compassplant, wholeleaf rosinweed, and prairie bundleflower. Other important forbs are Canada goldenrod, white heath aster, tall blazing star, white sagebrush, American licorice, roundhead lespedeza, and white prairie clover. Desert false indigo and common buttonbush are shrubs that commonly occur, especially along upland drainageways. Eastern cottonwood and black willow are the major trees in the broad floodplains and are generally located along streambanks. Although the major portion of the site was dominated by herbaceous plants, isolated areas supported groves of trees. The protection by streams and rivers allowed some of these tree areas to escape the intensity of wildfires. These areas often developed a savannah plant community with an overstory of hardwood trees that may include eastern cottonwood, black willow, bur oak, American elm, green ash, and black walnut. Eastern cottonwood is the dominant tree and often forms 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. 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 to favor big bluestem, Indiangrass, and eastern gamagrass. Growth of warm-season grasses on this site typically begins during the period of May 1 to May 15 and continues until mid 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 and eastern gamagrass will occasionally initiate spring growth in early April 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 spring (March through early June) and again in the fall (September and October). Some growth may occur in winter months during periods of unseasonably mild temperatures.

Resilience management. This is a stable plant community when grazing and fire are adequately managed. A prescribed grazing program that incorporates periods of deferment during the growing season benefits the tallgrasses and even the more palatable forb species. Concentrated livestock use, such as winter feeding areas,

can cause compaction of the wet, clay soils and stress the dominant tallgrasses.

Dominant plant species

- false indigo bush (*Amorpha fruticosa*), shrub
- common buttonbush (*Cephalanthus occidentalis*), shrub
- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- eastern gamagrass (*Tripsacum dactyloides*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3811	5716	7622
Forb	448	673	897
Shrub/Vine	224	336	448
Total	**4483**	**6725**	**8967**

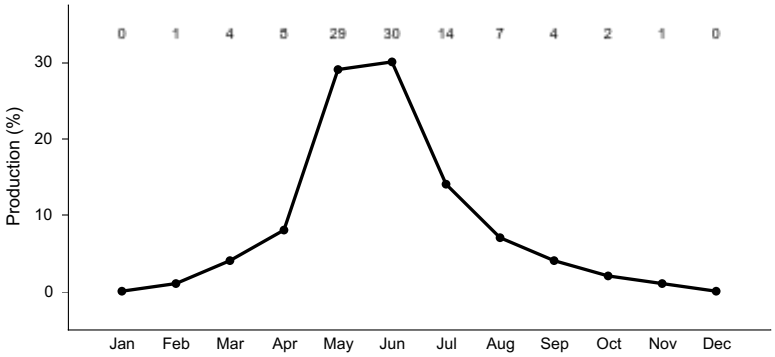


Figure 13. Plant community growth curve (percent production by month). KS7405, Loamy Lowland.

Community 1.2
Tallgrass-Midgrass Plant Community

Figure 14. MLRA 74 Tallgrass-Midgrass Plant Community.

This plant community developed as a result of many years of repeated, heavy grazing. The composition of this plant community is dominated by a mixture of tallgrasses and midgrasses. Compared with the Reference Plant Community, there has been a decrease in the more palatable tallgrasses and forbs and a subsequent increase in midgrasses. Although reduced by overgrazing tall grasses, 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 bristle grass, and

sideoats grama. Other secondary grasses that have increased are Texas bluegrass, Kentucky bluegrass, vine mesquite, smooth bromegrass 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, compassplant, and prairie bundleflower have decreased and largely been replaced by white heath aster, white sagebrush, Cuman ragweed, Baldwin's 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 false indigo bush, common buttonbush, rough leaf dogwood, smooth sumac, Great Plains false willow (Baccaris salicina), 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 in 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 health and 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

- eastern cottonwood (*Populus deltoides*), tree
- American elm (*Ulmus americana*), tree
- black willow (*Salix nigra*), tree
- false indigo bush (*Amorpha fruticosa*), shrub
- coralberry (*Symphoricarpos orbiculatus*), shrub
- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass

Community 1.3
Midgrass-Shortgrass Plant Community

Figure 15. MLRA 74 Midgrass-Shortgrass Plant Community.

This plant community developed as a result of long-term, heavy, continuous overgrazing. The amount of tallgrasses has decreased significantly and the site is dominated by midgrasses and shortgrasses. Major midgrasses are composite dropseed, sand dropseed, silver beardgrass, purpletop tridens, sideoats grama, western wheatgrass, and marsh bristlegrass. Two introduced cool-season grasses, smooth bromegrass (*Bromus inermis*) and tall fescue (Lolium arundenaceum), commonly invade this plant community. 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 drainageways are desert false indigo, common buttonbush, rough leaf 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, prairie cordgrass, eastern gamagrass, and switchgrass are only found in protected locations. These plants are usually grazed repeatedly and remain in a low state of health and vigor. Of these remnants, big bluestem is generally the most abundant. It has rhizomes that can persist for many years in a weakened condition. When in this state of vigor, 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 remnant plants respond favorably to periods of rest from grazing and may regain vigor in two to three years. However, their numbers or percentage of composition is greatly reduced that it may take many years to regain a large role in the plant community. Prescribed grazing with adequate rest and recovery periods during the growing season will shift this plant community to include more productive tallgrasses. With continued management the taller grasses will gradually increase in vigor and abundance to dominate the landscape.

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
- Osage-orange (*Maclura pomifera*), tree
- false indigo bush (*Amorpha fruticosa*), shrub
- common buttonbush (*Cephalanthus occidentalis*), shrub
- roughleaf dogwood (*Cornus drummondii*), shrub
- coralberry (*Symphoricarpos orbiculatus*), shrub
- composite dropseed (*Sporobolus compositus var. compositus*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- silver beardgrass (*Bothriochloa laguroides*), grass
- purpletop tridens (*Tridens flavus*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- marsh bristlegrass (*Setaria parviflora*), 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 ten years will shift functional and structural plant group dominance towards 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 or maintenance.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.2 to 1.3
Community 1.2 to 1.3

Tallgrass-Midgrass Plant Community

Midgrass-Shortgrass 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 towards a Midgrass-Shortgrass Plant Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3 to 1.2
Community 1.3 to 1.2

Midgrass-Shortgrass 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 or 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 has 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-Midgrass Plant Community

This plant community presents a distinctive shortgrass aspect on the landscape. It is dominated by a mixture of shortgrasses and midgrasses. It occurs following many years of heavy, 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 arvensis*), 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, and white sagebrush. A number of thistles, both native and introduced, are common in this plant community and may include wavyleaf thistle, yellowspine thistle, tall thistle, Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), and nodding pumeless thistle (*Carduus nutans*). The most common shrub 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, common sunflower (*Helianthus annuus*), and poison hemlock (*Conium maculatum*). Although productivity is significantly reduced, when compared to the Reference Plant Community, this plant community can be managed as a stable community. Currently, restoration to the Grassland State has not been observed.

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

- coralberry (*Symphoricarpos orbiculatus*), shrub
- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- Carolina crabgrass (*Digitaria pubiflora*), grass
- thin paspalum (*Paspalum setaceum*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass
- silver beardgrass (*Bothriochloa laguroides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- vine mesquite (*Panicum obtusum*), 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

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 in a period as short as 20 to 30 years. Cottonwood and willow produce an abundance of seed that is distributed by the wind for long distances. Russian olive, common hackberry and eastern redcedar are spread by birds. Periodic burning tends to hinder the establishment of most of these woody species and favor forb and grass species. 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, smooth bromegrass, 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. Herbage production is significantly reduced because of the tree and shrub competition for light and moisture. Grass yields vary from 30 to 40 percent of the total vegetative production. Forbs generally produce 5 to 10 percent of the total. Usually a prescribed burning program, accompanied with a plan of prescribed grazing, 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 having the intensity to control the 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.

Resilience management. The shrub and tree plant community is sustained by the absence of fire and brush control.

Dominant plant species

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

- Siberian elm (*Ulmus pumila*), tree
- common hackberry (*Celtis occidentalis*), tree
- Osage-orange (*Maclura pomifera*), tree
- eastern redcedar (*Juniperus virginiana*), tree
- Russian olive (*Elaeagnus angustifolia*), tree
- roughleaf dogwood (*Cornus drummondii*), shrub
- coralberry (*Symphoricarpos orbiculatus*), shrub
- smooth sumac (*Rhus glabra*), shrub
- false indigo bush (*Amorpha fruticosa*), shrub
- common buttonbush (*Cephalanthus occidentalis*), shrub
- Texas bluegrass (*Poa arachnifera*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass

State 4
Tillage State

Extensive areas of the historic Loamy 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/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/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. The tillage state 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 the 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 earlier 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, smooth bromegrass, 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 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 on 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 earlier 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, 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 (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass dominant 73%**			2802–4909	
	big bluestem	ANGE	*Andropogon gerardii*	1121–2690	–
	switchgrass	PAVI2	*Panicum virgatum*	448–1009	–
	Indiangrass	SONU2	*Sorghastrum nutans*	448–1009	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	448–1009	–
	prairie cordgrass	SPPE	*Spartina pectinata*	224–673	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	112–336	–
2	**Midgrasses minor 6%**			168–404	
	little bluestem	SCSC	*Schizachyrium scoparium*	112–336	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	28–112	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–22	–

3	**Cool-season grasses minor 5%**			112–336	
	western wheatgrass	PASM	*Pascopyrum smithii*	28–140	–
	Canada wildrye	ELCA4	*Elymus canadensis*	28–140	–
	Virginia wildrye	ELVI3	*Elymus virginicus*	28–140	–
	sedge	CAREX	*Carex*	0–56	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–56	–
4	**Shortgrasses trace 1%**			0–67	
	blue grama	BOGR2	*Bouteloua gracilis*	0–34	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–34	–
Forb					
5	**Forbs minor 10%**			168–673	
	upright prairie coneflower	RACO3	*Ratibida columnifera*	11–34	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	6–34	–
	hoary verbena	VEST	*Verbena stricta*	0–34	–
	common yarrow	ACMI2	*Achillea millefolium*	0–34	–
	yellowspine thistle	CIOC2	*Cirsium ochrocentrum*	0–34	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	6–34	–
	white heath aster	SYER	*Symphyotrichum ericoides*	11–34	–
	Carolina woollywhite	HYSCC	*Hymenopappus scabiosaeus var. corymbosus*	17–34	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	11–34	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	11–34	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	11–22	–
	ashy sunflower	HEMO2	*Helianthus mollis*	0–22	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–22	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	11–22	–
	compassplant	SILA3	*Silphium laciniatum*	11–22	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–22	–
	prairie blazing star	LIPY	*Liatris pycnostachya*	0–22	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	11–22	–
	roundhead lespedeza	LECA8	*Lespedeza capitata*	11–22	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–22	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	11–22	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–22	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	6–22	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	0–22	–
Shrub/Vine					
6	**Shrubs and Trees minor 5%**			84–336	
	leadplant	AMCA6	*Amorpha canescens*	0–39	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–39	–
	American elm	ULAM	*Ulmus americana*	0–39	–

	American plum	PRAM	*Prunus americana*	0–39	–
	eastern cottonwood	PODE3	*Populus deltoides*	0–39	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–39	–
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–39	–
	bur oak	QUMA2	*Quercus macrocarpa*	0–39	–
	common hackberry	CEOC	*Celtis occidentalis*	0–39	–

Animal community

This site is excellent wildlife habitat because of its plant diversity and its proximity to riparian areas. The site is preferred habitat for white-tail deer, wild turkey, quail, pheasant, squirrel, cottontail rabbit, and migrant waterfowl and mourning dove as well. Furbearers such as mink, raccoon, skunk, and opossum are common as are coyotes and red fox. The encroachment of woody species can make this site even more attractive to a wide variety of wildlife species.

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 use this habitat and bald eagles will occasionally utilize it as well.

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, 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 upon 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 inMLRA 74:
Public supply—surface water, 6.5%; 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.

Recreational uses

The Loamy Floodplain ecological site is often used for outdoor recreational pursuits because of its plant and wildlife diversity. 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. Recurrent flooding and sediment deposition are a site hazard.

Wood products

In some locations there have been commercial harvests of eastern cottonwood and limited harvests of black walnut and bur oak. 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 was used extensively to develop this ecological site description.

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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 11-8-2018 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 Loamy 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):** Tobin OSD:

   A1--0 to 51 centimeters (0 to 20 inches); dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; slightly acid; gradual smooth boundary.

   A2--51 to 81 centimeters (20 to 32 inches); dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; moderately alkaline; diffuse smooth boundary. (The combined thickness of the A horizons is 51 to 102 centimeters (20 to 40 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 are that of the Reference Plant Community (see functional and structural group worksheet). Note changes to plant communities if different than that of the functional and structural group worksheet.

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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 73% 4380 lbs.; big bluestem 1000-2400, switchgrass 400-900, Indiangrass 400-900, eastern gamagrass 400-900, prairie cordgrass 200-600, composite dropseed 100-300

    Sub-dominant: None

    Other: Group 2 Midgrasses Minor 6% 360 lbs.; little bluestem 100-300, sideoats grama 25-100, purple threeawn 0-20 Group 3 Cool-season grasses Minor 5% 300 lbs.; Canada wildrye 25-125, Virginia wildrye 25-125, western wheatgrass

25-125, Scribner's rosette grass 0-50, sedge 0-50
Group 4 Shortgrass Trace 1% 60 lbs.; blue grama 0-30, buffalograss 0-30

Additional: Group 5 Forbs Minor 10% 600 lbs
Group 6 Shrubs and Trees Minor 5% 300 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 8,000 lbs in an above-average rainfall year. The representative value for this site is 6,000 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.
