Ecological site R079XY112KS
Limy Plains

Last updated: 9/21/2018
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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 Limy Plains (079XY112) ecological site was formerly named Limy Upland (R079XY012KS). This site occurs on uplands or paleoterraces. The Limy Plains site is characteristic of soils that are calcareous to the surface. Soil surface textures range from fine sandy loam to clay loam and slopes range from 0 to 15 percent.

Associated sites

R079XY107KS	**Clayey Plains** This site sits adjacent to and in conjunction with the Limy 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.
R079XY115KS	**Loamy Plains** This site sits adjacent to and in conjunction with the Limy 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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

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.

This ecological site consists of Clark and Case soils, which lie on nearly level to strongly sloping areas where they receive no extra moisture from drainage or overflow.

Figure 1. MLRA 79 ecological site block diagram.

Table 2. Representative physiographic features

Landforms	(1) Paleoterrace
Flooding frequency	None
Ponding frequency	None
Elevation	500 – 790 m
Slope	0 – 20 %
Ponding depth	0 cm
Water table depth	0 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 (average)	180 days
Freeze-free period (average)	200 days
Precipitation total (average)	790 mm

- (1) KINGMAN [USC00144313], Kingman, KS
- (2) STERLING [USC00147796], Sterling, KS
- (3) NORWICH [USC00145870], Norwich, KS
- (4) PRATT [USC00146549], Pratt, KS
- (5) HUTCHINSON 10 SW [USC00143930], Hutchinson, KS

Influencing water features

Case and Clark soils are well drained and have moderate permeability. Modest soil moisture on the Limy Plains site is due to moderate to high available water capacity (AWC). High carbonate values along with moderate slopes limits the total annual forage production on this site.

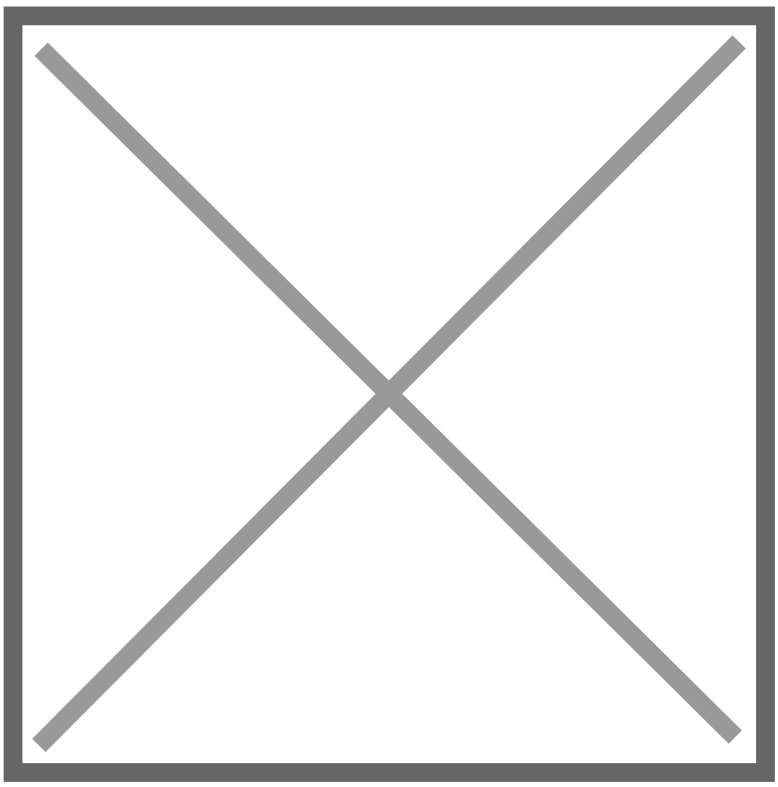

Figure 6. Fig.7-1 from National Range and Pasture Handbook.

Soil features

The soils are on paleoterraces. They are deep with loamy surface layers and subsoils. These soils are characterized with a weakly calcareous surface and strongly calcareous subsoils.

The major soils common to this site are Clark and Case.

Figure 7. Case typical soil profile image.

Table 4. Representative soil features

Surface texture	(1) Clay loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	19.05 – 28.45 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 50 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10

Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

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

The soils of the Limy Plains ecological site have a surface of clay loam to loam over calcareous alluvium and absorb water at a moderate rate. The site is nearly level to steeply sloping with slopes of 0 to 15 percent. In some cases limestone rock outcrops will be associated with the site. The taller grasses that evolved and dominated the original plant community had deep, efficient root systems capable of utilizing moisture throughout most of the profile. Although the vegetative production is limited by slope on portions of the site, as well as low to moderate available water capacity, the site is quite productive.

The Limy Plains site developed with fires of various intensity, frequency, and season of year playing important roles in ecological processes. Historically, fires were usually started by lightning during spring and early summer months when thunderstorms were most prevalent. It is also recognized that early Native Americans often used fire to attract herds of migratory herbivores, especially bison. All of the dominant tallgrasses were rhizomatous which enabled them 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. Growth of perennial forbs, especially legumes, was usually enhanced following a fire event. Following these fires, other than late spring burns, there was usually a substantial increase in the abundance of annual forbs as well. This upsurge was 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 probably intense but of short duration. Typically, this site was not grazed as intensively as more level, adjacent ones. As herds moved to other areas, the vegetation was afforded a period of recovery. 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 out and the production of deeper-rooted plants significantly decreased. When sufficient rainfall occurred after an extended period of dry years, annual forbs and annual grasses would temporarily occur in abundance. As precipitation returned to normal or above normal, the deeper-rooted grasses responded quickly to production potentials.

State and Transition Diagram

As utilization of the site for domestic livestock production replaced that of roaming bison herds, its ecological dynamics were altered and major portions of the plant community changed from their original compositions. Changes were usually in proportion to the season and intensity of grazing by livestock. A combination of drought and overgrazing accelerated these changes. The taller grasses and forbs palatable to bison were equally relished and selected by cattle and other domestic livestock. When repeatedly grazed, these grasses 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 for many years, even the plants that initially increased were often replaced by even less desirable, lower-producing plants. In some areas plant cover was reduced to a mixture of native shortgrasses, annual grasses, and forbs.

The occurrence of wildfires and the impact that fire played in maintaining the plant community was diminished with the advent of roads and cultivated fields. Use of prescribed fire as a management tool also diminished. In the absence of fire there has been a gradual increase of woody species in many areas. In some areas shrubs and trees have spread to the point they have become the dominant influence in the plant community.

Large areas of the more level portion of the site were broken out for the cultivation of annual crops. Some of these areas are easily identified by their yellow, calcareous soils. Low production and other factors resulted in many of these fields being returned to grass through reseeding. The advent of the Conservation Reserve Program increased reseeding of these tilled areas.

The following diagram illustrates some of the pathways that the vegetation on this site may take from the Interpretive 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 61%**			1177-2051	
	big bluestem	ANGE	*Andropogon gerardii*	897-1681	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	280-673	–
	little bluestem	SCSC	*Schizachyrium scoparium*	392-673	–
2	**Grasses Minor 10%**			112-336	
	western wheatgrass	PASM	*Pascopyrum smithii*	22-112	–
	switchgrass	PAVI2	*Panicum virgatum*	56-112	–
	Indiangrass	SONU2	*Sorghastrum nutans*	56-112	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	22-112	–
3	**Grasses Subdominant 15%**			168-504	
	blue grama	BOGR2	*Bouteloua gracilis*	84-504	–
	buffalograss	BODA2	*Bouteloua dactyloides*	84-168	–
4	**Grasses Trace 2%**			0-67	
	hairy grama	BOHI2	*Bouteloua hirsuta*	0-17	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0-17	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0-17	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-17	–
Forb					
5	**Forbs Minor 10%**			112-336	
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0-56	–
	compassplant	SILA3	*Silphium laciniatum*	11-56	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	0-45	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	11-34	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	11-34	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	11-34	–
	butterfly milkweed	ASTU	*Asclepias tuberosa*	0-34	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	11-28	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	11-28	–
	blacksamson echinacea	ECANA	*Echinacea angustifolia var. angustifolia*	11-28	–
	dotted blazing star	LIPU	*Liatris punctata*	11-28	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	11-28	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	11-28	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	11-28	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	11-28	–
	velvety goldenrod	SOMOM	*Solidago mollis var. mollis*	11-28	–
	white heath aster	SYER	*Symphyotrichum ericoides*	11-28	–
	blue wild indigo	BAAUM	*Baptisia australis var. minor*	11-22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0-11	–

	rose heath	CHER2	*Chaetopappa ericoides*	0-11	–
	Fremont's leather flower	CLFR	*Clematis fremontii*	0-11	–
	golden prairie clover	DAAU	*Dalea aurea*	0-11	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	0-11	–
	prairie fleabane	ERST3	*Erigeron strigosus*	0-11	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-11	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0-11	–
Shrub/Vine					
6	**Trees, Shrubs, and Cacti Trace 2%**			0-67	
	leadplant	AMCA6	*Amorpha canescens*	0-22	–
	Jersey tea	CEHE	*Ceanothus herbaceus*	0-17	–
	pricklypear	OPUNT	*Opuntia*	0-11	–
	bur oak	QUMA2	*Quercus macrocarpa*	0-11	–
	prairie rose	ROAR3	*Rosa arkansana*	0-11	–
	soapweed yucca	YUGL	*Yucca glauca*	0-11	–

Table 6. Community 1.2 plant community composition

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

Table 7. Community 1.3 plant community composition

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

Table 8. Community 2.1 plant community composition

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

Table 9. Community 3.1 plant community composition

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

Table 10. Community 4.1 plant community composition

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

Table 11. Community 4.2 plant community composition

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

Animal community

This site is an excellent mixed grass prairie habitat when maintained in good to excellent condition, especially on its lesser-sloping portions. It is a favored foraging place for white-tailed and mule deer as well as pronghorn. Management that favors a good variety of forbs along with grasses on this site will attract a larger variety of wildlife species including ground nesting birds, such as the western meadowlark, and rodents. Reptiles including various snakes, lizards, and the box turtle are commonly found. A variety of avian predators, such as hawks and owls, are common as well. When the site is in poor condition, black-tailed prairie dogs, small rodents such as thirteen lined ground squirrels, and the black-tailed jackrabbit find it to be preferred habitat. Furbearing predators such as coyotes and badgers are common. 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 resources, maintains or improves rangeland health, and is consistent with management objectives. In addition to usable forage, safe stocking rates should consider ecological condition, trend of the site, past grazing use history, season of use, stock density, kind and class of livestock, forage digestibility, forage nutritional value, variation of harvest efficiency based on preference of plant species, and/or grazing system, and site grazeability factors (such as steep slopes, site inaccessibility, or distance to drinking water). Often the current plant community does not entirely match any particular Community Phase as described in this Ecological Site Description. Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of inventory data will permit the establishment of a safe initial stocking rate. No two years have exactly the same weather conditions. For this reason, year-to-year and season-to-season fluctuations in forage production are to be expected on

grazing lands. Livestock producers must make timely adjustments in the numbers of animals or in the length of grazing periods to avoid overuse of forage plants when production is unfavorable, and to make advantageous adjustments when forage supplies are above average. Initial stocking rates should be improved through the use of vegetation monitoring and actual use records that include number and type of livestock, the timing and duration of grazing, and utilization levels. Actual use records over time will assist in making stocking rate adjustments based on the variability factors. Average annual production must be measured or estimated to properly assess useable forage production and stocking rates.

Hydrological functions

Water is the primary factor limiting forage production on this site. Following are the estimated withdrawals of freshwater 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). The soils on this site are well drained, have moderate permeability, and are hydrologic group B soils. 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 are in bloom throughout the growing season, especially in those years with average and above rainfall, which provide much aesthetic appeal to the landscape. This site is subject to both wind and water erosion when mismanaged. Vehicular traffic can lead to gully formation on steeper areas. This site is often an excellent area for hunting deer and pronghorn.

Wood products

This site generally does not produce trees of sufficient size for commercial harvest.

Other products

None.

Other information

This site is one of the most visually attractive to visitors and residents alike due to its topography and diversity of plants. The steeply sloping portions of this site provide a colorful but rustic vista. The subsoil material from this site, sometimes referred to as “caliche,” may be used for road-base material. 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. Range Condition Guides and Technical Range Site Descriptions for Kansas, Limy Upland, USDA, Soil Conservation Service, March, 1967. Range Site Description for Kansas, Limy Upland, USDA-Soil Conservation Service, September, 1985. Ecological Site Description for Kansas, Limy Upland(R079XY012KS) 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. 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, audiotape, 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 5-22-2018 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	05/22/2018
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills: The loam and clay 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 5-6.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Clark OSD: Ap--0 to 28 centimeters (0 to 11 inches); very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; 21 percent clay; strongly effervescent throughout (HCl, unspecified); moderately alkaline; clear wavy boundary. (10 to 36 centimeters (4 to 14 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: Group 1 Grasses Dominant 61% big bluestem 800-1500, little bluestem 350-600, sideoats grama 250-600

    Sub-dominant: Group 2 Grasses Minor 10% Indiangrass 50-100, switchgrass 50-100, composite dropseed 20-100, western wheatgrass 20-100

    Other: Group 3 Grasses Subdominant 15% blue grama 75-450, buffalograss 75-150

    Additional: Grasses Group 4 Trace 2%, Forbs Minor 10%, Group 6 Trace 2% Trees, Shrubs, and Cacti

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Recruitment of plants is occurring and there is a mixture of many age classes of plants. The majority of the plants are alive and vigorous. Some mortality and decadence is expected for the site, due to drought, unexpected wildfire, or a combination of the two events. This would be expected for both dominant and subdominant groups.

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14. **Average percent litter cover (%) and depth (in):** Plant litter is distributed evenly throughout the site. There is no restriction to plant regeneration due to depth of litter. When prescribed burning is practiced, there will be little litter the first half of the growing season.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** All species (e.g., native, seeded, and weeds) alive in the year of the evaluation, are included in the determination of total above ground production. Site potential (total annual production) ranges from 2,200 lbs in a below-average rainfall year and 4,000 lbs in an above-average rainfall year. The representative value for this site is 3,000 lbs production per year.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** There are no noxious weeds present. Invasive plants make up a small percentage of plant community, and invasive brush species are < 5% canopy.

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17. **Perennial plant reproductive capability:** 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.
