USDA Natural Resources
Conservation Service

Ecological site R075XY077NE
Shallow Limy

Accessed: 05/12/2025

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): 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 is primarily 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 are mesic, ustic Mollisols, commonly represented by the Uly, Hord, Hall and Holdredge 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.
Average annual precipitation ranges from 23 to 36 inches, with the number of freeze-free days ranging from 150 to 200.

The matrix vegetation type is mixed-grass prairie, with big and little bluestem, switchgrass, Indiangrass, and sideoats and blue grama making up the bulk of the warm-season species, while western wheatgrass in the dominant cool season grass.
Seventy two percent of the land in this MLRA has been broken out of native prairie and farmed; primarily, corn, wheat, and grain sorghum, while only eighteen percent of the grasslands remain intact. Livestock grazing, primarily cattle, is the main industry on these remnants. Irrigation of croplands uses over 90 percent of the total annual water withdrawal.
Wildlife flourishes in this combination of crop and grassland environment, with both mule and white-tailed deer being the most abundant wild ungulate. 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 heterogenous 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 both by lightning strikes, and 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 red cedar (ERC) as a windbreak species further facilitates invasion by this species.
While eastern red cedar 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, or non-existent. Widespread plantings of windbreaks with eastern red cedar as a primary component has 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 red cedar is very susceptible to fire when under six feet tall. Management with prescribed fire is exceedingly effective if applied before this stage. Larger cedars 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 development by European man has 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

NRCS FOTG Section 1 - Nebraska Vegetation Zone 3.

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

This approved ecological site description has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with the Shallow Limy ecological site meets the Approved Ecological Site Description Standard, and has been through a Quality Control and Quality Assurance processes to assure consistency and completeness. Further investigations, reviews, and correlations are necessary before it progresses to the Correlated level.

Ecological site concept

The Shallow Limy site is located on the breaks and sidehills of the uplands. This is a run-off site with calcareous soils that effervesce throughout the profile. Slopes are commonly less than 15 percent, but may be as high as 70 percent. Soil depth is less than 20 inches.

Associated sites

R075XY050NE	**Loamy Terrace** Occurs on lower flatter part of landscape directly below Shallow Limy. This site receives runoff from adjacent uplands.
R075XY057NE	**Clayey Plains** Occurs within or adjacent to shallow limy on uplands
R075XY058NE	**Loamy Plains** Occurs within or adjacent to shallow limy on uplands.

Similar sites

R075XY059NE	**Limy Loess Slopes** Similar enough that this site can be confused easily with Shallow Limy, but Limy Loess Slopes has a deeper soil profile and more vegetative production. Both sites have high soil pH and support similar plant communities.

Table 1. Dominant plant species

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

Physiographic features

This site is generally on the breaks of the hills between the uplands and valleys. Much of the site is steep and associated with rock ledges forming vertical drops.

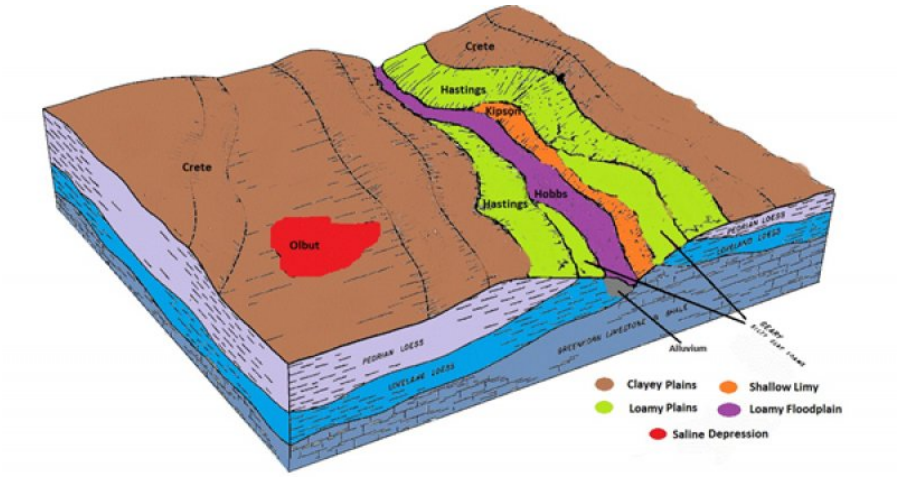


Figure 2. Block Diagram

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,130–2,765 ft
Slope	3–70%
Ponding depth	0 in

Water table depth	0 in
Aspect	Aspect is not a significant factor

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)	158 days
Freeze-free period (average)	179 days
Precipitation total (average)	30 in

Climate stations used

- (1) RED CLOUD [USC00257070], Red Cloud, NE
- (2) BELLEVILLE [USC00140682], Belleville, KS
- (3) HEBRON [USC00253735], Hebron, NE
- (4) SUPERIOR 4E [USC00258320], Hardy, NE

Influencing water features

Upland sites with no additional runoff received.

Soil features

The soils on this site are shallow or very shallow over calcareous shale. Typical profiles range from 4 to 20 inches deep. The soils are calcareous throughout.

Major soil series correlated to this ecological site ion MLRA 75 include: Kipson

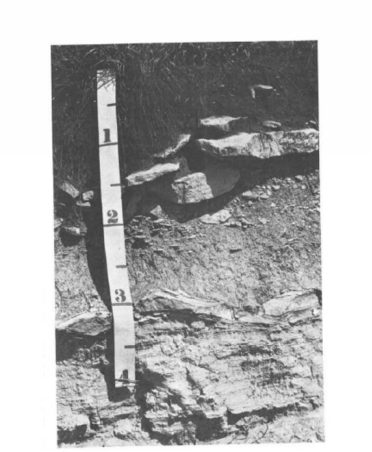


Figure 7. Kipson Series Profile

Table 4. Representative soil features

Parent material	(1) Residuum–clayey shale
Surface texture	(1) Silty clay loam (2) Channery silty clay loam (3) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow to moderately rapid
Soil depth	4–20 in
Surface fragment cover <=3"	0–34%
Surface fragment cover >3"	0–15%
Available water capacity (0-40in)	2–4 in
Calcium carbonate equivalent (0-40in)	10–60%
Electrical conductivity (0-40in)	2–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–34%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

Shallow Limy sites developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire, and other biotic and abiotic factors that typically influence soil/site development. This continues to be a disturbance driven site, with the disturbances being 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 site 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 plants ability to harvest sunlight

depletes the root reserves, subsequently decreasing the root mass. This negatively impacts the plants' ability 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.

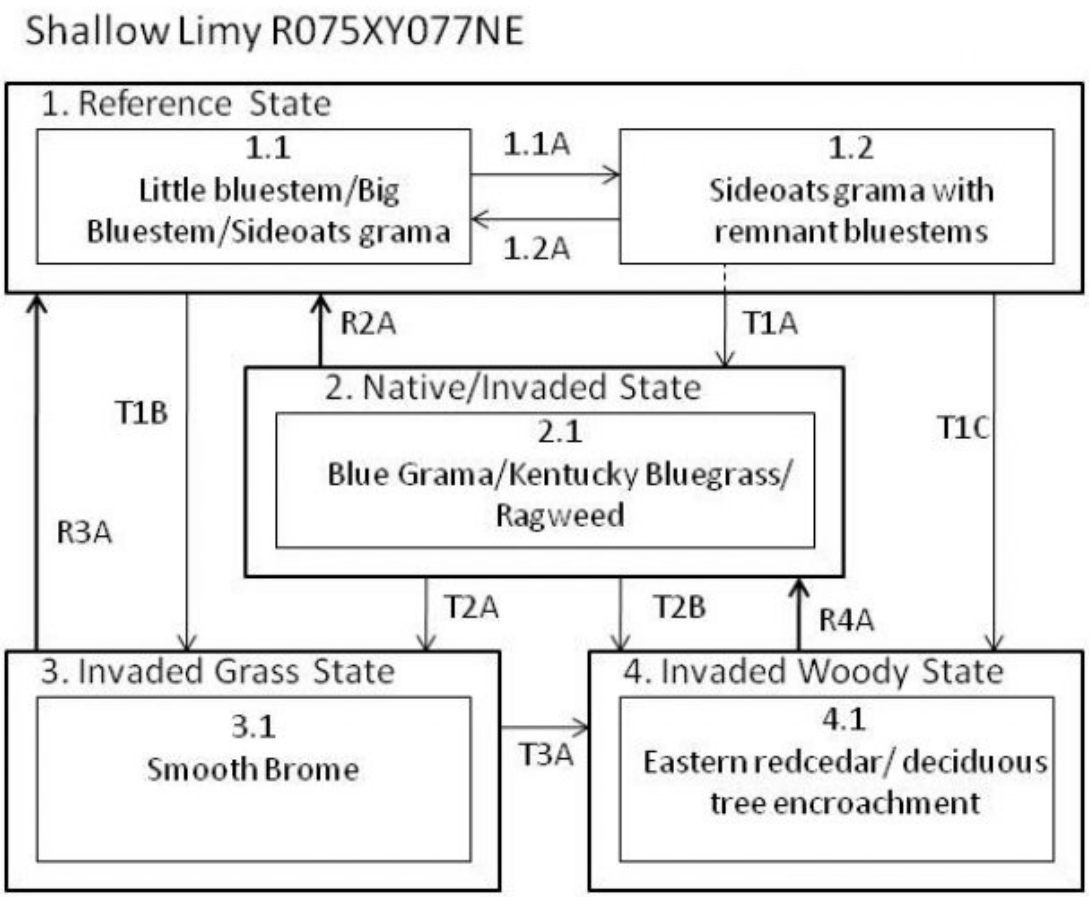
The State and Transition Model (STM) is depicted below, and is made up of a Reference State, a Native/Invaded State, an Invaded Grass State and an Invaded Woody State. Each state represents the crossing of a major ecological threshold due to alteration of the functional dynamic properties of the ecosystem. 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 that 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.
The species distribution and abundance on this site are particularly influenced by the degree of inclination and aspect of the local topography. Northern and eastern slopes are typically cooler and wetter, generally producing more biomass than the drier and warmer exposures. Severe inclines receive less grazing pressure than the more moderate slopes.
Management activities such as selective placement of mineral feeders and watering facilities are required to achieve equitable livestock distribution.

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

State and transition model



Refer to narrative in the Plant Community Section for detailed descriptions of these transitions/pathways. **1.1A** - Continuous season long grazing, inadequate recovery periods; **1.2A** – Return to adequate recovery periods. **T1A** – Introduction/ encroachment of non-native species. **T1B & T2A** – Outside energy inputs such as haying, fertilizer, seeding. **T1C & T2B** – Continuous season long grazing, inadequate recovery periods, lack of fire. **T3A** – Lack of brush management . **R2A** – Prescribed grazing with adequate recovery periods. **R3A** – Range seeding with native species; if significant native remnants exist - prescribed fire, chemical treatments, animal impact with targeted prescribed grazing and adequate recovery periods. **R4A** – Wildfire, prescribed fire, brush management

State 1
Reference State

This state describes the range of vegetative community phases that occur on the Shallow Limy 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 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. 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. This plant community is made up of 70-80 percent grasses and grass-like

plants, 5-10 percent forbs, and 2-10 percent shrubs. Little bluestem, big bluestem, and sideoats grama are the dominant species in this community. Secondary grasses include blue grama, needleandthread, switchgrass, and indiangrass. The site has a very diverse forb population. Common forbs include Nutall's sensitive-briar, dotted blazing star and purple prairie clover. Shrubs include leadplant, smooth sumac and western snowberry. Though considered only moderately productive and less diverse than associated sites, this plant community is still resilient when management includes proper stocking and adequate rest periods between grazing events. Total annual production during an average year ranges from 1800 to 3000 pounds of air dry vegetation per acre.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1640	2076	2500
Shrub/Vine	45	144	250
Forb	115	180	250
Total	**1800**	**2400**	**3000**

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
At-Risk Native Phase

In this plant community, Big bluestem is significantly reduced, while other dominant warm season species experience decreased vigor. Timing of defoliation impacts the ratio of cool season grass species to warm season species in the community. Production declines, and soil health is affected by reduced efficiency in the nutrient, mineral and hydrologic cycles. Continued long-term growing-season heavy grazing will cause this community to degrade to the point of crossing the state threshold into the Native/Invaded State. Drought or damaging hail will accelerate this degradation. Total annual production ranges from 1700 to 2800 pounds of air dry vegetation per acre per year.

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
Excessive Litter

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 drouth-like conditions.

Community 1.4
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 reestablish dominance within 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 At-Risk Native Grass community occurs with continuous season long grazing and inadequate recovery periods during the growing season.

Pathway CP 1.1-1.3
Community 1.1 to 1.3

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

Pathway CP 1.1-1.4
Community 1.1 to 1.4

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, a prolonged intensive grazing event, long-term drought, etc.

Pathway CP 1.2-1.1
Community 1.2 to 1.1

Altering the timing and degree of the disturbance regime will allow growing season rest of desirable mid-grass species, and facilitate a return to the Mid-Grass Community. In the presence of excessive drought, a return to the normal precipitation regime may be required to allow full recovery.

Conservation practices

Access Control
Prescribed Grazing

Pathway CP 1.2-1.3
Community 1.2 to 1.3

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

Pathway CP 1.2-1.4
Community 1.2 to 1.4

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, a prolonged intensive grazing event, long-term drought, etc.

Pathway CP 1.3-1.1
Community 1.3 to 1.1

Re-introduction of the natural processes of appropriately timed grazing and fire will convert this community back to the Native Mixed Grass Community.

Pathway CP 1.3-1.2
Community 1.3 to 1.2

Re-introduction of an appropriately timed grazing system, and the application of fire will facilitate restoration to community phase 1.2.

Pathway CP 1.3-1.4
Community 1.3 to 1.4

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, a prolonged intensive grazing event, long-term drought, etc.

Pathway CP 1.4-1.1
Community 1.4 to 1.1

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

Pathway CP 1.4-1.2
Community 1.4 to 1.2

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
Smooth bromegrass

Smooth brome readily encroaches from adjacent fields, roadside ditches and seeded areas. It increases due to late spring Nitrogen fertilizer applications and heavy summer grazing reducing warm season grass vigor and under-utilization of Smooth bromegrass in the spring. Production on smooth brome dominated plant communities is highly variable depending on the percent composition of the plant in the community. Production can range from 1800 lbs /acre to 2800 pounds/acre with an average of 2300 lbs/acre in normal years on rangelands whose smooth brome component is 50% or more. Clipping or ocular estimates of production should be conducted to verify current annual production. Prescribed grazing, prescribed burning, or the use of herbicide treatments at critical time periods can reduce the smooth brome component in the plant community. Fertilization and other cultural practices in combination with prescribed grazing will maintain or increase the presence of smooth brome. Refer to Forage Suitability Group descriptions for more information on smooth brome production potentials under low and high management inputs.

Figure 11. 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

Figure 12. 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

Community 2.2
Smooth bromegrass

Smooth brome readily encroaches from adjacent fields, roadside ditches and seeded areas. It increases due to late spring Nitrogen fertilizer applications and heavy summer grazing reducing warm season grass vigor and under-utilization of Smooth bromegrass in the spring. Production on smooth brome dominated plant communities is highly variable depending on the percent composition of the plant in the community. Production can range from 1800 lbs /acre to 2800 pounds/acre with an average of 2300 lbs/acre in normal years on rangelands whose smooth brome component is 50% or more. Clipping or ocular estimates of production should be conducted to verify current annual production. Prescribed grazing, prescribed burning, or the use of herbicide treatments at critical time periods can reduce the smooth brome component in the plant community. Fertilization and other cultural practices in combination with prescribed grazing will maintain or increase the presence of smooth brome. Refer to Forage Suitability Group descriptions for more information on smooth brome production potentials under low and high management inputs.

Figure 13. 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

Figure 14. 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 2.1

Introduced grass seeding, excessive warm season grazing, inadequate warm season rest, multi season haying and nitrogen fertilizing in spring and/or fall are all practices that will convert this community to the Smooth Bromegrass Community.

Pathway CP 2.1-2.2
Community 2.2 to 2.1

Introduced grass seeding, excessive warm season grazing, inadequate warm season rest, multi season haying and nitrogen fertilizing in spring and/or fall are all practices that will convert this community to the Smooth Bromegrass Community.

Pathway CP 2.1-2.2
Community 2.1 to 2.2

Introduced grass seeding, excessive warm season grazing, inadequate warm season rest, multi season haying and nitrogen fertilizing in spring and/or fall are all practices that will convert this community to the Smooth Bromegrass Community.

Pathway CP 2.1-2.2
Community 2.2 to 2.2

Introduced grass seeding, excessive warm season grazing, inadequate warm season rest, multi season haying and nitrogen fertilizing in spring and/or fall are all practices that will convert this community to the Smooth Bromegrass Community.

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. Typical ecological impacts are a loss of native warm season grasses, degraded forage productivity and reduced soil quality.

Community 3.1
Eastern redcedar

This community has at least a 15 percent canopy of Eastern redcedar. 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 1500 pounds per acre. Trees of all heights can be controlled with the use of specifically adapted preparation, and ignition and holding techniques. Total annual production during an average year varies significantly, depending on the production level prior to encroachment and the percentage of canopy cover.

Figure 15. 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 T 1-2
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 T 1-3
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.

Restoration pathway R 2-1
State 2 to 1

Restoration from the Native Evaded/Invasives State to the Reference State is achieved by shifting grazing pressure to the growth period for the cool-season grasses, and providing growing season rest for the desired warm season species. Prescribed fire timed to improve native warm season grasses will accelerate this process. Use of burn down herbicides in the early spring and late fall when native warm season grasses are dormant can also be beneficial. A management plan including appropriate prescribed grazing and prescribed fire will maintain the restored community.

Conservation practices

Prescribed Burning
Access Control
Integrated Pest Management (IPM)
Prescribed Grazing

Transition T 2-3
State 2 to 3

Disruption of the natural fire regime and the planting of invasive exotic and native woody species all contribute to shifting this state to the Invaded Woody State.

Restoration pathway R 3-1,2
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.

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	**Tall Warm Season Grasses**			380–720	
	big bluestem	ANGE	*Andropogon gerardii*	360–600	–
	switchgrass	PAVI2	*Panicum virgatum*	0–120	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–120	–
2	**Mid Warm Season Grasses**			620–840	
	little bluestem	SCSC	*Schizachyrium scoparium*	480–720	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	120–360	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–48	–
3	**Native Cool Season Grasses**			80–240	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	24–240	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–120	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–120	–
	western wheatgrass	PASM	*Pascopyrum smithii*	48–120	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–48	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–48	–
4	**Short Warm Season Grasses**			80–120	
	blue grama	BOGR2	*Bouteloua gracilis*	72–120	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–48	–
5	**Other Native Grasses and Grass-Likes**			0–175	
	Grass, perennial	2GP	*Grass, perennial*	0–48	–
	sedge	CAREX	*Carex*	0–48	–
Forb					
6	**Forbs**			120–240	
	Forb, perennial	2FP	*Forb, perennial*	2–48	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–48	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–48	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	0–48	–
	hoary verbena	VEST	*Verbena stricta*	0–48	

	hoary verbena	VEST	*Verbena stricta*	0–48	–
	purple prairie clover	DAPUA	*Dalea purpurea var. arenicola*	0–48	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–48	–
	dotted blazing star	LIPU	*Liatris punctata*	0–48	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–48	–
	evening primrose	OENOT	*Oenothera*	0–48	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–48	–
	beardtongue	PENST	*Penstemon*	0–48	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–48	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–48	–
	ragwort	SENEC	*Senecio*	0–24	–
	goldenrod	SOLID	*Solidago*	0–24	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–24	–
Shrub/Vine					
7	**Shrubs**			48–240	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	24–72	–
	leadplant	AMCA6	*Amorpha canescens*	0–72	–
	prairie rose	ROAR3	*Rosa arkansana*	0–35	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–24	–
	smooth sumac	RHGL	*Rhus glabra*	0–24	–

Animal community

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 also to browsing by livestock such as goats or sheep that 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; 2,400 lbs/acre production and 0.66 AUM/acre carrying capacity*
-At-Risk Native Grass; 1,600 lbs/acre production and 0.43 AUM/acre carrying capacity*

*Continuous season-long grazing by cattle under average growing conditions, 25 percent harvest efficiency. Air-dry forage requirements based on 3 percent of animal body weight, or 912 lbs/AU/month.

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, 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 Shallow Limy 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 ring-necked 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 ring-necked 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 providing 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 Red Cedar/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

Adequate available soil moisture for plant growth is the principal factor limiting forage production on this site. Runoff occurs only during the most intense storms or when soils are saturated (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

For the interpretive plant community, rills and gullies should typically not be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present, in association with bunchgrasses such as little bluestem. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Overall this site has the appearance of being stable and productive.

Recreational uses

This site provides hunting opportunities for upland game species. 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 are present on the site.

Other information

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team. The project plan is: ES R075XY077NE- MLRA 75.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Mike Kucera, State Resource Conservationist, Nebraska; Mitch Faulkner, Rangeland Management Specialist, Nebraska; Dana Larsen, State Rangeland Management Specialist, Nebraska; Chuck Markley, Resource Soil Scientist, Nebraska; Mark

Willoughby, Resource Soil Scientist, Nebraska.
Doug Garrison, Dan Shurtliff and Mike Kucera completed the initial soils correlation and provided some of the photos. The positions listed were those held by the individuals at the time the original ESD was written.

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Contributors

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Revised By Doug Whisenhunt

Acknowledgments

Quality Assurance

Approved Status Verified in Legacy System

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)	Pat Broyles, Mike Kucera, Dana Larsen
Contact for lead author	Doug Whisenhunt
Date	06/01/2004
Approved by	Nadine Bishop
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Few, if any. No active headcutting and sides are covered with vegetation.

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2. **Presence of water flow patterns:** Little, if any, soil deposition or erosion. Water generally flows evenly over the entire landscape.

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3. **Number and height of erosional pedestals or terracettes:** No pedestaled plants or terracettes.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 95 percent or more of the ground is covered by plant canopy, litter, and stones. When prescribed burning is practiced there is little litter the first half the growing season.

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5. **Number of gullies and erosion associated with gullies:** Few, if any. No active headcutting and sides are covered with vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind has not created, or enlarged, bare areas or denuded vegetation.

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7. **Amount of litter movement (describe size and distance expected to travel):** Plant litter is distributed evenly throughout the site.

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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):** Plant canopy intercepts the majority of raindrops. There is no evidence of pedestaled plants or terracettes. A soil fragment will not "melt" or lose its structure when immersed in water for 30 seconds.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The topsoil layer has not been plowed or eroded.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** No negative effect due to plant composition or distribution. No rill formation or plant pedestalling has occurred. Any alteration to infiltration or runoff is due to cultural practices.

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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):** No compacted soil layers due to cultural practices.

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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: Warm Season (bunchgrass) - Little bluestem, Sideoats grama, composite dropseed

    Sub-dominant: Warm Season (rhizomatous) - Big bluestem, Indiangrass, Switchgrass,
    Warm Season (narrow bladed) - buffalograss, perennial threeawns

    Other: Minor: Cool Season - Canada wildrye, Scribner's rosette grass sedges, western wheatgrass, Minor: Forbs (perennial) - black Samson echinacea, compassplant, daisy fleabane, dotted gayfeather, heath aster, Louisiana sagewort, slimflower scurfpea, spiderwort, Cuman ragweed, woolly plantain
    Trace: Shrubs - leadplant, prairie rose

    Additional: Warm season rhizomatous grasses comprise 40 percent to 100 percent of the plant composition.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** The vast majority of plants are healthy and vigorous.

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14. **Average percent litter cover (%) and depth (in):** Plant litter is distributed evenly throughout. 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 the growing season.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1,800-3,000 pounds per acre.

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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:** common sunflower, fall witchgrass, Kochia, tansymustard, Japanese brome, wild lettuce, mullein, woolly verbena, windmill grass, Canada thistle, nodding plumeless thistle, ironweed, cheatgrass, Cuman ragweed, eastern redcedar

17. **Perennial plant reproductive capability:** Desirable perennial plants are healthy. The vast majority of perennial plants have healthy rhizomes and/or stolons.