USDA Natural Resources Conservation Service

Ecological site R075XY063NE
Loess Breaks

Accessed: 05/19/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

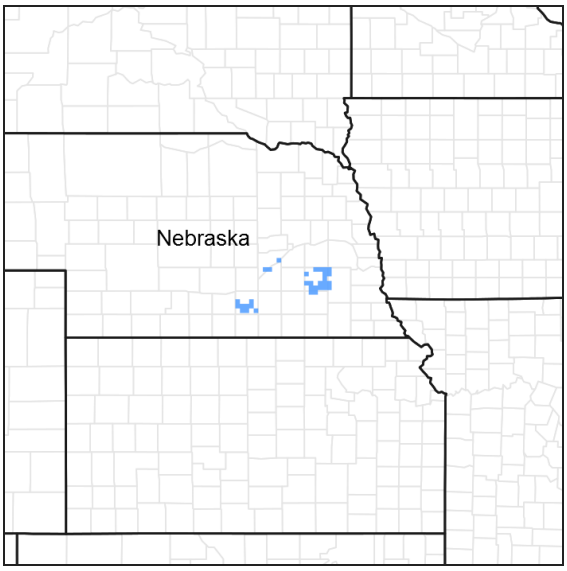


Figure 1. Mapped extent

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): 075X–Central Loess Plains

Named “The Central Loess Plains,” MLRA 75 is located primarily in south-central Nebraska, with about 10 percent lying in north-central Kansas. The approximately 5.3 million acre landscape covers all or parts of 21 counties: mainly Phelps, Kearney, Adams, Clay, Fillmore, York, Hamilton, Seward, Butler, Saline, Thayer, Nuckolls, and Webster in Nebraska, with a significant presence in Republic and Washington counties in Kansas. The physical appearance primarily consists of gently rolling plains, with a number of narrow, shallow stream valleys. The river valleys are broader, and most feature a number of terraces. The northern border is defined by the Platte River. This MLRA is home to the unique ecological system called “The Rainwater Basin,” which is comprised of a 24,000 acre network of wetlands and uplands that occupy portions of 13 of the northern counties.
The elevation in MLRA 75 ranges from nearly 2,600 to less than 1,100 feet above sea level. The local relief averages from 10 to 25 feet, but may stretch to a maximum of 165 feet in some areas.

The predominate soil orders in this geographic area are mesic, ustic Mollisols, commonly represented by the Geary, Hastings, Holder, Holdrege, Kenesaw, Coly, and Uly soil series.

Loess overlays the surface of almost all of the uplands in this MLRA. Alluvial clay, silt, sand, and gravel are deposited in the stream and river valleys, and can be extensive in the major drainages. Terraces are common in the valleys along the river systems.

The average annual precipitation ranges from 23 to 36 inches, and the number of freeze-free days range from 150 to 200.

The matrix vegetation type is mixed-grass prairie, with big and little bluestem, switchgrass, Indiangrass, and sideoats and blue grama make up the bulk of the warm-season species, while western wheatgrass is the dominant cool-season grass.

Seventy two percent of the land in this MLRA has been broken out of native prairie and farmed; the land is primarily planted to corn, wheat, and grain sorghum, while only eighteen percent of the grasslands remain intact. Livestock grazing, primarily by cattle, is the main industry on these remnants. Irrigation of croplands uses over 90 percent of the total annual water withdrawal in this area.

Wildlife flourishes in this combination of crop and grassland environment, with both mule and white-tailed deer being the most abundant wild ungulates. A variety of smaller species, including coyote, raccoon, opossum, porcupines, muskrat, beaver, squirrel, and mink thrive in the region, as well as several upland bird species. Grassland bird populations are somewhat limited by the lack of contiguous native prairie and fragmented habitat created by the farmland.

The rivers, streams, and lakes harbor excellent fisheries, and an estimated tens of millions of migrating and local waterfowl use the wetland complexes. These complexes provide ideal habitat for a number of wading and shore bird species as well.

This landscape serves as a backdrop for a disturbance-driven ecosystem, evolving under the influences of herbivory, fire, and variable climate. Historically, these processes created a heterogeneous mosaic of plant communities and structure heights across the region. Any given site in this landscape experienced fire every 6 to 8 years. The fires were caused by lightning strikes and also were set by native Americans, who used fire for warfare, signaling, and to refresh the native grasses. These people understood the value of fire as a tool, and that the highly palatable growth following a fire provided both excellent forage for their horses, and attracted grazing game animals such as bison and elk.

Even as post-European settlement's alteration of the fire regime allows the expansion of the woody component of the native prairie, introduction of eastern redcedar (ERC) as a windbreak species further facilitates invasion by this species.
While eastern redcedar is native to Nebraska, the historic population in MLRA 75 was limited to isolated pockets in rugged river drainages that were subsequently insulated from fire. Widespread plantings of windbreaks with eastern redcedar as a primary component have provided a seed source for the aggressive woody plant. The ensuing encroachment into the native grasslands degrades the native wildlife habit and causes significant forage loss for domestic livestock. However, since it is not a root sprouter, eastern redcedar is very susceptible to fire when under six feet tall. Management with prescribed fire is exceedingly effective if applied before this stage.

Larger redcedars can also be controlled with fire, but successful application requires the use of specifically designed ignition and holding techniques.
Fragmentation of the native grasslands by conversion to cropland, transportation corridors, and other developments have effectively disrupted the natural fire regime of this ecosystem. This has allowed encroachment by native and introduced shrubs and trees into the remnants of the native prairie throughout the MLRA. Aggressive fire suppression policies have exacerbated this process to the point that shrub and tree encroachment is a major ecological issue in the majority of both native and re-seeded grasslands.

Classification relationships

Major Land Resource Area (MLRA): Major Land Resource Area (MLRA)75 (USDA-Natural Resources Conservation Service, 2006)

Level IV Ecoregions of the Conterminous United States

Revision Notes:
A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land

Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise group during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

Ecological site concept

This ecological site is an upland site located in a run-off position with slopes greater than 30 percent. Slip slopes and cat-steps are evident.

Associated sites

R075XY050NE	**Loamy Terrace** Loamy Terrace: Located below and sometimes adjacent to the Loess Breaks site.
R075XY058NE	**Loamy Plains** Loamy Plains: Often located adjacent to Loess Breaks.

Similar sites

R075XY058NE	**Loamy Plains** Loamy Plains: Often located adjacent to Loess Breaks, but slopes are less than 30%. No catsteps are present.
R075XY059NE	**Limy Loess Slopes** Limy Loess Slopes; Effervescent sites often located adjacent to Loess Breaks, but the slopes are less than 30%. Slip slopes and cat-steps are evident on Loess Breaks, but absent on Limy Loess Slopes.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on hillslopes and valley sides that have been dissected by geologic erosion. The very steep slopes of this site are characteristically broken with a series of short slope slips, 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 to impossible on this site. This site produces runoff to areas lower on the landscape.

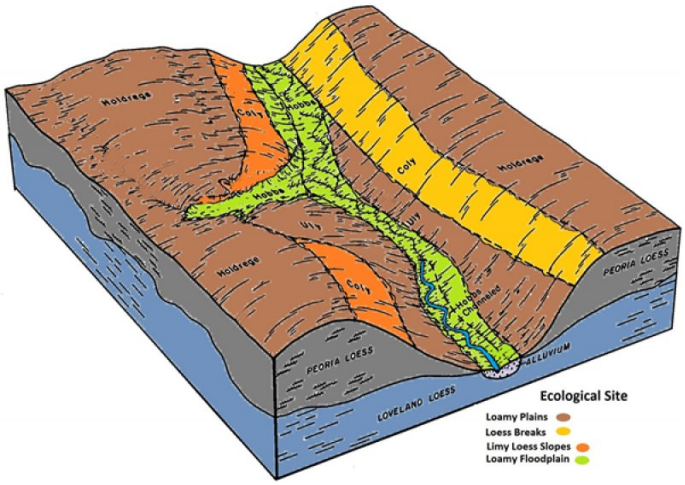


Figure 2. Block Diagram

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Valley
Flooding frequency	None
Ponding frequency	None
Slope	30–100%
Water table depth	152–203 cm

Climatic features

Like most Great Plains landscapes, the climate in this MLRA is under the sway of the continental effect. This creates a regime of extremes, with summer highs often in the triple digits, and winter lows plunging well below zero. Blizzards can occur anytime between early fall and late spring, often dropping the temperature more than 50 degrees in just a few hours. These events can pile up several feet of snow, often driven by winds in excess of 50 miles an hour. The resulting huge snow drifts can cause serious hardship for livestock, wildlife and humans. Winters can be open, with bare ground for most of the season, or closed, with up to several feet of snow persisting until March. Most winters have a number of warm days, interspersed with dropping temperatures, usually associated with approaching cold fronts. Spring brings violent thunderstorms, hail and high winds. Tornadoes occur frequently. Daily winds range from an average of 14 miles per hour during the spring to 11 miles per hour during the late summer. Occasional strong storms may bring brief periods of high winds with gusts to more than 80 miles per hour. Growth of native cool season plants begin in early April and continues to about mid-June. Native warm season plants begin growth in early June, and continue to early August. Green up of cool season plants may occur in September and October.

Table 3. Representative climatic features

Frost-free period (average)	155 days
Freeze-free period (average)	179 days
Precipitation total (average)	762 mm

Climate stations used

- (1) BELLEVILLE [USC00140682], Belleville, KS
- (2) WASHINGTON [USC00148578], Washington, KS
- (3) AURORA [USC00250445], Aurora, NE
- (4) FRIEND 3E [USC00253065], Friend, NE
- (5) SEWARD [USC00257715], Seward, NE

- (6) CLAY CTR [USC00251684], Saronville, NE
- (7) DAVID CITY [USC00252205], David City, NE
- (8) FAIRMONT [USC00252840], Fairmont, NE
- (9) HASTINGS 4N [USC00253660], Hastings, NE
- (10) HEBRON [USC00253735], Hebron, NE
- (11) HOLDREGE [USC00253910], Holdrege, NE
- (12) OSCEOLA [USC00256375], Osceola, NE
- (13) RAGAN [USC00257002], Alma, NE
- (14) SUPERIOR 4E [USC00258320], Hardy, NE
- (15) SURPRISE [USC00258328], Surprise, NE
- (16) FAIRBURY 5S [USC00252820], Fairbury, NE
- (17) GENEVA [USC00253175], Geneva, NE
- (18) MINDEN [USC00255565], Minden, NE
- (19) RED CLOUD [USC00257070], Red Cloud, NE
- (20) YORK [USC00259510], York, NE

Influencing water features

This site is an upland site and functions independently from ground and surface water features.

Soil features

These very deep soils are characterized by thin (<7 inches) surface layers. Soil texture for both surface and subsoil layers of these soils range from silty to loamy. Calcium Carbonates are found throughout, but may be leached to 10” in some instances. Organic matter content is generally low to moderately low in the surface layer.
Coly is the only major soil series associated with this ecological site.

Figure 7. Coly Soil Profile

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Loam (3) Very fine sandy loam
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	152–203 cm
Available water capacity (0-101.6cm)	14.48–23.37 cm
Calcium carbonate equivalent (0-101.6cm)	0–6%

Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%

Ecological dynamics

The Loess Breaks site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfires, and other biotic and abiotic factors which typically influence soil/site development. This continues to be a disturbance-driven site, by herbivory, fire, and variable climate. Changes occur in the plant communities due to weather variations, impacts of native and/or exotic plant and animal species, and management actions.

One of the primary impacts to this landscape introduced by European-man is season-long continuous grazing by domestic livestock. This management practice causes the repeated removal of the growing point and excessive defoliation of the leaf area of individual tall warm-season grasses. The resulting reduction of the ability of the plants to harvest sunlight depletes the root reserves, subsequently decreasing the root mass. This negatively impacts the ability of the plants to compete for life-sustaining nutrients, resulting in declining vigor and eventual mortality. The space created in the vegetative community is then occupied by a species that evades the negative grazing impacts by a growing season adaptation (such as a cool season), a shorter structure, or a reduced palatability mechanism. Because of the steepness of slope, the Loess Breaks site normally receives less grazing pressure than the less steep adjacent sites, but the degree of erosion is greatly accelerated if the stabilizing vegetative community is significantly degraded.

The State-and-Transition Model (STM) is depicted below, and is made up of a Reference State, a Native/Invaded State, and an Invaded Woody State. Each state represents the crossing of a major ecological threshold due to alteration of the functional dynamic properties of the ecosystem. The main properties observed to determine this change are the soil and vegetative communities and the hydrological cycle.

Each state may have one or more vegetative communities which fluctuate in species composition and abundance within the normal parameters of the state. Within each state, communities may degrade or recover in response to natural and man-caused disturbances such as variation in the degree and timing of herbivory, presence or absence of fire, and climatic and local fluctuations in the precipitation regime.

Interpretations are primarily based on the Reference State, and have been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics have been interpreted from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

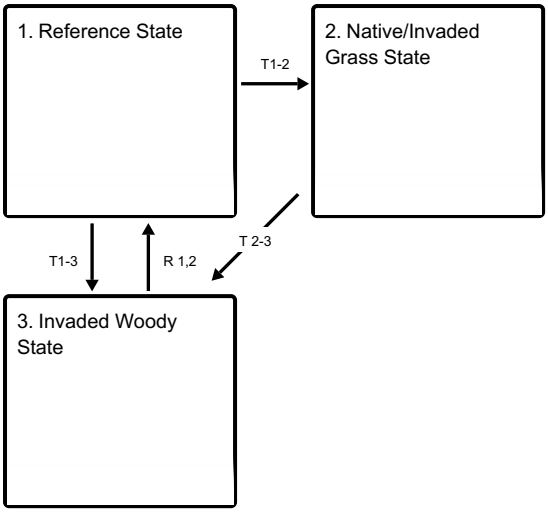
Growth of native cool-season plants begins about April 1, and continues to about June 15. Native warm-season plants begin growth about May 15, and continue to about August 15. Green-up of cool-season plants may occur in September and October if adequate moisture is available.

The species distribution and abundance on this site are also influenced by the degree of inclination and aspect of the local topography. Northern and eastern slopes typically are cooler and wetter, generally producing more biomass than the drier and warmer exposures. Severe inclines receive less grazing pressure than the more moderate slopes.

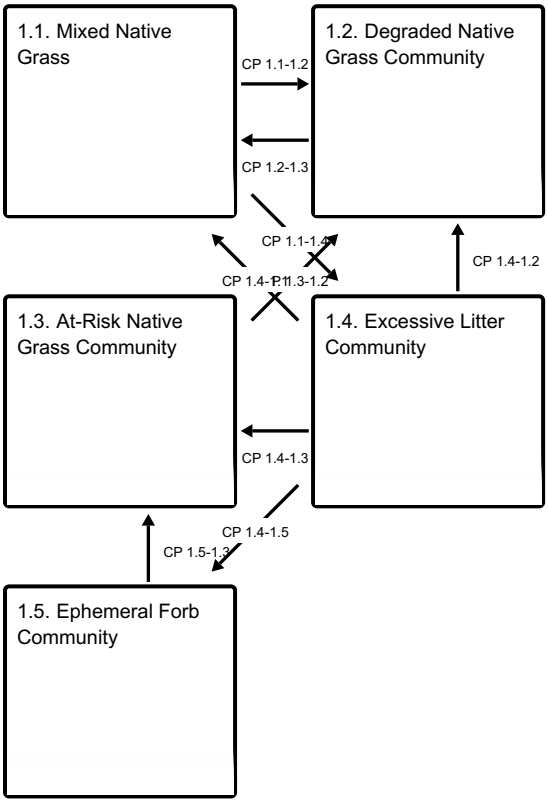
The following is a diagram illustrating the common plant communities that can occur on the site and the transition pathways between communities.

State and transition model

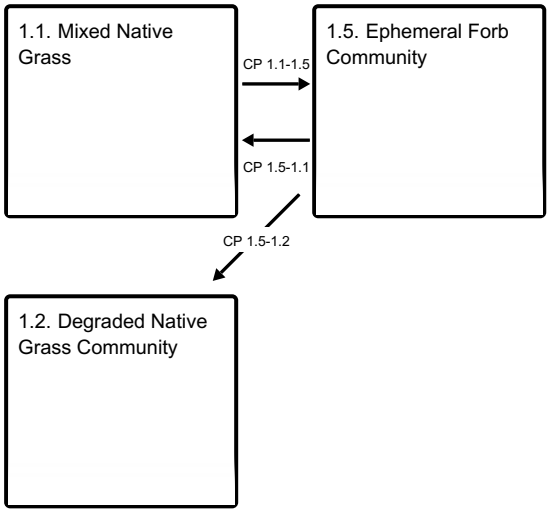
Ecosystem states



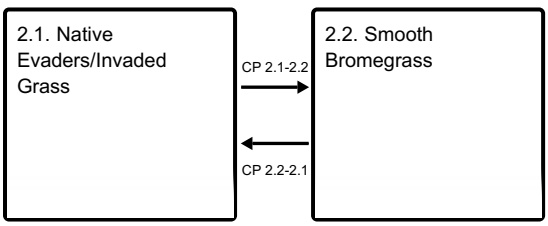
State 1 submodel, plant communities



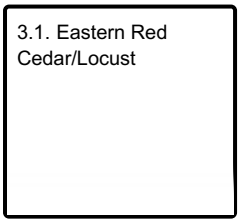
Communities 1, 5 and 2 (additional pathways)



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

This state describes the range of vegetative community phases that occur on the Loess Breaks site where the natural processes are mostly intact. The Reference Community is a representation of the native plant community phase that occupies a site that has been minimally altered by management. The Degraded Native Grass, the At-Risk Native Grass, and the Excessive Litter Communities are the phases that result from management decisions that are unfavorable for a healthy Reference Community. The Ephemeral Forb Community is the result of a high intensity disturbance event. High perennial grass cover and production allows for increased soil moisture retention, vegetative production, and overall soil quality.

Community 1.1
Mixed Native Grass

The Mixed Native Grass Community serves as a description of the native plant community that naturally occurs on the site when the natural disturbance regimes are intact, or closely mimicked by management practices. This phase is dynamic, with fluid relative abundance and spatial boundaries between the dominant structural vegetative groups. These fluctuations are primarily driven by different responses of the species to changes in precipitation timing and abundance, and fire and grazing events. The potential vegetation consists of approximately 75-85 percent grasses and grass-like plants, 5-10 percent forbs, and 2-5 percent shrubs. Little bluestem, big bluestem, and sideoats grama are the primary mid and tall grass species in this community. Shortgrass species include blue grama, and hairy grama. Western wheatgrass occurs as a secondary species in the western portion of the MLRA. The site has a very diverse forb population. This plant community is highly productive, diverse, and resistant to short term stresses such as drought and short periods of heavy stocking. The well-developed root systems support resiliency when allowed adequate recovery periods between grazing events. When exposed to long-term or frequent over-grazing events without adequate rest, this plant community will degrade. Total annual production ranges from 1,800 to 2,800 pounds of air dry vegetation per acre.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1855	2120	2774
Forb	118	178	241
Shrub/Vine	45	83	123
Total	**2018**	**2381**	**3138**

Figure 9. Plant community growth curve (percent production by month). NE7501, Central Loess Plains, warm season dominant. Native warm-season dominant, MLRA 75.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	21	33	18	8	6	3	1	0

Community 1.2
Degraded Native Grass Community

Little bluestem and sideoats grama are the dominant grasses. Big bluestem is declining, and this community phase signals a significant loss of production. This is due to continuous season-long grazing with inadequate recovery periods. Grazing-evasive warm-season and cool-season grasses increase. The composition of the forb component remains diverse, but the potential for encroachment by invasive woody species becomes more likely, due to fewer deep rooted species and a reduced fuel load to carry fire. While this plant community is less productive and less diverse than the representative plant community, it remains sustainable in regards to site/soil stability, watershed function, and biologic integrity. Total annual production ranges from 1,250 to 2,250 pounds of air dry vegetation per acre.

Figure 10. Plant community growth curve (percent production by month). NE7501, Central Loess Plains, warm season dominant. Native warm-season

dominant, MLRA 75.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	21	33	18	8	6	3	1	0

Community 1.3
At-Risk Native Grass Community

In this plant community, the more palatable tall warm-season grasses have been reduced to remnant populations by continued defoliation during their critical growth periods. Grazing-evasive warm-season and cool-season grasses increase significantly. Blue grama, sideoats grama and composite dropseed are the dominant warm season grasses. Bluegrass encroachment also occurs on flatter slopes. Soil health is affected by reduced efficiency in the nutrient, mineral, and hydrologic cycles as a result of decreases in plant litter and rooting depths. Total annual vegetative production declines to an average of 1,300 lbs./acre. Without a management change, this community is at-risk to degrade to the Native/Invaded Grass State.

Figure 11. Plant community growth curve (percent production by month). NE7502, Central Loess Plains, warm season at risk. Native warm-season at risk, reduced tall, warm-season grasses with increased cool-season grasses, MLRA 75.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	21	26	18	10	8	3	1	0

Community 1.4
Excessive Litter Community

The Excessive Litter Community Phase describes the response of the community to the removal of the natural disturbances of herbivory and fire. As the undisturbed duff layer deepens, infiltration of the precipitation is interrupted and evaporation increases significantly, simulating drought-like conditions.

Community 1.5
Ephemeral Forb Community

This community describes the flush of forbs that occurs in response to a major disturbance, or combination of disturbances. Growing season wildfire followed by hail, extreme prolonged drought, or extreme defoliation by herbivores are all examples of these disturbances. The native warm-season grasses re-establish dominance with-in a few years of the event.

Pathway CP 1.1-1.2
Community 1.1 to 1.2

A shift from the Mixed Native Grass to the Degraded Native Grass community occurs with continuous season long grazing and inadequate recovery periods during the growing season

Pathway CP 1.1-1.4
Community 1.1 to 1.4

Prolonged interruption of the natural disturbances of herbivory and fire will result in conversion from this community to the Excessive Litter Community.

Pathway CP 1.1-1.5
Community 1.1 to 1.5

A high-impact disturbance event or combination of events causing excessive defoliation of the vegetation, i.e. a growing season wildfire followed by a significant hailstorm, or a prolonged intensive grazing event or long-term drought, etc.

Pathway CP 1.2-1.3
Community 1.2 to 1.1

Maintaining continuous season long grazing with inadequate recovery periods during the growing season further degrades the site to the At-Risk Native Grass Community.

Pathway CP 1.3-1.2
Community 1.3 to 1.2

Reversing the downward trend to the previous community can be achieved with prescribed grazing early and late in the growing season to reduce undesirable cool season grasses. Targeting the peak growth period of cool season grasses with high intensity grazing events followed by rest will allow the tall native warm season grasses to rejuvenate. Appropriately timed prescribed fire will accelerate this process.

Conservation practices

Access Control
Prescribed Grazing

Pathway CP 1.4-1.1
Community 1.4 to 1.1

Re-introduction of the natural processes of herbivory and fire will allow the vegetation to return to the previous community.

Pathway CP 1.4-1.2
Community 1.4 to 1.2

Re-introduction of the natural processes of herbivory and fire will allow the vegetation to return to the previous community.

Pathway CP 1.4-1.3
Community 1.4 to 1.3

A high-impact disturbance event, or combination of events causing excessive defoliation of the vegetation, i.e. a growing season wildfire followed by a significant hailstorm, or a prolonged intensive grazing event, or long-term drought, etc.

Pathway CP 1.4-1.5
Community 1.4 to 1.5

Re-introduction of the natural processes of herbivory and fire will allow the vegetation to return to the previous community.

Pathway CP 1.5-1.1
Community 1.5 to 1.1

Restoration occurs naturally once the disturbance event has subsided. Allowing growing season rest will accelerate the recovery.

Pathway CP 1.5-1.2
Community 1.5 to 1.2

Restoration occurs naturally once the disturbance event has subsided. Allowing growing season rest will accelerate the recovery.

Pathway CP 1.5-1.3
Community 1.5 to 1.3

Restoration occurs naturally once the disturbance event has subsided. Allowing growing season rest will accelerate the recovery.

State 2
Native/Invaded Grass State

This state has been degraded from the Reference State and much of the native warm-season grass community has been replaced by less desirable plants. The loss of tall and mid- warm-season grasses has negatively impacted energy flow and nutrient cycling. Water infiltration is reduced due to the shallow root system and rapid runoff characteristics of the grazing-evasive plant communities. The Native Evaders/Invasives and the Smooth Bromegrass communities are the components of the Native/Invaded Grass State.

Community 2.1
Native Evaders/Invaded Grass

This plant community represents a shift from the Reference State across a plant community threshold. With continued grazing pressure, blue grama, Kentucky bluegrass, and composite dropseed will become the dominant plant species, with only trace remnants of the more palatable mid-warm-season grasses such as sideoats grama and little bluestem. Composite dropseed is a grazing-evasive warm-season mid-grass with low palatability. Continuous and heavy grazing pressure will maintain this plant community in a sod-bound condition. Forb richness and diversity has decreased. With the decline and loss of deeper penetrating root systems, a compacted layer may form in the soil profile below the more shallow replacement root systems. Grazing management practices that allow for adequate periods of recovery between grazing events will favor mid and tall warm-season grasses. Appropriately timed prescribed fire will accelerate the restoration process.

Figure 12. Plant community growth curve (percent production by month). NE7503, Central Loess Plains, warm season/cool season co-dominant. Native warm-season plant community encroached with cool-season grasses, MLRA 75.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	9	27	25	12	10	10	3	1	0

Community 2.2
Smooth Bromegrass

This plant community contains predominately smooth bromegrass but also contains some native warm-season grass remnants. Production of smooth bromegrass-dominated plant communities is highly variable, depending upon the percentages of composition present and outside inputs such as fertilizer and weed control. Clipping or ocular estimates of production should be conducted to verify current annual production.

Figure 13. Plant community growth curve (percent production by month). NE7504, Central Loess Plains, cool season dominant, warm season remnants. Cool season, smooth brome with native warm season remnants, MLRA 75.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	13	29	19	7	10	13	6	1	0

Pathway CP 2.1-2.2
Community 2.1 to 2.2

This community will be converted to a Smooth Bromegrass community through excessive warm season grazing with inadequate rest.

Pathway CP 2.2-2.1
Community 2.2 to 2.1

Restoration can be achieved by herbicide treatment and reseeding. If adequate native remnants are present, appropriately timed prescribed fire and a follow-up prescribed grazing program may achieve the desired results.

State 3
Invaded Woody State

Once the tree canopy cover reaches 15 percent with an average tree height exceeding 5 feet, the threshold is crossed to the Invaded Woody State. The primary coniferous interloper is Eastern redcedar. Locust, elm and green ash number among the deciduous native trees, along with several exotic introduced species. These woody species are encroaching due to lack of prescribed fire and other brush management practices. Typical ecological impacts are a loss of native warm season grasses, degraded forage productivity and reduced soil quality. This state consists of the Eastern Red Cedar/Locust Community.

Community 3.1
Eastern Red Cedar/Locust

This community has at least a 15 percent canopy of Eastern redcedar. Honey locust encroachment may occur in the eastern portion of the MLRA, when brush management and prescribed burning is absent over an extended period of time. Generally this site is very conducive to cedar seedling invasion especially when adjacent to a seed source. Cedars will eventually dominate the site, resulting in a closed canopy, reduced forage production and limited livestock grazing and wildlife habitat value. Eastern redcedar control can usually be accomplished with prescribed burning while the trees are six foot tall or less and fine fuel production is over 1,500 pounds per acre. Trees of all heights can be controlled with the use of specifically adapted preparation, and ignition and holding techniques. Mechanical removal followed by a chemical treatment on stumps is effective on locust. Total annual production during an average year varies significantly, depending on the production level prior to encroachment and the percentage of canopy cover.

Figure 14. Plant community growth curve (percent production by month). NE7505, Central Loess Plains, woody encroachment. Woody plant encroachment with warm- and cool-season grasses MLRA 75.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	3	8	12	20	25	14	5	8	4	1	0

Transition T1-2
State 1 to 2

Heavy grazing without adequate recovery periods will cause this state to lose a significant proportion of tall and mid- warm-season grass species and cross a threshold to the Native/Invaded State. Water infiltration and other hydrologic functions will be reduced due to the root matting presence of sod-forming grasses. With the decline and loss of deeper penetrating root systems, soil structure and biological integrity are catastrophically degraded to the point that recovery is unlikely. Once this occurs, it is highly unlikely that grazing management alone will return the community to the Reference State.

Transition T1-3
State 1 to 3

Disruption of the natural fire regime and the planting of invasive exotic and native woody species can cause this state to shift to the Invaded Woody State.

Transition T 2-3
State 2 to 3

Disruption of the natural fire regime and the planting of invasive exotic and native woody species can cause this state to shift to the Invaded Woody State.

Restoration pathway R 1,2
State 3 to 1

Prescribed burning, wildfire, harvest, and brush management will move this plant community toward one of the herbaceous plant dominated plant communities. The forb component of a site with heavy tree density or canopy cover will initially increase following tree removal through mechanical brush management treatments and prescribed fire. If re-sprouting brush such as Honey locust or Siberian elm is present, stumps must be chemically treated immediately after mechanical removal. Ongoing brush management such as hand cutting, chemical spot treatments or periodic prescribed burning is required to prevent a return to this state.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season Grasses**			358–595	
	big bluestem	ANGE	*Andropogon gerardii*	358–476	15–20
	switchgrass	PAVI2	*Panicum virgatum*	0–119	0–5
	Indiangrass	SONU2	*Sorghastrum nutans*	0–72	0–3
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–72	0–3
2	**Mid Warm Season Grasses**			595–1191	
	little bluestem	SCSC	*Schizachyrium scoparium*	476–834	20–35
	sideoats grama	BOCU	*Bouteloua curtipendula*	239–476	10–20
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–119	0–5
3	**Native Cool Season Grasses**			0–119	
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–48	0–2
	Canada wildrye	ELCA4	*Elymus canadensis*	0–48	0–2
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–48	0–2
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–48	0–2
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–48	0–2
	western wheatgrass	PASM	*Pascopyrum smithii*	0–48	0–2
4	**Short Warm Season Grasses**			0–119	
	blue grama	BOGR2	*Bouteloua gracilis*	0–119	0–5
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–48	0–2
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–48	0–2
5	**Other Native Grasses and Grasslike**			0–72	
	threadleaf sedge	CAFI	*Carex filifolia*	0–72	0–3
	sedge	CAREX	*Carex*	0–48	0–2
	Grass, perennial	2GP	*Grass, perennial*	0–48	0–2
Forb					

6	**Forbs**			119–239	
	Forb, perennial	2FP	*Forb, perennial*	24–48	1–2
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	24–48	1–2
	white heath aster	SYER	*Symphyotrichum ericoides*	24–48	1–2
	spiderwort	TRADE	*Tradescantia*	0–48	0–2
	purple prairie clover	DAPUA	*Dalea purpurea var. arenicola*	24–48	1–2
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–48	0–2
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–48	0–2
	dotted blazing star	LIPU	*Liatris punctata*	24–48	1–2
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–48	0–2
	evening primrose	OENOT	*Oenothera*	0–48	0–2
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	24–48	1–2
	beardtongue	PENST	*Penstemon*	0–48	0–2
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–48	0–2
	upright prairie coneflower	RACO3	*Ratibida columnifera*	24–48	1–2
	ragwort	SENEC	*Senecio*	0–24	0–1
	goldenrod	SOLID	*Solidago*	0–24	0–1
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–24	0–1
Shrub/Vine					
7	**Shrubs**			48–119	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	24–72	1–3
	leadplant	AMCA6	*Amorpha canescens*	24–72	1–3
	prairie rose	ROAR3	*Rosa arkansana*	24–48	1–2
	western snowberry	SYOC	*Symphoricarpos occidentalis*	24–48	1–2
	twistspine pricklypear	OPMA2	*Opuntia macrorhiza*	0–24	0–1

Animal community

LIVESTOCK – GRAZING INTERPRETATIONS:
This site is well adapted to managed grazing by domestic livestock. The predominance of herbaceous plants across all plant community phases best lends these sites to grazing by cattle but browsing livestock such as goats or sheep will more heavily utilize invasive forbs and brush. Carrying capacity and production estimates are conservative estimates that should be used only as guidelines in initial stages of grazing lands planning.

Suggested stocking rates (carrying capacity) for cattle under continuous season-long grazing under normal growing conditions are listed below:
-Mixed Native Grass; 2125 lbs/acre production and 0.58 AUM/acre carrying capacity*
-Degraded Native Grass; 1750 lbs/acre production and 0.48 AUM/acre carrying capacity*

If grazing distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. Carrying capacity and production estimates are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Utilizing a rotational grazing system that allows for adequate rest and recovery will increase plant vigor and carrying capacity. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended to document plant composition and production. More precise carrying capacity estimates can be calculated based on actual site information along with animal preference data, particularly when livestock other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

WILDLIFE INTERPRETATIONS:
Major Land Resource Area (MLRA) 75 lies primarily within the loess mixed-grass prairie ecosystem mixed with tallgrass prairie in lower areas. Prior to European settlement, this area consisted of diverse grassland habitats interspersed with varying densities of depressional wetlands and limited woody riparian corridors. These habitats provided critical life cycle components for the grassland birds, prairie dogs and herds of roaming bison, elk, and pronghorn that historically occupied this landscape. Diverse populations of small mammals and insects provided a bountiful prey base for raptors and omnivores such as coyotes, foxes, raccoons and opossums. Native Americans, bobcats, wolves, and mountain lions occupied the apex predator niche. In addition, a wide variety of reptiles and amphibians thrived in this landscape.

The loess mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory and climate functioning as the primary disturbances. Following European settlement, elimination of fire, widespread conversion to cropland, and other sources of habitat fragmentation significantly altered the appearance and functionality of the entire ecosystem. The reduced stability of the system is reflected by major changes in the composition and abundance of the native flora and fauna. Introduced and invading species further degrade the ecological integrity of the plant and animal communities. Bison and prairie dogs were historically keystone species but free-roaming bison herds and nearly all prairie dogs have been extirpated. The loss of bison and fire as ecological drivers greatly influenced the character of the remaining native grasslands and the habitats that they provide. Fragmentation has reduced habitat quality for numerous area-sensitive species, as highlighted by the decline of the greater prairie chicken. Many grassland nesting bird populations such as dickcissel and Henslow's sparrow are also declining. In addition to free-ranging bison, extirpated species include pronghorn, wolves and swift fox.

Historically, an ecological mosaic of Loamy Plains, Clayey Plains, Limy Loess Slopes, Loess breaks, Closed Upland Depression, Loamy Terrace, and Loamy Floodplain sites, provided habitat for species requiring unfragmented grasslands. Important habitat features and components found commonly or exclusively on modern day remnants include upland nesting habitat for grassland birds and game birds; nesting and escape cover for waterfowl; forbs and insects for brood rearing habitat; and a forage source for small and large herbivores. Within MLRA 75, remaining Loamy Hills ecological sites provide grassland cover with an associated forb and limited shrub component.

In this fragmented landscape, native grassland bird populations face increasing competition from the opportunistic European starlings and house sparrows, and are subject to nest parasitism from brown-headed cowbirds.

Tree encroachment creates habitat that favors generalist species such as American robin and mourning dove, and provides perches for raptors, increasing the predation mortality.

Introduced species such as smooth bromegrass, reed canarygrass, Kentucky bluegrass, nodding plumeless thistle, and Canada thistle further degrade the biological integrity of many of these remnant prairies.

1. REFERENCE STATE: The predominance of tall and mid statured grasses plus a high diversity of forbs and shrubs in this community makes it ideal for grazers and mixed-feeders. Pollinating insects play a large role in maintaining the forb community and provide a food source for grassland birds and other grassland dependent species. The vegetative structural diversity provides habitat for reptiles, amphibians, and a wide array of native and introduced bird species including Henslow's sparrow, Western meadowlark, Northern bobwhite, and ringneck pheasants. The abundant prey base supports populations of Swainson’s hawk, burrowing, short-eared and great horned owls and other grassland raptors.
Western meadowlark and American crow over-winter in this habitat.

The diversity of grasses, forbs and shrubs provide high nutrition levels for small and large herbivores including moles, mice, ground squirrels, white-tailed jackrabbit, and whitetail deer. The structure of this plant community provides suitable thermal, protective and escape cover for small herbivores and grassland birds. Many wide-ranging predators utilize this plant community including coyote, badger, red fox and least and long-tailed weasels.

As the plant community degrades to more mid-grasses and fewer tall grasses, less winter and escape cover are provided. It also provides less cover for predators. As the plant community shifts from tall warm season grasses to

mid-height grasses, it favors grassland birds that prefer shorter vegetation. This structural community provides better habitat for greater prairie chicken, lark bunting, and lark sparrow populations. Habitat in plant community 1.3 is much the same as 1.2 but provides less winter protection because of the reduced plant height and cover.

2. NATIVE/INVADED STATE: Although the amount of Kentucky bluegrass in this plant community varies, the generally lower structure height favors the suite of grassland birds that prefer more visual space. Increased dominance by Kentucky bluegrass with lower plant diversity provides less habitat for ringneck pheasant, Northern bob-white and mixed-feeders, such as whitetail deer and small mammals. Insect populations are somewhat reduced but still play a large role in maintaining the forb community and provide a moderate forage supply for grassland birds and other species.

The reduced stature of this plant community still provides suitable thermal, protective and escape cover for small herbivores and grassland birds.

3. INVADED WOODY STATE: The Eastern Redcedar/ Locust Community provides habitat niches for white-tailed deer, wild turkey, raccoon, and Cooper's, and sharp-shinned hawk among other species.

Birds that are habitat generalists, such as the Bell's Vireo, common yellowthroat, Eastern kingbird, mourning dove, American goldfinch, Northern bobwhite, field sparrow, solitary vireo, and pigmy nuthatch use woody cover for nesting, food, and breeding habitats.

While a woody component of the grassland provides specific short-term habitats for some species, an expansive forest component is very detrimental to grassland wildlife species diversity and abundance overall.

Hydrological functions

Water is the principal factor limiting forage production on this site, which is dominated by soils in hydrologic group B. Permeability is moderate, and runoff potential is medium to high. In general, the infiltration rate is directly proportional to vegetative cover, while the run off potential is inversely proportional. An exception is sod-bound short grasses. The T erosion factor is 5.
(Refer to NRCS Section 4, National Engineering Handbook (NEH-4) for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting opportunities for upland game species, and white-tailed deer. The wide varieties of plants which bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site. Redcedar can be utilized for veneer and/or cedar furniture.

Other products

No appreciable other products.

Other information

Site Development and Testing Plan:
Future work is needed to validate the information in this Provisional Ecological Site Description. Additional data collection and evaluation may also be needed to develop this ESD to the Approved, then Correlated level. This could include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Field reviews of the project plan should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Inventory data references

Information presented here has been derived from field observations from range-trained personnel and literature and soil surveys.

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Contributors

Doug Whisenhunt

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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)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:

    Sub-dominant:

    Other:

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
