USDA Natural Resources
Conservation Service

Ecological site R071XY036NE
Loamy Upland

Accessed: 05/06/2024

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.

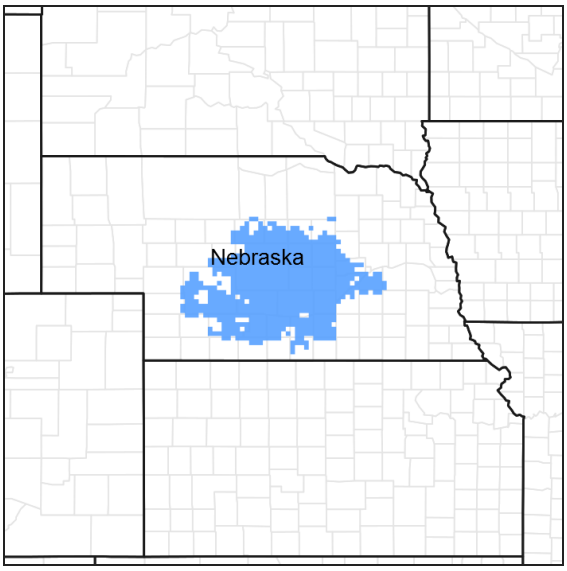

Figure 1. Mapped extent

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): 071X–Central Nebraska Loess Hills

This PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the Approved Ecological Site Description Standard, but it has been through a Quality Control and Quality Assurance processes to assure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an Approved Ecological Site Description.

MLRA 71 is named “The Central Nebraska Loess Hills”, and is located exclusively in Nebraska. The approximately 5.3 million acre landscape covers all or parts of 21 counties, primarily Custer, Dawson, Buffalo, Sherman, Howard, Valley, Greeley and Hall. The physical appearance of the landscape is dominated by loess hills dissected by the North, Middle and South Loup Rivers and their tributaries. The Platte River defines the southern border.
The elevation in MLRA 71 ranges from over 3,000 to less than 1,700 feet above sea level, with average local relief stretching from 20 to 200 feet. The predominate soil orders are mesic, udic Mollisols and Entisols, commonly represented by the Coly, Uly, Cozad, 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 21 to 26 inches, with the number of freeze-free days averaging around 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 is the dominant cool season species.
The primary large-patch vegetative component of the landscape is dominated by Needle-and-thread, prairie sandreed, sand and little bluestem, and blue grama grass.
The majority of the small-patch communities are associated with upland playas and the wetter sites found along the floodplains.
Forty four percent of the land in this MLRA has been broken out of native prairie and farmed; mostly corn, alfalfa and some soybeans, while 48 percent of the grasslands remain intact. Livestock grazing, primarily cattle, is a major industry here.
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 a suite of grassland and upland birds. The rivers, streams and lakes harbor excellent fisheries.
This landscape developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores and repeated natural or man-caused wildfire. Other biotic and abiotic factors also typically influence soil/site development. This is 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 7 to 9 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 as a windbreak component further facilitates invasion by this species.
While eastern red cedar is native to Nebraska, the historic population in MLRA 71 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 requires the use of specially designed ignition and suppression 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

Major Land Resource Area (MLRA): Major Land Resource Area (MLRA) 71 (USDA-Natural Resources Conservation Service, 2006)

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

The loamy upland is a non-effervescing run-off site occurring on less than 30 percent slopes. Soil texture is other than SL, LS or S.

Associated sites

R071XY028NE	**Loamy Lowland** Loamy Lowland (formally Silty Lowland)is adjacent to but positioned below the Loamy Upland site.
R071XY037NE	**Limy Upland** Limy Upland is adjacent to, and often shares a landscape with the Loamy Upland site. Slopes are similar, but the Limy Upland may be positioned above the Loamy Upland in many cases.
R071XY042NE	**Loess Breaks** Loess Breaks (formally Thin Loess)is adjacent to the Loamy Uplands, but almost always occupies the uphill position.

Similar sites

R071XY028NE	**Loamy Lowland** loamy lowland is located below the Loamy upland in a run-on landscape position.
R071XY037NE	**Limy Upland** Limy Upland occupies a similar landscape position with similar slopes, but is differentiated from the Loamy upland by containing effervescing soils in the top 7" of the horizon, whereas Loamy Upland does not.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on nearly level to steep uplands of less than 30 percent. The site has very deep upland soils with silty or loamy surface layers and subsoil. Surface slope slips known as “catsteps” are not characteristic of this site. Where this site occurs on moderately steep to steep slopes, the identifying characteristics are calcium carbonate (CaCO3) leached to a depth of at least 7 inches to well below 10 inches, and an absence of “catsteps”. Where this site occurs in complex with a Limy Upland counterpart, it occupies the lower, slightly concave part of hill slopes. This site produces runoff to areas lower on the landscape. This site is subject to erosion by water if the vegetative cover is reduced or absent by such things as overgrazing and fire events. Livestock trailing on this site often leads to the formation of gullies.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plain (3) Interfluve
Flooding frequency	None
Ponding frequency	None
Elevation	497–937 m
Slope	0–30%
Ponding depth	0 cm
Water table depth	152–203 cm

Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 22 to 26 inches per year. Hourly winds are estimated to average about 13 miles per hour annually. Peak wind gusts range from 46 to 80 miles per hour. Daytime winds are generally stronger than nighttime winds. Growth of native cool season plants begins 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)	137 days
Freeze-free period (average)	156 days
Precipitation total (average)	660 mm

Climate stations used

- (1) BROKEN BOW 2 W [USC00251200], Broken Bow, NE
- (2) STAPLETON 5W [USC00258133], Stapleton, NE
- (3) ANSELMO 2 SE [USC00250245], Anselmo, NE
- (4) BURWELL [USC00251345], Burwell, NE
- (5) CANADAY STEAM PLT [USC00251450], Lexington, NE
- (6) COMSTOCK [USC00251835], Comstock, NE
- (7) LOUP CITY [USC00254985], Loup City, NE
- (8) MASON CITY [USC00255250], Mason City, NE
- (9) OVERTON 3 W [USC00256439], Overton, NE
- (10) GRAND ISLAND AP [USW00014935], Grand Island, NE
- (11) CENTRAL CITY [USC00251560], Central City, NE
- (12) KEARNEY 4 NE [USC00254335], Kearney, NE
- (13) NORTH LOUP [USC00256040], North Loup, NE
- (14) RAVENNA [USC00257040], Ravenna, NE
- (15) ARNOLD [USC00250355], Arnold, NE
- (16) GOTHENBURG [USC00253365], Gothenburg, NE
- (17) OCONTO [USC00256167], Oconto, NE
- (18) SAINT PAUL [USC00257515], Saint Paul, NE
- (19) TAYLOR [USC00258455], Taylor, NE

Influencing water features

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

Soil features

The soils on this site are well drained and very deep. The surface layer of the soils in this site is primarily silty or loamy (but the range includes clayey textures). The surface layer ranges from a depth of 5 to 20 inches thick. The subsoil and underlying material have a similar range in texture as the surface layer. Soils in this site are generally high in fertility. These soils are susceptible to erosion, primarily by water. The potential for water erosion accelerates as the slope increases. Calcium carbonate ($CaCO_3$) may be present in these soils; however it is leached to a depth of at least 7 inches.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam (3) Silty clay loam

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	14.48–23.37 cm
Calcium carbonate equivalent (0-101.6cm)	0–6%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site 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 is a disturbance driven site, with the disturbances being herbivory, fire, and variable climate. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions.
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 as a windbreak species has compounded the issue.
While eastern red cedar is native to Nebraska, the historic population in MLRA 71 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.

Continuous grazing without adequate recovery periods following each grazing occurrence will cause species such as blue grama and Kentucky bluegrass to increase. Big Bluestem, Little Bluestem, and western wheatgrass will decrease in frequency and production as well as key shrubs.

Highly preferred species such as big bluestem, little bluestem and switchgrass are difficult to maintain on this site with continuous season long grazing even with moderate stocking. Sideoats grama will initially increase and fill voids left by declining tall grass species. Blue grama, Kentucky bluegrass and ragweed may increase as tall warm season grasses decline. Smooth brome grass can readily encroach the Loamy Upland site. Erosion in the form of gullies and terraces caused by livestock trailing on the steeper portion of the site will generally occur with continued heavy grazing and without adequate rest periods.

Grazing management that includes proper stocking rates within systems that incorporate scheduled periodic rest periods during the growing season will help maintain this site near production potential.

The reference plant community has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, and areas under long-term rotational grazing practices as well as historical accounts.

The following diagram illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

Community and Vegetation State Naratives:
Following the diagram are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable plant communities. The plant composition tables shown above have been developed from the best available knowledge at the time of this revision. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added.

State and transition model

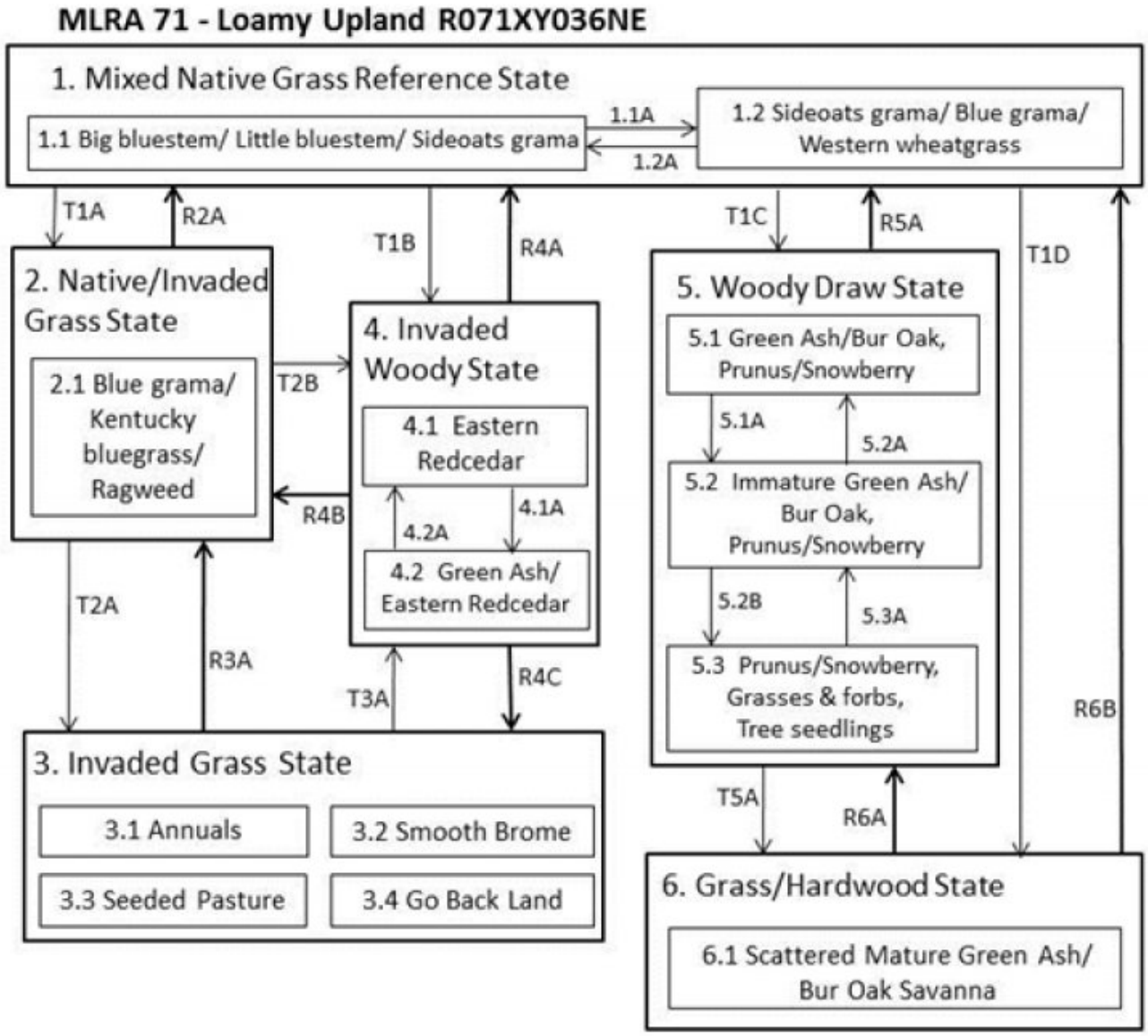

Figure 6. MLRA 71 - Loamy Upland - R071XY036NE

	State and Transition Diagram Legend for Loamy Upland MLRA 71
CP 1.1A T 1A T 2A T 2B T 2C	Continuous season-long grazing, growing season haying, overstocking, prolonged drought.
T 1B T 1C T 1D T 2B T 3A	Lack of fire and brush management allows the encroachment of eastern red cedar and deciduous trees. Once the canopy cover reaches 15 percent with an average tree height exceeding 5 feet, the threshold is crossed.
T 5A	Fire, heavy grazing and heavy browsing.
CP 1.2A R 2A R 3A	A combination of appropriately timed prescribed fire and grazing followed by rest during the optimal growth period for the warm-season grasses will move this community back towards the previous state.
CP 4.1A CP 5.1A CP 5.2B R 4A R 4B R 5A R 6B	A combination of mechanical treatment and prescribed fire. In the case of dense canopies of mature trees, a combination of the mechanical operation of "cutting and stuffing' and specialized ignition techniques may be required. Maintenance burns will be needed to prevent re-invasion.
CP 4.2A	Lack of fire and timber harvest and thinning of deciduous trees.
R 4C	Prescribed grazing, prescribed fire, mechanical and chemical treatments, native seeding.
CP 5.2A CP 5.3A	Light or deferred grazing, lack of fire
R 6A	Continuous heavy grazing, lack of fire.

Figure 7. STM Legend for Loamy Upland MLRA 71

State 1
Mixed Native Grass Reference State

This state comprises the communities within the range of natural variability under historic conditions and

disturbance regimes. The vegetation is predominately native, warm season, tall, and mid-grasses.

Community 1.1
Big bluestem/ Little bluestem/ Sideoats grama

The potential vegetation of this site is a mixed grass prairie consisting of approximately 70 – 85 percent grasses and grass-like plants, 5 – 10 percent forbs, and 5 – 10 percent woody plants. Big Bluestem, little bluestem and sideoats grama are the primary species in this community. Secondary species include western wheatgrass, blue grama, Indiangrass and switchgrass. The site has a very diverse forb population. This plant community is highly productive, diverse, and resistant to short term (less than 4 years) stresses such as drought, heavy stocking or non-use by grazing animals. This plant community is resilient when proper management includes adequate recovery periods between grazing events. The total annual production ranges from 2250 to 4000 pounds of air dry vegetation per acre per year with a representative value of 3124 pounds during an average year.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2174	2977	3699
Shrub/Vine	174	262	392
Forb	174	262	392
Total	**2522**	**3501**	**4483**

Figure 9. Plant community growth curve (percent production by month). NE7138, Central NE Loess Hills, warm-season dominant. Warm-season grass dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	15	20	30	15	5	5	0	0

Community 1.2
Sideoats grama/ Blue grama/ Western wheatgrass

This state marks a shift in plant composition from that of a tall and mid grass community to a mid and short grass plant community. Tall grasses, such as big bluestem, Indiangrass, and switchgrass have decreased in vigor with continued defoliation during their critical growth periods. Tall grasses will be replaced by short and mid height grasses. Dominant plant species include sideoats grama, blue grama, and western wheatgrass. Western ragweed may increase as well. Timing of defoliation (grazing, wildfire, hail, etc.) will have an impact on the proportions of species within the community such as western wheatgrass, needleandthread, and sedge species. Due to the decrease in plant litter,effective precipitation is reduced, causing a significant decline in production compared to the Big Bluestem/Little Bluestem/Sideoats grama plant community. Soil health is affected by inefficient nutrient, mineral and hydrologic cycles. Total annual production ranges from 2000 to 3000 pounds of air dry vegetation per acre per year and will average 2600 pounds during an average year.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2074	2608	2903
Forb	140	219	308
Shrub/Vine	28	87	151
Total	**2242**	**2914**	**3362**

Figure 11. Plant community growth curve (percent production by month). NE7137, Central NE Loess Hills, warm-season dominant, cool-season sub-dominant. Warm-season grass dominant with cool-season plants sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	8	15	24	23	15	5	5	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous Heavy Grazing without adequate recovery periods will convert the Big Bluestem/Little Bluestem/Sideoats Grama reference plant community to the Sideoats grama/ Blue grama/Western wheatgrass plant community. Continued heavy defoliation during the critical growth period for warm season grasses will reduce the proportions of these grass species.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed Grazing with adequate recovery periods, will improve the vigor and health of the mid grass species and help move the plant community toward the Big Bluestem/Little bluestem/Sideoats grama plant community.

State 2
Native/Invaded Grass State

This state consists of one plant community phase. The state has very little native tall and mid warm season grasses remaining. Less productive grasses such as blue grama remain and Kentucky bluegrass has invaded the site. Forb diversity is low and Cuman ragweed is the dominant forb species.

Community 2.1
Blue grama/ Kentucky bluegrass/ Ragweed

With continued heavy grazing pressure, blue grama, Kentucky bluegrass and Cuman ragweed will become the dominant plant species, with only remnants of the tall and mid warm season grasses such as big and little bluestem, sideoats grama, and other mixed grass species. Continuous season-long grazing and heavy grazing pressure will maintain this plant community in a sod-bound condition. Forb diversity has drastically decreased with Cuman ragweed becoming a dominant species. The shrub species present will depend upon the location within the MLRA. Small soapweed will be the dominant shrub species in the western part of the MLRA. Total annual production ranges from 1500 to 2500 pounds of air dry vegetation per acre per year and will average 1650 pounds during an average year. average year.

Figure 13. Plant community growth curve (percent production by month). NE7136, Central NE Loess Hills, cool season/warm season co-dominant. Cool-season grass and warm-season grass co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	25	20	10	5	5	0	0

State 3
Invaded Grass-Seeded State

This state consists of four community phases that have been altered and are highly variable. One consists of seeded pastureland, the second consists of invaded smooth bromegrass. The third is abandoned farmland and the fourth is annual forbs and grasses. The community phases in this state are primarily introduced grasses and/or low succession forbs. They are derived through four distinct management scenarios and may not be related in terms of succession. Infiltration, runoff and soil erosion varies depending on the vegetation present.

Community 3.1
Annuals

This plant community develops under continuous heavy or season-long grazing. Annual grasses and forbs such as

annual bromes, foxtail and other introduced annuals are the dominant plants. Blue grama and Kentucky bluegrass are present only as remnants. Production, succession, the nutrient cycle, water cycle and overall energy flow have been severely impaired. These plants will give some protection from erosion and start to rebuild organic matter. Changing this plant community to one with more perennial grasses that yield higher production per acre will generally require drastic and expensive inputs including seeding. Total annual production varies significantly every year dependant upon the timing and amount of precipitation.

Community 3.2
Smooth Brome

Production on smooth brome dominated plant communities are highly variable depending on the percent composition of the plant in the community. Production can range from 1500 lbs /acre to 3500 pounds/acre with an average of 2500 lbs/acre in average years on rangelands whose smooth brome component is 50 percent or more of the plant community. The composition and condition of the encroached plant community will also affect total production. Clipping or ocular estimates of production should be conducted to verify the 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.

Community 3.3
Seeded Pasture

This plant community can vary considerably depending on the extent of soil erosion, the kind of species seeded, the quality of the stand that was established, how long ago the stand was established and the management of the stand since establishment. Prescribed grazing with adequate recovery periods will be needed to maintain productivity and desirable species. There are several factors that make seeded rangeland a different grazing resource than native rangeland. Factors such as species selected, stand density, improved or selected varieties and harvest efficiency all impact the production level and palatability. Species diversity on seeded rangeland is often lower and native forb species generally take longer to re-establish. This results in uneven utilization when both seeded and native rangelands are in the same grazing unit. Therefore, the seeded rangeland should be managed as a separate grazing unit if possible unless intensive grazing management methods are used.

Community 3.4
Go Back Land

This plant community is created when the soil is tilled or farmed and abandoned. All of the native plants are generally killed, soil organic matter/carbon reserves are reduced, soil structure is changed, and a plow-pan or compacted layer can be formed which decreases water infiltration. Residual synthetic chemicals may remain from farming operations. In early successional stages, this community is not stable. Erosion is a concern.

State 4
Invaded Woody State

This state can develop when brush management, harvest, prescribed burning and wildfire is absent over an extended period of time. Generally, this state is very conducive to cedar seedling invasion. Cedars will eventually dominate the site, over time resulting in a closed canopy. This will reduce grass production and limit grazing potential. In southern and eastern portions of the MLRA honey locust encroachment may occur.

Community 4.1
Eastern Redcedar

This plant community develops over time, and with a lack of fire and overgrazing from adjacent seed sources. Eastern red cedar will dominate the vegetation, and eventually form a nearly closed canopy. The understory vegetation will be the most suppressed of all woody dominated plant communities. Fire on this or the previous plant community will result in a change to a herbaceous plant community. However, if this plant community persists long enough, the resultant herbaceous community may consist mostly of pioneer species with a likelihood of an

abundance of Kentucky bluegrass and/or smooth brome.

Community 4.2
Green Ash/ Eastern Redcedar

The next two plant communities can occur whenever this site is near a seed source for eastern red cedar. This plant community typically develops after some amount of deciduous canopy exists, which provides a suitable microclimate for the establishment of eastern red cedar. If no fire occurs, the eastern red cedar will continue to increase in size, and in the process, change the microclimate (soil moisture) so that it becomes less suitable for the deciduous trees. This plant community is the beginning stage of this transformation, and typically will have numerous immature cedar under the deciduous tree canopy. The herbaceous/shrub understory will begin to decline rapidly.

Pathway 4.1A
Community 4.1 to 4.2

Advance of green ash growth will lead to a shift from the Eastern redcedar community phase to the green ash-eastern redcedar community phase.

Pathway 4.2A
Community 4.2 to 4.1

Timber harvest and tree thinning can cause the Green ash-Eastern redcedar community phase to shift to the Eastern redcedar community phase.

State 5
Woody Draw State

This state consists of three community phases that represent a progressive increase in the amount of woody species present. The community phases range from a mixture of shrub, tree seedlings and grasses to a phase dominated by shrubs and immature trees, to a plant community dominated by mature trees and shrubs.

Community 5.1
Green Ash/ Bur Oak/ Prunus/ Snowberry

A relatively full canopy of green ash, bur oak, or a combination of the two, dominates this plant community phase. It develops over time from the Immature Green Ash/Bur Oak, Prunus/Snowberry Plant Community, with prescribed grazing or light grazing that allows for survival of the young trees, and a healthy, productive herbaceous/shrub understory. Green ash and hackberry will generally be more dominant in woody draws in the western portion of the MLRA, particularly Custer County, while bur oak would dominate in the eastern portion of the MLRA. Woody shrubs will remain in the understory, but typically in lesser amounts than in the previous two plant communities. While somewhat reduced, the herbaceous understory will remain relatively productive. The trees will mostly be in the mature stage, but regeneration will normally be evident (i.e., seedlings and saplings should be present). The landscape position of the upper draws somewhat protects this community from disturbance by wildfire, and facilitates the development of the woody community.

Community 5.2
Immature Green Ash/ Bur Oak/ Prunus/ Snowberry

With time and prescribed grazing or light grazing that allows for survival of the young trees, this plant community will develop from the Prunus/Snowberry, Grasses & Forbs, Tree Seedlings Plant Community. On the eastern portions of the MLRA, bur oak will tend to be the likely tree to establish; whereas, on the western portions of the MLRA, green ash will be more prevalent. Green ash and/or bur oak trees will be from the immature to young mature stage, and seedling and saplings will still be present in the understory. The herbaceous plant community will remain relatively productive, but will be reduced somewhat from the Big Bluestem/Western Wheatgrass Plant Community. This is due mainly to the competition for sunlight, moisture, and nutrients from the woody shrub understory. Woody vegetation will predominantly be found on the north and east aspects at the density levels represented by this

community.

Community 5.3
Prunus/ Snowberry/ Grasses & Forbs/ Tree Seedlings

This plant community phase typically occurs when woody shrubs and trees from adjacent sites encroach, and with a lack of fire. The woody shrubs provide a suitable microclimate for the establishment of trees. Trees will be from seedling to immature stages, and the herbaceous understory will still be productive as a result of the filtered canopy of the deciduous trees. The vegetation will consist of more woody shrubs than in the Big Bluestem/Western Wheatgrass Plant Community, and the herbaceous component will be reduced slightly. Understory shrubs, primarily plum and/or chokecherry, and snowberry will be most likely to establish. However, other species, including silver buffaloberry and currants can establish and dominate the shrub layer.

Pathway 5.1A
Community 5.1 to 5.2

Brush management, wood harvest and prescribed burning may all be needed to shift this community phase to the immature green ash/bur oak/prunus/snowberry plant community. Prescribed grazing or light grazing in conjunction with the woody control methods is also necessary.

Pathway 5.2A
Community 5.2 to 5.1

Prescribed or light grazing that allows for survival of young trees and shrubs will lead to a canopy of green ash and/or bur oak with a healthy herbaceous/shrub understory.

Pathway 5.2B
Community 5.2 to 5.3

Brush management and prescribed burning will both be needed to shift this community phase to the Prunus/Snowberry, Grasses & Forbs / tree seedling community phase. Prescribed grazing or light grazing in conjunction with the woody control methods is also necessary.

Pathway 5.3A
Community 5.3 to 5.2

Continued absence of fire combined with prescribed or light grazing that allows for the survival of young trees will move the prunus/snowberry/grasses & forbs/tree seedlings community phase to immature green ash/bur oak/Prunus-snowberry plant community.

State 6
Grass/Hardwood State

This state consists of one plant community which is a result of continuous season long grazing or continuous seasonal grazing. There is little regeneration of trees mainly due to grazing of seedlings and saplings.

Community 6.1
Scattered Mature Green Ash/ Bur Oak Savanna

This plant community is typically derived from the Immature Green Ash/Bur Oak, Prunus/Snowberry Plant Community or the Green Ash/Bur Oak, Prunus/Snowberry Plant Community as a result of continuous season-long grazing or continuous seasonal grazing. With time, the trees that survive become mature, and little or no regeneration occurs due mainly to grazing of seedlings & saplings. When this plant community comes from the more mature stages, the canopy becomes scattered as a result of tree loss by disease or old age. The type of grazing that limits regeneration also results in a reduction of the desirable native herbaceous species, often resulting in a dominance of species such as bluegrass and/or smooth bromegrass, and forbs such as aster, cudweed sagewort, goldenrod and western ragweed. The trees are scattered, and may be limited to microsites on

the south and west aspects. The site may have a “park-like” appearance with few trees and reduced understory. With fire, this plant community may return to an herbaceous dominated plant community. Bur oak does sprout with fire, but the dominance of the herbaceous understory may result in few or no bur oak trees remaining on the site after fire.

Transition T1A
State 1 to 2

Continuous Heavy Grazing without adequate recovery periods will cause this plant community to lose a significant proportion of tall warm season grass species and cross a threshold to a Blue Grama/Kentucky Bluegrass/Ragweed plant community. Once this occurs it will require considerable time (more than 40 years) and expense to return this site to a more productive plant community. Water infiltration and other hydrologic functions will be reduced due to the root matting presence of sod-forming grasses.

Transition T1B
State 1 to 4

No-Fire, No-Use, and Encroachment will allow an increase of Eastern red cedar and deciduous trees such as locusts in the plant community.

Transition T1C
State 1 to 5

Long-term prescribed grazing and lack of fire may shift this plant community toward a plant community dominated by trees. See the plant community descriptions for areas on lower and upper reaches of drainages.

Transition T1D
State 1 to 6

No fire, encroachment and no brush management can cause the reference state to transition to the Grass/Hardwood State.

Restoration pathway R2A
State 2 to 1

Prescribed Grazing with adequate recovery periods, will allow perennial plants to increase in the plant community and move toward the Sideoats grama/ Blue grama/Western wheatgrass community as long as there is a remnant warm-season plant component within the plant community.

Transition T2A
State 2 to 3

Continuous Heavy Grazing without adequate recovery periods will cause this plant community to shift toward an Annuals plant community. The loss of perennial vegetation will increase the potential for soil erosion, and reduce water infiltration, and other biotic, soil, and hydrologic functions.

Transition T2B
State 2 to 4

Encroachment of woody species, no grazing and no fire will cause the Native/ Invaded Grass State to transition to the Invaded Woody State

Restoration pathway R3A
State 3 to 2

Prescribed Grazing with adequate recovery periods, will allow the sod-forming grasses to increase in composition and help move the plant community back toward the Native/Invaded state over a long period of time (more than 15

years).

Transition T3A
State 3 to 4

Encroachment of woody species, no grazing, and no fire will cause the Invaded Grass-Seeded State to transition to the Invaded Woody State.

Restoration pathway R4A
State 4 to 1

Harvest,wildfire, prescribed burning or brush management of eastern red cedar and other woody plants will maintain the reference plant community and control woody plant encroachment. Eastern red cedar control can usually be accomplished with a prescribed burn while the trees are six foot tall or less and fine fuel production is over 1500 pounds per acre. Mechanical removal followed by a chemical treatment on stumps is effective on honey locust. Prescribed grazing or targeted grazing with browsing animals may also help maintain a grass-dominant plant community.

Restoration pathway R4B
State 4 to 2

Harvest,wildfire, prescribed burning or brush management of eastern red cedar and other woody plants will maintain the reference plant community and control woody plant encroachment. Eastern red cedar control can usually be accomplished with a prescribed burn while the trees are six foot tall or less and fine fuel production is over 1500 pounds per acre. Mechanical removal followed by a chemical treatment on stumps is effective on honey locust. Prescribed grazing or targeted grazing with browsing animals may also help maintain a grass-dominant plant community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Restoration pathway R4C
State 4 to 3

Prescribed burning, continuous heavy grazing, brush management, plowing, and/or seeding can cause the Invaded Woody State to be restored back to the Invaded Grass-Seeded State.

Restoration pathway R5A
State 5 to 1

Wildfire, prescribed burning, brush management and long term prescribed grazing will cause the Lower Woody Draw State to shift back to the Mixed Native Grass Reference State.

Transition T5A
State 5 to 6

Long term prescribed grazing, wildfire, prescribed burn, and heavy browsing can all cause the Lower Woody Draw state to transition to the Grass/Hardwood State.

Restoration pathway R6B
State 6 to 1

Timber harvest, prescribed burn, brush management, and long term prescribed grazing can cause the

Grass/Hardwood State to shift back to the Mixed Native Grass Reference State.

Restoration pathway R6A
State 6 to 5

Continuous heavy grazing, no fire, or flooding will cause the Grass/Hardwood State to shift back to the Lower Woody Draw State.

Additional community tables

Table 7. 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**			875–1401	
	big bluestem	ANGE	*Andropogon gerardii*	701–875	20–25
	switchgrass	PAVI2	*Panicum virgatum*	175–351	5–10
	Indiangrass	SONU2	*Sorghastrum nutans*	0–351	0–10
2	**Mid Warm Season Grasses**			701–1226	
	little bluestem	SCSC	*Schizachyrium scoparium*	526–875	15–25
	sideoats grama	BOCU	*Bouteloua curtipendula*	175–526	5–15
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–175	0–5
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–175	0–5
3	**Native Cool Season Grasses**			351–701	
	western wheatgrass	PASM	*Pascopyrum smithii*	351–526	10–15
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–351	0–10
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–175	0–5
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–175	0–5
	green needlegrass	NAVI4	*Nassella viridula*	0–175	0–5
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–175	0–5
	Canada wildrye	ELCA4	*Elymus canadensis*	0–71	0–2
4	**Short Warm Season Grasses**			175–351	
	blue grama	BOGR2	*Bouteloua gracilis*	175–351	5–10
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–175	0–5
5	**Other Native Grasses and Grasslikes**			35–175	
	sedge	CAREX	*Carex*	35–175	1–5
	Grass, perennial	2GP	*Grass, perennial*	0–71	0–2
Forb					
7	**Forbs**			175–351	
	Forb, annual	2FA	*Forb, annual*	0–71	0–2
	Forb, perennial	2FP	*Forb, perennial*	0–71	0–2
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–71	0–2
	pussytoes	ANTEN	*Antennaria*	0–71	0–2
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–71	0–2
	false boneset	BREU	*Brickellia eupatorioides*	0–71	0–2
	thistle	CIRSI	*Cirsium*	0–71	0–2

	purple prairie clover	DAPU5	*Dalea purpurea*	0–71	0–2
	common sunflower	HEAN3	*Helianthus annuus*	0–71	0–2
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–71	0–2
	dotted blazing star	LIPU	*Liatris punctata*	0–71	0–2
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–71	0–2
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–71	0–2
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–71	0–2
	beardtongue	PENST	*Penstemon*	0–71	0–2
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–71	0–2
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–71	0–2
	ragwort	SENEC	*Senecio*	0–71	0–2
	goldenrod	SOLID	*Solidago*	0–71	0–2
	white heath aster	SYER	*Symphyotrichum ericoides*	0–71	0–2
	vervain	VERBE	*Verbena*	0–71	0–2
Shrub/Vine					
8	**Shrubs**			175–351	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–71	0–2
	leadplant	AMCA6	*Amorpha canescens*	0–71	0–2
	smooth sumac	RHGL	*Rhus glabra*	0–71	0–2
	prairie rose	ROAR3	*Rosa arkansana*	0–71	0–2
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–71	0–2
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–71	0–2
	soapweed yucca	YUGL	*Yucca glauca*	0–71	0–2

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season Grass**			146–583	
	big bluestem	ANGE	*Andropogon gerardii*	146–437	5–15
	switchgrass	PAVI2	*Panicum virgatum*	0–146	0–5
	Indiangrass	SONU2	*Sorghastrum nutans*	0–146	0–5
2	**Mid-Warm Season Grass**			437–1166	
	sideoats grama	BOCU	*Bouteloua curtipendula*	437–874	15–30
	little bluestem	SCSC	*Schizachyrium scoparium*	291–437	10–15
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–291	0–10
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–146	0–5
3	**Native Cool Season Grass**			146–729	
	western wheatgrass	PASM	*Pascopyrum smithii*	291–583	10–20
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–146	0–5
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–58	0–2
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–58	0–2
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–58	0–2

	grass		*Schizachyrium*		
	Canada wildrye	ELCA4	*Elymus canadensis*	0–58	0–2
4	**Short Warm Season Grass**			29–583	
	blue grama	BOGR2	*Bouteloua gracilis*	291–583	10–20
5	**Other Native Grasses/Grass-Likes**			29–146	
	Grass, perennial	2GP	*Grass, perennial*	0–146	0–5
	sedge	CAREX	*Carex*	29–146	1–5
6	**Non-Native Grasses**			0–146	
	smooth brome	BRIN2	*Bromus inermis*	0–291	0–10
	cheatgrass	BRTE	*Bromus tectorum*	0–58	0–2
	Kentucky bluegrass	POPR	*Poa pratensis*	0–58	0–2
Forb					
7	**Forbs**			146–291	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–146	0–5
	pussytoes	ANTEN	*Antennaria*	0–58	0–2
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–58	0–2
	false boneset	BREU	*Brickellia eupatorioides*	0–58	0–2
	purple prairie clover	DAPU5	*Dalea purpurea*	0–58	0–2
	common sunflower	HEAN3	*Helianthus annuus*	0–58	0–2
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–58	0–2
	dotted blazing star	LIPU	*Liatris punctata*	0–58	0–2
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–58	0–2
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–58	0–2
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–58	0–2
	beardtongue	PENST	*Penstemon*	0–58	0–2
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–58	0–2
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–58	0–2
	ragwort	SENEC	*Senecio*	0–58	0–2
	goldenrod	SOLID	*Solidago*	0–58	0–2
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–58	0–2
	white heath aster	SYER	*Symphyotrichum ericoides*	0–58	0–2
	vervain	VERBE	*Verbena*	0–58	0–2
	Forb, annual	2FA	*Forb, annual*	0–58	0–2
	Forb, perennial	2FP	*Forb, perennial*	0–58	0–2
Shrub/Vine					
8	**Shrubs**			29–146	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–58	0–2
	leadplant	AMCA6	*Amorpha canescens*	0–58	0–2
	smooth sumac	RHGL	*Rhus glabra*	0–58	0–2
	prairie rose	ROAR3	*Rosa arkansana*	0–58	0–2
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–58	0–2
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–58	0–2
	soapweed yucca	YUGL	*Yucca glauca*	0–58	0–2

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season Grasses**			925–1295	
	big bluestem	ANGE	*Andropogon gerardii*	0–56	0–3
	switchgrass	PAVI2	*Panicum virgatum*	0–37	0–2
2	**Mid Warm Season Grasses**			93–185	
	sideoats grama	BOCU	*Bouteloua curtipendula*	37–93	2–5
	little bluestem	SCSC	*Schizachyrium scoparium*	0–93	0–5
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–93	0–5
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–93	0–5
3	**Native Cool Season Grasses**			0–185	
	western wheatgrass	PASM	*Pascopyrum smithii*	93–185	5–10
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–93	0–5
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–37	0–2
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–37	0–2
	Canada wildrye	ELCA4	*Elymus canadensis*	0–37	0–2
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–37	0–2
4	**Short Warm Season Grasses**			370–555	
	blue grama	BOGR2	*Bouteloua gracilis*	370–555	20–30
5	**Other Native Grasses/Grasslikes**			19–93	
	sedge	CAREX	*Carex*	19–93	1–5
	Grass, perennial	2GP	*Grass, perennial*	0–37	0–2
6	**Non-Native Grasses**			278–463	
	Kentucky bluegrass	POPR	*Poa pratensis*	278–370	15–20
	cheatgrass	BRTE	*Bromus tectorum*	0–93	0–5
Forb					
7	**Forbs**			185–370	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	185–370	10–20
	vervain	VERBE	*Verbena*	19–93	1–5
	Forb, annual	2FA	*Forb, annual*	0–37	0–2
	Forb, perennial	2FP	*Forb, perennial*	0–37	0–2
	pussytoes	ANTEN	*Antennaria*	0–19	0–1
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–19	0–1
	false boneset	BREU	*Brickellia eupatorioides*	0–19	0–1
	purple dalea	DALA4	*Dalea lasiathera*	0–19	0–1
	common sunflower	HEAN3	*Helianthus annuus*	0–19	0–1
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–19	0–1
	dotted blazing star	LIPU	*Liatris punctata*	0–19	0–1
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–19	0–1
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–19	0–1
	silverleaf Indian	PEAR6	*Pediomelum argophyllum*	0–19	0–1

	silvery Indian breadroot	PLAR15	*Pediomelum argophyllum*	0–19	0–1
	beardtongue	PENST	*Penstemon*	0–19	0–1
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–19	0–1
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–19	0–1
	ragwort	SENEC	*Senecio*	0–19	0–1
	goldenrod	SOLID	*Solidago*	0–19	0–1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–19	0–1
	white heath aster	SYER	*Symphyotrichum ericoides*	0–19	0–1
Shrub/Vine					
8	**Shrubs**			19–93	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–37	0–2
	leadplant	AMCA6	*Amorpha canescens*	0–37	0–2
	smooth sumac	RHGL	*Rhus glabra*	0–37	0–2
	prairie rose	ROAR3	*Rosa arkansana*	0–37	0–2
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–37	0–2
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–37	0–2
	soapweed yucca	YUGL	*Yucca glauca*	0–37	0–2

Animal community

Grazing Interpretations:
Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide year-long forage for cattle, sheep, or horses. During the dormant period, the protein levels of the forage may be lower than the minimum needed to meet livestock (primarily cattle and sheep) requirements.

The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. 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, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers 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.

Production Carrying Capacity*
Plant Community (lbs./acre) (AUM/acre)
Big Bluestem/Little Bluestem/Sideoats Grama 3125 0.86
Sideoats Grama/Blue Grama/Western Wheatgrass 2600 0.71
Blue Grama/Kentucky Bluegrass/Ragweed
1600 0.43
Smooth Brome (dryland, unfertilized, greater than 50 percent of plant composition
2700 0.74

* Based upon the following conditions: 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.

Hydrological functions

Water is the principal factor limiting forage production on this site. Runoff is expected to occur only during the most intense storms (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic

curves).

For the interpretive plant community, rills and gullies should not typically 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. Cryptogamic crusts are present but only cover 1-2 percent of the soil surface. Overall this site has the appearance of being stable and productive.

Recreational uses

This site provides hunting opportunities for upland game species. The wide variety 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.

Other products

none noted

Other information

Revision Notes: “This PROVISIONAL ecological site concept has been QC’d and QA’d to ensure that the site meets the NESH standards for a provisional ecological site that provides basic compiled information in one location. This site should not be considered an Approved ESD until further data entry and editing is completed.

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.

Other references

Field Offices:
Broken Bow
Thedford
North Platte
Lexington
Kearney
Grand Island
Fullerton
Central City
St. Paul
Loup City
Ord
Greeley
Albion
Burwell
Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Contributors

Dana Larsen

Doug Whisenhunt

Acknowledgments

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.
The State and Transitional Model and corresponding pathways and associated vegetative communities will need to be reviewed and upgraded to adhere to the new guidelines.
Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team. The project plan is: ES R071XY036NE- MLRA 71 -

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):**

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):**

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

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

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:**

17. **Perennial plant reproductive capability:**