USDA Natural Resources Conservation Service

Ecological site HX074XY132
Subirrigated

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Accessed: 07/17/2024

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 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 Subirrigated ecological site occurs on level to nearly level land adjacent to major streams. Soils on this site are characterized as very deep with a high water table less than 6 feet from the surface but is generally within 1 foot to 4 feet. Textures can range from sandy to clayey.

Associated sites

HX074XY122	**Sand Plains** The Sand Plains ecological site can be found adjacent to and in conjunction with the Subirrigated ecological site. The Sand Plains site was formerly known as Sands R074XY021KS and Sandy R074XY022KS. It is made up of sandy soils generally with greater than 52 percent sand at the surface. Located on nearly level to moderately steep uplands, the Sand Plains site has deep soils with loamy sand and sandy loam surface textures.
HX074XY113	**Loamy Floodplain** The Loamy Floodplain ecological site sits adjacent to and in conjunction with the Subirrigated site. 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.
HX074XY104	**Clay Lowland** The Clay Lowland ecological site sits adjacent to and in conjunction with the Subirrigated ecological site. The Clay Lowland site was formerly known as Clay Lowland R074XY004KS. It is made up of alluvial soils which occur on the floodplains or low terraces of drainageways or river valleys. The Clay Lowland site has deep to very deep soils with silty clay loam, silty clay, and clay surface textures. This site is very rarely to frequently flooded.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Spartina pectinata*

Legacy ID

R074XY132KS

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. The 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 Subirrigated ecological site occurs on level to nearly level land adjacent to major streams. Soils on this site are characterized as deep, loamy soils with a high water table generally within 1 foot to 4 feet of the soil surface. Locally the soils can be moderately saline.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain (2) River valley > Interdune (3) River valley > Depression

Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding duration	Very brief (4 to 48 hours) to long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	1,100–2,000 ft
Slope	0–2%
Ponding depth	2–20 in
Water table depth	0–25 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)	147-156 days
Freeze-free period (characteristic range)	175-190 days
Precipitation total (characteristic range)	30-33 in
Frost-free period (actual range)	139-158 days
Freeze-free period (actual range)	170-196 days
Precipitation total (actual range)	29-33 in
Frost-free period (average)	150 days
Freeze-free period (average)	184 days
Precipitation total (average)	31 in

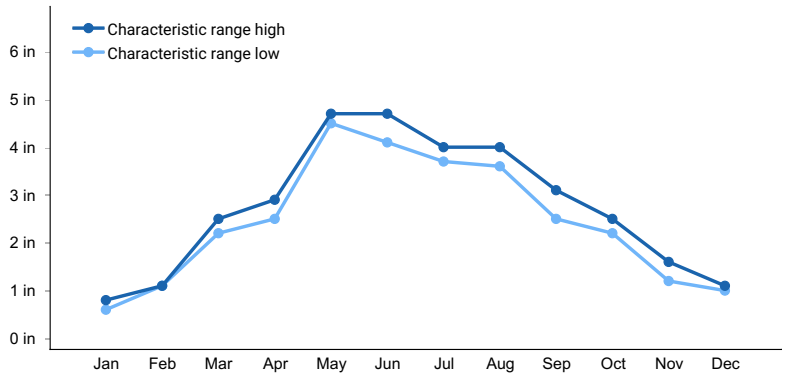


Figure 1. Monthly precipitation range

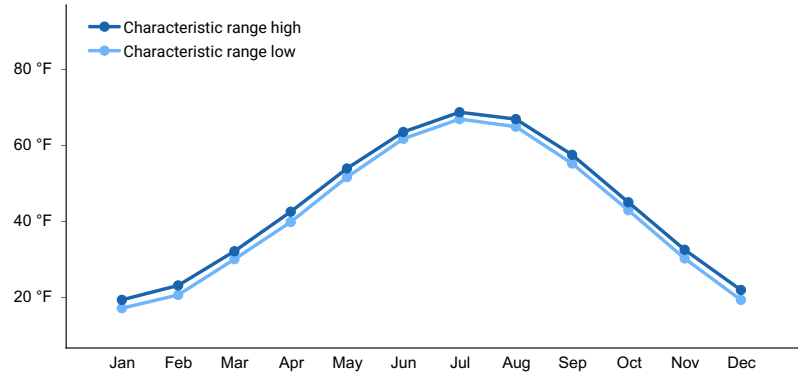


Figure 2. Monthly minimum temperature range

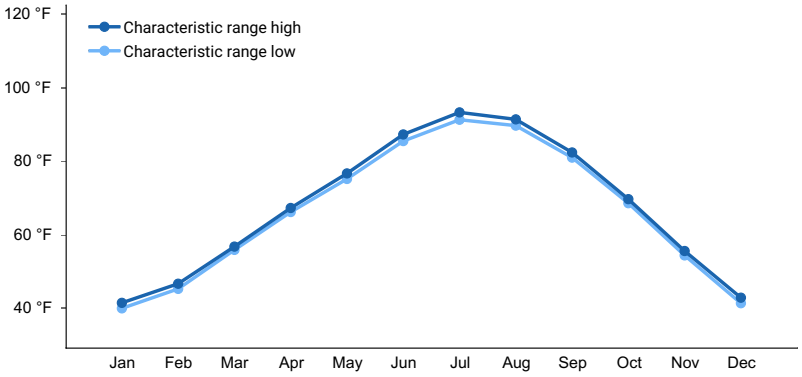


Figure 3. Monthly maximum temperature range

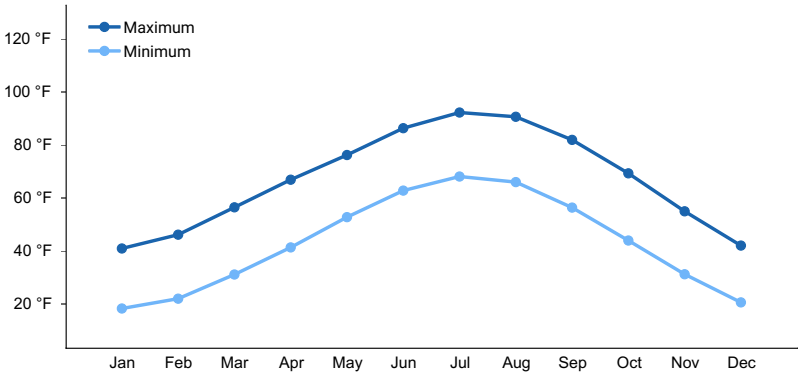


Figure 4. Monthly average minimum and maximum temperature

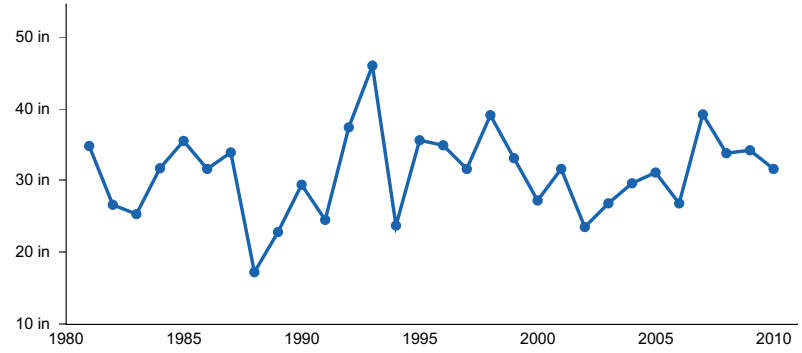


Figure 5. Annual precipitation pattern

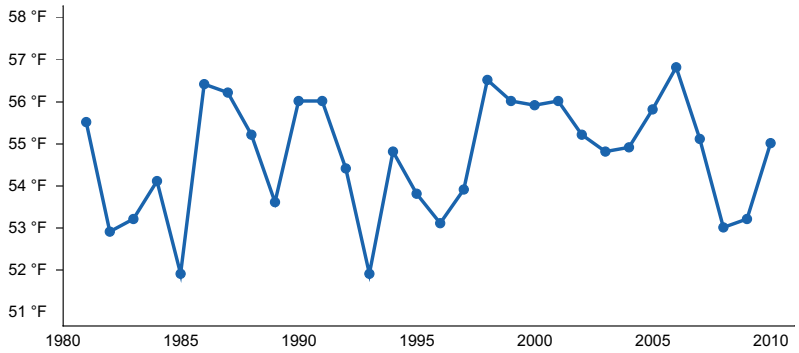


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MINNEAPOLIS [USC00145363], Minneapolis, KS
- (2) ABILENE [USC00140010], Abilene, KS
- (3) MILFORD LAKE [USC00145306], Junction City, KS
- (4) NEWTON [USC00145744], Newton, KS
- (5) KANOPOLIS LAKE [USC00144178], Ellsworth, KS
- (6) SMOLAN 1NE [USC00147551], Lindsborg, KS
- (7) ELLSWORTH [USC00142459], Ellsworth, KS
- (8) CLAY CTR [USC00141559], Clay Center, KS

Influencing water features

The Subirrigated ecological site is adjacent to major streams. The soils have a high water table that is usually within 1 foot to 4 feet of the surface. This significantly affects both the kinds and amounts of potential vegetation. The water table will fluctuate during the growing season, but moisture is usually available within the root zone of the deeper-rooted grasses and forbs. In some locations the soils are moderately saline. While this fact may not restrict plant production, it does favor some of the more salt-tolerant plant species.

Wetland description

Stream Types: (Rosgen System)
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.

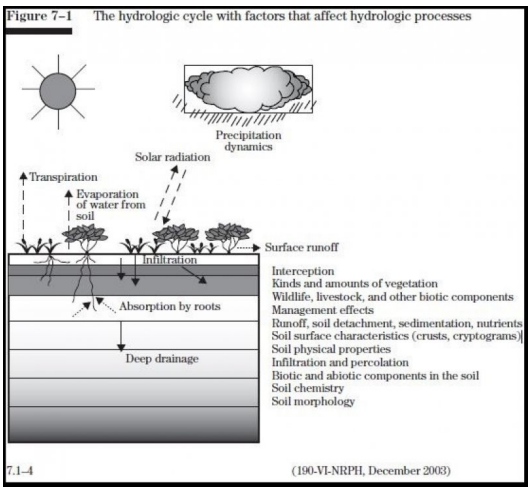


Figure 7. Fig. 7-1 from the National Range and Pasture Handbook.

Soil features

Characteristic soils on this site are Calco, Carwile, Els, Elsmere, Gibbon, and Solomon. These soils are very deep with a high water table. Surface and subsurface textures range from fine sands to clays. The water table normally varies from 1 foot to 4 feet below the surface. Its presence significantly affects both the kinds and amounts of potential vegetation. Although the water table fluctuates somewhat during the growing season, moisture is usually available within the root zone of the deeper-rooted grasses and forbs. In some localities the soils are moderately saline. This does not restrict production but does favor some of the salt-tolerant species.

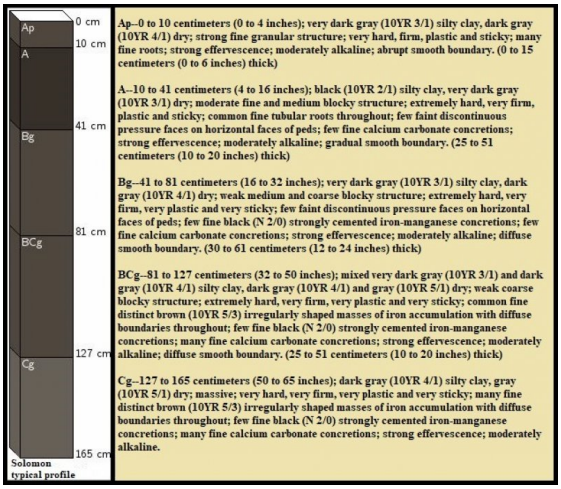


Figure 8. MLRA 74 Solomon soil series typical profile and description.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silty clay loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Sandy (2) Fine-silty (3) Fine
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Very slow to rapid
Soil depth	80 in
Available water capacity (0-40in)	2.6–8.5 in
Calcium carbonate equivalent (0-40in)	0–18%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–6
Soil reaction (1:1 water) (0-40in)	6.5–8.4

Ecological dynamics

The Subirrigated ecological site is a dynamic plant community due to the complex interaction of many ecological processes. The vegetation evolved on deep alluvial soils on nearly level floodplains. The site was exposed to a 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 soils representative of this site generally occur on broad, nearly level floodplains usually adjacent to rivers or streams. They also may occur along narrow drainageways or on areas containing perennial seeps or springs. The major influence for plant adaptation and growth is the presence of a permanent water table that generally varies a few inches from the surface to a depth of two to four feet. Occasional flooding may occur in some locations from stream overflow. In some local areas the soils are moderately saline. The plants that evolved and dominated the original plant community were adapted to these soil conditions and benefited from the dependable source of moisture. The soil-plant moisture relationship is mutually proficient and the site is very productive.

The plant community developed with occasional fires as an important element of the ecological processes. Historically fires were usually started by lightning during spring and early summer months when thunderstorms were most prevalent. It is also recognized that early Native Americans often used fire to attract herds of migratory herbivores, especially bison. Because all of the dominant tallgrasses were rhizomatous and soil conditions were usually moist, these plants could survive the ravages of even intense wildfires. This gave them a competitive advantage in the plant community. In contrast, most trees and shrubs were suppressed by fire and occurred only sparsely on protected areas, generally along stream banks.

Grazing history had a major impact on the dynamics of the site. The vegetative community developed under a grazing regime that primarily consisted of periodic grazing by large herds of bison. As the herds moved through an area, grazing could be intense but usually was of short duration. Typically, as herds moved to adjacent areas, the vegetation was afforded a period of recovery. This grazing regime, however, was probably altered somewhat during periods of severe drought. Because of its proximity to streams and the growth benefit from the water table, grazing animals likely utilized it more often than during periods of normal precipitation. Other grazing and feeding animals such as deer, rabbits, rodents, and insects had secondary influences on the development of the plant community.

Variations in climate had only minimal impact upon the development of the plant community. Because of the ever-present water table, deep-rooted tall grasses could continue to grow even during periods of extended drought. Occasional flooding that resulted from intense thunderstorms was usually of brief duration, and the resulting inundation only temporarily affected major plants. The extensive rhizomes of many of the major plants enabled them to recover through silt deposited during these flood events.

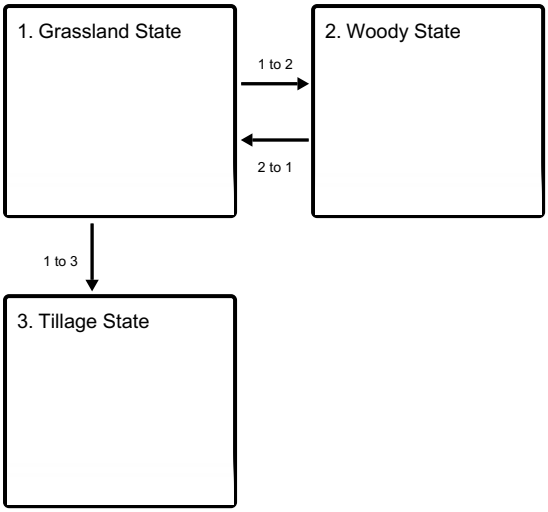
As utilization of the area for production of domestic livestock replaced that of roaming bison herds, the ecological dynamics of the site were altered. In many areas the plant community changed from its original composition. Fencing enabled continuous grazing that, in many areas, led to overgrazing and accelerated 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 the plant community. 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 occurrence of wildfires and the impact that fire played in maintaining the plant community was diminished with the advent of roads and cultivated fields. Use of prescribed fire as a management tool, often not an option in modern communities, also diminished. Due to the absence of fire, shrub and tree species have gradually increased in many areas. In some locations shrubs and trees have spread to the point they have become a major influence in the plant community.

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

State and transition model

Ecosystem states

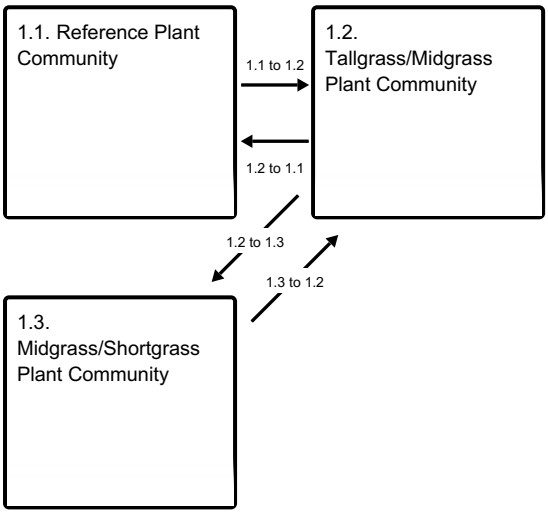


1 to 2 - Lack of fire, fire frequency, and timing

1 to 3 - Mechanical tillage

2 to 1 - Brush management, prescribed burning, prescribed grazing

State 1 submodel, plant communities



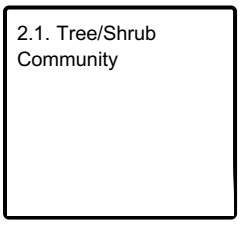
1.1 to 1.2 - Heavy, continuous grazing without adequate rest and recovery

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

1.2 to 1.3 - Long-term (greater than 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

3.1. Reseed Community	3.2. Go-back Plant Community

State 1
Grassland State

The Grassland State defines the ecological potential and natural range of variability resulting from the natural disturbance regime of the Subirrigated ecological site. This state is supported by empirical data, historical data, local expertise, and photographs.

Characteristics and indicators. The Grassland State is defined by a suite of native plant communities that are the result of periodic fire, drought, and grazing. These events are part of the natural disturbance regime and climatic process. The Reference Plant Community consists of warm-season tall- and midgrasses, cool-season and sod-forming grasses, forbs, and shrubs. The Tallgrass/Midgrass Plant Community is made up primarily of warm-season tallgrasses with midgrasses, sedges, and rushes as a subdominant component and decreasing amounts of forbs. The Midgrass Plant Community is dominated by less desirable midgrasses, while shortgrasses, forbs, sedges, rushes, and tallgrasses are sudominant.

Resilience management. Management that includes a forage and animal balance and a prescribed burning program should sustain the Grassland State and prevent a transition.

Community 1.1
Reference Plant Community

Figure 9. MLRA 74 Reference Plant Community.

The interpretive plant community for the Subirrigated ecological site is the Reference Plant Community. It 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. Another tall grass, common reed, is occasionally found on the site. It generally forms large colonies on deep sandy alluviums adjacent to streams. Combined, these tall grasses will account for 75 to 85 percent of the total vegetation produced annually. Other prevalent grasses and grasslike plants are Canada wildrye, Virginia wildrye, western wheatgrass, little bluestem, marsh bristlegrass, composite dropseed, and several species of sedges and rushes. The two major forbs found interspersed throughout the grass sward are Maximilian sunflower and prairie bundleflower. Other important forbs include Canada goldenrod, pitcher sage, white heath aster, white sagebrush, American licorice, roundhead lespedeza, and white prairie clover. Desert false indigo, common buttonbush, and roughleaf dogwood are shrubs that occur in sparse amounts over the site. Eastern cottonwood and black willow are the major trees. Eastern cottonwood may be found as isolated plants scattered over the site or it may form small groves. Black willow is

generally located along drainageways. In a number of locations this plant community is managed exclusively for hay production. Mowing tends to reduce the amount of switchgrass and prairie cordgrass plants and favor big bluestem, Indiangrass, and eastern gamagrass.

Resilience management. This is a stable, resilient, and very productive plant community when adequately managed. A prescribed grazing program that incorporates periods of rest and recovery during the growing season perpetuates the more palatable tall grasses and forb species.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass
- eastern gamagrass (*Tripsacum dactyloides*), grass
- prairie cordgrass (*Spartina pectinata*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	6000	6800	8000
Forb	1125	1275	1500
Shrub/Vine	375	425	500
Total	**7500**	**8500**	**10000**

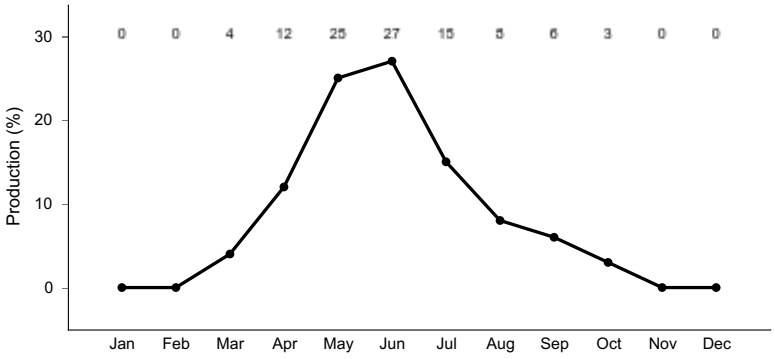


Figure 11. Plant community growth curve (percent production by month). KS7401, Subirrigated.

Community 1.2
Tallgrass/Midgrass Plant Community

Figure 12. MLRA 74 Tallgrass-Midgrass Plant Community.

The composition of the Tallgrass-Midgrass Plant Community is dominated by a mixture of tallgrasses and

midgrasses. Compared with the Reference Plant Community, there has been a decrease of the more palatable tallgrasses and forbs and a subsequent increase in less palatable and lower-producing midgrasses. Although reduced by overgrazing, tall grasses such as big bluestem, Indiangrass, switchgrass, and prairie cordgrass remain the dominant plants in this community. However, the proportion of midgrasses, sedges, and rushes in the overall production of the site has increased. These include composite dropseed, little bluestem, western wheatgrass, marsh bristlegrass, Torrey's rush, and threesquare. Other secondary grasses that have increased are Texas bluegrass, alkali sacaton, vine mesquite, and sedges. Combined, secondary plants now comprise 30 to 40 percent of the total annual production. Forbs (Maximilian sunflower and prairie bundleflower) have decreased and have largely been replaced by white heath aster, white sagebrush, Cuman ragweed, Baldwin's ironweed, and Canada goldenrod. Forbs account for 8 to 10 percent of the annual production. In some locations the site supports an increasing amount of shrubs and trees. The most abundant shrubs are desert false indigo, common buttonbush, rough leaf dogwood, Great Plains false willow, and coralberry. Eastern cottonwood, black willow, American elm, and Russian olive (*Elaeagnus angustifolia*) are the major trees found on the site. Shrubs and trees usually will not comprise over 5 percent of the total production.

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

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- prairie cordgrass (*Spartina pectinata*), grass

Community 1.3
Midgrass/Shortgrass Plant Community

Figure 13. MLRA 74 Midgrass-Shortgrass Plant Community.

The Midgrass-Shortgrass Plant Community results from many years of overgrazing. The amount of tallgrasses has decreased significantly and the site is dominated by midgrasses and shortgrasses. Major midgrasses are composite dropseed, Madagascar dropseed, vine mesquite, silver beardgrass, sideoats grama, western wheatgrass, and marsh bristlegrass. Shortgrasses include Kentucky bluegrass, Texas bluegrass, Texas dropseed, buffalograss, blue grama, Carolina crabgrass, and inland saltgrass. Grasslike plants such as chairmaker's threesquare, Baltic rush, Torrey's rush, and sedges have increased and may comprise 10 to 20 percent of the plant community in some locations. Major forbs on the site are Cuman ragweed, Canada goldenrod, Missouri goldenrod, white sagebrush, Carruth's sagewort, white heath aster, swamp smartweed, swamp milkweed, swamp verbena, annual marshelder, and annual ragweed. In some locations the Subirrigated site supports an increasing amount of shrubs and trees.

The most abundant shrubs are desert false indigo, common buttonbush, rough leaf dogwood, Great Plains false willow, and coralberry. Saltcedar (*Tamarix ramosissima*) may occur on soils with moderate salinity. Eastern cottonwood, black willow, peachleaf willow, American elm, eastern redcedar (*Juniperus virginiana*), and Russian olive are the major trees found on the site. Both eastern redcedar and Russian olive were introduced to the area through shelterbelt and windbreak plantings and have spread onto the site. Shrubs and trees usually will not comprise over ten percent of the total production. Remnant plants of big bluestem, Indiangrass, switchgrass, prairie cordgrass, eastern gamagrass, and Maximilian sunflower are often found scattered throughout the site. These plants are usually grazed repeatedly and maintained in a low state of vigor. These remnants respond favorably to periods of rest from grazing during the growing season and often regain vigor in one to two years.

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

Dominant plant species

- composite dropseed (*Sporobolus compositus*), grass
- silver bluestem (*Bothriochloa saccharoides*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), grass

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Reference Plant Community

Tallgrass/Midgrass Plant Community

The following describes the mechanisms of change from Plant Community 1.1 to Plant Community 1.2. These mechanisms include management controlled by repetitive heavy use, no rest or recovery of the key forage species, and no forage and animal balance for many extended grazing seasons. This type of management for periods greater than 10 years will shift functional and structural plant group dominance toward Plant Community 1.2.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Tallgrass/Midgrass Plant Community

Reference Plant Community

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

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 toward a Midgrass-Shortgrass Plant Community.

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 Tallgrass/Midgrass 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
Woody State

The Woody State is dominated by a shrub and/or tree plant community.

Characteristics and indicators. 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 tends to hinder the establishment of most woody species and favors forbs and grasses. However, it should be pointed out that not all unburned areas have a woody plant invasion. 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 base of trees are considerably higher than losses associated with the canopy. The decomposed material retains approximately 40 percent of the water that is not retained in the canopy (Thurow and Hester, 1997). Soil properties affected include biological activity, infiltration rates, and soil fertility. Special planning will be necessary to assure that sufficient amounts of fine fuel are available to carry fires with enough intensity to control woody species. In some locations the use of chemicals as a brush management tool may be desirable to initiate and accelerate this transition. Birds, small mammals, and livestock are instrumental in the distribution of seed and accelerating the spread of most tree and shrubs common to this site. The speed of encroachment varies considerably and can occur on both grazed and non-grazed pastures. Many species of wildlife, especially bobwhite quail, turkey, and white-tailed deer benefit from the growth of trees and shrubs for both food and cover. When management for specific wildlife populations is desirable, these options should be considered in any brush management plan.

Resilience management. This Woody State is sustained by a lack of fire and brush management.

Community 2.1
Tree/Shrub 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 (*Celtis occidentalis*), eastern redcedar, and Russian olive. More abundant shrubs are roughleaf dogwood, coralberry, Great Plains false willow, desert false indigo, and common buttonbush. Saltcedar has invaded and become well established in some locations, especially where soils are moderately saline. 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. Cottonwood and willow produce an abundance of seed that is distributed long distances by the wind. Russian olive 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, marsh bristlegrass, chairmaker's threesquare, sedges, white sagebrush, swamp verbena, Baldwin's ironweed, and white heath aster. Where woody plants have encroached onto nonutilized areas, the understory consists largely of big bluestem, Indiangrass, prairie cordgrass, Canada wildrye, chairmaker's threesquare, sedges, prairie bundleflower, and Maximilian sunflower. Herbage production is significantly reduced because of the tree and shrub competition. Grass yields vary from 30 to 40 percent of the total vegetative production. Forbs generally produce 5 to 10 percent of the total.

Resilience management. Usually a prescribed burning program, accompanied by 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 with enough intensity to control the woody species. In some locations use of chemicals or mechanical methods as a brush management tools may be necessary to initiate and accelerate this transition.

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
- eastern redcedar (*Juniperus virginiana*), tree
- Russian olive (*Elaeagnus angustifolia*), tree
- roughleaf dogwood (*Cornus drummondii*), shrub
- coralberry (*Symphoricarpos orbiculatus*), shrub
- false indigo bush (*Amorpha fruticosa*), shrub
- common buttonbush (*Cephalanthus occidentalis*), shrub

State 3
Tillage State

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

Characteristics and indicators. Many reseeded plant communities were planted with a local seeding mix under the Conservation Reserve Program (CRP), or were planted to a monoculture of sideoats grama or other species. 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). 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. This state should incorporate prescribed grazing and prescribed burning management strategies.

Community 3.1
Reseed Community

The Reseed Plant Community occurs on areas that were formerly farmed. When farming operations ended, the area was seeded and established to a mixture of plants. These were usually native species common in the Reference Plant Community. Most seeding mixtures consisted of a blend of grasses that included big bluestem, Indiangrass, switchgrass, and little bluestem. In some locations seed of additional plants such as eastern gamagrass, prairie bundleflower, and Maximilian sunflower were included in the mixture. When reseeded areas and areas supporting native rangeland exist in the same pasture, they seldom are utilized at the same intensity. There is usually a preference by domestic livestock for the plants on the native rangeland areas. When feasible, reseeded plant communities should be managed as separate pastures or units. These areas are generally productive when managed for hay production. Some seeded areas are invaded by trees and shrubs during the establishment period of the desired plants. These invader species commonly include Siberian elm, common hackberry, eastern redcedar, eastern cottonwood, black willow, roughleaf dogwood, and Great Plains false willow. Occasional burning is effective in controlling the establishment of these woody plants. Once seeded areas become fully established, production is comparable to that of the Reference Plant Community. Total annual production is variable. Sufficient data does not exist to give estimates at this time.

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 3.2
Go-back Plant Community

This plant community occurs on areas that were formerly farmed. When tillage operations were discontinued, the areas were allowed to revegetate or “go back” naturally. This was in contrast to artificial reseeding with selected species or a group of species. This is a slow, gradual process that entails 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, Canadian horseweed (*Conyza canadensis*), common sunflower (*Helianthus annuus*), Mexican fireweed (Kochia scoparia), annual marshelder, and golden tickseed. Gradually these are replaced by annual grasses including prairie threeawn (*Aristida oligantha*), prairie cupgrass (*Eriochloa contracta*), little barley (*Hordeum pusillum*), cheatgrass (*Bromus tectorum*), and bearded sprangletop (*Leptochloa fusca* ssp. fascecularis). Usually plant succession will progress until the plant community is dominated by perennial grasses and grasslike plants including composite dropseed, alkali sacaton, foxtail barley, marsh bristlegrass, silver beardgrass, inland saltgrass, Texas dropseed, buffalograss, Torrey’s rush, and chairmaker’s threesquare. 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. Some go-back areas are invaded by trees and shrubs. The more common include Siberian elm, common hackberry, eastern redcedar, eastern cottonwood, black willow, roughleaf dogwood, and Great Plains false willow. Occasional burning is effective in controlling 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.

Transition 1 to 2
State 1 to 2

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 a reduction 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, with desirable forage grasses often being most severely reduced (Eddleman, 1983). As vegetation cover changes from grasses to trees, a greater proportion of precipitation is lost through interception and evaporation; therefore, less precipitation is available for producing herbaceous forage or for deep drainage or runoff (Thurow and Hester, 1997). Tree and shrub establishment becomes increasingly greater while fine fuel loads decrease. As trees and shrubs increase at levels of greater than 20 percent canopy cover, the processes and functions that allow the Woody State to become resilient are active and dominate over the processes and systems inherent of the Grassland State. Using prescribed fire as a standalone management tool is unsuccessful to eradicate the trees and shrubs due to a lack of fine fuel loads.

Constraints to recovery. A closed canopy cover and lack of fine fuel loads could potentially preclude recovery of the former state.

Transition 1 to 3
State 1 to 3

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.

Context dependence. 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 2 to 1
State 2 to 1

Restoration efforts will be costly and labor-intensive, and it 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, 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

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 63%**			2500–5355	
	big bluestem	ANGE	*Andropogon gerardii*	1200–1610	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	500–1340	

	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	300–1340	–
	common reed	PHAU7	*Phragmites australis*	0–1000	–
	switchgrass	PAVI2	*Panicum virgatum*	400–800	–
	Indiangrass	SONU2	*Sorghastrum nutans*	200–535	–
	prairie cordgrass	SPPE	*Spartina pectinata*	200–535	–
2	**Midgrasses minor 10%**			430–850	
	little bluestem	SCSC	*Schizachyrium scoparium*	200–400	–
	marsh bristlegrass	SEPA10	*Setaria parviflora*	50–150	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	50–150	–
	Canada wildrye	ELCA4	*Elymus canadensis*	50–150	–
	western wheatgrass	PASM	*Pascopyrum smithii*	50–150	–
	Virginia wildrye	ELVI3	*Elymus virginicus*	20–75	–
	vine mesquite	PAOB	*Panicum obtusum*	10–65	–
	silver beardgrass	BOLA2	*Bothriochloa laguroides*	0–50	–
	rice cutgrass	LEOR	*Leersia oryzoides*	0–50	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–50	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–50	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–50	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	0–50	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–50	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–30	–
	fall panicgrass	PADI	*Panicum dichotomiflorum*	0–20	–
	Texas dropseed	SPTE5	*Sporobolus texanus*	0–20	–
3	**Sedges and Rushes minor 5%**			100–425	
	chairmaker's bulrush	SCAM6	*Schoenoplectus americanus*	15–50	–
	softstem bulrush	SCTA2	*Schoenoplectus tabernaemontani*	0–50	–
	heavy sedge	CAGR4	*Carex gravida*	0–50	–
	smoothcone sedge	CALA12	*Carex laeviconica*	15–50	–
	common spikerush	ELPA3	*Eleocharis palustris*	0–50	–
	Torrey's rush	JUTO	*Juncus torreyi*	0–50	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–50	–
4	**Shortgrasses trace 2%**			0–170	
	blue grama	BOGR2	*Bouteloua gracilis*	0–35	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–35	–
	saltgrass	DISP	*Distichlis spicata*	0–35	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–35	–
	Mexican muhly	MUME2	*Muhlenbergia mexicana*	0–35	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	0–35	–
Forb					
5	**Forbs subdominant 15%**			400–1275	
	American licorice	GLLE3	*Glycyrrhiza lepidota*	50–170	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	50–170	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	50–170	–

	wholeleaf rosinweed	SIIN2	*Silphium integrifolium*	50–170	–
	swamp verbena	VEHA2	*Verbena hastata*	15–60	–
	blue wild indigo	BAAU	*Baptisia australis*	15–60	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	15–60	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	15–60	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	15–60	–
	sessileleaf ticktrefoil	DESE	*Desmodium sessilifolium*	15–60	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	0–15	–
	dogbane	APOCY	*Apocynum*	0–15	–
	grooved flax	LISU4	*Linum sulcatum*	0–15	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–15	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–15	–
	bluejacket	TROH	*Tradescantia ohiensis*	0–15	–
	false gaura	STLI2	*Stenosiphon linifolius*	0–15	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	0–15	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–15	–
	whorled milkweed	ASVE	*Asclepias verticillata*	0–15	–
	hoary verbena	VEST	*Verbena stricta*	0–15	–
Shrub/Vine					
6	**Shrubs minor 5%**			250–425	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–70	–
	willow baccharis	BASA	*Baccharis salicina*	0–70	–
	common buttonbush	CEOC2	*Cephalanthus occidentalis*	0–70	–
	roughleaf dogwood	CODR	*Cornus drummondii*	0–70	–
	eastern cottonwood	PODE3	*Populus deltoides*	0–70	–
	peachleaf willow	SAAM2	*Salix amygdaloides*	0–70	–
	sandbar willow	SAIN3	*Salix interior*	0–70	–
	black willow	SANI	*Salix nigra*	0–70	–
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–70	–
	American elm	ULAM	*Ulmus americana*	0–70	–

Animal community

Wildlife

This site is excellent wildlife habitat for a number of reasons including the plant diversity associated with the site, wetland inclusions, and the fact that this site is frequently located in riparian areas. The site is characterized by scattered trees of willow and cottonwood 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 the mourning dove. Furbearers such as mink, raccoon, skunk, and opossum are common, as are coyotes and red fox. The site is especially valuable as winter cover for many of these same species including deer, pheasant, quail, and rabbit, especially where dense cover has been maintained.

Songbirds are common to the site and include scissortailed flycatchers, eastern and western kingbirds, brown thrasher, eastern bluebird, and redwinged blackbird, just to name a few. Hawks and owls commonly use this habitat and bald eagles occasionally utilize 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 grazability 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, 6.5%; 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.

Soils on this site are hydrologic group D soils. These have a high water table which normally varies from 1 foot to 4 feet below the soil surface. Runoff potential for this site is low. Please refer to the NRCS National Engineering Handbook Section 4 (NEH-4) for runoff quantities and hydrologic curves when making hydrology determinations.

Recreational uses

This site is very desirable 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/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. Recreation can be a high-value use, but the excessive wetness due to the prevalent high water table is a significant site consideration.

Wood products

Eastern cottonwood is harvested commercially in some locations.

Other products

None

Other information

The presence of abundant soil moisture makes this site especially vulnerable to several invasive woody plant species such as Russian olive, multiflora rose (Rosa multifloria), and saltcedar on more saline soils. An extra effort should be made to eradicate any known plantings of these three species near subirrigated sites. These three species have been recognized as invasive and are no longer recommended for woody plantings. Extra care should be taken in the planning and design of any woody plantings adjacent to or near this site.

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

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators

are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Chris Tecklenburg/Revision 12-14-2018; 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 Subirrigated 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):** Solomon OSD:

   Ap--0 to 10 centimeters (0 to 4 inches); very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; strong fine granular structure; very hard, firm, plastic and sticky; many fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary. (0 to 15 centimeters (0 to 6 inches) thick)

   A--10 to 41 centimeters (4 to 16 inches); black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate fine and medium blocky structure; extremely hard, very firm, plastic and sticky; common fine tubular roots throughout; few faint discontinuous pressure faces on horizontal faces of peds; few fine calcium carbonate concretions; strong effervescence; moderately alkaline; gradual smooth boundary. (25 to 51 centimeters (10 to 20 inches) thick)

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** 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 63% 5355 lbs.; big bluestem 1200-1610, eastern gamagrass 500-1340, switchgrass 400-800, Indiangrass 200-535, prairie cordgrass 200-535, common reed 0-1000

    Sub-dominant: Group 5 Forbs Subdominant 15% 1275 lbs

    Other: Group 2 Midgrasses Minor 10% 850 lbs. see reference plant community
    Group 3 Sedges and Rushes Minor 5% 425 lbs see reference plant community
    Group 4 Shortgrasses Trace 2% 170 lbs see reference plant community

    Additional: Group 6 Trees/Shrubs Minor 5% 425 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 7,500 lbs in a below-average rainfall year and 10,000 lbs in an above-average rainfall year. The representative value for this site is 8,500 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.
