USDA Natural Resources
Conservation Service

Ecological site R079XY105KS
Sodic Plains

Last updated: 9/21/2018
Accessed: 05/18/2024

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.

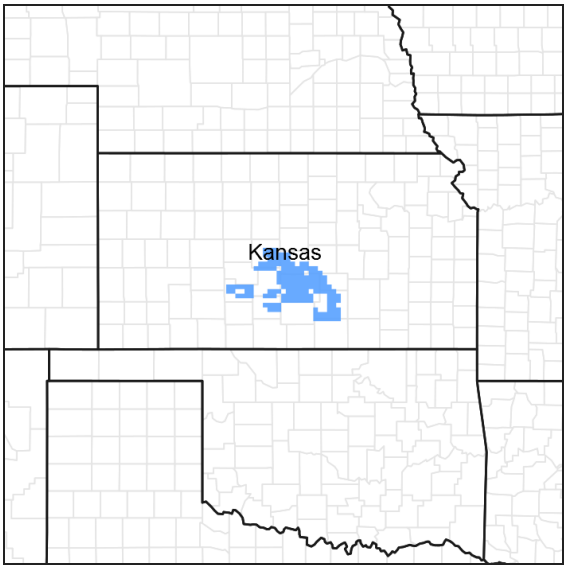


Figure 1. Mapped extent

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 used as 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): 079-Great Bend Sand Plains

Ecological site concept

The Sodic Plains (079XY105) ecological site was formerly named Sodic Claypan (R079XY005KS). This site occurs on nearly level to very gently sloping soils on paleoterraces in river valleys of the Great Bend Sand Plains of MLRA 79. The Sodic Plains ecological site is characteristic of soils with visible salts more than eight inches from the soil surface. This site also has a sodium absorption ratio greater than 13 at a depth of more than four inches from the soil surface. Soil surface textures range from dine sandy loam to silt loam. The slopes range from 0 to 3 percent.

Associated sites

R079XY115KS	**Loamy Plains** This site sits adjacent to and in conjunction with the Sodic Plains ecological site. The Loamy Plains ecological site is made up of moderately deep to deep, moderately well to well drained upland soils. This site has a silty or loamy surface texture and is non-calcareous to the surface. Generally, the Loamy Plains ecological site is located on paleoterraces and/or uplands with a slope range of 0 to 12 percent.
R079XY107KS	**Clayey Plains** This site sites adjacent to and in conjunction with the Sodic Plains ecological site. The Clayey Plains ecological site is characterized by soils that are very deep, moderately well to well drained, and on paloeterraces in river valleys formed in alluvium. The slopes range from 0 to 6 percent. The surface texture is clay loam to silt loam with a clay increase of greater than 35 percent within 12 inches from the surface.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bouteloua gracilis* (2) *Bouteloua curtipendula*

Physiographic features

Most of MLRA 79 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. The 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 MLRA 79, Rattlesnake Creek flows north and the Little Arkansas River flows south into the Arkansas River.

The Sodic Plains ecological site consists of very deep, moderately well to somewhat poorly drained soils formed in calcareous alluvium. This site occurs on nearly level to very gently sloping plains. Runoff is very low to medium and permeability is very slow. The slope ranges from 0 to 3 percent.

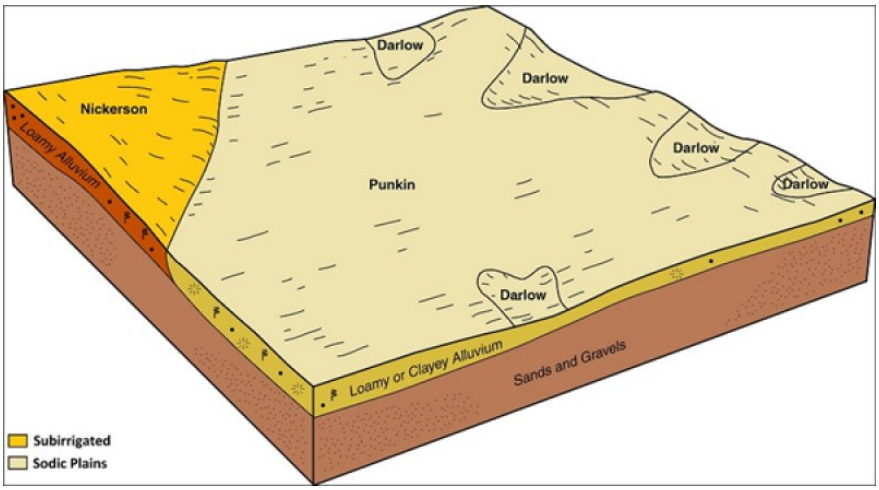


Figure 2.

Table 2. Representative physiographic features

Landforms	(1) River valley > Paleoterrace
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	503–792 m
Slope	0–3%
Water table depth	152 cm
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 as the wettest months. Summer precipitation occurs during intense summer thunderstorms. The following weather data originated from weather stations chosen across the geographical extent of the ecological site, and will likely vary from the data for the entire MLRA. The climate data 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)	153-164 days
Freeze-free period (characteristic range)	193-196 days
Precipitation total (characteristic range)	737-813 mm
Frost-free period (actual range)	147-171 days
Freeze-free period (actual range)	191-197 days
Precipitation total (actual range)	711-813 mm
Frost-free period (average)	159 days
Freeze-free period (average)	194 days
Precipitation total (average)	762 mm

Climate stations used

- (1) STERLING [USC00147796], Sterling, KS
- (2) HUDSON [USC00143847], Hudson, KS
- (3) HUTCHINSON [USC00143929], Hutchinson, KS
- (4) HUTCHINSON 10 SW [USC00143930], Hutchinson, KS
- (5) WICHITA [USW00003928], Wichita, KS

Influencing water features

Soils on the Sodic Plains ecological site are moderately well to somewhat poorly drained. The water table may enter the root zone during growing season wet cycles. These soils are not subject to flooding.

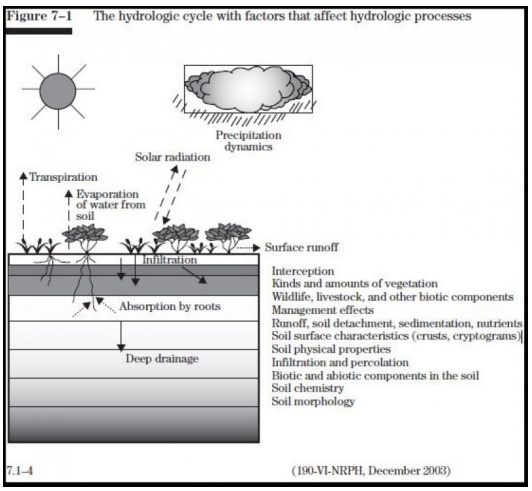


Figure 9.

Soil features

The soils are on paleoterraces. They are very deep with loamy surface layers and loamy to clayey subsoils. These soils are characterized with high amounts of salts within 4 inches from the surface.

The major soils common to this site are Darlow and Punkin.

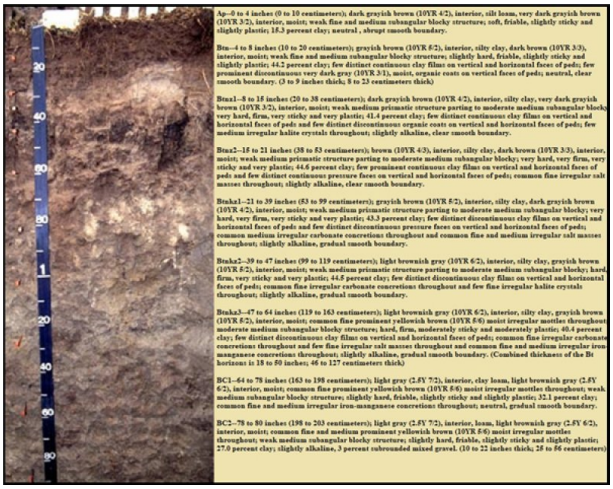


Figure 10.

Table 4. Representative soil features

Parent material	(1) Alluvium

Surface texture	(1) Fine sandy loam (2) Loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Very slow
Soil depth	203 cm
Available water capacity (0-101.6cm)	12.19–24.13 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1–40
Soil reaction (1:1 water) (0-101.6cm)	4.5–9

Ecological dynamics

The Sodic Plains ecological site is a dynamic plant community due to the complex interaction of many ecological processes. The site was exposed to a diverse and fluctuating climate, grazed by herds of large herbivores, and periodically subjected to intense wildfires. The plants that evolved and dominated the original plant community were well-adapted to these climatic, soil, and biological conditions.

In this particular resource area, the Sodic Plains site occurs on only two land forms: terraces or paleoterraces in the Arkansas River Basin. This is very different from the many upland landform settings on which the site is found in major land resource areas 74 or 76. Additionally, depressions, or “buffalo wallows” common to this site in other resource areas are virtually non-existent here.

The soils on this site include physical characteristics that considerably influence plant growth. For example, the ability of the plants to extract water from the subsoil is limited by the amount of exchangeable sodium present. Although the water-holding capacity of the subsoil is high, its slow release of water to plants causes the site to be droughty. Also, plants have evolved in soils with dense clay subsoils that restrict vertical root development.

The site developed with fire playing an important role in ecological processes. Historically, fires were usually started by lightning, typically during the 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. Due to the rhizomatous nature of the dominant tallgrasses, they were able to survive the ravages of even intense wildfires and gain a competitive advantage in the plant community. Most trees and shrubs were suppressed by fire and occurred only sparsely on protected areas on the adjacent Clayey Plains site. Growth of forbs, especially legumes, was usually enhanced following a fire event. After a fire there was usually a substantial increase in the abundance of annual forbs as well. Although temporary, this increase may have lasted for up to one to two years.

Herd behavior and grazing patterns had a major impact on the dynamics of this site. Typically, herds did move on to adjacent areas, which gave the vegetation 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 plant community development. Species composition fluctuated according to the duration and severity of droughts. During prolonged dry cycles, many of the shallow-rooted plants died out and the production of deeper-rooted plants significantly decreased. When sufficient rainfall occurred following an extended period of dry years, annual forbs and annual grasses would temporarily occur in great abundance. As precipitation returned to normal or above-normal, the deeper-rooted grasses responded quickly to production potentials.

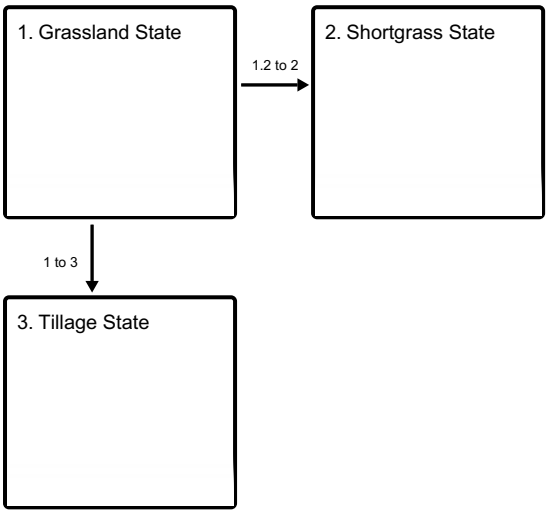
State and Transition Diagram

As the practice of fencing and domestic livestock husbandry replaced open spaces and wild herds of wandering bison, pronghorn, and deer, the site's ecological dynamics were altered and the plant community changed from its original composition. Changes were usually in proportion to the season and intensity of grazing livestock, and were often accelerated by a combination of drought and overgrazing. For example, the taller grasses and forbs palatable to bison were equally relished and selected by cattle. When repeatedly grazed, these plants were weakened and gradually replaced by the increase and spread of less-palatable midgrasses, shortgrasses, and forbs. Where the history of overgrazing by domestic livestock was intense for many years, even the plants that initially increased were often replaced by even less-desirable, lower-producing vegetation. In some areas plant cover was reduced to a mixture of native shortgrasses, annual grasses, and forbs.

The following diagram illustrates some of the pathways that the site's vegetation 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

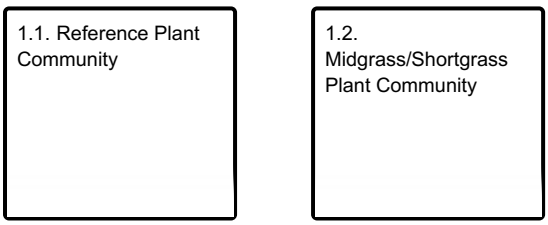
Ecosystem states



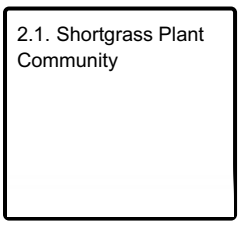
1.2 to 2 - Long-term, heavy, stocking rates.

1 to 3 - Mechanical tillage

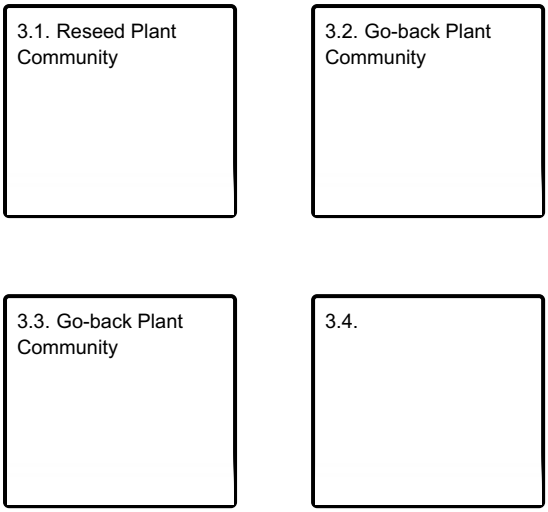
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 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 Sodic 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.

Characteristics and indicators. The Grassland State is made up of two native plant communities. The Reference Plant Community consists of warm-season mid- and shortgrasses, cool-season and sod-forming grasses, forbs, and shrubs. The shortgrass/midgrass community is made up primarily of warm-season shortgrasses, with an interspersed cool-season component and decreasing amounts of forbs and midgrasses.

Resilience management. This is a stable state when grazing is adequately managed. A prescribed grazing program that incorporates proper stocking rates during the growing season will maintain this state.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- switchgrass (*Panicum virgatum*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- sideoats grama (*Bouteloua curtipendula var. caespitosa*), grass

Community 1.1
Reference Plant Community

The interpretive plant community for this site is the Reference Plant Community and represents the original vegetation that existed prior to European settlement. The site is characterized as open grassland essentially free of trees and large shrubs and dominated by blue grama, buffalograss, and western wheatgrass. Other prevalent midgrasses are sideoats grama, alkali sacaton, and composite dropseed. These grasses will account for just over 65 percent of vegetation produced annually. Sodic Plains soils support a dominance of midgrasses in the Reference Plant Community; however, pockets of deeper Clayey Plains soils do occur as inclusions on Sodic Plains ecological sites and do support populations of tall, warm-season grasses such as big bluestem, switchgrass, and Indiangrass. These tall, warm-season grasses may temporarily express themselves following a wet cycle, giving the false appearance that the Sodic Plains site is dominated by tallgrasses. The site supports a wide variety of native forbs and legumes interspersed throughout the grass sward. The most abundant are dotted blazing star, upright prairie coneflower, slimflower scurfpea, white heath aster, and prairie bundleflower. Other important forbs include Dakota mock vervain, field pussytoes, common yarrow, and Missouri goldenrod.

Resilience management. This is a stable plant community when grazing is adequately managed. A prescribed grazing program that incorporates periods of deferment during the growing season benefits both midgrasses and tallgrasses and the more palatable forb species.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- switchgrass (*Panicum virgatum*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- composite dropseed (*Sporobolus compositus var. compositus*), grass
- alkali sacaton (*Sporobolus airoides*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1261	2270	3256
Forb	269	409	560
Shrub/Vine	28	56	84
Total	**1558**	**2735**	**3900**

Community 1.2
Midgrass/Shortgrass Plant Community

This plant community developed as a result of many years of repeated heavy grazing. Blue grama, buffalograss, and western wheatgrass are dominant. Midgrasses include little bluestem, sideoats grama, composite dropseed, and purple lovegrass. Tallgrasses have been all but eliminated, and surviving plants are in a very low state of vigor. Shortgrasses such as Kentucky bluegrass, tumble windmill grass, tumblegrass, fall panicgrass, and little barley play a more prominent role. Forb production is quite variable and may range from 10 to 25 percent of the total vegetation, depending upon amounts and timing of rainfall events. Perennial forbs include white sagebrush, slimflower scurfpea, Missouri goldenrod, white heath aster, and Cuman ragweed. Total annual production ranges from 1,100 to 2,800 pounds of air-dry vegetation per acre and averages about 2,000 pounds.

Resilience management. Prescribed grazing with adequate rest and recovery periods during the growing season will shift this plant community to include more mid- and tallgrasses. With continued management these will gradually increase in vigor and abundance, along with the more dominant blue grama, buffalograss, and western wheatgrass.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

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. 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 have been documented. As plant community cover decreases from bunchgrasses to more of the sodgrasses, there is a decrease in infiltration and interception and an increase in surface runoff (Thurow T., 2003).

Resilience management. This is a stable state that can be maintained by providing a forage and animal balance during the growing season.

Dominant plant species

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

Community 2.1
Shortgrass Plant Community

Developed after many years of continuous overgrazing, this plant community presents a distinctive shortgrass aspect on the landscape. It is dominated by blue grama and buffalograss, with notable amounts of western wheatgrass and sideoats grama present in states of low vigor and productivity. Other grasses include field brome, cheatgrass, composite dropseed, silver beardgrass, Kentucky bluegrass, prairie threeawn, and tumble windmill grass. These species commonly account for 70 to 80 percent of the annual forage production. Like the desirable grasses, palatable legumes and other forbs have been reduced by continuous heavy grazing and competition over many years. Prevalent broadleaf species in this situation include annual ragweed, white sagebrush, Cuman ragweed, Baldwin ironweed, wavyleaf thistle, and curlycup gumweed. Forbs may comprise 20 to 30 percent of the total vegetation. Total annual production ranges from 950 to 1,500 pounds of air-dry vegetation per acre and averages about 1,200 pounds.

Resilience management. Recovery of midgrasses, tallgrasses, and associated forbs characteristic 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 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
- buffalograss (*Bouteloua dactyloides*), grass

State 3
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. This state will not transition to other states due to the inherited soil properties from years of tillage.

Community 3.1
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.

Resilience management. 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.

Community 3.2
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 upon 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 invaders 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.

Community 3.3
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.

Resilience management. The speed and extent of revegetation depends upon 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 invaders 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.

Community 3.4

Transition 1.2 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 hydrologic and nutrient cycles are the ecological processes affected. 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.

Context dependence. The amount of time it takes for this transition to occur will vary.

Transition 1 to 3
State 1 to 3

This transition is triggered by a management action as opposed to a natural event. Tillage, or breaking the ground with machinery for crop production, will move the Grassland State to a Tillage State.

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.

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	**Grasses Dominant 70%**			897–1917	
	blue grama	BOGR2	*Bouteloua gracilis*	280–560	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	112–448	–
	buffalograss	BODA2	*Bouteloua dactyloides*	280–448	–
	western wheatgrass	PASM	*Pascopyrum smithii*	168–336	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	112–336	–
	alkali sacaton	SPAI	*Sporobolus airoides*	56–168	–
2	**Grasses Minor 10%**			84–275	
	little bluestem	SCSC	*Schizachyrium scoparium*	56–135	–
	switchgrass	PAVI2	*Panicum virgatum*	34–84	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–50	–
	big bluestem	ANGE	*Andropogon gerardii*	0–50	–
3	**Grasses Minor 3%**			39–78	
	sedge	CAREX	*Carex*	11–28	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	11–28	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	11–28	–
	prairie threeawn	AROL	*Aristida oligantha*	0–11	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–11	–
Forb					

4	**Forbs Subdominant 15%**			129–409	
	dotted blazing star	LIPU	*Liatris punctata*	11–34	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	11–34	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	11–22	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	0–22	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	6–22	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	6–22	–
	blue wild indigo	BAAUM	*Baptisia australis var. minor*	6–22	–
	white heath aster	SYER	*Symphyotrichum ericoides*	11–22	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	0–17	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	6–17	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	6–17	–
	false gaura	STLI2	*Stenosiphon linifolius*	0–17	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–17	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	6–17	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	6–17	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–17	–
	common yarrow	ACMI2	*Achillea millefolium*	6–17	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	6–17	–
	field pussytoes	ANNE	*Antennaria neglecta*	6–11	–
	Dakota mock vervain	GLBIB	*Glandularia bipinnatifida var. bipinnatifida*	6–11	–
	hoary verbena	VEST	*Verbena stricta*	0–11	–
Shrub/Vine					
5	**Shrub/Vine Trace 2%**			0–56	
	pricklypear	OPUNT	*Opuntia*	0–56	–

Animal community

The Sodic Plains ecological site is a unique prairie wildlife habitat when maintained in good to excellent condition. The site provides nesting habitat for a number of ground-nesting bird species, including eastern and western meadowlarks.

Historically, big game animals such as white-tailed deer, pronghorn, and bison used this site for grazing. The Claypan site, being an open prairie with shorter grasses, is a preferred habitat for the black-tailed jack rabbit and black-tailed prairie dog. Other small mammals such as the thirteen-lined ground squirrel are found on the site as well. Larger predators such as the coyote and badger are attracted by these smaller animals, as are avian predators such as hawks and owls.

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&T) website at http://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 upon preference of plant species, and/or grazing system, and site grazeability factors (such as steep slopes, site inaccessibility, or distance to drinking water).

Often the current plant community does not entirely match any particular Community Phase as described in this Ecological Site Description. Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of inventory data will permit the establishment of a safe initial stocking rate.

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

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

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

Hydrological functions

Water is the primary factor limiting forage production on this site.

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

Darlow and Punkin soils are in hydrologic groups C and D, respectively. Because Sodic Plains soils take in water very slowly, large amounts of rainfall are lost to runoff. 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 provides opportunities for a variety of outdoor activities which might include bird watching, hiking, outdoor/wildlife photography, and hunting. A wide variety of plants is in bloom throughout the growing season, especially in those years with average and above-average rainfall, providing much aesthetic appeal to the landscape. This site is subject to sheet erosion when mismanaged.

Wood products

This site produces no wood products.

Other products

Other products are generally not produced on this site.

Other information

This site is not suited for home sites and other developments. The high clay content (high shrink-swell potential) of these soils can create foundation problems and severely limits their suitability for septic systems and access roads.

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.

Ecological Site Description for Kansas, Sodic Claypan (R079XY005KS) located in Ecological Site Information System (ESIS), 2007.

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Contributors

Chris Tecklenburg

Approval

David Kraft, 9/21/2018

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 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.

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 5-29-2018 David Kraft, John Henry, Doug Spencer and Dwayne Rice/original authors 2-15-2005
Contact for lead author	State Rangeland Management Specialist for Kansas located in Salina 785-823-4500.
Date	05/29/2018
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** The loam and silt 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):** Punkin OSD:

   Ap--0 to 4 inches (0 to 10 centimeters); dark grayish brown (10YR 4/2), interior, silt loam, very dark grayish brown (10YR 3/2), interior, moist; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; 15.3 percent clay; neutral , abrupt smooth boundary.

   Btn--4 to 8 inches (10 to 20 centimeters); grayish brown (10YR 5/2), interior, silty clay, dark brown (10YR 3/3), interior, moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 44.2 percent clay; few distinct continuous clay films on vertical and horizontal faces of peds; few prominent discontinuous very dark gray (10YR 3/1), moist, organic coats on vertical faces of peds; neutral, clear smooth boundary. (3 to 9 inches thick; 8 to 23 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 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 increased 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 Grasses Dominant 70% 1710 lbs. blue grama 250-500, buffalograss 200-400, sideoats grama 100-400, western wheatgrass 150-300, composite dropseed 100-300, alkali sacaton 50-150

    Sub-dominant: Group 2 Grasses Minor 10% 245 lbs. little bluestem 50-120, switchgrass 30-75, big bluestem 0-45, Indiangrass 0-45

    Other: Group 3 Grasses Minor 3% 70 lbs. Scribner's rosette grass 10-25, sedge 10-25, purple lovegrass 10-25, purple threeawn 0-10, prairie threeawn 0-10

    Additional: Forbs Subdominant component 15%, 365 lbs. see functional/structural group sheet for specific forbs

    Shrubs Trace 2% 50 lbs. pricklypear 0-50

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.

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.

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 1,390 lbs in a below-average rainfall year and 3,480 lbs in an above-average rainfall year. The representative value for this site is 2,440 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 the 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.