Ecological site HX074XY122
Sand Plains

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Accessed: 05/10/2025

General information

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

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 Sand Plains ecological site was formerly known as Sands R074XY021KS and Sandy R074XY022KS. This site is made up of sandy soils generally with greater than 52 percent sand at the surface. This ecological site is located on nearly level to moderately steep uplands. The Sand Plains site has deep soils with loamy sand and sandy loam surface textures.

Associated sites

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

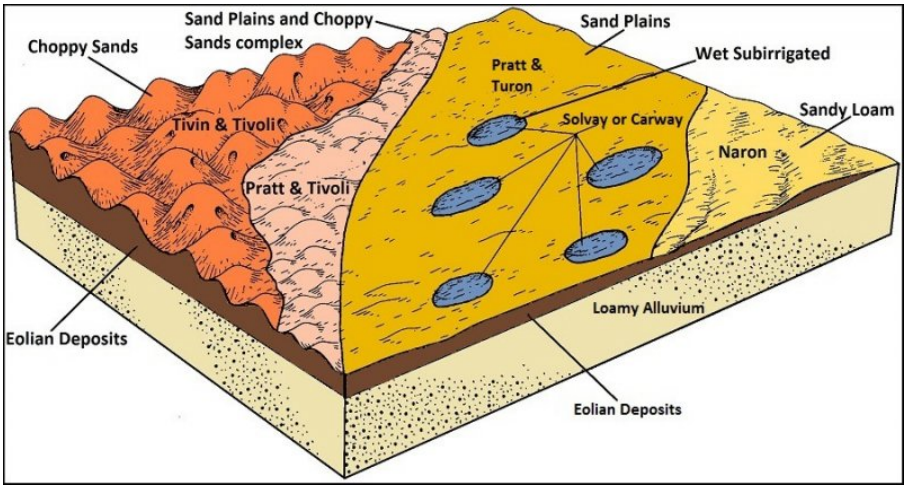


Figure 1. MLRA 74/79 Sand Plains ESD block diagram.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Schizachyrium scoparium*

Legacy ID

R074XY122KS

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. 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 fourdigit 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 Sand Plains site occurs on nearly level to moderately steep uplands. The soils are deep with loamy sand and sandy loam surface textures.

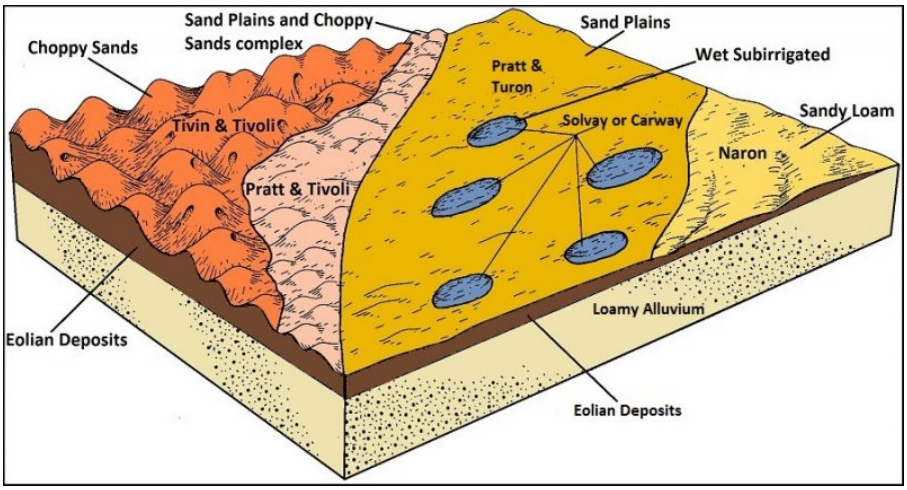


Figure 2. MLRA 79/74 ESD block diagram for Sand Plains ESD.

Table 2. Representative physiographic features

Landforms	(1) River valley > Dune (2) Hills > Hillslope
Runoff class	Low to negligible
Flooding frequency	None
Elevation	984–1,968 ft
Slope	0–15%
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 being the driest months and May and June being 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)	29-32 in
Frost-free period (actual range)	145-157 days
Freeze-free period (actual range)	175-193 days
Precipitation total (actual range)	28-33 in
Frost-free period (average)	152 days
Freeze-free period (average)	185 days
Precipitation total (average)	31 in

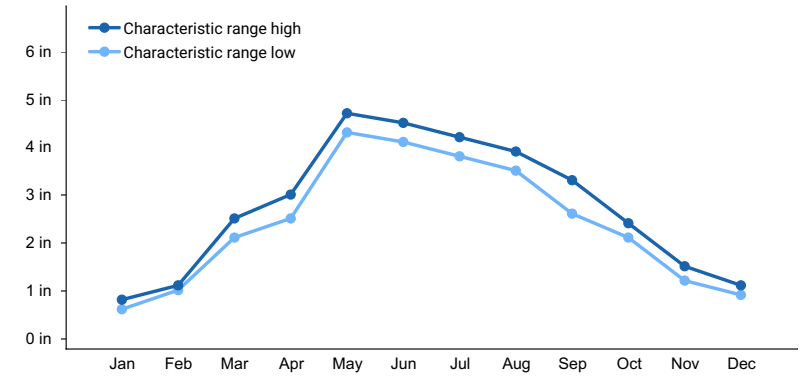


Figure 3. Monthly precipitation range

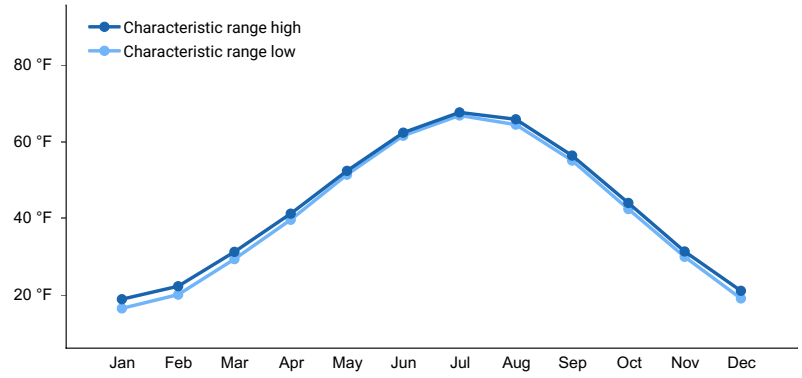


Figure 4. Monthly minimum temperature range

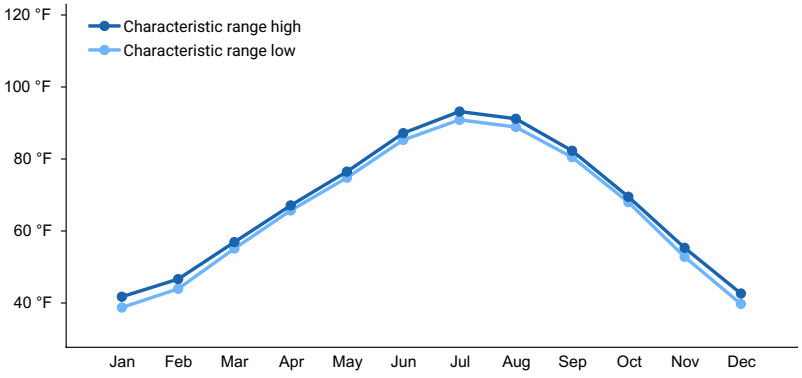


Figure 5. Monthly maximum temperature range

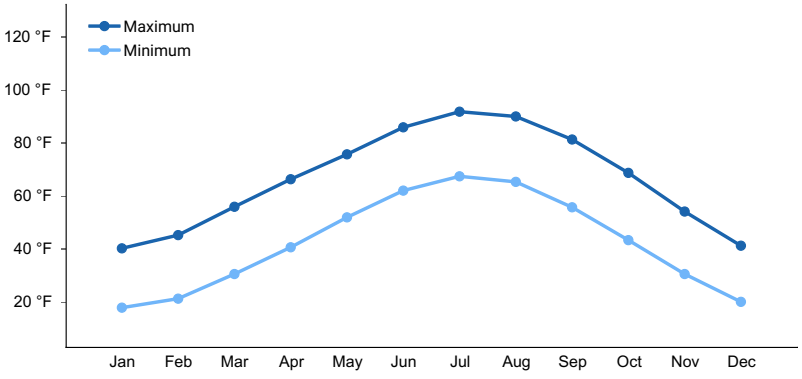


Figure 6. Monthly average minimum and maximum temperature

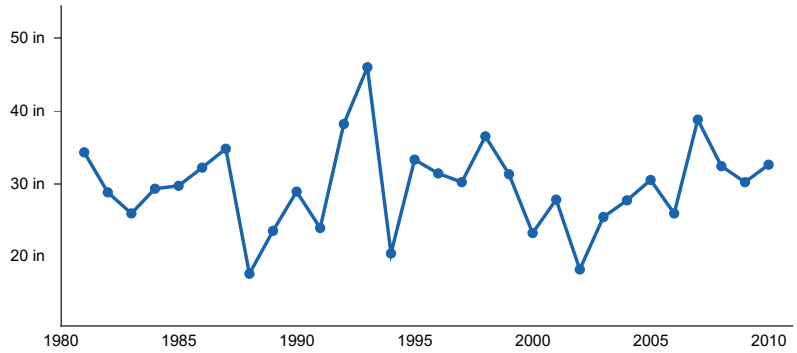


Figure 7. Annual precipitation pattern

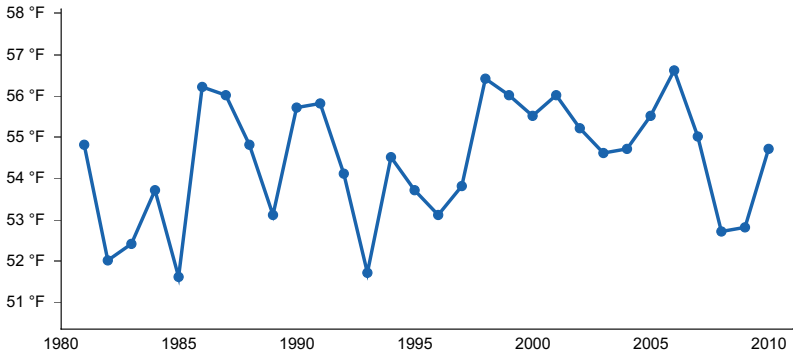


Figure 8. Annual average temperature pattern

Climate stations used

- (1) 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

Soils on the Sand Plains ecological site are well drained and have moderate to moderately rapid permeability.

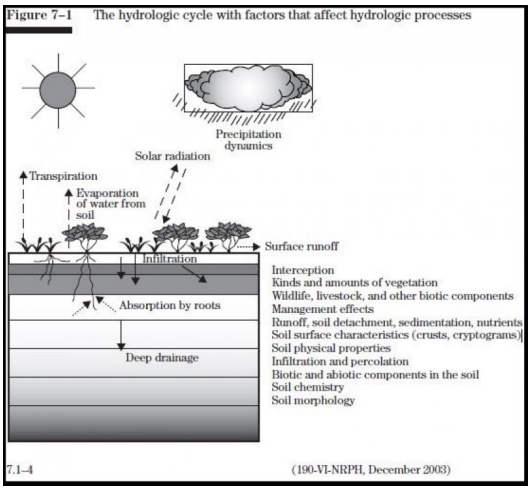


Figure 9. Fig. 7-1 from the National Range and Pasture Handbook.

Soil features

Attica, Ortello, and Pratt soils represent the site for this area. They are deep soils with a fine sandy loam or sandy loam surface layer and a loamy subsoil. Wind erosion is a major hazard when good vegetative cover is not maintained and water erosion can be a hazard on the steeper portions of this site.

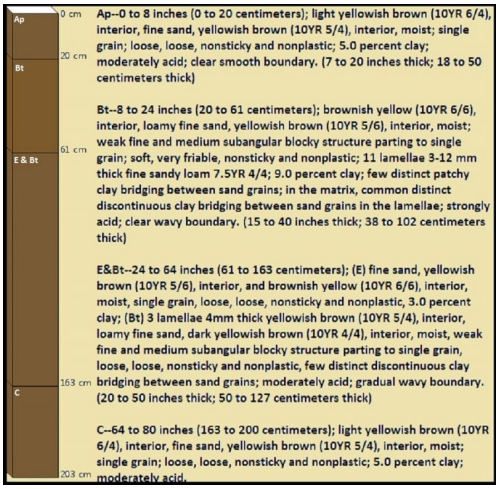


Figure 10. Pratt soil series profile and description.

Table 4. Representative soil features

Parent material	(1) Eolian deposits
Surface texture	(1) Loamy fine sand (2) Fine sandy loam (3) Loam
Family particle size	(1) Coarse-loamy (2) Sandy
Drainage class	Well drained
Permeability class	Rapid to moderately rapid
Available water capacity (0-40in)	3.5–6.7 in
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–7.3

Ecological dynamics

The Sand Plains ecological site is a dynamic plant community due to the complex interaction of many ecological processes. The vegetation evolved on deep sandy soils on uplands. 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, sandy soils characteristic of this site absorb water moderately rapid and have a moderate water holding capacity. As such, the taller grasses that evolved and dominated the original plant community had deep, efficient root systems capable of utilizing moisture throughout most of the soil profile. There is almost no runoff from this site and most precipitation enters the root profile. The soil-plant moisture relationship is mutually proficient and the site can be productive. Seed heads of sand bluestem often reach six to seven feet in height.

The original plant community developed with occasional fire being an integral part of ecological processes.

Historically, fires were 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. These intentional fires probably occurred frequently. Because all of the dominant tallgrasses were rhizomatous, they were able to survive the ravages of even intense wildfires and gain a competitive advantage over bunch grasses in the plant community. In contrast, most trees and shrubs were suppressed by fire and occurred only sparsely on protected areas. Growth of perennial forbs, especially legumes, was usually enhanced following a fire event. After an intense fire there was also usually a substantial increase in the abundance of annuals. This increase was generally temporary lasting for one to two years.

Grazing history had a major impact on the dynamics of the site. The vegetative community developed under a grazing regime that consisted primarily of periodic grazing by large herds of bison. As the herds moved through an area, grazing was probably intense. 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.
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, especially drought cycles, also had a major impact upon the development of the plant community. Species composition fluctuated according to the duration and severity of droughts. During prolonged dry cycles, many of the shallow-rooted plants died and production of deeper-rooted plants significantly diminished. When sufficient rainfall occurred following an extended dry period, annual forbs and annual grasses would temporarily occur in great abundance. As precipitation returned to normal or above normal in a sequence of years, the deeper-rooted grasses responded and returned to production potentials.

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. Reduced plant cover resulting from severe overgrazing and trailing by livestock led to wind erosion in some areas.

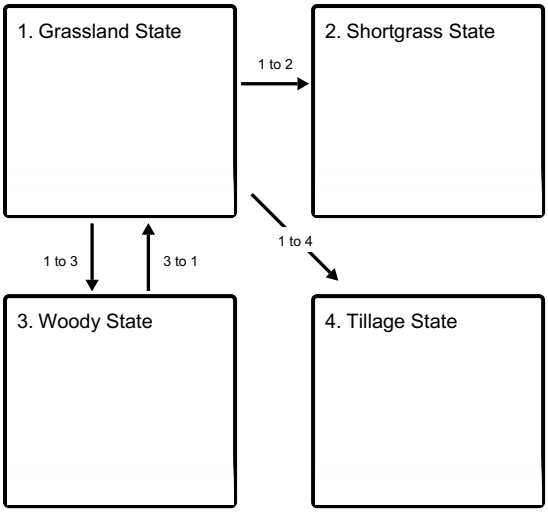
The frequency and role that fires played in maintaining the plant community was reduced with the advent of roads, cultivated fields, and fire suppression techniques developed by European settlers. Use of prescribed fire as a management tool has also diminished in some localities, especially surrounding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



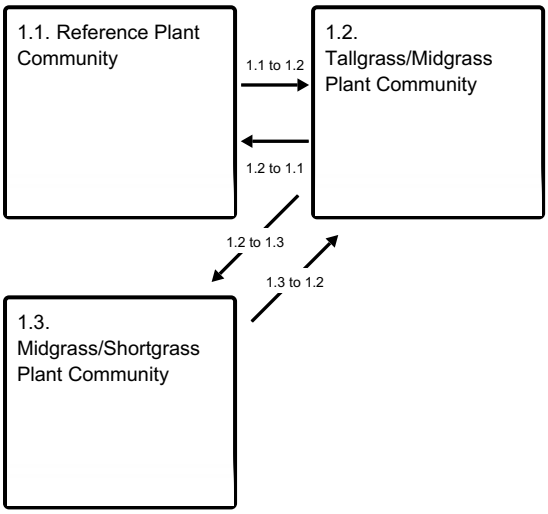
1 to 2 - Long-term, heavy, continuous overgrazing, no rest and recovery

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



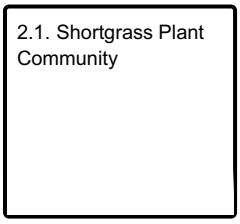
1.1 to 1.2 - Heavy, continuous grazing without adequate rest and recovery

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

3.1. Shrubs and Tree Plant Community

State 4 submodel, plant communities

4.1. Reseed Plant Community

4.2. 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 Sandy Plains 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, coolseason and sod-forming grasses, forbs, and shrubs. The Tallgrass/Midgrass Plant Community is made up primarily of warm season midgrasses, with an interspersed coolseason 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 Migrasses 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

The interpretive plant community for this site is the Reference Plant Community. This plant community represents the original plant community that existed prior to European settlement. The site is characterized as grassland, essentially free of trees and large shrubs. It is dominated by tall, warm-season grasses including sand bluestem, switchgrass, and Indiangrass. These grasses have extensive root systems capable of penetrating the soil profile to depths of 10 to 12 feet. The major midgrass is little bluestem. Combined these four grasses will account for nearly 80 percent of vegetation produced annually. Other prevalent midgrasses are Canada wildrye, sideoats grama, sand lovegrass, purple lovegrass, western wheatgrass, composite dropseed, and sand dropseed. Scattered throughout are minor amounts of shortgrasses consisting of blue grama, hairy grama, thin paspalum, and Carolina crabgrass. The site supports a wide variety of legume species which are intermixed throughout the sward. The most abundant are Nuttall’s sensitive-briar, roundhead lespedeza, sessileleaf ticktrefoil, golden prairie clover, silky sophora, and prairie bundleflower. Other important forbs include Maximilian sunflower, scaly blazing star, stiff goldenrod, and pitcher sage. A small amount of annual plants are common most years. They often occur as a result of soil disturbances by rodents and other digging animals. They may be abundant in years when normal precipitation returns after an extended drought period. Leadplant and Jersey tea are low growing shrubs that occur over the site. Unlike many shrubs, these plants are both quite tolerant to fire and are readily grazed by livestock. A few small clumps of Chickasaw plum and fragrant sumac may be found on slope exposures where they partially escape the effects of intense fires. Growth of warm-season grasses on this site typically begins during the period of April 25 to May 10 and continues until late September. As a general rule, 75 percent of total production is completed by mid-July. This varies only slightly from year to year depending on temperature and precipitation patterns. There are exceptions. For example, some plants of sand bluestem 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 and grass-like plants generally have two primary growth periods, one in the fall (September and October) and again in the spring (April, May, and June). Some growth may occur in winter months during periods of unseasonably warm temperatures (Indian Summers). Numerous forbs and a few cool-season grasses form leaf rosettes in the fall that remain green throughout the winter. These plants then initiate rapid growth in early spring.

Resilience management. This is a stable plant community when grazing and fire are adequately managed. A prescribed grazing program that incorporates periods of rest and recovery during the growing season benefits the tallgrasses and even the more palatable forb species. Excessive grazing and livestock trailing can quickly impact soil stability and lead to sheet and gully erosion. The soils representative of this site are also susceptible to wind erosion, excessive grazing, and trailing by livestock that can impair the stability of the site.

Dominant plant species

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

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2175	3045	3915
Forb	200	280	360
Shrub/Vine	125	175	225
Total	**2500**	**3500**	**4500**

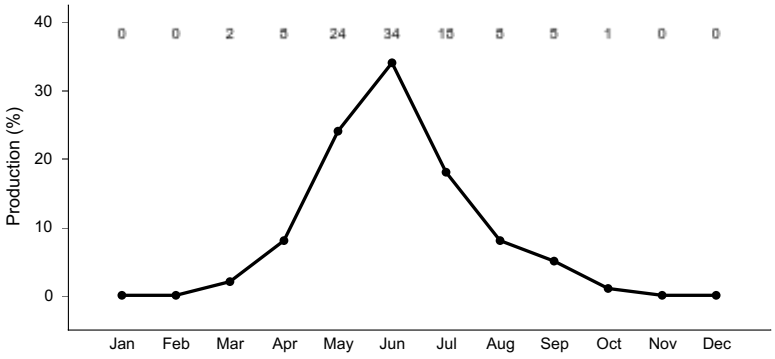


Figure 12. Plant community growth curve (percent production by month). KS7422, Sandy. .

Community 1.2
Tallgrass/Midgrass Plant Community

Figure 13. MLRA 74 Tallgrass/Midgrass Plant Community.

The composition of this plant community resembles that of the Reference Plant Community. Comparatively, there has been a decrease of the more palatable tallgrasses and forbs and a subsequent increase in midgrasses. The dominant grasses are sand bluestem and little bluestem with lesser amounts of switchgrass and Indiangrass. A number of midgrasses have increased in abundance as the taller grasses have been reduced by overgrazing. These include sand dropseed, sand lovegrass, purple lovegrass, western wheatgrass. Composite dropseed is a tallgrass that will increase. Other secondary grasses are Carolina crabgrass, red lovegrass, thin paspalum, tumble windmillgrass, Texas bluegrass, hairy grama, blue grama, and Scribner's rosette grass. Combined these secondary grasses now comprise 20 to 30 percent of the annual herbage produced. Forbs such as Maximilian sunflower, roundhead lespedeza, prairie bundleflower, and golden prairie clover have largely been replaced by white sagebrush, Cuman ragweed, Missouri goldenrod, Fendler's aster, redroot buckwheat, and tenpetal blazingstar. Forbs produce 10 to 12 percent of the total herbage. This site supports a few shrubs. Leadplant and Jersey tea may be scattered throughout the site. Chickasaw plum, smooth sumac, and fragrant sumac are usually found in small single species clumps or mottes. On pastures where only summer grazing is practiced, there is often an increase of soapweed yucca. Shrubs will usually not comprise over ten percent of the total production.

Resilience management. Periods of rest and recovery from grazing are essential in maintaining this as a stable plant community. Sand bluestem is preferred and readily grazed by cattle. When the site is grazed continuously throughout the growing season, sand bluestem is usually overgrazed and exists in a state of low vigor. Over time this results in a gradual reduction in its abundance. Even under moderate, continuous stocking, livestock tend to locate and severely overgraze the tops or crests of mounded areas or low sand dunes. Where this occurs sand dropseed, thin paspalum, red lovegrass, and mat sandbur replace the taller grasses. Concentrated grazing has eventually lead to exposed soils and wind erosion in some areas.

Dominant plant species

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

Community 1.3
Midgrass/Shortgrass Plant Community

This plant community developed as a result of many years of continuous overgrazing. Midgrasses dominate the site and comprise 50 to 70 percent of the annual production. Most abundant midgrasses include sand dropseed, little bluestem, western wheatgrass, sand lovegrass, and purple lovegrass. Composite dropseed is a tallgrass and will increase in abundance. Shortgrasses such as Carolina crabgrass, red lovegrass, tumble windmillgrass, purple threeawn, hairy grama, and blue grama produce 5 to 20 percent of the vegetation. Forb production is quite variable and may range from 10 to 30 percent of the total vegetation depending on amounts and timing of rainfall events. Perennial forbs include field sagewort, white sagebrush, redroot buckwheat, tenpetal blazingstar, bush morning-glory, and Cuman ragweed. Annual forbs common on the site include prairie sunflower, fourpoint evening-primrose, camphorweed, sleepingplant, annual ragweed, and annual buckwheat. In some locations shrubs such as fragrant sumac and Chickasaw plum comprise 5 to 20 percent of the vegetation. Where past grazing has been only during

the summer months there may be an increase in the abundance of soapweed yucca.

Resilience management. Remnant plants of sand bluestem, Indiangrass, switchgrass, and little bluestem, although sparse, are often found scattered throughout the site. These plants are usually grazed repeatedly and remain in a low state of vigor. Of these remnants, sand bluestem is generally the most abundant because it has rhizomes that can persist for many years in a weakened condition. When in this state, new growth consisting of three to five leaves will emerge in a prostate position rather than upright. This allows the plants to partially escape grazing. These remnants respond favorably to periods of rest from grazing and may regain vigor in two to three years. Prescribed grazing with adequate rest and recovery periods during the growing season will shift this plant community to include more productive midgrasses. With continued management the taller grasses will gradually increase in abundance.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- composite dropseed (*Sporobolus compositus*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- sand lovegrass (*Eragrostis trichodes*), grass
- purple lovegrass (*Eragrostis spectabilis*), grass

Pathway 1.1 to 1.2
Community 1.1 to 1.2

These mechanisms include management controlled by repetitive heavy use, no rest or recovery of the key forage species and no forage and animal balance for many extended grazing seasons. This type of management lasting for periods greater than 10 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

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

Conservation practices

Prescribed Grazing

Pathway 1.2 to 1.3
Community 1.2 to 1.3

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.

Pathway 1.3 to 1.2
Community 1.3 to 1.2

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/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 sod grasses there is a decrease in infiltration and interception and an increase in surface runoff (Thurow T., 2003).

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

Community 2.1
Shortgrass Plant Community

This plant community is dominated by shortgrasses which develops following many years of continuous heavy grazing. It is generally associated with smaller pastures on farming-oriented enterprises. Such pastures are often used as holding areas in anticipation of seasonal wheat pasture or grazing of cropland aftermath. Major grasses are blue grama, hairy grama, Carolina crabgrass, thin paspalum, red lovegrass, sand dropseed, composite dropseed, and silver beardgrass. Annual grasses including Japanese brome, cheatgrass, tumblegrass, prairie threeawn, purple threeawn, and witchgrass are common during seasons of normal or above normal precipitation. Major forbs are camphorweed, Cuman ragweed, redroot buckwheat, slender snakecotton, firewheel, Rocky Mountain beeplant, Canadian horseweed, curlycup gumweed, and blackeyed susan. In a few isolated areas where overgrazing was primarily done by sheep, the resulting plant community is completely dominated by shortgrasses as essentially all tall- and midgrasses have been eliminated. The major perennial grasses are blue grama, red lovegrass, foxtail barley, tumblegrass, and Fendler threeawn. With normal or above normal precipitation numerous annual grasses including prairie threeawn, little barley, sixweeks fescue, and cheatgrass will occur.

Resilience management. Recovery of the tallgrasses, midgrasses, and associated forb characteristics of the Reference Plant Community will require many years of careful management that includes prescribed grazing and extended periods of rest during the growing season. If remnant stands of the desired species are not present or located nearby as seed sources for reestablishment, interseeding measures may be necessary to create pioneer colonies for seed dispersal throughout the community. Prescribed burning can be a useful tool if used strategically to benefit the desired species, especially in the later stages of the recovery process.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- hairy grama (*Bouteloua hirsuta*), grass
- thin paspalum (*Paspalum setaceum*), grass
- red lovegrass (*Eragrostis secundiflora*), grass
- composite dropseed (*Sporobolus compositus*), grass

State 3
Woody State

This state is dominated by a shrub and/or tree plant community. The increase and spread of shrubs and trees results from an absence of fire. Woody plants can increase up to 34% from a lack of fire according to a study from 1937 to 1969, in contrast to a 1% 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% to 36.7% (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% 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
Shrubs and Tree Plant Community

This plant community is dominated by shrubs consisting primarily of Chickasaw plum, fragrant sumac, and smooth sumac. Trees including honeylocust, osage orange, and eastern redcedar have invaded and become established in isolated areas. Chickasaw plum is generally the most abundant shrub and typically forms large mottes or thickets scattered over the site. Shrubs and trees may produce 30 to 60 percent of the total vegetation. The spread of shrubs and trees results from the absence of fire because periodic burning tends to hinder the establishment of most of these woody species and favor forbs and grasses. It should be pointed out, however, that not all unburned areas have a woody plant invasion, that the speed of encroachment varies considerably, and that it can occur on both grazed and non-grazed pastures. Other than the lack of fire, factors that accelerate intrusion include the presence of birds and small mammals which distribute seed of most shrubs over the site. When encroachment occurs on areas that have been subjected to longterm continuous overgrazing, the associated grasses will usually consist of sand dropseed, sand lovegrass, purple lovegrass, Texas bluegrass, and Scribner’s rosette grass. When both grazing and fire have been excluded for many years, associated grasses generally are sand bluestem, little bluestem, Indiangrass, switchgrass, sedges, and Canada wildrye. Grass yields are significantly reduced because of the shrub competition and vary from 30 to 50 percent of the total vegetative production. Forbs generally produce 10 to 20 percent of the total. Major forbs include white sagebrush, field sagewort, redroot buckwheat, Cuman ragweed, lemon scurfpea, camphorweed, and tenpetal blazingstar. Usually a prescribed burning program accompanied with prescribed grazing will gradually return the plant community to one dominated by grasses and forbs. Special planning will be necessary to assure that sufficient amounts of fine fuel are available to carry fires with enough intensity to control the woody species. In some locations use of chemicals as a brush management tool will be necessary to initiate and accelerate this transition. Many species of wildlife, especially bobwhite quail and white-tailed deer, benefit from the growth of shrubs for both food and as cover. When wildlife populations are a desirable component, this should be considered in any brush management plan.

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

Dominant plant species

- honeylocust (*Gleditsia triacanthos*), tree
- Osage-orange (*Maclura pomifera*), tree
- eastern redcedar (*Juniperus virginiana*), tree
- Chickasaw plum (*Prunus angustifolia*), shrub
- fragrant sumac (*Rhus aromatica*), shrub
- smooth sumac (*Rhus glabra*), shrub

State 4
Tillage State

Extensive areas of the historic Sand Plains 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. 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 is a result of a land use management decision.

Community 4.1
Reseed Plant Community

This plant community occurs on areas that were formerly farmed and reseeded with a mixture of native species common in the Reference Plant Community. Most seeding mixtures consisted of a blend of grasses that include sand bluestem, Indiangrass, switchgrass, little bluestem, sideoats grama, blue grama, and western wheatgrass. In some locations, seed of legumes and forbs such as prairie bundleflower and Maximilian sunflower were included in the mixture. Once these areas become fully established, production is comparable to that of the Reference Plant Community. Total annual production ranges 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, 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.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses dominant 66%**			1150–2310	
	sand bluestem	ANHA	*Andropogon hallii*	700–1300	–
	switchgrass	PAVI2	*Panicum virgatum*	175–350	–
	Indiangrass	SONU2	*Sorghastrum nutans*	175–350	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–245	–
	composite dropseed	SPCO16	*Sporobolus compositus*	50–175	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	50–175	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	10–50	–
	purpletop tridens	TRFL2	*Tridens flavus*	0–35	–
2	**Midgrasses subdominant 14%**			200–490	
	little bluestem	SCSC	*Schizachyrium scoparium*	200–500	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	5–50	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–35	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–20	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–20	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–20	–
3	**Cool-season grasses minor 5%**			50–175	
	Canada wildrye	ELCA4	*Elymus canadensis*	20–100	–
	sedge	CAREX	*Carex*	10–50	–

	porcupinegrass	HESP11	*Hesperostipa spartea*	0–50	–
	western wheatgrass	PASM	*Pascopyrum smithii*	10–50	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	5–20	–
4	**Shortgrasses trace 2%**			0–70	
	blue grama	BOGR2	*Bouteloua gracilis*	0–50	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–50	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–25	–
Forb					
5	**Forbs minor 8%**			75–280	
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	25–75	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	10–50	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	10–50	–
	roundhead lespedeza	LECA8	*Lespedeza capitata*	10–50	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	10–50	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–20	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–20	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–20	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	0–20	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–20	–
	hoary verbena	VEST	*Verbena stricta*	0–15	–
	Virginia tephrosia	TEVI	*Tephrosia virginiana*	0–15	–
	common yarrow	ACMI2	*Achillea millefolium*	0–15	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	0–15	–
	dotted blazing star	LIPU	*Liatris punctata*	0–15	–
	purple poppymallow	CAIN2	*Callirhoe involucrata*	0–15	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–15	–
	spotted beebalm	MOPU	*Monarda punctata*	0–15	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–15	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–15	–
	partridge pea	CHFA2	*Chamaecrista fasciculata*	0–15	–
	Illinois ticktrefoil	DEIL2	*Desmodium illinoense*	0–15	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–15	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–15	–
	compassplant	SILA3	*Silphium laciniatum*	0–15	–
Shrub/Vine					
6	**Shrubs and Trees minor 5%**			50–175	
	American plum	PRAM	*Prunus americana*	10–75	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	10–75	–
	prairie rose	ROAR3	*Rosa arkansana*	10–50	–
	soapweed yucca	YUGL	*Yucca glauca*	0–25	–
	pricklypear	OPUNT	*Opuntia*	0–25	–

Animal community

Wildlife

Where good vegetative cover exists, upland game birds such as bobwhite quail and greater prairie chicken find this site suitable habitat. Big game animals such as white-tailed deer and wild turkey also utilize this rangeland habitat. Small birds like the western kingbird, grasshopper sparrow, and western meadowlark are commonly found. Small mammals such as the skunk, opossum, and cottontail are present. Soil properties on this site make it a preferred habitat for burrowing mammals such as the plains pocket gopher and badger along with other small animals that might use the underground burrows as habitat. Predators such as foxes, coyotes, hawks, and owls are commonly found. A variety of snakes including the bull snake and prairie rattlesnake, as well as lizards and the box turtle, frequent this site.

Maintaining good to excellent vegetative cover on this site is the key to providing good wildlife habitat. In some cases, development of wildlife watering facilities in areas that are remote to natural water sources can be beneficial.

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 on the variability factors.

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

Hydrological functions

Following are the estimated withdrawals of freshwater by use in MLRA 74: Public supply—surface water, 6.6%; ground water, 5.7%; Livestock—surface water, 0.3%; ground water, 4.2%; Irrigation—surface water, 70.8%; ground water, 0.5%; Other—surface water, 12.0%; ground water, 0.0%

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

Water is the primary factor limiting forage production on this site. Infiltration rates are high and 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 which provide much aesthetic appeal to the landscape.There are a number of site considerations because of the fragile nature of the soils and potential for severe wind erosion and water erosion on the steeper portions of the site.

Wood products

This site normally produces no wood products.

Other products

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

Other information

Site Development and Testing Plan

This site went through the approval process.

Inventory data references

Information presented here has been derived from NRCS clipping data, numerous ocular estimates and other inventory data. Field observations from experienced range-trained personnel was 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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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 12-6-2018 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 Sand Plains 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 10% 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 4-6.

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

   Ap--0 to 8 inches (0 to 20 centimeters); light yellowish brown (10YR 6/4), interior, fine sand, yellowish brown (10YR 5/4), interior, moist; single grain; loose, loose, nonsticky and nonplastic; 5.0 percent clay; moderately acid; clear smooth boundary. (7 to 20 inches thick; 18 to 50 centimeters 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 66% 2310 lbs.; sand bluestem 700-1300, switchgrass 175-350, Indiangrass 175-350, composite dropseed 50-175, sand dropseed 50-175, prairie sandreed 0-245, purple lovegrass 10-50, purple tridens 0-35

    Sub-dominant: Group 2 Midgrass subdominant 14% 490 lbs.; little bluestem 200-500, sideoats grama 5-50, sand lovegrass 0-35, Fendler threeawn 0-20, purple threeawn 0-20, thin paspalum 0-20

    Other: Group 3 Cool-season grasses Minor 5% 175 lbs.; Canada wildrye 20-100, western wheatgrass 10-50, sedge 10-

50, Scribner's rosette grass 5-20, porcupinegrass 0-50
Group 4 Shortgrasses Trace 2% 70 lbs.; blue grama 0-50, hairy grama 0-50, buffalograss 0-25

Additional: Group 5 Forbs Minor 8% 280 lbs.
Group 6 Shrubs and Treess Minor 5% 175 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 2,500 lbs in a below-average rainfall year and 4,500 lbs in an above-average rainfall year. The representative value for this site is 3,500 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.
