

Ecological site R079XY105KS

Sodic Plains

Last updated: 9/21/2018
 Accessed: 06/18/2026

General information

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

MLRA notes

Major Land Resource Area (MLRA): 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 fine sandy loam to silt loam. The slopes range from 0 to 3 percent.

Associated sites

R079XY115KS	<p>Loamy Plains</p> <p>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.</p>
--------------------	---

R079XY107KS	<p>Clayey Plains</p> <p>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.</p>
-------------	--

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	<p>(1) <i>Bouteloua gracilis</i></p> <p>(2) <i>Bouteloua curtipendula</i></p>

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.

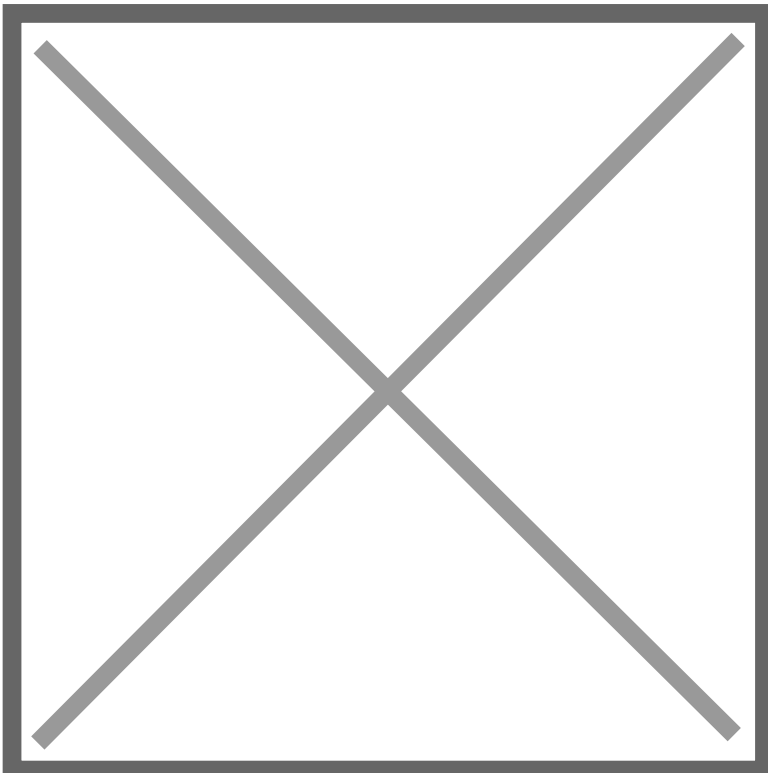


Figure 1.

Table 2. Representative physiographic features

Landforms	(1) River valley > Paleoterrace
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	500 – 790 m
Slope	0 %
Water table depth	150 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)	150-160 days
Freeze-free period (characteristic range)	190-200 days
Precipitation total (characteristic range)	740-810 mm
Frost-free period (actual range)	150-170 days
Freeze-free period (actual range)	190-200 days
Precipitation total (actual range)	710-810 mm

Frost-free period (average)	160 days
Freeze-free period (average)	190 days
Precipitation total (average)	760 mm

- (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.

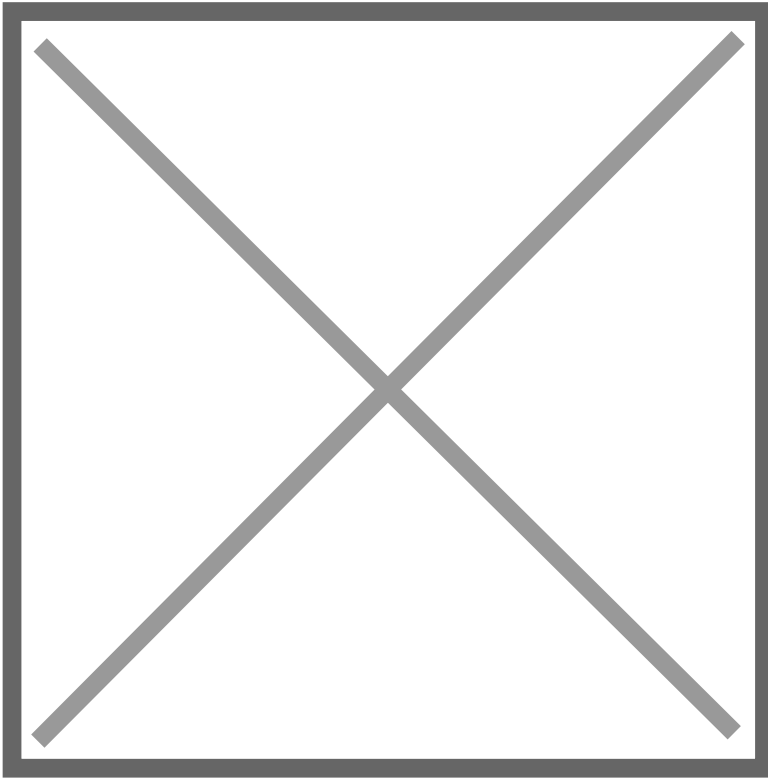


Figure 8.

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.

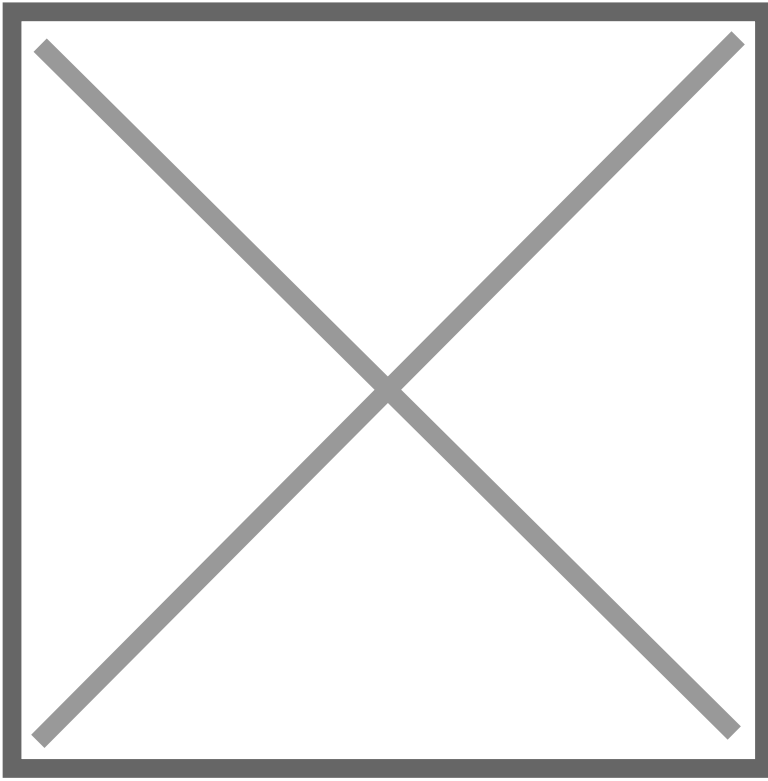


Figure 9.

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	200 cm
Available water capacity (0-101.6cm)	12.19 – 24.13 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %

Electrical conductivity (0-101.6cm)	0 – 20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 40
Soil reaction (1:1 water) (0-101.6cm)	4.5 – 10

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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Grasses Dominant 70%			897-1917	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	280-560	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	112-448	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	280-448	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	168-336	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus var. compositus</i>	112-336	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	56-168	–
2	Grasses Minor 10%			84-275	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	56-135	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	34-84	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0-50	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-50	–
3	Grasses Minor 3%			39-78	
	sedge	CAREX	<i>Carex</i>	11-28	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	11-28	–
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	11-28	–
	prairie threeawn	AROL	<i>Aristida oligantha</i>	0-11	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0-11	–
Forb					
4	Forbs Subdominant 15%			129-409	
	dotted blazing star	LIPU	<i>Liatris punctata</i>	11-34	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	11-34	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	11-22	–
	pitcher sage	SAAZG	<i>Salvia azurea var. grandiflora</i>	0-22	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	6-22	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	6-22	–
	blue wild indigo	BAAUM	<i>Baptisia australis var. minor</i>	6-22	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	11-22	–
	Baldwin's ironweed	VEBA	<i>Vernonia baldwinii</i>	0-17	–
	purple prairie clover	DAPUP	<i>Dalea purpurea var. purpurea</i>	6-17	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	6-17	–
	false gaura	STLI2	<i>Stenosiphon linifolius</i>	0-17	–
	scarlet beeblossom	OESU3	<i>Oenothera suffrutescens</i>	0-17	–
	stiff goldenrod	OLRI	<i>Oligoneuron rigidum</i>	6-17	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	6-17	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-17	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	6-17	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	6-17	–
	field pussytoes	ANNE	<i>Antennaria neglecta</i>	6-11	–
	Dakota mock vervain	GLBIB	<i>Glandularia bipinnatifida var. bipinnatifida</i>	6-11	–
	hoary verbena	VEST	<i>Verbena stricta</i>	0-11	–

Shrub/Vine					
5	Shrub/Vine Trace 2%			0-56	
	pricklypear	OPUNT	<i>Opuntia</i>	0-56	-

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 9. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 10. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 11. Community 3.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

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.

Other references

Brady, N. and R. Weil. 2008. The nature and properties of soils, 14th ed.

Bragg, T. and L. Hulbert. 1976. Woody plant invasion of unburned Kansas bluestem prairie. *J. Range Management.*, 29:19-23.

Dyksteruis, E.J. 1958. Range conservation as based on sites and condition classes. *J. Soil and Water Conserv.* 13: 151-155.

Eddleman, L. 1983. Some ecological attributes of western juniper. In: *Research in rangeland management. Agric. Exp. Stan. Oregon State Univ., Corvallis Spec. Rep. 682.P. 32-34.*

Hester, J.W. 1996. Influence of woody dominated rangelands on site hydrology and herbaceous production, Edwards Plateau, Texas. M.S. Thesis, Texas A&M University, College State, TX.

Holechek, J., R. Pieper, and C. Herbel. *Range Management: principles and practices.*—5th ed.

Kuchler, A. A new vegetation map of Kansas. *Ecology (1974) 55: pp. 586-604.*

Launchbaugh, J., C. Owensby. *Kansas Rangelands, their management based on a half century of research. Bull. 622 Kansas Agricultural Experiment Station, October, 1978.*

Moore, R., J. Frye, J. Jewett, W. Lee, and H. O'Connor. 1951. The Kansas rock column. *Univ. Kans. Pub., State Geol. Survey Kans. Bull. 89. 132p.*

National Climatic Data Center. Weather data. <http://www.ncdc.noaa.gov/>. Accessed online 04/05/2017.

Society for Rangeland Management. 1994. *Rangeland cover types of the United States.*

Soil Series—Official Series Descriptions. Available online. <https://soilseries.sc.egov.usda.gov/osdname.asp>. Accessed 04-05-2017.

Sauer, Carl. 1950. Grassland climax, fire, and man. *J. Range Manage.* 3: 16-21.

Thurow, T. and J. Hester. 1997. How an increase or reduction in juniper cover alters rangeland hydrology. In: C.A. Taylor, Jr. (ed.). *Proc. 1997 Juniper Symposium*. Texas Agr. Exp. Sta. Tech. Rep. 97-1. San Angelo, TX: 4:9-22.

USDA-Natural Resources Conservation Service. Soil surveys and Web Soil Survey. Available online. Accessed 04/05/2017.

USDA-NRCS. 1997. National range and pasture handbook. Chapter 7, rangeland and pastureland hydrology and erosion.

USDA Handbook 296. 2006. LRR and MLRA of the U.S., the Caribbean, and the Pacific Basin.

Waller, S., L. Moser, P. Reece., and G. Gates. 1985. Understanding grass growth.

Weaver, J. and F. Albertson. April, 1940. Deterioration of midwestern ranges. *Ecology*, Vol. 21, No. 2. pp. 216-236.

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.

Non-discrimination Statement In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident. Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English. To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture Office of the Assistant Secretary for Civil Rights 1400 Independence Avenue, SW Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. USDA is an equal opportunity provider, employer, and lender.

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.

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.

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.

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).

5. **Number of gullies and erosion associated with gullies:** No evidence of accelerated water flow resulting in downcutting of the soil.

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.

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).

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.

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)

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.

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).

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.
