USDA Natural Resources Conservation Service

Ecological site R079XY122KS
Sandy Loam

Last updated: 12/08/2020
Accessed: 05/03/2024

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.

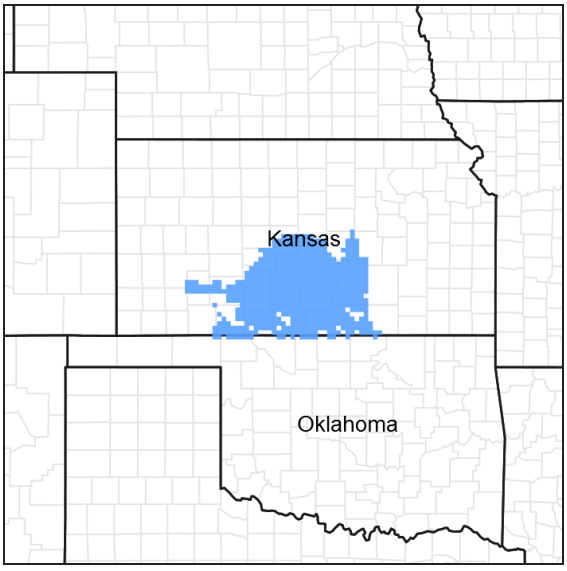


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 079X–Great Bend Sand Plains

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

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

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

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

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

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

Classification relationships

Major Land Resource Area (MLRA) 79--Great Bend Sand Plains

Ecological site concept

This ecological site was formerly known as Sandy R079XY022KS. The Sandy Loam ecological site is made up of well drained and very deep (greater than 60 inches) soils. These soils have a loamy subsurface texture and greater than 52 percent sand throughout the profile. Generally this site is located on paleoterraces (erosional remnant of a terrace) and dunes on paleoterraces with a slope range of 0 to 15 percent.

Associated sites

R079XY121KS	**Sand Plains** The Sand Plains ecological site is commonly located adjacent to and in coordination with the Sandy Loam ecological site. The Sand Plains site can be identified with soils that have more than 70 percent sand in the surface layer. This site also has soils with a clay increase, from lamellae, at 8 inches from the soil surface.
R079XY123KS	**Sand Floodplain** Sand Floodplain ecological site is commonly located adjacent to or in coordination with the Sandy Loam site. This site is located on Floodplains that have a seasonal or perennial high water table greater than 6 feet from the surface. This site has soils with more than 79 percent sand in the surface.

Table 1. Dominant plant species

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

Physiographic features

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

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

The Sandy Loam ecological site consists of deep, fine sandy loam or sandy loam soils on nearly level to moderately sloping areas on paleoterraces or dunes on paleoterraces on river valleys.

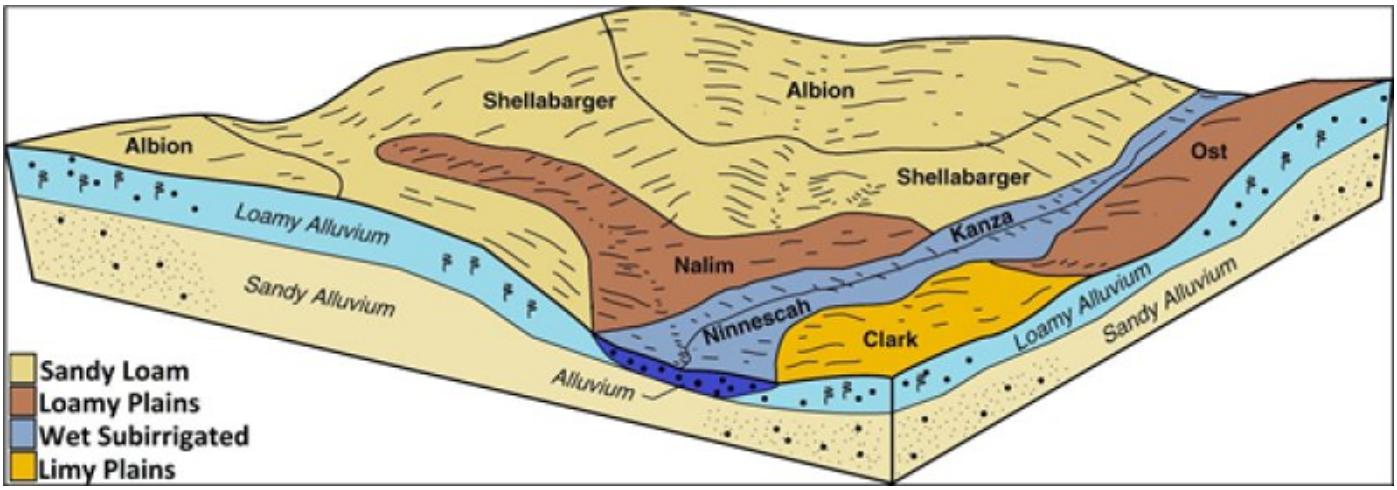


Figure 2.

Table 2. Representative physiographic features

Landforms	(1) River valley > Paleoterrace
Runoff class	Very low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	503–792 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in MLRA 79 is 25 to 33 inches (635 to 840 millimeters). Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from the middle of spring to early in autumn. The annual snowfall ranges from about 14 inches (35 centimeters) in the southern part of the area to 20 inches (50 centimeters) in the northern part. The average annual temperature is 55 to 57 degrees F (13 to 14 degrees C). The freeze-free period averages 197 days, increasing in length from northwest to southeast.

Precipitation is usually evenly distributed throughout the year, with the exception of November through February as the driest months and May and June are the wettest months. Summer precipitation occurs during intense summer thunderstorms.

The following weather data originated from weather stations chosen across the geographical extent of the ecological site, and will likely vary from the data for the entire MLRA. The climate data derives from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The dataset is from 1981-2010.

Table 3. Representative climatic features

Frost-free period (characteristic range)	148-163 days
Freeze-free period (characteristic range)	185-197 days
Precipitation total (characteristic range)	711-813 mm
Frost-free period (actual range)	146-181 days
Freeze-free period (actual range)	184-203 days
Precipitation total (actual range)	660-864 mm
Frost-free period (average)	159 days

Freeze-free period (average)	192 days
Precipitation total (average)	762 mm

Climate stations used

- (1) KINSLEY 2E [USC00144333], Kinsley, KS
- (2) NORWICH [USC00145870], Norwich, KS
- (3) HUTCHINSON [USC00143929], Hutchinson, KS
- (4) WELLINGTON [USC00148670], Wellington, KS
- (5) HUDSON [USC00143847], Hudson, KS
- (6) HUTCHINSON 10 SW [USC00143930], Hutchinson, KS
- (7) WICHITA [USW00003928], Wichita, KS
- (8) GREENSBURG [USC00143239], Greensburg, KS
- (9) KINGMAN [USC00144313], Kingman, KS
- (10) PRATT [USC00146549], Pratt, KS
- (11) STERLING [USC00147796], Sterling, KS

Influencing water features

The soils on this site are well drained and have a slow to moderately rapid permeability. Water erosion can be a hazard on the steeper portions of this site.

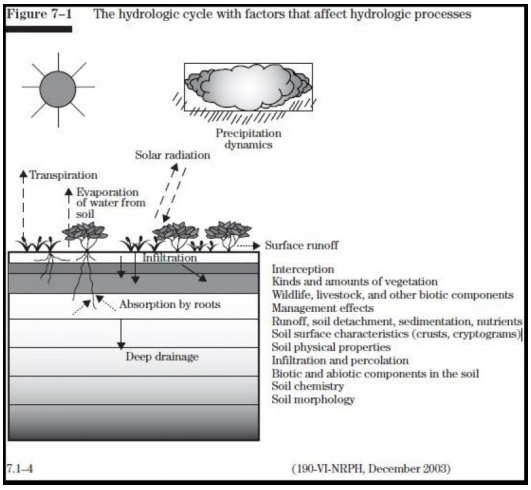


Figure 9.

Soil features

The soils representing the Sandy Loam ecological site are somewhat excessively to well drained and moderately deep to very deep. The surface layer of the soils in this site is primarily sandy loam (but the range includes loamy sand textures). The surface layer ranges from a depth of 4 to 20 inches thick. The subsoil and underlying material have a similar texture to the somewhat higher clay content texture as the surface layer. Contrasting sandy or very clayey layers may occur at depths around 40 inches in several of the listed soil series. Soils in this site are generally high in fertility and have a moderate to high available water capacity. These soils are susceptible to erosion, primarily by wind. The potential for wind erosion increases with sandier surface texture and drier climates.

The major soils that characterize this site include Albion, Attica, Hayes, Naron, Poxmash, Saltcreek, Shellabarger, Spelvin, and Zellmont.

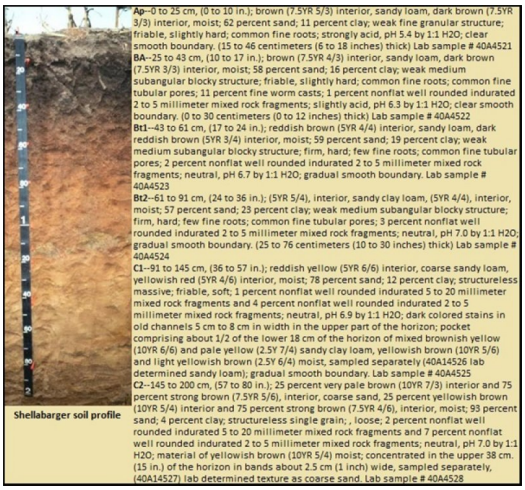


Figure 10.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Eolian deposits
Surface texture	(1) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0–14%
Available water capacity (0-101.6cm)	8.38–28.96 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–30%

Ecological dynamics

The Sandy Loam ecological site is a dynamic plant community resulting from the complex interaction of many ecological processes. The vegetation evolved on deep to moderately deep soils under a diverse, fluctuating climate. Plants were grazed by herds of large herbivores and periodically subjected to intense wildfires.

The deep, sandy soils characteristic of this site absorbed water moderately rapid and water-holding capacities were moderate. 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. Because there is almost no runoff from this site, most precipitation enters the root profile. This site has the potential to be productive. Seedheads of sand bluestem often reach six to seven feet in height.

The original plant community developed with occasional fire as 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 more frequently than did natural fires, even on an annual basis. All of the dominant tallgrasses were rhizomatous. This enabled them to survive the ravages of even intense wildfires and gave them a competitive advantage over bunchgrasses 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 usually a substantial increase in the abundance of annuals. This increase was generally temporary, perhaps 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 intense, both long and of short duration. As herds moved to adjacent areas, vegetation was provided a period of time to recover. Other grazing and feeding animals such as deer, rabbits, insects, and numerous burrowing rodents had secondary influences on plant community development.

Variations in climate, especially drought cycles, also had a major impact upon the development of the plant community. Species composition fluctuated according to the duration and severity of droughts. During prolonged dry cycles, many of the shallow-rooted plants died 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.

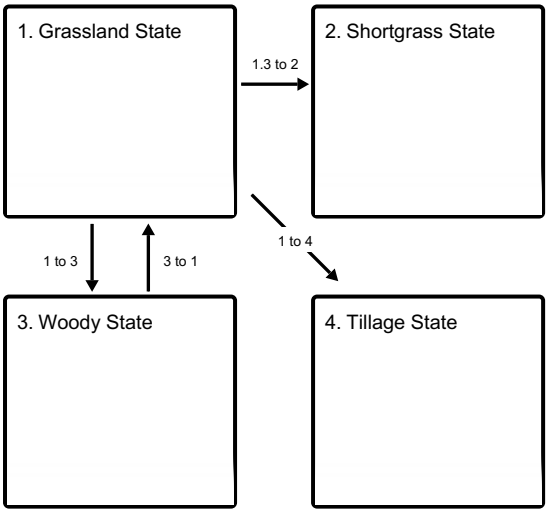
As the utilization of the site for production of domestic livestock replaced that of roaming bison herds, the ecological dynamics were altered and the plant community changed from its original composition. Changes were usually in proportion to the intensity and season of grazing. A combination of drought and overgrazing accelerated these changes. The taller grasses and forbs that were palatable to bison were, with few exceptions, equally relished and selected by cattle. When repeatedly grazed, tallgrasses were weakened and gradually replaced by the increase and spread of less palatable midgrasses and forbs. Where the history of overgrazing by domestic livestock was more intense, even plants that initially increased were often replaced by even less desirable, lower-producing vegetation. Reduced plant cover resulting from severe overgrazing, and trailing by livestock led to wind erosion in some areas.

The occurrence of wildfires and the impact that fire played in maintaining the plant community diminished with the advent of roads and cultivated fields. Use of prescribed fire as a management tool, often not an option adopted in modern communities, also diminished. The absence of fire contributed to a gradual increase of shrub species in many areas. In some areas shrubs and trees have spread to the point they have become a dominant influence in the plant community.

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.

State and transition model

Ecosystem states



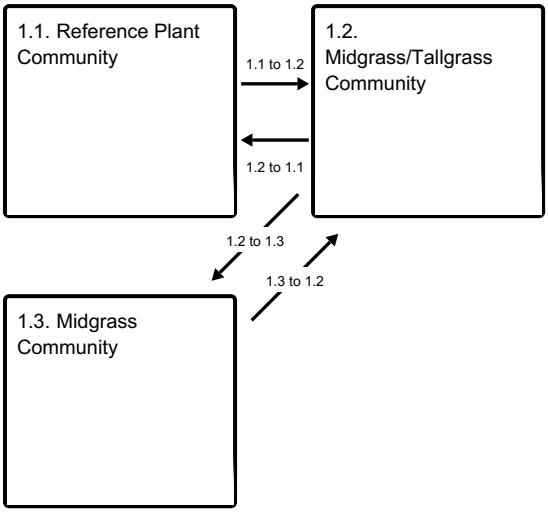
1.3 to 2 - Long-term management (approximately 30 years) without a forage and animal balance and heavy, continuous grazing without adequate recovery periods between grazing events.

1 to 3 - No prescribed fires or brush management.

1 to 4 - Mechanical tillage

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

State 1 submodel, plant communities



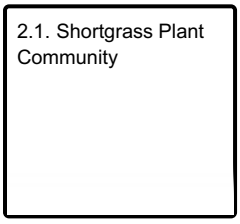
1.1 to 1.2 - Repetitive heavy use, no forage and animal balance, no rest or recovery of key forage species.

1.2 to 1.1 - Rest and recovery of key forage species.

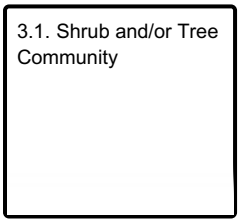
1.2 to 1.3 - Continuous, heavy use of the native vegetation, no forage and animal balance, and inadequate rest and recovery of the native grasses.

1.3 to 1.2 - Prescribed grazing and/or prescribed fire.

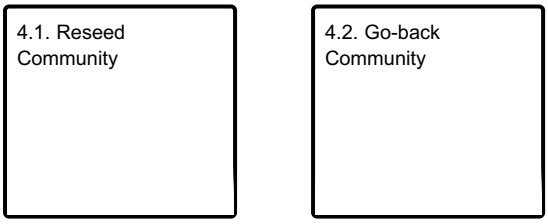
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Grassland State

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

local expertise, and photographs. It is defined by a suite of native plant communities that are a result of periodic fire, drought, and grazing. These events are part of the natural disturbance regime and climatic process. The Reference Plant Community consists of warm-season tall- and midgrasses, cool-season and sod-forming grasses, forbs, and shrubs. The Midgrass/Tallgrass community is made up primarily of warm-season midgrasses with an interspersed cool-season component and decreasing amounts of forbs and tallgrasses. The Midgrass Plant Community is dominated by less desirable midgrasses, shortgrasses, and cool-season midgrasses.

Characteristics and indicators. This state is distinguished from other states by the tall- and midgrass native species that that dominate the site.

Resilience management. The Grassland State is defined by a suite of native plant communities that are a result of periodic fire, drought, and grazing.

Community 1.1
Reference Plant Community

The interpretive plant community for this site is the Reference Plant Community. This community represents the original plant community that existed prior to European settlement. The site is characterized as a grassland essentially free of trees and large shrubs. It is dominated by tall, warm-season grasses, including sand bluestem, switchgrass, and Indiangrass. These tallgrasses have extensive root systems that penetrate the soil profile to depths of 10 to 12 feet. The major midgrass species is little bluestem. Combined, the sand bluestem, switchgrass, Indiangrass, and little blusestem will account for approximately 80 percent of the vegetation produced annually. Other prevalent midgrasses include 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 Sandy Loam ecological 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 pitchersage. 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 also 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. Sand sagebrush occurs in some of the extreme western portions of MLRA 79. The Reference Plant Community is stable when properly managed. A prescribed grazing program that incorporates periods of deferment during the growing season benefits tallgrasses and even the more palatable forb species. Soils are susceptible to wind erosion and excessive grazing. Trailing by livestock can impair the stability of the site. 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. 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. Total annual production ranges from 2,000 to 4,000 pounds of air-dry vegetation per acre and averages about 3000 pounds.

Resilience management. A prescribed grazing program that incorporates periods of deferment during the growing season benefits tallgrasses and even the more palatable forb species.

Dominant plant species

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

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1905	2858	3811
Forb	224	336	448
Shrub/Vine	112	168	224
Total	**2241**	**3362**	**4483**

Community 1.2
Midgrass/Tallgrass Community

Figure 12. Midgrass/Tallgrass Plant Community

The composition of this plant community resembles that of the Reference Plant Community. Comparatively, there has been a decrease in the amount of the more palatable tallgrasses and forbs and a subsequent increase in midgrasses. The dominant grasses are little bluestem and sand 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, and composite dropseed. Other secondary grasses are Carolina crabgrass, red lovegrass, thin paspalum, tumble windmill grass, Texas bluegrass, hairy grama, blue grama, and Scribner’s rosette grass. Combined these secondary grasses now comprise 20 to 30 percent of the total herbage produced annually. 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 10 percent of the total production. Total annual production ranges from 2,000 to 3,600 pounds of air-dry vegetation per acre and averages about 2,600 pounds. Prescribed grazing that incorporates periods of deferment during the growing season will improve the vigor and gradual recovery of the more palatable tallgrasses and forbs.

Resilience management. Periods of deferment 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 thus maintained in a state of low vigor. This results in a gradual reduction in its abundance over time. 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. Such grazing concentrations in some areas have eventually lead to wind erosion and even the establishment of small blowouts.

Dominant plant species

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

Community 1.3
Midgrass Community

Figure 13. Midgrass 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. The most abundant midgrasses include sand dropseed, composite dropseed, western wheatgrass, sand lovegrass, and purple lovegrass. Shortgrasses such as Carolina crabgrass, red lovegrass, tumble windmill grass, purple threeawn, hairy grama, and blue grama produce 10 to 15 percent of the vegetation. 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. 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. 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 Carruth's sagewort, white sagebrush, redroot buckwheat, tenpetal blazingstar, bush morning-glory, queen's-delight, 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 10 to 20 percent of the vegetation. Where past grazing has usually been only during the summer months there may be an increase in the abundance of soapweed yucca. Usually this species is grazed primarily during the period of February and March. Total annual production ranges from 1,600 to 3,200 pounds air dry vegetation per acre and averages about 2,300 pounds. 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.

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

Dominant plant species

- sand dropseed (*Sporobolus cryptandrus*), grass
- composite dropseed (*Sporobolus compositus var. 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

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/or 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.

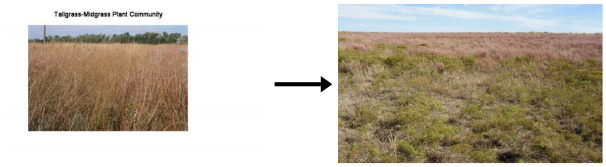
Pathway 1.2 to 1.1
Community 1.2 to 1.1

The following describes the mechanisms of change from Plant Community 1.2 to Plant Community 1.1. Management (10-15 years) that includes adequate rest and recovery of the key forage species (sand bluestem, switchgrass, and Indiangrass) within the Reference Plant Community; and, 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

Pathway 1.2 to 1.3
Community 1.2 to 1.3

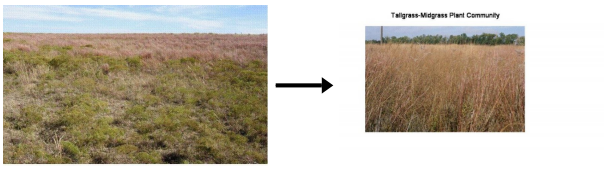


Midgrass/Tallgrass Community

Midgrass Community

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

Pathway 1.3 to 1.2
Community 1.3 to 1.2



Midgrass Community

Midgrass/Tallgrass Community

The following describes the mechanisms of change from Plant Community 1.3 to Plant Community 1.2. Management (approximately 10 years) that includes adequate rest and recovery of the key forage species in the Midgrass Community 1.2 (little bluestem, sand bluestem, switchgrass, Indiangrass). Implement prescription fires at a frequency of 6-8 years. Dependent upon the level of woody vegetation encroachment, the fire return interval might need to be adjusted to two consecutive years of prescribed fires.

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. Species diversity has been reduced further. Water infiltration is reduced and runoff is increased due to the sod nature of the blue grama and buffalograss. Specific dynamic soil property changes between the Grassland

State and the Sod-bound State 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).

Characteristics and indicators. Plant community functional and structural group shift from a midgrass community to a shortgrass dominant community.

Resilience management. Maintaining a forage and animal balance will sustain this plant community.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- hairy grama (*Bouteloua hirsuta*), grass
- buffalograss (*Bouteloua dactyloides*), grass

Community 2.1
Shortgrass Plant Community

Figure 14. Shortgrass Plant Community

This plant community is dominated by shortgrasses. It develops following many years of continuous heavy grazing, generally in small pastures associated with a farming-oriented enterprise. Such pastures are often used as holding areas in anticipation of seasonal wheat pasture or other cropland forages. 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, 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 tallgrasses and midgrasses have been eliminated. The major perennial grasses are blue grama, red lovegrass, foxtail barley, tumblegrass, Fendler threeawn, and, in some locations, false buffalograss. With normal or above-normal precipitation, numerous annual grasses including prairie threeawn, little barley, sixweeks fescue, and cheatgrass will occur. Although productivity is significantly reduced when compared to the Reference Plant Community, this plant community can be managed as a stable shortgrass community. Restoration to tallgrasses in a reasonable period of time would require range seeding. Total annual production ranges from 1,100 to 2,800 pounds of air-dry vegetation per acre, and averages about 1,900 pounds.

Resilience management. Although productivity is significantly reduced when compared to the Reference Plant Community, this plant community can be managed as a stable shortgrass community. Prescribed grazing that includes a forage and animal balance and periodic rest will sustain this plant community.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- hairy grama (*Bouteloua hirsuta*), grass

State 3
Woody State

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

Characteristics and indicators. Hydrologic function is affected by the amount of vegetative cover. Canopy interception loss can vary from 25.4 percent to 36.7 percent (Thurow and Hester, 1997). A small rainfall event is usually retained in the foliage and does not reach the litter layer at the base of the tree. Only when canopy storage is reached and exceeded does precipitation fall to the soil surface. Interception losses associated with the accumulation of leaves, twigs, and branches at the 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.

Resilience management. The Woody State is maintained by the absent of fire and mechanical and/or chemical control of woody species.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- Chickasaw plum (*Prunus angustifolia*), shrub
- fragrant sumac (*Rhus aromatica*), shrub
- smooth sumac (*Rhus glabra*), shrub

Community 3.1
Shrub and/or Tree Community

This plant community is dominated by shrubs consisting primarily of Chickasaw plum, fragrant sumac, and smooth sumac. Sand sagebrush occurs in some locations in the extreme western portion of MLRA 79. Trees such as honeylocust 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 in the absence of fire. Periodic burning tends to hinder the establishment of most of these woody species and favor forbs and grasses. However, it should be pointed out that not all unburned areas have a woody plant problem. Birds and small mammals are instrumental in the distribution of seed and accelerating the spread of most shrubs common to this site. The speed of encroachment varies considerably and can occur on both grazed and non-grazed pastures. When encroachment occurs on areas that have been subjected to long-term 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 production is significantly reduced because of the shrub competition. Grass yields vary from 30 to 50 percent of the total vegetative production. Forbs generally produce 10 to 20 percent of the total vegetation production. Major forbs include white sagebrush, Carruth’s 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 whitetail deer, benefit from the growth of shrubs

for both food and as cover. When wildlife populations are a desirable component, this should be a considered in any brush management plans.

Resilience management. Sustaining this plant community entails the absence of fire as a natural disturbance.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- honeylocust (*Gleditsia triacanthos*), tree
- Chickasaw plum (*Prunus angustifolia*), shrub
- sand dropseed (*Sporobolus cryptandrus*), grass
- sand lovegrass (*Eragrostis trichodes*), grass
- purple lovegrass (*Eragrostis spectabilis*), grass
- Texas bluegrass (*Poa arachnifera*), grass
- Scribner's rosette grass (*Dichanthelium oligosanthes var. scribnerianum*), grass

State 4
Tillage State

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. Until further evidence is fulfilled the tillage state does not have a restoration pathway.

Community 4.1
Reseed 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, seeds from legumes and forbs such as prairie bundleflower and Maximilian sunflower were included in the mixture. 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. 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.

Dominant plant species

- sand bluestem (*Andropogon hallii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass

- western wheatgrass (*Pascopyrum smithii*), grass

Community 4.2
Go-back 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.

Resilience management. 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 will become 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 windmill grass. 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 upon seasonal precipitation and the stage of plant succession in the plant community.

Dominant plant species

- sand dropseed (*Sporobolus cryptandrus*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass
- thin paspalum (*Paspalum setaceum*), grass
- purple lovegrass (*Eragrostis spectabilis*), grass
- red lovegrass (*Eragrostis secundiflora*), grass
- Scribner's rosette grass (*Dichanthelium oligosanthes var. scribnerianum*), grass

Transition 1.3 to 2
State 1 to 2

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

Constraints to recovery. Due to species composition change there is an increase in evaporation rate, runoff, and in bulk density. There is a decrease in infiltration, plant composition changes, 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

Lack of prescribed fire and brush management cause this transition. 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. 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 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).

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. 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.

Constraints to recovery. Soil structure and aggregate stability are soil properties that have changed as a result of mechanical tillage. These properties affect the infiltration and percolation of water in the soil profile which affects the hydrology on the landscape.

Restoration pathway 3 to 1
State 3 to 1

Restoration efforts will be costly, labor-intensive, and can take many years, if not decades, to return to a Grassland State. Once canopy levels reach greater than 20 percent, estimated cost to remove trees is very expensive and includes high energy inputs. The technologies necessary in order to go from an invaded Woody State to a Grassland State include but are not limited to: prescribed burning—the use of fire as a tool to achieve a management objective on a predetermined area under conditions where the intensity and extent of the fire are controlled; brush management—manipulating woody plant cover to obtain desired quantities and types of woody cover and/or to reduce competition with herbaceous understory vegetation, in accordance with overall resource management objectives; and prescribed grazing—the controlled harvest of vegetation with grazing or browsing animals managed with the intent to achieve a specified objective. In addition to grazing at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation. When a juniper tree is cut and removed, the soil structure and the associated high infiltration rate may be maintained for over a decade (Hester, 1996). This explains why the area near the dripline usually has substantially greater forage production for many years after the tree has been cut. It also explains why runoff will not necessarily dramatically increase once juniper is removed. Rather, the water continues to infiltrate at high rates into soils previously ameliorated by junipers, thereby increasing deep drainage potential. In rangeland, deep drainage amounts can be 16 percent of the total rainfall amount per year (Thurow and Hester, 1997).

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass Dominant 47%**			1177–1580	
	sand bluestem	ANHA	*Andropogon hallii*	1009–1345	–
	Indiangrass	SONU2	*Sorghastrum nutans*	168–336	–
	switchgrass	PAVI2	*Panicum virgatum*	56–168	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	6–56	–
	composite dropseed	SPCO16	*Sporobolus compositus*	0–22	–
2	**Midgrass Subdominant 25%**			448–841	
	little bluestem	SCSC	*Schizachyrium scoparium*	448–785	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	56–168	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–22	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–22	–
3	**Shortgrass Minor 8%**			168–336	
	blue grama	BOGR2	*Bouteloua gracilis*	112–280	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–56	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–22	–
	tumble windmill grass	CHVE2	*Chloris verticillata*	0–22	–
4	**Cool-season grass Minor 5%**			56–168	
	sedge	CAREX	*Carex*	6–56	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	6–56	–
	Canada wildrye	ELCA4	*Elymus canadensis*	6–56	–
Forb					
5	**Forbs Subdominant 10%**			168–336	
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	22–50	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	11–39	–
	roundhead lespedeza	LECA8	*Lespedeza capitata*	11–39	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	6–34	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	6–34	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	6–34	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	6–34	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–34	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–34	–
	bractless blazingstar	MENUS	*Mentzelia nuda var. stricta*	0–28	–
	purple poppymallow	CAIN2	*Callirhoe involucrata*	0–28	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–28	–
	common yarrow	ACMI2	*Achillea millefolium*	0–28	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–28	–
Shrub/Vine					
6	**Shrubs and Cacti Minor 5%**			0–168	

0	**Shrubs and Cacti Minor 5%**			0–168	
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–34	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	0–34	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	0–34	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–34	–
	smooth sumac	RHGL	*Rhus glabra*	0–34	–
	prairie rose	ROAR3	*Rosa arkansana*	0–34	–
	soapweed yucca	YUGL	*Yucca glauca*	0–34	–

Animal community

Wildlife

Where good vegetative cover exists, upland game birds such as bobwhite quail and greater prairie chicken find this site suitable habitat. Lesser prairie chicken are found on the western portions of the site. 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, and small mammals such as the skunk, opossum, and cottontail are also 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 and coyotes are commonly found on this site as are avian predators, hawks, and owls. A variety of snakes, including the bull snake and prairie rattlesnake, as well as lizards and the box turtle, also 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 is also necessary.

Some animals are important because of their threatened and endangered status and require special consideration. Please check the Kansas Department of Wildlife and Parks (KDWP) website at www.kdwp.state.ks.us 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 ESD. Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of inventory data will permit the establishment of a safe initial stocking rate.

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

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

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

Hydrological functions

Water is the primary factor limiting forage production on this site. Infiltration rates are high and runoff potential is low for this site.

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

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

Recreational uses

This site provides opportunities for a variety of outdoor activities including bird watching, hiking, outdoor/wildlife photography, and hunting. There are a wide variety of plants in bloom throughout the growing season, especially in those years with average and above rainfall, and they provide much aesthetic appeal to the landscape. There are a number of site considerations because of the fragile nature of the soils, and the potential for severe wind erosion and water erosion on the steeper portions of the site.

Wood products

Other than a few honeylocust and northern catalpa post lots that were planted on this site, it 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 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

Chris Tecklenburg

Approval

Curtis Talbot, 12/08/2020

Acknowledgments

The ecological site development process is a collaborative effort, conceptual in nature, dynamic, and is never considered complete. I thank all those who set the foundational work in the mid 2000s in regards 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.

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 12-21-2017 David Kraft, John Henry, Doug Spencer and Dwayne Rice Original Authors and date 2-15-2005
Contact for lead author	State Rangeland Management Specialist for Kansas.
Date	12/21/2017
Approved by	Curtis Talbot

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** The sandy loam textured soils that characterize this site have a low potential for rill formation, therefore no rills or active headcutting are present on the 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):**
   Shellabarger OSD:
   Ap--0 to 25 cm, (0 to 10 in.); brown (7.5YR 5/3) interior, sandy loam, dark brown (7.5YR 3/3) interior, moist; 62 percent sand; 11 percent clay; weak fine granular structure; friable, slightly hard; common fine roots; strongly acid, pH 5.4 by 1:1 H2O; clear smooth boundary. (15 to 46 centimeters (6 to 18 inches) thick)

BA--25 to 43 cm, (10 to 17 in.); brown (7.5YR 4/3) interior, sandy loam, dark brown(7.5YR 3/3) interior, moist; 58 percent sand; 16 percent clay; weak medium subangular blocky structure; friable, slightly hard; common fine roots; common fine tubular pores; 11 percent fine worm casts; 1 percent nonflat well rounded indurated 2 to 5 millimeter mixed rock fragments; slightly acid, pH 6.3 by 1:1 H2O; clear smooth boundary. (0 to 30 centimeters (0 to 12 inches) thick)

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Functional and Structural groups are that of the reference plant community (see functional and structural group worksheet). Note changes to plant communities if different than that of the functional and structural group worksheet.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** There is no evidence of a compacted soil layer less than 6 inches from the soil surface. Soil structure is similar to that described in indicator 9. Compacted physical features will include platy, blocky, dense soil structure over less dense soil layers, horizontal root growth, and increase bulk density (measured by weighing a known volume of oven-dry soil).

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Tallgrass Dominant 45% 1350 lbs. sand bluestem 900-1200, switchgrass 50-150, Indiangrass 150-300

    Sub-dominant: Midgrass Subdominant 23% 690 lbs. little bluestem 400-700
    Grass Subdominant 10% 300 lbs. sideoats grama 50-150, blue grama 100-300, hairy grama 0-50

    Other: Grass Minor 5% 150 lbs.
    Grass Trace 2% 60 bls

    Additional: Forb Subdominant 10% 300 lbs.
    Shrubs and Cacti Minor 5% 150 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 2000 lbs in a below average rainfall year and 4000 lbs in an above average rainfall year. The representative value for this site is 3000 lbs production per year.

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.

17. **Perennial plant reproductive capability:** Plants on site exhibit the required vigor and growth to be able to reproduce vegetatively or by seed. Current management activities do not adversely effect the capability of plants to reproduce.