Ecological site R072XY114KS
Loess Breaks

Accessed: 04/19/2024

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.

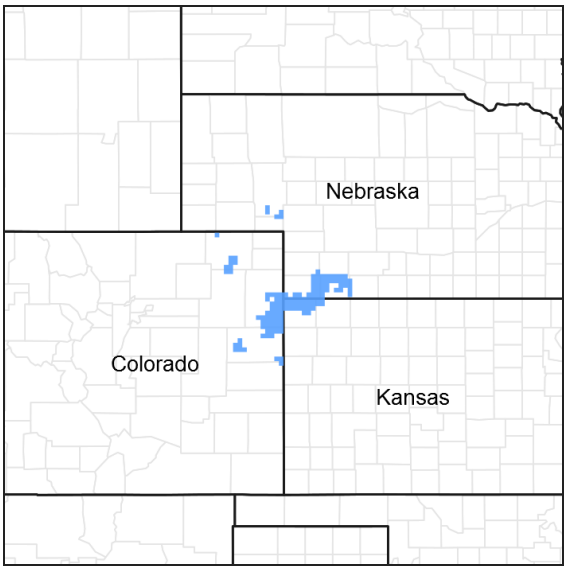


Figure 1. Mapped extent

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): 072X–Central High Tableland

Major Land Resource Area (MLRA) 72-Central High Tableland. This area is in Kansas (54 percent), Nebraska (25 percent), and Colorado (21 percent). A very small part of the area is in Wyoming. The area makes up about 34,550 square miles (89,535 square kilometers). It includes the towns of Garden City, Goodland, and Colby, Kansas; Imperial, North Platte, Ogallala, and Sidney, Nebraska; and Holyoke and Wray, Colorado. Interstate 70 bisects the area, and Interstates 76 and 80 follow the south side of the South and North Platte Rivers, respectively. The Cimarron National Grasslands occur in the southwest corner of the MLRA.

Classification relationships

Major land resource area (MLRA): 072-Central High Tableland

Ecological site concept

This ecological site occurs in the breaks landscape of MLRA72 (Central High Tableland). The loess breaks occur on steep to very steep hillslopes and canyon walls that have been dissected by geologic erosion creating narrow ridges or divides that break off steeply to narrow drainageways below. The slopes range from approximately 30 percent to near vertical. The hillslopes of this site are characteristically broken with a series of slope slips, often

referred to as "catsteps."

Associated sites

R072XY101KS	**Limy Slopes** The Limy Slopes ecological site is located on shoulders and backslopes on hillslopes on tableland landscapes. Soils correlated with this site are moderately deep to very deep and have a surface that is <8 inches (20cm). The soil surface texture ranges from silt loam to loam with the majority of the site surface textures being silt loam. Soils that are correlated to Limy Slopes have free carbonates occurring within 4 inches (10cm) of the surface. This site is dominated by loess parent material.
R072XY108KS	**Loamy Lowland** Alluvial soils make up the parent material of this ecological site. This site occurs on flood plains or low stream terraces and is characterized by a seasonal or perennial high water table greater than 6 feet from the surface. The soils characteristic of this site are deep and well drained that formed in calcareous alluvial sediments.
R072XY112KS	**Shallow Limy** This site occurs on the breaks landscape and characterized by soils that are less than 20 inches to bedrock. The breaks landscape is the area between the tableland and river valleys highlighted by cliff faces. The Shallow Limy ecological site occurs on nearly level to steeply sloping uplands. Much of the site is steep and characterized by rock ledges forming vertical drops.

Table 1. Dominant plant species

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

Physiographic features

This site occurs as areas on steep to very steep loess slopes that have experienced mass movement that can be enhanced by water erosion. The mass movement creates a series of loess faces above the tops of slump blocks. The tops of these slump blocks form terracettes, which are commonly referred to as "catsteps". The depth and height of these catsteps intensifies with increasing slope. Vertical faces of loess, areas of broken sod and deep gullies are common on this site. Vehicular traffic is very limited on this site. This site produces runoff to areas lower on the landscape.

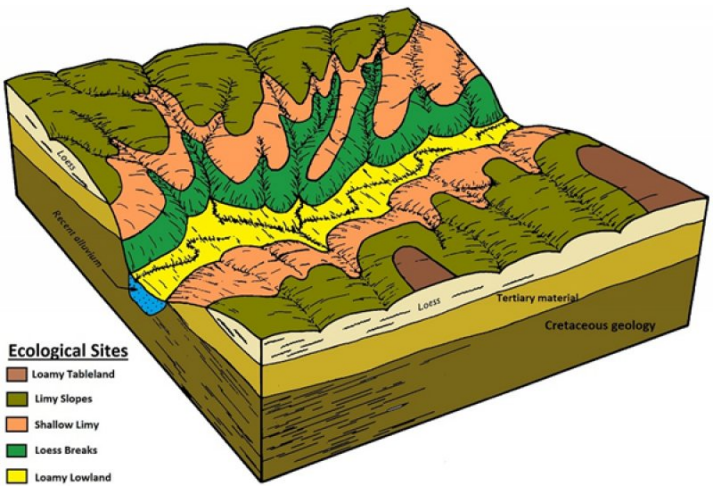


Figure 2. MLRA72 block diagram

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Canyon

Flooding frequency	None
Ponding frequency	None
Elevation	1,500–5,000 ft
Slope	15–60%
Ponding depth	0 in
Water table depth	80 in

Climatic features

The average annual precipitation in this area is 14 to 25 inches (355 to 635 millimeters). It fluctuates widely from year to year. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from late spring through early autumn. Precipitation in winter occurs as snow. The annual snowfall ranges from about 16 inches (40 centimeters) in the southern part of the area to 35 inches (90 centimeters) in the northern part. The average annual temperature is 46 to 57 degrees F (8 to 14 degrees C). The freeze-free period averages 159 days and ranges from 135 to 210 days, increasing in length from northwest to southeast. Climate data comes from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The data set is from 1981-2010.

Table 3. Representative climatic features

Frost-free period (average)	141 days
Freeze-free period (average)	158 days
Precipitation total (average)	21 in

Climate stations used

- (1) BENKELMAN [USC00250760], Benkelman, NE
- (2) HAYES CENTER 1NW [USW00024020], Hayes Center, NE
- (3) SAINT FRANCIS [USC00147093], Saint Francis, KS
- (4) IMPERIAL [USC00254110], Imperial, NE
- (5) IDALIA [USC00054242], Idalia, CO
- (6) ENDERS LAKE [USC00252741], Enders, NE

Influencing water features

There are no water features of the ecological site or adjacent wetland/riparian regimes that influence the vegetation and/or management of the site that make it distinctive from other ecological sites.

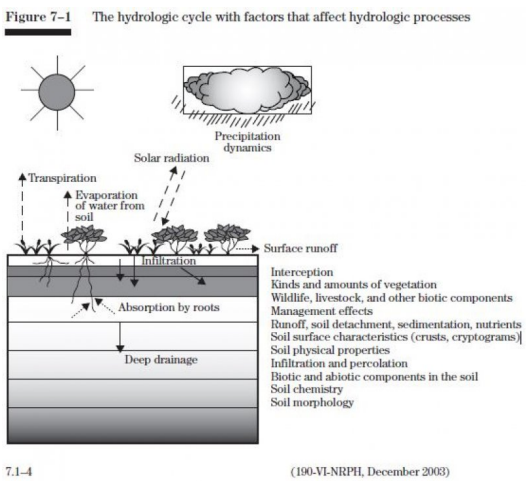


Figure 7. Fig. 7-1 from National Rangeland and Pastureland H

Soil features

This site is dominated by steep to very steep slopes of loess breaks, and includes narrow ridges and divides separating these loess faces. The slope of the soils in this site range from 20 percent to near vertical with slopes dominantly exceeding 30 percent. Those slopes under 30 percent are primarily on the included narrow ridges and divides.

The soils on this site are very deep and have thin, normally calcareous, silty surface layers. The content of organic matter is generally low to moderately low in the surface layer. The silty substratum is calcareous with relatively low inherent fertility, and generally has a calcium carbonate equivalent (CCE) of less than 15 percent.

Water flow patterns should be evident on most of this site due to slope and vegetation morphology. They may be broken and irregular in appearance or connected with some minor erosion. This site should exhibit slight to no evidence of rills or wind-scoured areas. Pedestaled plants would be common, especially in water flow patterns. Sub-surface soil layers are non-restrictive to water movement and root penetration. Included within this site are surfaces that have broken sod and are generally unstable on the steepest slopes and within gullies. The soils on this site are highly susceptible to both wind and water erosion when void of vegetative protection.

Major soil series correlated to this ecological site include Colby, Sulco and Sully.

These attributes represent 0-40 inches in depth or to the first restrictive layer.

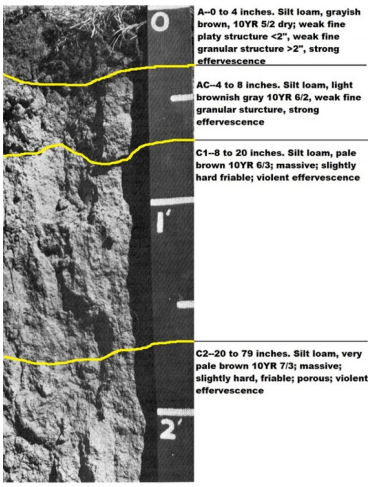


Figure 8. Colby silt loam, Thomas County, KS.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	0–60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	7.7–8.6 in
Calcium carbonate equivalent (0-40in)	0–15%

Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–9
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The plant communities for the Loess Breaks ecological site are dynamic due to the complex interaction of many ecological processes. The interpretive plant community for this site is the Reference Plant Community. The Reference Community has been determined by the study of rangeland relic areas, areas protected from excessive disturbance, areas under long term rotational grazing strategies, literature of plant communities from the early 1900s and local expertise. Trends in plant community dynamics, ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

This ecological site is made up of a grassland state. The grassland state is characterized by non-broken land (no tillage), both warm and cool season, rhizomatous, and bunch grasses, forbs and shrubs.

Vegetation changes are expected within this ecological site and will be dependent on the site's geographical location inside Major Land Resource Area (MLRA) 72. Variation in precipitation east and west is not as affected as is temperature north and south. The northern part of MLRA 72 is characterized by cooler temperatures and a shorter growing season in respect to the southern end. As a result, cool season bunchgrasses and sod formers proliferate. Growth of native cool season plants begins about April 15, and continues to about June 15. Native warm season plants begin growth about May 15, and continue to about August 15. Green up of cool season plants may occur in September and October if adequate moisture is available (weather data from National Climate Data Center 1980-2010).

The Loess Breaks ecological site developed with occasional fires as part of the ecological processes. Historically, it is believed that the fires were infrequent, randomly distributed, and started by lightning at various times throughout the season when thunderstorms were likely to occur. It is also believed that pre-European inhabitants may have used fire as a management tool for attracting herds of large migratory herbivores (bison, elk, deer and pronghorn). The impact of fire over the past 100 years has been relatively insignificant due to the human control of wildfires and the lack of acceptance of prescribed fire as a management tool in the semi-arid, High Plains area.

The degree of herbivory (feeding on herbaceous plants) has a significant impact on the dynamics of the site. Historically, periodic grazing by herds of large migratory herbivores was a primary influence.

The management of herbivory by humans through grazing of domestic livestock and/or manipulation of wildlife populations has been a major influence on the ecological dynamics of the site. This management, coupled with the High Plains climate, largely dictates the plant communities for the site.

Drought cycles were part of the natural range of variability within the site, and have historically had a major impact upon the vegetation. The species composition changes according to the duration and severity of the drought cycle (Albertson and Weaver 1942).

The vegetation on this site is impacted by topography. The percent (steepness) and aspect of the slope interact with the other ecological processes to further influence the vegetative dynamics of the site.

This site occurs on the sloping parts of the landscape. The site is generally not a preferred grazing area because of the steepness of the slopes. Adjacent sites are much flatter and generally receive the majority of the grazing pressure resulting in grazing distribution problems.

The general response of the Loess Breaks ecological site to long term continuous grazing pressure is to gradually lose the vigor and reproductive potential of the tall and mid-grass species and shift the plant community toward short-grass species.

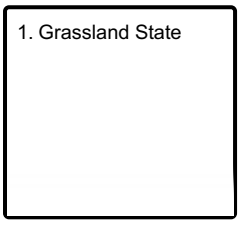
Grazing on Loess Breaks ecological site is limited at best, due to the degree of slope and limited access by cattle and other grazing animals. These sites can be over grazed by heavy, continuous grazing, but usually at the expense of other more accessible sites.

The tall and mid-grass species generally escape excessive grazing pressure on the steeper less accessible areas. The tall and mid grasses maintained on the steep area help to provide a source for these species to repopulate the site after long periods of drought and/or overgrazing. The use of grazing management that includes needed distribution tools, proper stocking, and adequate recovery periods during the growing season, helps to restore this site to its productive potential.

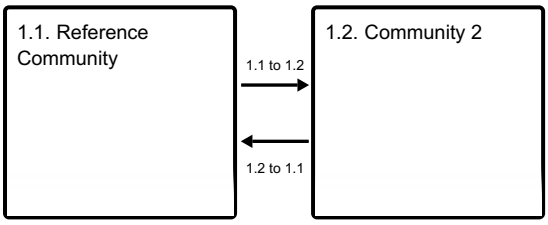
The following diagram illustrates pathways that the vegetation on this site may take from the Reference Plant Community as influencing ecological factors change. There may be other states or plant communities not shown in the diagram, as well as noticeable variations within those illustrated and described in the following sections.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Grassland State

The grassland state is supported by empirical data, historical data, local expertise and photographs. This state is defined by two native plant communities that are a result of periodic fire, drought and grazing. These events are part of the natural disturbance regime and climatic process. The Reference Plant Community consists of warm season sod and bunchgrasses, cool season sod forming grasses, forbs and shrubs. Plant community 2 is made up primarily of warm season shortgrass and few midgrasses with increasing amounts of threadleaf sedge and small soapweed.

Community 1.1
Reference Community

The Reference Community is supported by empirical data, historical data, local expertise and photographs. The potential vegetation is a mixed grass prairie consisting of approximately 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent shrubs. Little bluestem, sideoats grama, and big bluestem are the dominant grasses in this community. Secondary species include blue grama, switchgrass, Indiangrass, and western wheatgrass. This community has a diverse forb population, most of which occur in small amounts. Shrubs include sand sagebrush, leadplant and soapweed yucca. Little bluestem, sideoats grama and big bluestem are the dominant, mid-tallgrass species in this plant community. Combined, they make up approximately 53% of the total annual production, by weight, per acre, for the year. Western wheatgrass, switchgrass, and blue grama make up

approximately 25%. The cool season grasses play a minor component in this plant community, which includes needle and thread, green needlegrass, and western wheatgrass. Combined they make up 10% of the total annual production, by weight, per acre, for the year. Both are a valuable forage plant in late spring and/or early summer. Needle and thread appears to be more prevalent in the northern part of MLRA 72 as well as along the western reaches. The Reference Plant Community is diverse and productive. Litter is uniformly distributed with very little movement off-site and natural plant mortality is very low. This community is resistant to many disturbances with the exception of heavy, long term continuous grazing, tillage, and/or development into urban or other uses. Total annual production ranges from 800 to 2,500 pounds of air-dried vegetation per acre per year and will average 1,900 pounds. These production figures are the fluctuations expected during favorable, normal and unfavorable years due to the timing and amount of precipitation and temperature. Total annual production should not be confused with species productivity, which is annual production and variability by species throughout the extent of the community phase.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	680	1615	2125
Forb	80	190	250
Shrub/Vine	40	95	125
Total	**800**	**1900**	**2500**

Figure 10. Plant community growth curve (percent production by month). KS3672, little bluestem, sideoats grama, big bluestem.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	25	30	25	10	5	0	0	0

Community 1.2
Community 2

Figure 11. plant community 1.2 image

This plant community developed with heavy, continuous grazing without adequate recovery periods during the growing season. The dominant grasses are blue grama, buffalograss, threadleaf sedge, threeawns and small soapweed. Little bluestem and sideoats grama, if present, are in remnant amounts. Big bluestem, switchgrass, and western wheatgrass have been significantly reduced and are at risk of being removed from the plant community. Small soapweed and fringed sagebrush have increased. Total annual plant production and litter levels are lower compared to the Reference Plant Community. Soil erosion may be a concern at this point, especially on high travel or impact areas. Some flow paths may be connected and rills may be present. The water and nutrient cycles are beginning to be affected by the reduction of dominant warm season species, forbs and shrubs. Total annual production ranges from 500 to 1,800 pounds of air-dried vegetation per acre per year and will average 1,300 pounds.

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Long term management without a forage and animal balance and heavy, continuous grazing without adequate recovery periods between grazing events will convert the Reference Plant Community to a community dominant of blue grama, buffalograss, threadleaf sedge, and small soapweed. Drought, in combination with this type of management, will quicken the rate at which the Reference Community pathways to Community 2.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Prescription grazing to include a forage and animal balance, adequate rest and recovery during the growing season will move this plant community towards the Reference Plant Community, given that remnant reference plants are still present.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm season mid-tallgrass dominant 55%**			605–1045	
	little bluestem	SCSC	*Schizachyrium scoparium*	325–525	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	200–285	–
	big bluestem	ANGE	*Andropogon gerardii*	80–200	–
	switchgrass	PAVI2	*Panicum virgatum*	0–95	–
2	**Warm season shortgrasses subdominant 15%**			100–285	
	blue grama	BOGR2	*Bouteloua gracilis*	100–190	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–95	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–50	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–50	–
3	**Cool season grasses subdominant 10%**			90–190	
	green needlegrass	NAVI4	*Nassella viridula*	20–190	–
	western wheatgrass	PASM	*Pascopyrum smithii*	50–190	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	20–100	–
4	**Other grasses minor component 5%**			10–95	
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–30	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	5–30	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	5–30	–
Forb					
5	**Forbs subdominant 10%**			20–190	
	dotted blazing star	LIPU	*Liatris punctata*	5–20	–
	white prairie clover	DACA7	*Dalea candida*	5–20	–
	Anderson's larkspur	DEAN	*Delphinium andersonii*	5–20	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	5–20	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–10	–
	aromatic aster	SYOB	*Symphyotrichum oblongifolium*	0–10	–

	stemless four-nerve daisy	TEAC	*Tetraneuris acaulis*	0–10	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–10	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–10	–
	stiffstem flax	LIRI	*Linum rigidum*	0–10	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–10	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–10	–
	common evening primrose	OEBI	*Oenothera biennis*	0–10	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–10	–
	beardtongue	PENST	*Penstemon*	0–10	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–10	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–10	–
Shrub/Vine					
6	**Shrubs minor component 5%**			0–95	
	soapweed yucca	YUGL	*Yucca glauca*	10–25	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	5–20	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–15	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–15	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–15	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–15	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–15	–
	chokecherry	PRVI	*Prunus virginiana*	0–15	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–15	–
	golden currant	RIAU	*Ribes aureum*	0–15	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–15	–
	leadplant	AMCA6	*Amorpha canescens*	0–15	–
	prairie rose	ROAR3	*Rosa arkansana*	0–10	–

Animal community

Wildlife Interpretations

This ecological site is on the sides of upland ridges that are dissected by deeply entrenched drainageways. Slopes are generally greater than 30 percent. The steep slopes make farming this site difficult, if not impossible, leaving the majority of these sites in native vegetation.

Historically, the predominance of grasses, forbs, and shrubs on this site supported grazers and mixed feeders such as bison, elk, deer and pronghorn and a variety of grassland-associated birds and small mammals. Due to the heterogeneity inherent in all landscapes, some areas were not grazed uniformly by these historic large herds of grazing animals. This type of grazing enhanced habitat for wildlife by creating a mosaic pattern, or patchiness, of vegetative structural diversity throughout the landscape. Wildlife native to the site depend upon a plant community diverse in species and structure. This need is evident in the variability of known habitat requirements of grassland-associated wildlife. Low-growing shrubs offer escape and thermal cover for several species of wildlife. The southern exposure of this site often provides protection from cold winter winds for birds, mammals, insects, and reptiles. Animals, such as the coyote and fox, often prefer this site for denning and loafing as it affords easy digging and visual protection.

Periodic events such as prolonged drought, wildfire, disease, or high insect numbers will alter plant community diversity and structure and associated wildlife species. Plant community structure is highly dependent upon rainfall

since the water-holding capacity of the site is very low.

Grazing Interpretations

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide yearlong forage under prescribed grazing for cattle, sheep, horses and other herbivores. During the dormant period, livestock may need supplementation based on reliable forage analysis.

Calculating Safe Stocking Rates: Proper stocking rates should be incorporated into a grazing management strategy that protects the resource, maintains or improves rangeland health, and is consistent with management objectives. In addition to usable forage, safe stocking rates should consider ecological condition, trend of the site, past grazing use history, season of use, stock density, kind and class of livestock, forage digestibility, forage nutritional value, variation of harvest efficiency based on desirability preference of plant species and/or grazing system and site grazability 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 usable forage production and stocking rates.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B. Infiltration and runoff potential for this site is moderate. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. (Refer to NRCS Section 4, National Engineering Handbook (NEH-4) for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting, hiking, photography, bird watching and other opportunities. The wide varieties of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

Site Development and Testing Plan

Future work (for approved ESD) includes field visits to verify ES site concepts with field staff. Field staff include but

not limited to project office leader, area soil scientist, state soil scientist, ecological site specialist, state rangeland conservationist, area rangeland management specialist and local field personnel. Field visits are to be determined by spatial extent of the site as well as personal knowledge of the site. Activity during field visits will include, but not limited to, identifying the soil, landform, plant community and verifying existing site concepts.

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 individuals involved in developing the Loess Breaks (South) ESD in 2001 include Tim Watson, Amanda Shaw, Susan Francis, Jon Deege, and Robert Schiffner from Kansas; Josh Saunders and Harvey Sprock from Colorado.

NRCS individuals involved in developing the Loess Breaks (North) ESD in 2001 include: Harvey Sprock from Colorado. Carol Eakins, Chuck Markley, Jeff Nichols, and Mary Schrader from Nebraska. Joan Gienger and Ted Houser from Kansas.

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Contributors

Chris Tecklenburg

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 early 2000s in regards to this ESD. I thank all those who contributed to the development of this site. In advance, I thank those who would provide insight, comments and questions about this ESD in the future.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	08/18/2016
Approved by	David Kraft
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slight evidence of rills may exist on steeper slopes.

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2. **Presence of water flow patterns:** Typically none, if present (steeper slopes following intense storms) short and not connected.

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3. **Number and height of erosional pedestals or terracettes:** None to slight, in or near water flow paths.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5-10% bare ground, with bare patches generally less than 6-8 inches in diameter. Extended drought can cause bare ground to increase upwards to 10-20% with bare patches reaching upwards to 8-12 inches in diameter. Cross sectional viewing of this site appears to have more bare ground than vertical viewing due to exposed loess-steps.

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5. **Number of gullies and erosion associated with gullies:** There are few, if any, gullies and there is no active

headcutting and sides are covered with vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Slight wind scouring is possible on areas of exposed loess.

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7. **Amount of litter movement (describe size and distance expected to travel):** Movement of 1-3 feet is possible following intense rain storms.

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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):** Stability class rating anticipated to be 3-5 in interspaces at soil surface.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM is 0.5-1%. Soils are very deep. Surface texture is silt loam. The A-horizon is 0-4 inches in depth. Soil color is dark grayish brown (10YR 4/2) moist, weak fine platy structure to a depth of 2 inches, weak fine granular structure below 2 inches; strong effervescence.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass, forb, shrub canopy and root structure reduces raindrop impact and slows overland flow providing increased time for infiltration to occur. Extended drought reduces short, mid, and bunchgrasses causing decreased infiltration and increased runoff following intense storms. However, exposed loess has more affect on infiltration and runoff than the composition of the plant community on steeper slopes.

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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):** None

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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: 55% mid-tallgrass group- little bluestem >> sideoats grama > big bluestem >> switchgrass

    Sub-dominant: 15% Shortgrasses; blue grama > buffalograss > hairy grama = plains muhly. 10% cool season grasses, western wheatgrass = green needlegrass > needle and thread. Forbs 10%

    Other: Other grasses 5% composite dropseed = sand dropseed > fendler threeawn. Shrubs are 5%

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Typically minimal. Expect slight mortality/decadence during and following drought, fire and/or long-term lack of disturbance.

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14. **Average percent litter cover (%) and depth (in):** 35-45% litter cover at 0.25 inch depth. Litter cover during and following extended drought ranges from 15-30%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 800 lbs./ac. low precip years, 1900 lbs./ac. average precip years, 2500 lbs./ac. above average precip years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 450 – 750 lbs./ac. or more.

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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:** Invasive plants should not occur in the Reference Plant Community. However, cheatgrass, Russian thistle, kochia, other non-native annuals will invade following extended drought assuming a seed source is available. Blue grama, little bluestem, hairy grama, sand dropseed, red threeawn, threadleaf sedge, milkvetches and small soapweed are the major native (non-invasive) increasers on this site.

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17. **Perennial plant reproductive capability:** The only limitations are weather-related, wildfire, natural disease, and insects that may temporarily reduce reproductive capability.
