Ecological site R071XY037NE
Limy Upland

Accessed: 04/20/2024

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.

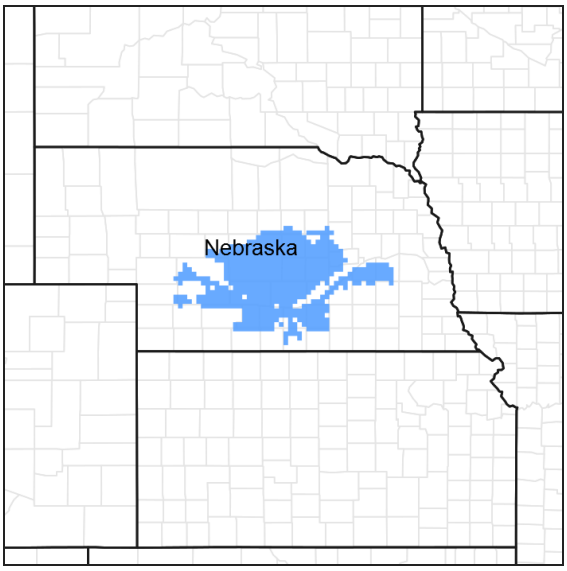

Figure 1. Mapped extent

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

This site occupies a run-off position on the landscape on slopes of less than 30 percent. The soils associated with

this site are effervescent due to the presence of calcium carbonate at or near the surface.

Associated sites

R071XY028NE	**Loamy Lowland** Loamy Lowland- Often found adjacent to Limy Upland, but positioned lower on the landscape.
R071XY036NE	**Loamy Upland** Loamy Upland- Similar landscape position and slope, can occur adjacent to Limy Upland.
R071XY042NE	**Loess Breaks** Loess Breaks- Occurs adjacent to Limy Upland, but usually higher on the landscape.

Similar sites

R071XY042NE	**Loess Breaks** Loess Breaks-Occurs on slopes greater than 30 percent, cat-steps are evident. The steeper slopes and cat-steps differentiate this site from Limy Upland.
R071XY036NE	**Loamy Upland** Loamy Upland- The soils are non effervescent.

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 steeply sloping uplands or high terraces. This site consists of very deep upland soils with silty (or loamy) surface layers and subsoils. On all slopes a primary identifying feature for this site is the presence of calcium carbonate at or near the soil surface. This site produces runoff to areas lower on the landscape. This site is subject to severe 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
Elevation	1,630–3,075 ft
Slope	0–30%
Ponding depth	0 in
Water table depth	60–80 in

Climatic features

Annual precipitation ranges from 22 to 26 inches per year. Winds are estimated to average about 13 miles per hour annually. Peak wind gusts range from 46-80 miles per. 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 into 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)	26 in

Climate stations used

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

These very deep soils are characterized by thin (<7 inches) surface layers. (Under cultivation calcium carbonate is usually at the surface and throughout the entire soil depth, but often is leached in the upper 3 to 6 inches in non-cultivated areas.) Soil texture for both surface and subsoil layers of these soils range from silty to loamy. Organic matter content is generally low to moderately low in the surface layer.
Coly is the only major soil series associated with this ecological site.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam (3) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	60–80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5.7–9.2 in
Calcium carbonate equivalent (0-40in)	0–6%

Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	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 generally occurs on nearly level to steeply sloping uplands or high terraces where no extra moisture from drainage or overflow is received. With excessive overgrazing, or grazing without adequate recovery periods, little bluestem, sideoats grama, big bluestem, and other tall and mid grasses are generally reduced. Blue grama and Kentucky bluegrass increase. Forbs and shrubs make up about 15 percent of the plant components on this site and increase significantly as excessive grazing occurs.
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.

Heavy grazing without adequate rest periods cause big bluestem and other tall grass species to rapidly lose productive capacity through loss of vigor and reproductive potential. Sideoats grama will initially increase, and fill the voids left by declining tall grass species. Continued overgrazing results in a decrease of sideoats grama. Blue grama, Kentucky bluegrass, and forbs increase as the taller warm season grass species decline. Smoothbrome will readily encroach on this site. Erosion in the form of gullying and terraces (contour trailing of livestock) 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 with adequate recovery periods for the entire grazing unit is usually required to improve or maintain this site. Intensive grazing management using concentrated livestock numbers, combined with long recovery periods, can be beneficial in improving forage utilization, quantity, and quality.

The reference plant community has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short duration/time controlled grazing and historical accounts.

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

State and transition model

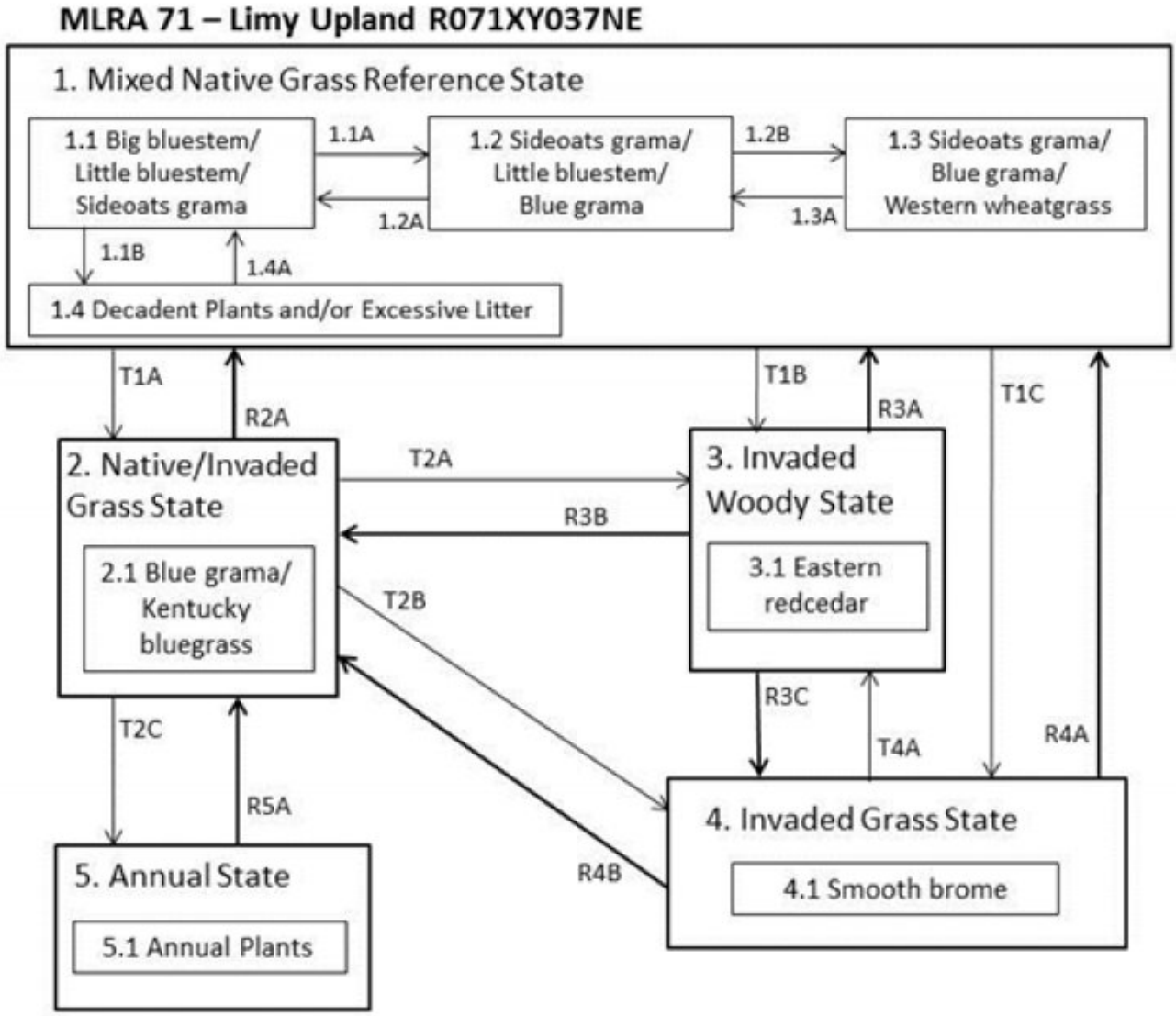

Figure 6. MLRA 71 - Limy Upland - R071XY037NE

	State and Transition Diagram Legend for Limy Upland MLRA 71
CP 1.1A CP 1.2B	Continuous season-long grazing, growing season haying, overstocking, prolonged drought
CP 1.1B	Lack of natural disturbance processes, i.e fire and grazing.
CP 1.2A CP 1.3A	Managed grazing, reduced stocking rate, appropriately timed prescribed fire.
CP 1.4A	Introduction/allowance of natural disturbance regimes, i.e. grazing and fire.
T 1A T 1C T 2B T 2C	Continuous season-long grazing, growing season haying, overstocking, prolonged drought.
T 1B T 2A T 4A	Lack of fire allows the encroachment of eastern red cedar. Once the canopy cover reaches 15 percent with an average tree height exceeding 5 feet, the threshold is crossed to the Invaded Woody State.
R 2A	A combination of prescribed fire and grazing timed to impact the invading cool-season grasses followed by rest during the optimal growth period for the warm-season grasses will move this community back towards the reference state.
R 3A R 3B R 3C	This state can be converted back to the previous state with 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.
R 4A R 4B R 5A	Prescribed grazing, prescribed fire, chemical treatments, native seeding.

Figure 7. STM Legend

State 1
Reference State

This state contains two community phases historically maintained by frequent fire and herbivory(grazing) with

adequate recovery periods. High perennial grass cover and production allows for increased soil moisture retention, vegetative production and overall soil quality.

Community 1.1
Big bluestem/ Little bluestem/ Sideoats grama

This plant community developed under large herbivore grazing and occasional wildfire. The site is made up of 70 to 90 percent grasses and grass-like plants, 5 to 10 percent forbs, and 5 to 10 percent shrubs. The dominant grasses include big bluestem, little bluestem and sideoats grama. Secondary species include blue grama, western wheatgrass, and Indiangrass. Forbs include dotted blazingstar, white heath aster, Cuman ragweed, and purple prairie clover. Shrubs that may be present include leadplant, buckbrush, rose, and sumac. This plant community is highly productive and diverse. Plant health and vigor maintained by prescribed grazing and adequate recovery periods between grazing events, allows this site to withstand short-term environmental stress, short-term heavy grazing or several years of non-use by grazing animals. Total annual production during ranges from 2000 to 3250 pounds of air dry vegetation per acre per year and will average 2625 pounds.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1845	2349	2840
Forb	130	197	275
Shrub/Vine	25	79	135
Total	**2000**	**2625**	**3250**

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/ Little bluestem/ Blue grama

This plant community develops under continued grazing without adequate recovery periods during the growing season. Big bluestem and other tall grass species rapidly lose productive capacity through loss of vigor and reproductive potential. Little bluestem, sideoats grama, blue grama increase to fill the voids left by the decrease of the more desirable tall warm season grass species. Forbs and some shrubs also increase in this plant community. Soil health is not adversely affected. Total annual production during an average year ranges from 1600 to 2800 pounds of air dry vegetation per acre per year and will average 2200 pounds.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1475	1969	2460
Forb	105	165	225
Shrub/Vine	20	66	115
Total	**1600**	**2200**	**2800**

Figure 11. 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 1.3
Sideoats grama/ Blue grama/ Western wheatgrass

This plant community marks a shift in plant composition from that of a tall and mid grass community to a mid and short grass community. Tall grasses, such as big bluestem, Indiangrass, and switchgrass are decreasing in vigor with continued defoliation. Little bluestem declines. Tall grasses will be replaced by short grasses such as blue grama, forbs and shrubs. Dominant plant species include blue grama, sideoats grama, and western wheatgrass. Western ragweed increases as well. Timing of defoliation events 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 the amount of plant litter generated, effective precipitation is reduced, causing a significant decline in production compared to the Sideoats grama, Little bluestem, Blue grama plant community. Soil health is affected by inefficient nutrient, mineral and hydrology cycles. Total annual production during an average year ranges from 1200 to 2400 pounds of air dry vegetation per acre per year and will average 1800 pounds.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1010	1521	2005
Forb	175	225	300
Shrub/Vine	15	54	95
Total	**1200**	**1800**	**2400**

Figure 13. 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

Community 1.4
Decadent plants and/or Excessive Litter

This plant community occurs when grazing is removed for long periods of time or there is an absence of fire. Plant composition is similar to the Reference Plant Community, however individual species production and frequency will be lower. Over time, species diversity decreases. Much of the nutrients on the site are tied up in excessive litter. Nutrient recycling is severely reduced by the lack of animal impact. Decomposition is slowed due to the semiarid environment. The litter limits sunlight from reaching root crowns, and many plants, especially bunchgrasses, die. The reproductive potential of perennial plants is reduced. Bare ground is common in advanced stages. Annual forbs, grasses and on occasion cryptogamic crusts often occupy these areas. If periodic grazing and/or grazing and fire are limited, perennial plants die and on steeper slopes erosion may increase. Increased practice cost and management will be required to establish a more productive perennial plant community.

Pathway 1.1A
Community 1.1 to 1.2

Continuous grazing without adequate recovery periods will convert the reference plant community to the Sideoats grama, Little bluestem, Blue grama plant community. Continued defoliation during critical growth periods will reduce the proportion of tall grass species. The more accessible slopes of this site are preferred by livestock and can lead to uneven grazing distribution.

Pathway 1.1B
Community 1.1 to 1.4

No-Fire and No-use can also result in heavy mulch/thatch build-up, reduced plant vigor, and will eventually cause plant mortality, which can move the reference plant community to a Decadent Plants and/or Excessive Litter

community. Prescribed grazing and Prescribed burning will maintain the reference plant community.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed Grazing with adequate recovery periods, will improve the vigor and health of the tall grass species and maintain mid grass species and will shift this community to the Big bluestem, Little bluestem, Sideoats grama plant community. This movement can occur over relatively short periods of time (less than five years).

Pathway 1.2B
Community 1.2 to 1.3

Continuous grazing without adequate recovery periods will cause this plant community to change to a Sideoats grama, Blue grama, Western wheatgrass plant community. Continued defoliation without adequate rest periods will significantly reduce the remaining proportions of the tall grass species and begin to reduce the proportions of mid grass species. The more accessible slopes of this site are preferred by livestock and can lead to uneven grazing distribution.

Pathway 1.3A
Community 1.3 to 1.2

Prescribed Grazing with adequate recovery periods, will improve the vigor and health of the mid grass species and move towards the Sideoats Grama, Little bluestem, Blue grama plant community. This movement will occur over longer periods of time (five to fifteen years).

Pathway 1.4A
Community 1.4 to 1.1

Prescribed Grazing (with adequate recovery periods) and/or Prescribed Burning or wildfire (to reduce excess litter) will shift this plant community toward the Big bluestem, Little bluestem, Sideoats grama plant community.

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 Kentucky bluegrass and blue grama plant communities.

Community 2.1
Blue grama/ Kentucky bluegrass

Blue grama and Kentucky bluegrass have developed a dense sod due to continued defoliation without rest periods. All tall grass species have been lost and many mid grass species are only remnants. Plant diversity is extremely low and plant vigor is significantly reduced. Deep percolation will be severely impacted by the root mass present in this plant community. Total annual production during an average year ranges from 500 to 900 pounds of air dry vegetation per acre per year and will average 700 pounds.

Figure 14. Plant community growth curve (percent production by month). NE7141, Central NE Loess Hills, lowland cool season/warm season co-dominant. Cool-season and warm-season grasses co-dominant, lowland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	12	20	25	19	11	5	3	0	0

State 3

Invaded Woody State

The spatial extent of eastern red cedar encroachment has expanded and individual trees have grown substantially. The areas under and near individual cedars have experienced altered function through shading, evergreen litter, and suppressed herbaceous understory. The woody overstory now dictates certain disturbance responses, and prescribed fire options become increasingly problematic as any fire will be largely carried by the volatile evergreen canopy instead of the herbaceous understory.

Community 3.1
Eastern redcedar

This community can develop when fire is withheld from any plant community over an extended period of time. Generally this site is very conducive to cedar seedling invasion. Cedars will eventually dominate the site, reducing grass production and limiting grazing potential. Siberian elm and/or honey locust encroachment may occur as you move east within the MLRA. Encroachment can occur within any plant community state or phase. Annual production varies widely depending on condition of the site and degree of encroachment.

State 4
Invaded Grass State

Introduced cool-season invasion has progressed to the point that native species comprise a negligible portion of the community and the aggressively rhizomatous invasive smooth bromegrass preclude native germination and seedling survival. The native component may be completely absent and the site then will resemble a seeded pasture.

Community 4.1
Smooth brome

This community can develop when smooth brome is present within or near the native plant community. Roadside plantings of smooth brome are often the source of encroachment. 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 1700 lbs/acre to 3700 lbs/acre with an average of 2700 lbs/acre in average 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.

State 5
Annual State

Nutrient cycling, hydrologic function and/or soil stability have been severely altered and possibly coompromised. This is a highly variable stte in which the specific observed plants will depend largely on the original community and the nature of the disturbance. This state encompasses (but is not necessarily limited to) events such as severe fire impacts, heavy continuous grazing, heavy nutrient inputs, and abandoned cropland.

Community 5.1
Annual Plants

This plant community develops with long term continuous grazing. Blue grama, Kentucky bluegrass, exotic annuals, and forbs are the dominant plants. Erosion has increased. Rills and small gullies are starting to form resulting in pedastalling of plants. Production, succession, the nutrient cycle, water cycle and overall energy flow have been severely impaired. Changing this plant community to one with more perennial grasses with higher production per acre will generally require drastic and expensive inputs including seeding. Production varies dramatically with precipitation.

Transition T1A
State 1 to 2

Continuous grazing without adequate recovery periods will cause this plant community to cross a threshold and

change to a Blue grama, Kentucky bluegrass Sod plant community. Continued defoliation without adequate recovery periods will significantly reduce the proportions of the mid grass species and begin to increase the proportions of short grass species.

Transition T1B
State 1 to 3

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

Transition T1C
State 1 to 4

Continuous heavy grazing or grazing without adequate recovery periods can allow Smooth Bromegrass to invade the plant communities of the Reference State and cause it to transition to the Invaded Grass State.

Restoration pathway R2A
State 2 to 1

Prescribed Grazing with adequate recovery periods between grazing events will shift this plant community back across an ecologic threshold to the Sideoats grama, Blue grama, Western wheatgrass plant community. A shift to this community could take many years to achieve.

Transition T2A
State 2 to 3

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

Transition T2B
State 2 to 4

Continuous heavy grazing or grazing without adequate recovery periods will cause Smooth Bromegrass to continue to invade the plant communities of the Native/Invaded Grass State and cause it to transition to the Invaded Grass State.

Transition T2C
State 2 to 5

Continued Grazing without adequate recovery periods can cause this plant community to change to an Annuals plant community. This plant community is at significant risk to soil erosion. The percent and aspect of slope will impact the rate of change.

Restoration pathway R3A
State 3 to 1

Agressive intervening actions will be required to simultaneously recolonize native grasses and suppress vigor in undesirable species. Restoration from the Invaded Woody State toward the Reference State can be achieved with brush management and/or prescribed burning for red cedar control. If re-sprouting species such as Honey locust or Siberian elm are present, stumps must be treated after mechanical removal. Ongoing brush management such as hand cutting, chemical spot treatments or periodic prescribed burning is required.

Restoration pathway R3B
State 3 to 2

Agressive intervening actions will be required to simultaneously recolonize native grasses and suppress vigor in undesirable species. Prescribed burning, brush management, and prescribed grazing can cause the Invaded Woody

State to return to the Native/Invaded Grass State. Ongoing brush management will be needed to maintain the herbaceous state.

Restoration pathway R3C
State 3 to 4

Agressive intervening actions will be required to simultaneously recolonize native grasses and suppress vigor in undesirable species. Prescribed burning, brush management, and prescribed grazing can cause the Invaded Woody State to return to the Invaded Grass State. Ongoing brush management will be needed to maintain the herbaceous state.

Restoration pathway R4A
State 4 to 1

Restoration from the Invaded Grass State to the Reference State is achieved by killing existing vegetation through the use of burn down herbicides or by growing annual crops for 2 or more years, and then planting the site with native grasses and forb following the range seeding practice standard. If significant native remnants exist, prescribed fire, chemical treatments, targeted grazing of undesired species with adequate recover periods over an extended period of time will eventually return the site to the Reference State.

Restoration pathway R4B
State 4 to 2

Restoration from the Invaded Grass State to the Native/Invaded State can be achieved if significant native remnants exist. Prescribed fire, chemical treatments, targeted grazing of undesired species with adequate recover periods over an extended period of time will eventually return the site to the Native/Invaded State.

Transition T4A
State 4 to 3

The presence of an invasion source coupled with fire exclusion allows cedar seeds to germinate and establish within the herbaceous stand. This typically begins near fencerows, woody draws, and windbreaks, and accelerates outward as propagules increase. Lack of intervening action allows cedar expansion to continue and tree sizes to increase. Cedar will eventually modify site function in ways that promote further encroachment such as rainfall interception and stemflow, heavy duff litter and shading of the herbaceous understory.

Restoration pathway R5A
State 5 to 2

Restoration from the Annual State to the Native/Invaded State can be achieved if significant perennial remnants exist. Prescribed grazing, chemical treatments, targeted grazing of undesired species with adequate recover periods over an extended period of time will eventually return the site to the Native/Invaded State.

Additional community tables

Table 8. 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**			394–1181	
	big bluestem	ANGE	*Andropogon gerardii*	394–788	15–30
	Indiangrass	SONU2	*Sorghastrum nutans*	0–263	0–10
	switchgrass	PAVI2	*Panicum virgatum*	0–131	0–5
2	**Mid Warm Season Grasses**			919–1444	
	little bluestem	SCSC	*Schizachyrium scoparium*	656–919	25–35

	sideoats grama	BOCU	*Bouteloua curtipendula*	263–394	10–15
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–131	0–5
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–131	0–5
3	**Native Cool Season Grasses**			131–525	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–263	0–10
	western wheatgrass	PASM	*Pascopyrum smithii*	131–263	5–10
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–131	0–5
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–131	0–5
	green needlegrass	NAVI4	*Nassella viridula*	0–131	0–5
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–131	0–5
	Canada wildrye	ELCA4	*Elymus canadensis*	0–53	0–2
4	**Short Warm Season Grasses**			131–263	
	blue grama	BOGR2	*Bouteloua gracilis*	131–263	5–10
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–131	0–5
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–131	0–5
5	**Other Native Grasses/Grass-likes**			26–131	
	Grass, perennial	2GP	*Grass, perennial*	0–131	0–5
	sedge	CAREX	*Carex*	26–131	1–5
Forb					
7	**Forbs**			131–263	
	common sunflower	HEAN3	*Helianthus annuus*	0–53	0–2
	white heath aster	SYER	*Symphyotrichum ericoides*	0–53	0–2
	Forb, perennial	2FP	*Forb, perennial*	0–53	0–2
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–53	0–2
	dotted blazing star	LIPU	*Liatris punctata*	0–53	0–2
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–26	0–1
	beardtongue	PENST	*Penstemon*	0–26	0–1
	scurfpea	PSORA2	*Psoralidium*	0–26	0–1
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–26	0–1
	goldenrod	SOLID	*Solidago*	0–26	0–1
	pussytoes	ANTEN	*Antennaria*	0–26	0–1
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–26	0–1
	false boneset	BREU	*Brickellia eupatorioides*	0–26	0–1
	thistle	CIRSI	*Cirsium*	0–26	0–1
	purple prairie clover	DAPU5	*Dalea purpurea*	0–26	0–1
	vervain	VERBE	*Verbena*	0–26	0–1
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–26	0–1
	Forb, annual	2FA	*Forb, annual*	0–26	0–1
Shrub/Vine					
8	**Shrubs**			26–131	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	26–79	1–3
	leadplant	AMCA6	*Amorpha canescens*	0–53	0–2
	rose	ROSA5	*Rosa*	0–53	0–2

	rose	ROSA5	*Rosa*	0–53	0–2
	snowberry	SYMPH	*Symphoricarpos*	0–53	0–2
	soapweed yucca	YUGL	*Yucca glauca*	0–53	0–2

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season Grasses**			110–330	
	big bluestem	ANGE	*Andropogon gerardii*	110–220	5–10
	switchgrass	PAVI2	*Panicum virgatum*	0–110	0–5
	Indiangrass	SONU2	*Sorghastrum nutans*	0–110	0–5
2	**Mid Warm Season Grasses**			440–1100	
	sideoats grama	BOCU	*Bouteloua curtipendula*	440–880	20–40
	little bluestem	SCSC	*Schizachyrium scoparium*	220–440	10–20
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–220	0–10
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–110	0–5
3	**Native Cool Season Grasses**			220–440	
	western wheatgrass	PASM	*Pascopyrum smithii*	220–330	10–15
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–110	0–5
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–110	0–5
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–110	0–5
	Canada wildrye	ELCA4	*Elymus canadensis*	0–44	0–2
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–44	0–2
4	**Short Warm Season Grasses**			220–660	
	blue grama	BOGR2	*Bouteloua gracilis*	220–330	10–15
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–110	0–5
5	**Other Native Grasses/Grass-likes**			22–110	
	Grass, perennial	2GP	*Grass, perennial*	0–110	0–5
	sedge	CAREX	*Carex*	22–110	1–5
6	**Non-Native Grasses**			0–110	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–110	0–5
	cheatgrass	BRTE	*Bromus tectorum*	0–44	0–2
Forb					
7	**Forbs**			110–220	
	Forb, perennial	2FP	*Forb, perennial*	0–44	0–2
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–44	0–2
	dotted blazing star	LIPU	*Liatris punctata*	0–44	0–2
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–22	0–1
	beardtongue	PENST	*Penstemon*	0–22	0–1
	scurfpea	PSORA2	*Psoralidium*	0–22	0–1
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–22	0–1
	goldenrod	SOLID	*Solidago*	0–22	0–1
	white heath aster	SYER	*Symphyotrichum ericoides*	0–22	0–1

	white heath aster	SYER	*Symphyotrichum ericoides*	0–22	0–1
	vervain	VERBE	*Verbena*	0–22	0–1
	pussytoes	ANTEN	*Antennaria*	0–22	0–1
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–22	0–1
	false boneset	BREU	*Brickellia eupatorioides*	0–22	0–1
	thistle	CIRSI	*Cirsium*	0–22	0–1
	purple prairie clover	DAPU5	*Dalea purpurea*	0–22	0–1
	common sunflower	HEAN3	*Helianthus annuus*	0–22	0–1
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–22	0–1
	Forb, annual	2FA	*Forb, annual*	0–22	0–1
Shrub/Vine					
8	**Shrubs**			22–110	
	soapweed yucca	YUGL	*Yucca glauca*	0–110	0–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–110	0–5
	leadplant	AMCA6	*Amorpha canescens*	0–110	0–5
	rose	ROSA5	*Rosa*	0–66	0–3
	snowberry	SYMPH	*Symphoricarpos*	0–22	0–1

Table 10. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season Grasses**			0–90	
	big bluestem	ANGE	*Andropogon gerardii*	0–54	0–3
	switchgrass	PAVI2	*Panicum virgatum*	0–54	0–3
2	**Mid Warm Season Grasses**			18–1080	
	sideoats grama	BOCU	*Bouteloua curtipendula*	360–720	20–40
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–270	0–15
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–90	0–5
	little bluestem	SCSC	*Schizachyrium scoparium*	0–90	0–5
3	**Native Cool Season Grasses**			180–360	
	western wheatgrass	PASM	*Pascopyrum smithii*	180–270	10–15
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–90	0–5
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–90	0–5
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–90	0–5
4	**Short Warm Season Grasses**			360–540	
	blue grama	BOGR2	*Bouteloua gracilis*	270–360	15–20
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–90	0–5
5	**Other Native Grasses/Grass-likes**			18–90	
	Grass, perennial	2GP	*Grass, perennial*	0–90	0–5
	sedge	CAREX	*Carex*	18–90	1–5
6	**Non-Native Grasses**			0–90	
	cheatgrass	BRTE	*Bromus tectorum*	0–90	0–5
	Kentucky bluegrass	POPR	*Poa pratensis*	0–90	0–5

Forb					
7	**Forbs**			180–270	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	36–180	2–10
	Forb, annual	2FA	*Forb, annual*	0–90	0–5
	Forb, perennial	2FP	*Forb, perennial*	0–90	0–5
	scurfpea	PSORA2	*Psoralidium*	36–90	2–5
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–90	1–5
	false boneset	BREU	*Brickellia eupatorioides*	0–18	0–1
	thistle	CIRSI	*Cirsium*	0–18	0–1
	purple prairie clover	DAPU5	*Dalea purpurea*	0–18	0–1
	common sunflower	HEAN3	*Helianthus annuus*	0–18	0–1
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–18	0–1
	dotted blazing star	LIPU	*Liatris punctata*	0–18	0–1
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–18	0–1
	beardtongue	PENST	*Penstemon*	0–18	0–1
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–18	0–1
	goldenrod	SOLID	*Solidago*	0–18	0–1
	white heath aster	SYER	*Symphyotrichum ericoides*	0–18	0–1
	vervain	VERBE	*Verbena*	0–18	0–1
	pussytoes	ANTEN	*Antennaria*	0–18	0–1
Shrub/Vine					
8	**Shrubs**			18–90	
	soapweed yucca	YUGL	*Yucca glauca*	36–180	2–10
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–90	0–5
	rose	ROSA5	*Rosa*	0–90	0–5
	snowberry	SYMPH	*Symphoricarpos*	0–90	0–5

Animal community

Grazing Interpretations:
The following table lists suggested initial stocking rates for cattle with 50% (25% harvest efficiency) forage use under average growing conditions. These are 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/vegetative state (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 herbivores other than cattle are involved. Under more intensive management systems, improved harvest efficiencies can result in an increased carrying capacity.

Plant Community Total Production Carrying Capacity*
Vegetative State (lbs./acre) (AUM/acre)**
Big bluestem, Little bluestem, Sideoats 2625 0.72
Sideoats, Little bluestem, Blue grama 2200 0.60
Sideoats, Blue grama, Western wheatgrass 1300 0.42
Blue grama, Western wheatgrass 700 0.19**

* Continuous growing season-long grazing by cattle under average growing conditions (utilizing 50% of usable herbage or 25% harvest efficiency).

**AUM = The amount of forage required by one animal unit (one mature cow weighing 1000 lbs. and her calf as old as 3 months, or their equivalent) for one month or 912 pounds of air dry forage.

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.

Hydrological functions

(under development)

Recreational uses

The sloping portions of this site provide a colorful and rustic landscape used for hunting, birding, and site-seeing.

Wood products

No appreciable wood products are present on the site.

Other products

none known

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

Associated Sites:
(R071XY036NE)–Loamy Upland (formerly Silty)
(R071XY042KS)–Loess Breaks (formerly Thin Loess)
(R071XY028NE)–Loamy Lowland (formerly Silty Lowland)
(R071XY048NE)–Loamy Overflow (formerly Silty Overflow)

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: Dana Larsen, State Rangeland Management Specialist, Chuck Markley, Resource Soil Scientist

Data Source Number of Records Sample Period State County
SCS-RANGE-417 1 1982 NE Custer
SCS-RANGE-417 2 1979 – 1981 NE Greeley
SCS-RANGE-417 1 1968 NE Logan
SCS-RANGE-417 1 1981 NE Howard
SCS-RANGE-417 3 1968-1978 NE Sherman

Field Offices:
Broken Bow
Thedford
North Platte
Lexington
Kearney
Grand Island
Fullerton

Central City
St. Paul
Loup City
Ord
Greeley
Albion
Burwell

Relationship to Other Established Classifications:
Level IV Ecoregions of the Conterminous United States

Other References:
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.

Other references

Other References:
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

Nadine Bishop
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):**

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

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

---

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
