

Ecological site R071XY036NE Loamy Upland

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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.

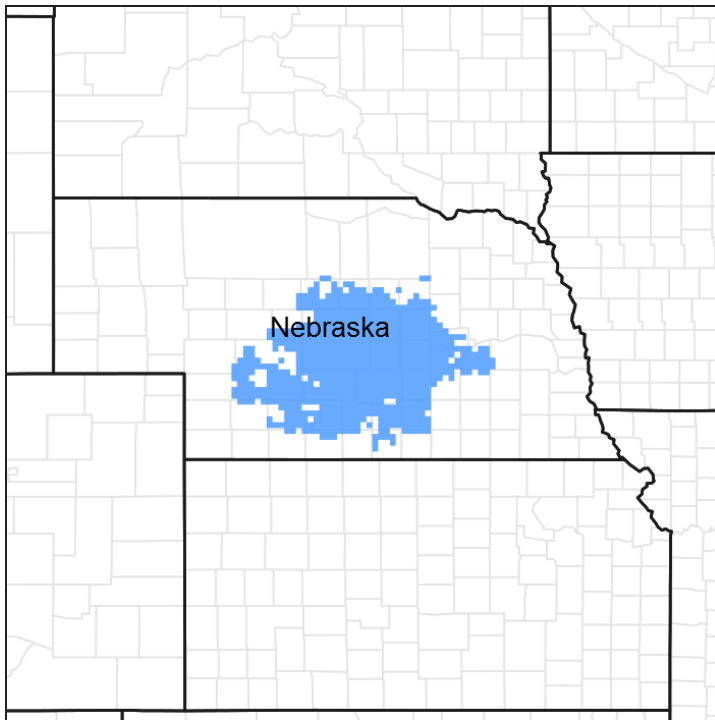


Figure 1. Mapped extent

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

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. Average annual precipitation ranges from 21 to 26 inches, with the number of freeze-free days averaging around 200.

Loess overlays the surface of almost all of the uplands in this MLRA. Alluvial clay, silt, sand, and gravel are deposited in the stream and river valleys and can be extensive in the major drainages. Terraces are common in the valleys along the river systems. The predominate soil orders are mesic, udic Mollisols and Entisols, commonly represented by the Coly, Uly, Cozad, Hord, Hall, and Holdrege soil series.

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. 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 and 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.

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.

Even as post European settlement's alteration of the fire regime allows the expansion of the woody component of the native prairie, introduction of eastern redcedar as a windbreak component further facilitates invasion by this species. While eastern redcedar 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 redcedar as a primary component has established a seed source for the aggressive woody plant. The ensuing encroachment into the native grasslands degrades the native wildlife habit and causes significant forage loss for domestic livestock. However, since it is not a root-sprouter, eastern redcedar is very susceptible to fire when under six feet tall. Management with prescribed fire is exceedingly effective if applied before this stage. Larger eastern redcedars can also be controlled with fire but requires the use of specially designed ignition and suppression techniques.

Classification relationships

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

Ecological site concept

The Loamy Upland site is a non-effervescing run-off site occurring on slopes of less than 30 percent. Soil textures are primarily silt loam, loam, and silty clay loam.

Associated sites

R071XY028NE	<p>Loamy Lowland</p> <p>The Loamy Lowland ecological site is adjacent to the Loamy Upland site but its landscape position is below the Loamy Upland site.</p>
R071XY037NE	<p>Limy Upland</p> <p>The Limy Upland ecological site is adjacent to, and often shares a landscape with the Loamy Upland site. Slopes are similar, but the Limy Upland site is often positioned above the Loamy Upland site.</p>
R071XY042NE	<p>Loess Breaks</p> <p>The Loess Breaks ecological site is adjacent to the Loamy Upland site and typically occupies the uphill position.</p>

Similar sites

R071XY037NE	<p>Limy Upland</p> <p>The soils present on the Limy Upland ecological site are calcareous in the top 7 inches of the soil profile which causes the soil to effervesce. Loamy Upland sites are not calcareous at or near the soil surface.</p>
R071XY028NE	<p>Loamy Lowland</p> <p>The Loamy Lowland ecological site receives additional moisture because it is located on a run-on landscape position below the Loamy Upland site.</p>

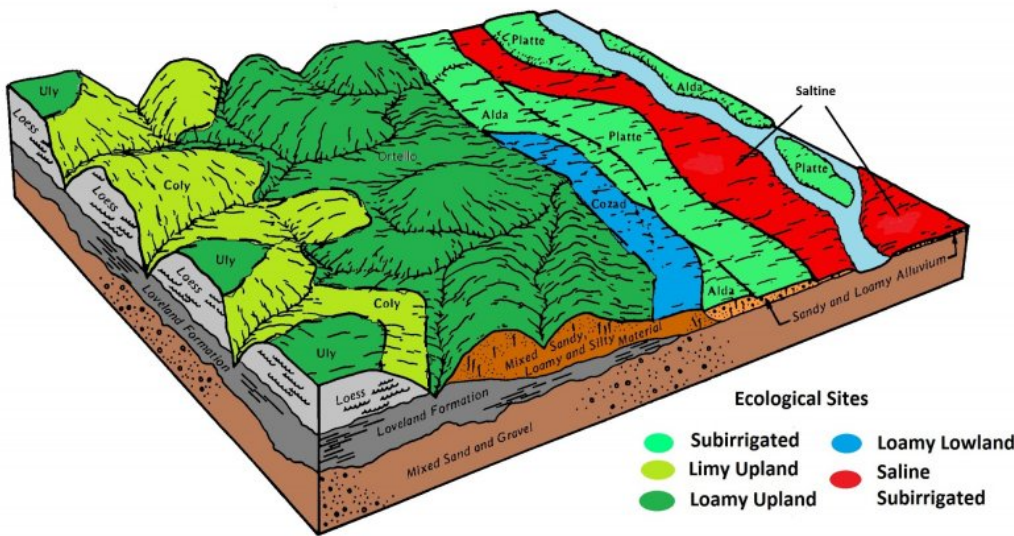


Figure 2. Block diagram

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Schizachyrium scoparium</i>

Physiographic features

This site occurs on nearly level to steep uplands with slopes 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.

When 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 often leads to the

formation of gullies.

Table 2. Representative physiographic features

Landforms	(1) Hillslope (2) Plain (3) Interfluve
Runoff class	Negligible to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,630–3,075 ft
Slope	0–30%
Water table depth	80 in
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 if moisture conditions are favorable.

Table 3. Representative climatic features

Frost-free period (characteristic range)	120-131 days
Freeze-free period (characteristic range)	135-154 days
Precipitation total (characteristic range)	23-26 in
Frost-free period (actual range)	115-140 days
Freeze-free period (actual range)	134-165 days
Precipitation total (actual range)	23-27 in
Frost-free period (average)	127 days
Freeze-free period (average)	147 days
Precipitation total (average)	25 in

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) TAYLOR [USC00258455], Taylor, NE
- (10) OVERTON 3 W [USC00256439], Overton, NE
- (11) GRAND ISLAND AP [USW00014935], Grand Island, NE
- (12) CENTRAL CITY [USC00251560], Central City, NE
- (13) KEARNEY 4 NE [USC00254335], Kearney, NE
- (14) NORTH LOUP [USC00256040], North Loup, NE
- (15) RAVENNA [USC00257040], Ravenna, NE
- (16) ARNOLD [USC00250355], Arnold, NE
- (17) GOTHENBURG [USC00253365], Gothenburg, NE
- (18) OCONTO [USC00256167], Oconto, NE
- (19) SAINT PAUL [USC00257515], Saint Paul, NE

Influencing water features

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

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 (CaCO₃) may be present in these soils; however, it is leached to a depth of at least 7 inches.

Major soil series correlated to this ecological site include Gates, Graybert, Holdrege, Kenesaw, Uly. More information can be found in the various soil survey reports. Contact the local USDA Service Center for the internet links to soil survey data that includes more details specific to your location.

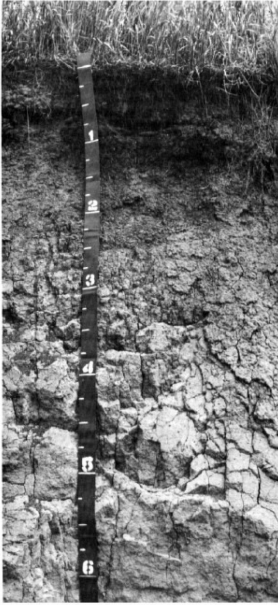


Figure 9. Hastings series profile

Table 4. Representative soil features

Parent material	(1) Loess
Surface texture	(1) Silt loam (2) Very fine sandy loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderate
Soil depth	80 in
Surface fragment cover ≤ 3 "	0%
Surface fragment cover > 3 "	0%
Available water capacity (0-40in)	5.7–9.1 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.5–8.4
Subsurface fragment volume ≤ 3 " (Depth not specified)	0–5%

Subsurface fragment volume >3" (Depth not specified)	0%
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Ecological dynamics

The Loamy Upland site developed under Central 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 and site development. This is a disturbance driven site, with the disturbances being herbivory, fire, and variable climate. Changes 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 redcedar as a windbreak species has compounded the issue. While eastern redcedar 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 redcedar 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 redcedar 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 tallgrass species. Blue grama, Kentucky bluegrass, and Cuman ragweed may increase as warm-season tallgrasses decline. Smooth brome 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 generally occurs with continued heavy grazing and without adequate rest periods.

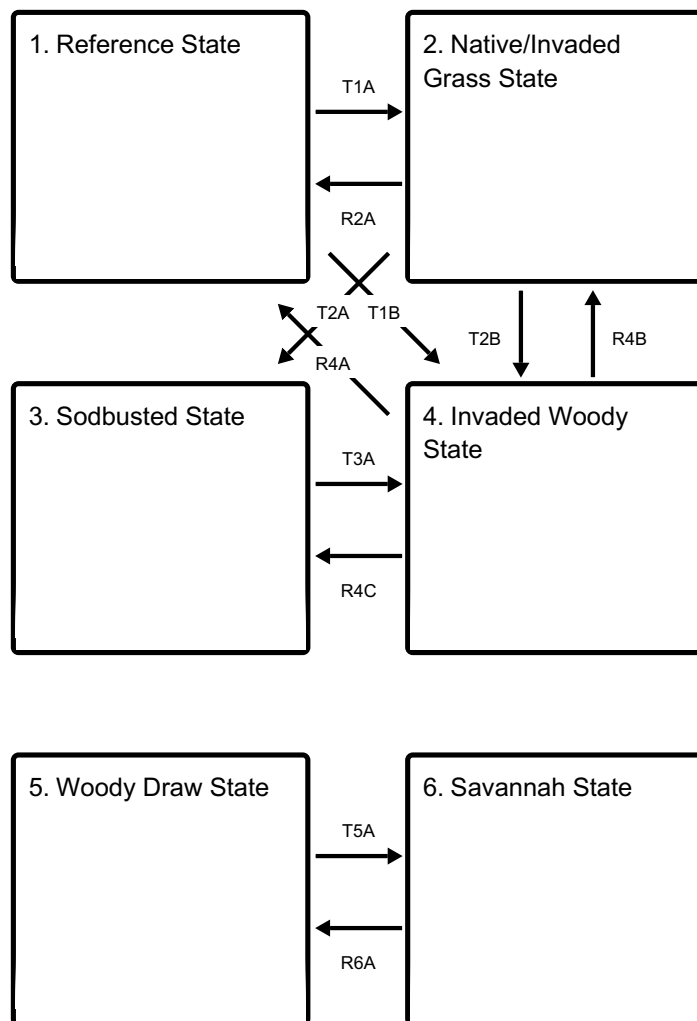
Grazing management that includes proper stocking rates within systems that incorporate scheduled periodic rest periods during the growing season will help maintain this site near production potential.

The Reference 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.

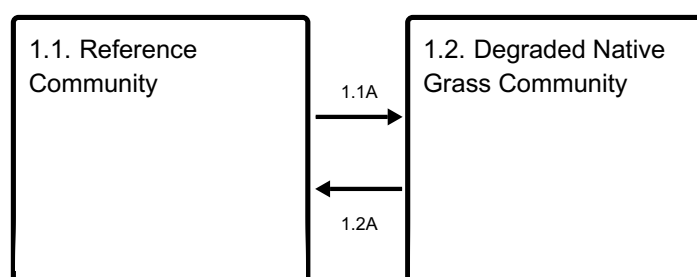
The State and Transition Model (STM) is depicted below, and includes the Reference State, Native/Invaded Grass State, Sodbusted State, Invaded Woody State, Woody Draw State, and Savannah State. Each state represents the crossing of a major ecological threshold due to the alteration of the functional dynamic properties of the ecosystem. The primary properties observed to determine this change are soil stability, vegetative communities, and the hydrologic cycle. Each state may have one or more plant communities that fluctuate in species composition and abundance within the normal parameters of the state. The processes that cause the movement between the states and communities are discussed in more detail in the state and community descriptions following the diagram.

State and transition model

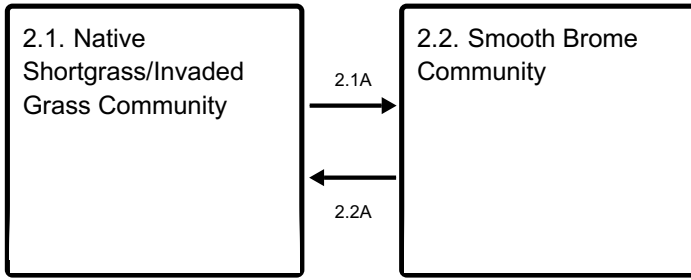
Ecosystem states



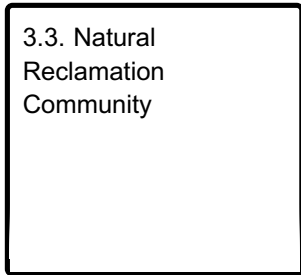
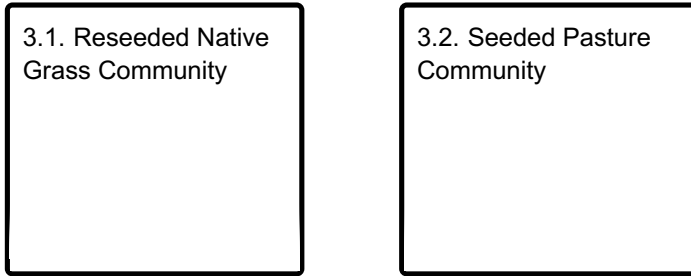
State 1 submodel, plant communities



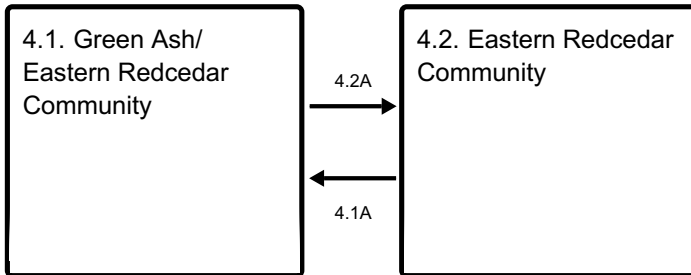
State 2 submodel, plant communities



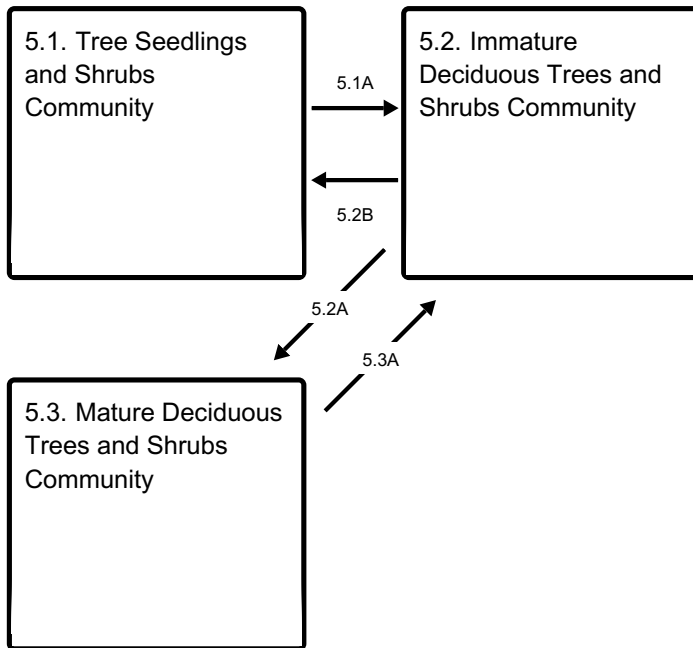
State 3 submodel, plant communities



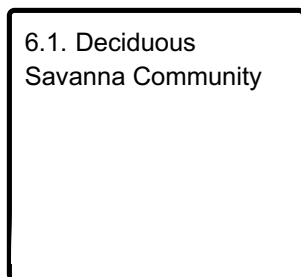
State 4 submodel, plant communities



State 5 submodel, plant communities



State 6 submodel, plant communities



State 1 Reference State

The Reference State describes the range of vegetative community phases that occur on the Loamy Upland site where the range of natural variability under historic conditions and disturbance regimes is mostly intact. The vegetation is predominately native, mixed-grass prairie. The Reference Community is representative of the native plant community historically maintained by frequent fire and herbivory (grazing) with adequate recovery periods. The Degraded Native Grass Community results from management decisions that are unfavorable for the plant community and soil health. High perennial grass cover and production allows for increased soil moisture retention, vegetative production, and overall soil quality.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1 Reference Community

The Reference Community can be found on areas that are managed with prescribed grazing with adequate recovery periods and prescribed burning. The potential vegetation of this community is a mixed-grass prairie averaging 70 to 85 percent grasses and grass-like plants, 5 to 10 percent forbs, and 5 to 10 percent shrubs. 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 2,250 to 4,000 pounds per acre of air dry vegetation with a representative value of 3,125 pounds per acre.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1940	2657	3300
Forb	155	234	350
Shrub/Vine	155	234	350
Total	2250	3125	4000

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 1.2 Degraded Native Grass Community

The Degraded Native Grass Community marks a shift in plant composition from that of a tall- and mid-grass community to a mid- and shortgrass plant community. Tallgrasses, such as big bluestem, Indiangrass, and switchgrass have decreased in vigor due to continued defoliation during their critical growth periods. As this management continues, tallgrasses will be replaced by mid- and shortgrasses. Dominant plant species include

sideoats grama, blue grama, and western wheatgrass. Cuman ragweed may increase as well. Timing of defoliation from disturbances such as grazing, wildfire, hail, and other sources will have an impact on the population dynamics within the community. Due to the decrease in plant litter, effective precipitation is reduced. This causes a significant decline in production compared to the Reference Community. Soil health is affected by inefficient nutrient, mineral and hydrologic cycles. Total annual production ranges from 2,000 to 3,000 pounds per acre of air dry vegetation with a representative value of 2,600 pounds per acre.

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1850	2327	2590
Forb	125	195	275
Shrub/Vine	25	78	135
Total	2000	2600	3000

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

Pathway 1.1A Community 1.1 to 1.2

Continuous heavy grazing without adequate recovery periods will convert the Reference Community to the Degraded Native Grass Community. Continued heavy defoliation during the critical growth period for warm-season grasses will further 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 midgrass species and help move the Degraded Native Grass Community toward the

Reference Community.

State 2

Native/Invaded Grass State

The Native/Invaded Grass State has been degraded from the Reference State and much of the native warm-season tall- and midgrass community has been replaced by less productive plants. The dominant grasses are native shortgrasses and introduced cool-season grasses which have invaded the site. Forb diversity is low, and Cuman ragweed is the dominant forb species.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous

Community 2.1

Native Shortgrass/Invaded Grass Community

The Native Shortgrass/Invaded Grass Community develops as a result of continuous heavy grazing without adequate recovery periods. With continued heavy grazing pressure, blue grama, Kentucky bluegrass, and Cuman ragweed will become the dominant plant species. Only remnants of the native warm-season tall- and midgrasses are present. 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. Soapweed yucca will be the dominant shrub species in the western part of the MLRA. Total annual production ranges from 1,500 to 2,500 pounds per acre of air dry vegetation with a representative value of 1,650 pounds per acre.

Dominant plant species

- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- smooth brome (*Bromus inermis*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous

Figure 15. 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

Community 2.2

Smooth Brome Community

The Smooth Brome Community contains predominately smooth brome but may contain native warm-season grass remnants. Production on smooth brome dominated plant communities are highly variable depending upon the percent composition present and outside inputs such as fertilizer and weed control. Production can range from 2,500 to 3,000 pounds per acre with an average of 2,750 pounds per acre in normal years on rangelands with a smooth brome component of 50 percent 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.

Dominant plant species

- smooth brome (*Bromus inermis*), grass

Pathway 2.1A

Community 2.1 to 2.2

Transition from the Native Shortgrass/Invaded Grass Community to the Smooth Brome Community may occur with excessive summer grazing, inadequate rest during the summer, multi-season haying, nitrogen fertilization in spring and/or fall, or introduced grass seeding. Smooth brome and/or other non-native plants are predominant and there is limited plant species diversity.

Pathway 2.2A

Community 2.2 to 2.1

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

State 3

Sodbusted State

The Sodbusted State is a result of mechanical disturbance to facilitate production agriculture. If farming operations are suspended, the site can be abandoned or seeded to a perennial grass mixture. When tilled and abandoned the Natural Reclamation Community will result. When seeded the resulting community will be either the Reseeded Native Grass Community or the Seeded Pasture Community depending upon the type of seeding implemented. Permanent alterations of soils and hydrology make restoration to the Reference State extremely difficult, if not impossible.

Community 3.1

Reseeded Native Grass Community

The Reseeded Native Grass Community has been seeded to a mixture of native grasses and forbs. The community will vary considerably depending on the extent of soil erosion, the 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 3.2

Seeded Pasture Community

The Seeded Pasture Community does not contain native remnants and will vary considerably depending on the extent of soil erosion, the 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. There are several factors that make seeded pasture a different grazing resource than native rangeland and land seeded to a rangeland grass mixture. Factors such as species selected, stand density, improved varieties, and harvest efficiency all impact the production level and palatability. Species diversity on seeded pasture is often limited to a few species. When seeded pasture and native rangelands or seeded pasture and seeded rangeland are in the same grazing unit, uneven forage utilization will occur. Improve forage utilization by managing this community separately from native rangelands or land seeded to native grass species. Total annual production during an average year varies significantly depending on the level of management and grass species seeded. Improved varieties of warm-season or cool-season grasses are recommended for forage purposes. Single species stands of big bluestem, Indiangrass, switchgrass, or well managed cool-season grasses and legume plantings with improved varieties will yield 4,000 to 5,000 pounds per acre with an average of 4,500 pounds per acre annually.

Community 3.3

Natural Reclamation Community

The Natural Reclamation Community consists of annual and perennial weeds and less desirable grasses. These sites have been farmed (all previous plant communities were destroyed) and abandoned without being reseeded. 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. In some cases, this community may result from extremely heavy, continuous grazing. In those cases, blue grama may exist as a remnant. Production, the nutrient cycle, water cycle, and overall energy flow have been severely impaired. Total annual production during an average year varies significantly depending on the succession stage of the plant community and any management applied to the system.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- smooth brome (*Bromus inermis*), grass
- cheatgrass (*Bromus tectorum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- tumblegrass (*Schedonnardus paniculatus*), grass

State 4

Invaded Woody State

The Invaded Woody State can develop when brush management, harvest, prescribed burning, and wildfire are absent over an extended period of time. Generally, this state is very conducive to eastern redcedar encroachment. Eastern redcedars 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, honeylocust encroachment may occur.

Dominant plant species

- honeylocust (*Gleditsia triacanthos*), tree
- eastern redcedar (*Juniperus virginiana*), tree
- green ash (*Fraxinus pennsylvanica*), tree

Community 4.1

Green Ash/ Eastern Redcedar Community

The Green Ash/ Eastern Redcedar Community typically develops after some amount of deciduous canopy exists, which provides a suitable microclimate for the establishment of eastern redcedar. In the absence of fire, the eastern red cedar will continue to increase in size, and in the process, change the microclimate 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 eastern redcedar under the deciduous tree canopy. The herbaceous/shrub understory will begin to decline rapidly.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- green ash (*Fraxinus pennsylvanica*), tree

- honeylocust (*Gleditsia triacanthos*), tree

Community 4.2

Eastern Redcedar Community

The Eastern Redcedar Community develops from adjacent seed sources with a lack of fire and overgrazing. Eastern redcedar 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 will result in a change to an herbaceous plant community. However, if the Eastern Redcedar Community persists long enough, the resultant herbaceous community may consist mostly of pioneer species with a likelihood of an abundance of Kentucky bluegrass or smooth brome.

Pathway 4.2A

Community 4.1 to 4.2

Timber harvest and tree thinning can cause the Green Ash/Eastern redcedar Community to shift to the Eastern Redcedar Community.

Pathway 4.1A

Community 4.2 to 4.1

Removal of eastern redcedar will allow green ash growth moving the Eastern Redcedar Community Green Ash/Eastern Redcedar Community.

State 5

Woody Draw State

The Woody Draw 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.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- bur oak (*Quercus macrocarpa*), tree
- common hackberry (*Celtis occidentalis*), tree
- American plum (*Prunus americana*), shrub
- chokecherry (*Prunus virginiana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 5.1

Tree Seedlings and Shrubs Community

The Tree Seedlings and Shrubs Community 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 Reference and Degraded Native Grass State communities, and the herbaceous component will be reduced slightly. Understory shrubs, primarily American plum, chokecherry, and western snowberry will be most likely to establish. However, other species, including silver buffaloberry and currants can establish and dominate the shrub layer.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- bur oak (*Quercus macrocarpa*), tree
- American plum (*Prunus americana*), shrub
- chokecherry (*Prunus virginiana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 5.2

Immature Deciduous Trees and Shrubs Community

With time and prescribed grazing or light grazing that allows for survival of the young trees, the Immature Deciduous Trees and Shrubs Community will develop from the Tree Seedlings and Deciduous Shrubs Community. In the eastern portions of the MLRA, bur oak will tend to be the likely tree to establish, whereas, in the western portions of the MLRA, green ash will be more prevalent. Green ash and 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 Degraded Native Grass 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.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- bur oak (*Quercus macrocarpa*), tree
- American plum (*Prunus americana*), shrub
- chokecherry (*Prunus virginiana*), shrub

- western snowberry (*Symphoricarpos occidentalis*), shrub
- blue grama (*Bouteloua gracilis*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 5.3

Mature Deciduous Trees and Shrubs Community

A relatively full canopy of green ash, bur oak, or a combination of the two, dominates the Mature Deciduous Trees and Shrubs Community. It develops over time from the Immature Deciduous Trees and Shrubs 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 while bur oak will dominate in the eastern portion of the MLRA. Woody shrubs will remain in the understory, but typically in lesser amounts than in the other two plant communities in this state. While somewhat reduced from the Degraded Native Grass State communities, 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.

Dominant plant species

- common hackberry (*Celtis occidentalis*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- bur oak (*Quercus macrocarpa*), tree
- American plum (*Prunus americana*), shrub
- chokecherry (*Prunus virginiana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Pathway 5.1A

Community 5.1 to 5.2

Continued absence of fire combined with prescribed or light grazing that allows for the survival of young trees will move the Tree Seedlings and Shrubs Community to the Immature Deciduous Trees and Shrubs Community.

Pathway 5.2B

Community 5.2 to 5.1

Brush management and prescribed burning will both be needed to shift the Immature

Deciduous Trees and Shrubs Community to the Tree Seedlings and Shrubs Community. Prescribed grazing or light grazing is also necessary to produce this community change.

Pathway 5.2A **Community 5.2 to 5.3**

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

Pathway 5.3A **Community 5.3 to 5.2**

Brush management and prescribed burning will both be needed to shift the Mature Deciduous Trees and Shrubs Community to the Immature Deciduous Trees and Shrubs Community. Prescribed grazing or light grazing is also necessary to produce this community change.

State 6 **Savannah State**

The Savannah State consists of the Deciduous Savanna Community which is a result of continuous season long grazing or continuous seasonal grazing of the Woody Draw State communities. There is little regeneration of trees mainly due to grazing of seedlings and saplings.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- bur oak (*Quercus macrocarpa*), tree
- smooth sumac (*Rhus glabra*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- white heath aster (*Symphyotrichum ericoides*), other herbaceous

Community 6.1 **Deciduous Savanna Community**

The Deciduous Savanna Community is typically derived from the Immature Deciduous Tree Community or the Mature Deciduous Tree 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

and 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 smooth brome grass, and forbs such as aster, sagewort, goldenrod and Cuman 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.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- bur oak (*Quercus macrocarpa*), tree
- American plum (*Prunus americana*), shrub
- chokecherry (*Prunus virginiana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- white heath aster (*Symphotrichum ericoides*), other herbaceous
- Missouri goldenrod (*Solidago missouriensis*), other herbaceous

Transition T1A

State 1 to 2

Continuous heavy grazing without adequate recovery periods will cause the Reference State to lose a significant proportion of warm-season tallgrass species and cross a threshold to a Native/Invaded Grass State. Once this occurs it will require more than 40 years and considerable 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

Encroachment of woody species, no grazing, and no fire will cause an increase of eastern red cedar and deciduous trees such as honeylocust in the plant community transitioning the Reference State to the Invaded Woody State.

Restoration pathway R2A

State 2 to 1

Prescribed Grazing with adequate recovery periods, will allow perennial plants to increase

and move toward the Reference State long as there is a remnant warm-season plant component within the plant community. This restoration will require 20 to 40 or more years to return the site to a more productive state.

Transition T2A

State 2 to 3

The site has been significantly altered by mechanical tillage to allow the site to be converted to production agriculture. The disruption to the plant community, soils, and hydrology of the system make restoration unlikely. This transition can also occur when the site has been altered by long-term extremely heavy grazing. The loss of perennial vegetation will increase the potential for soil erosion, and negatively impact the water, biotic, soil, and hydrologic systems.

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

Transition T3A

State 3 to 4

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

Restoration pathway R4A

State 4 to 1

Timber harvest, wildfire, prescribed burning, or brush management of eastern redcedar and other woody plants will return the site to the Reference State and control woody plant encroachment. Eastern redcedar control can usually be accomplished with a prescribed burn while the trees are six foot tall or less and fine fuel production is over 1,500 pounds per acre. Mechanical removal followed by a chemical treatment on stumps is effective on honeylocust. Prescribed grazing or targeted grazing with browsing animals may also help maintain an herbaceous plant community.

Restoration pathway R4B

State 4 to 2

Timber harvest, wildfire, prescribed burning, or brush management of eastern redcedar and other woody plants will return the site to the Native/Invaded Grass State and control woody plant encroachment. Eastern redcedar control can usually be accomplished with a prescribed burn while the trees are six foot tall or less and fine fuel production is over

1,500 pounds per acre. Mechanical removal followed by a chemical treatment on stumps is effective on honeylocust. Prescribed grazing or targeted grazing with browsing animals may also help maintain an herbaceous plant community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Restoration pathway R4C

State 4 to 3

Timber harvest, wildfire, prescribed burning, or brush management of eastern redcedar and other woody plants will return the site to the Sod-Busted State and control woody plant encroachment. Eastern redcedar control can usually be accomplished with a prescribed burn while the trees are six foot tall or less and fine fuel production is over 1,500 pounds per acre. Mechanical removal followed by a chemical treatment on stumps is effective on honeylocust. Prescribed grazing or targeted grazing with browsing animals may also help maintain an herbaceous plant community.

Transition T5A

State 5 to 6

Long term prescribed grazing, wildfire, prescribed burns, and heavy browsing can all cause the Woody Draw State to transition to the Savannah State.

Restoration pathway R6A

State 6 to 5

Continuous heavy grazing, no fire, or flooding will cause the Savannah State to shift back to the Woody Draw State.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Warm-Season Tallgrass			781–1250	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	625–781	20–25
	switchgrass	PAVI2	<i>Panicum virgatum</i>	156–313	5–10

	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–313	0–10
2	Warm-Season Midgrass			625–1094	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	469–781	15–25
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	156–469	5–15
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0–156	0–5
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–156	0–5
3	Cool-Season Rhizomatous Grass			313–469	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	313–469	10–15
4	Warm-Season Shortgrass			156–313	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	156–313	5–10
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–156	0–5
5	Cool-Season Bunch Grass			63–156	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–156	0–5
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–156	0–5
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–156	0–5
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–156	0–5
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–156	0–5
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–156	0–5
6	Grass-like			31–156	
	sedge	CAREX	<i>Carex</i>	31–156	1–5
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–62	–
Forb					
7	Forbs			156–313	
	Forb, annual	2FA	<i>Forb, annual</i>	0–63	0–2
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–63	0–2
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–63	0–2
	pussytoes	ANTEN	<i>Antennaria</i>	0–63	0–2
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–63	0–2
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–63	0–2
	thistle	CIRSI	<i>Cirsium</i>	0–63	0–2

	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0-63	0-2
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-63	0-2
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-63	0-2
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-63	0-2
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-63	0-2
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0-63	0-2
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0-63	0-2
	beardtongue	PENST	<i>Penstemon</i>	0-63	0-2
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	0-63	0-2
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-63	0-2
	prairie groundsel	PAPL12	<i>Packera plattensis</i>	0-63	0-2
	goldenrod	SOLID	<i>Solidago</i>	0-63	0-2
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0-63	0-2
	hoary verbena	VEST	<i>Verbena stricta</i>	0-63	0-2
Shrub/Vine					
8	Shrubs			156-313	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-63	0-2
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-63	0-2
	smooth sumac	RHGL	<i>Rhus glabra</i>	0-63	0-2
	prairie rose	ROAR3	<i>Rosa arkansana</i>	0-63	0-2
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0-63	0-2
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-63	0-2

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Warm-Season Midgrass			390-1040	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	390-780	15-30
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	260-390	10-15

	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0–260	0–10
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–130	0–5
2	Native Cool-Season Grass			260–650	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	260–520	10–20
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–130	0–5
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–52	0–2
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–52	0–2
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–52	0–2
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–52	0–2
3	Warm-Season Shortgrass			260–520	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	260–520	10–20
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–52	0–2
4	Warm-Season Tallgrass			130–520	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	130–390	5–15
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–130	0–5
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–130	0–5
5	Grass-Likes			26–130	
	sedge	CAREX	<i>Carex</i>	26–130	1–5
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–52	–
6	Non-Native Grasses			0–130	
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–130	0–10
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–52	0–2
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–52	0–2
Forb					
7	Forbs			130–260	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–130	0–5
	pussytoes	ANTEN	<i>Antennaria</i>	0–52	0–2
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–52	0–2
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–52	0–2
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–52	0–2

	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-52	0-2
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-52	0-2
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-52	0-2
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-52	0-2
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0-52	0-2
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0-52	0-2
	beardtongue	PENST	<i>Penstemon</i>	0-52	0-2
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	0-52	0-2
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-52	0-2
	prairie groundsel	PAPL12	<i>Packera plattensis</i>	0-52	0-2
	goldenrod	SOLID	<i>Solidago</i>	0-52	0-2
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-52	0-2
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0-52	0-2
	hoary verbena	VEST	<i>Verbena stricta</i>	0-52	0-2
	Forb, annual	2FA	<i>Forb, annual</i>	0-52	0-2
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-52	0-2
Shrub/Vine					
8	Shrubs			26-130	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-52	0-2
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-52	0-2
	smooth sumac	RHGL	<i>Rhus glabra</i>	0-52	0-2
	prairie rose	ROAR3	<i>Rosa arkansana</i>	0-52	0-2
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0-52	0-2
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-52	0-2

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Warm-Season Tallgrass			825-1155	

	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–50	0–3
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–33	0–2
2	Warm-Season Midgrass			83–165	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	33–83	2–5
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–83	0–5
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0–83	0–5
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–83	0–5
3	Native Cool-Season grass			0–165	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	83–165	5–10
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–83	0–5
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–33	0–2
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–33	0–2
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–33	0–2
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–33	0–2
4	Warm-Season Shortgrass			330–495	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	330–495	20–30
5	Grasslikes			17–83	
	sedge	CAREX	<i>Carex</i>	17–83	1–5
6	Non-Native Grasses			248–413	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	248–330	15–20
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–83	0–5
Forb					
7	Forbs			165–330	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	165–330	10–20
	vervain	VERBE	<i>Verbena</i>	17–83	1–5
	Forb, annual	2FA	<i>Forb, annual</i>	0–33	0–2
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–33	0–2
	pussytoes	ANTEN	<i>Antennaria</i>	0–17	0–1
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–17	0–1
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–17	0–1
	nurple prairie	DAPU5	<i>Dalea nurnurea</i>	0–17	0–1

	purple prairie clover				
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-17	0-1
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-17	0-1
	prairie groundsel	PAPL12	<i>Packera plattensis</i>	0-17	0-1
	goldenrod	SOLID	<i>Solidago</i>	0-17	0-1
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-17	0-1
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0-17	0-1
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-17	0-1
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-17	0-1
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-17	0-1
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0-17	0-1
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0-17	0-1
	beardtongue	PENST	<i>Penstemon</i>	0-17	0-1
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	0-17	0-1
Shrub/Vine					
8	Shrubs			17-83	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-33	0-2
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-33	0-2
	smooth sumac	RHGL	<i>Rhus glabra</i>	0-33	0-2
	prairie rose	ROAR3	<i>Rosa arkansana</i>	0-33	0-2
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0-33	0-2
	coralberry	SYOR	<i>Symphoricarpos orbiculatus</i>	0-33	0-2
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-33	0-2

Animal community

LIVESTOCK - 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)

Community 1.1, Reference Community: 3,125 lbs./acre, 0.86 AUM/acre

Community 1.2, Degraded Native Grass Community: 2,600 lbs./acre, 0.71 AUM/acre

Community 2.1, Native Shortgrass/Invaded Grass Community: 1,650 lbs./acre, 0.45 AUM/acre

Community, 2.2, Smooth Brome Community: (dryland, unfertilized, greater than 50 percent of plant composition) 2,700 lbs./acre, 0.75 AUM/acre

* 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.

WILDLIFE INTERPRETATIONS:

Major Land Resource Area (MLRA) 71 lies primarily within the Mixed-grass prairie ecosystem. Though European settlers have converted about half of this landscape to farmland, a significant portion of the prairie is still intact. This area still consists of diverse grassland habitats interspersed with varying densities of depressional wetlands and limited woody riparian corridors. These habitats historically provided critical life cycle components for the grassland birds, prairie dogs, and herds of roaming bison, elk, and pronghorn. Bobcats, wolves, and mountain lions occupied the apex predator niche. Diverse populations of small mammals and insects still provide a bountiful prey base for raptors and omnivores such as coyotes, foxes, raccoons, and opossums. In addition, a wide variety of reptiles and amphibians thrive in this landscape.

The Mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbances. Following European settlement, elimination of fire, overgrazing, and some habitat fragmentation significantly altered the appearance and functionality of the entire ecosystem. Bison and prairie dogs were historically keystone species, but free-roaming bison herds have been extirpated in this region. The loss of bison and fire as ecological drivers greatly influenced the character of the remaining native grasslands and the habitats that they provide. Fragmentation has

reduced habitat quality for numerous area-sensitive species, as highlighted by the decline of the greater prairie chicken.

Historically, an ecological mosaic of the sites provided habitat for species requiring unfragmented grasslands. Most of these important habitat features and components are intact, providing upland nesting habitat for grassland birds and game birds; nesting and escape cover for waterfowl; forbs and insects for brood-rearing habitat; and a forage source for small and large herbivores.

Disruption of the natural fire regime and lack of appropriate grazing management are the greatest threats to the ecosystem dynamics today. Tree and shrub encroachment from lack of fire creates habitat that favors generalist species such as American robin and mourning dove, and provides perches for raptors, increasing the predation mortality on native bird populations. Introduced species such as smooth brome grass, Kentucky bluegrass, nodding plumeless thistle (musk thistle), and Canada thistle further degrade the biological integrity of many areas of the prairie.

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

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.

Field Offices:

Albion, Broken Bow, Burwell, Central City, Fullerton, Grand Island, Greeley, Kearney, Lexington, Loup City, North Platte, Ord, St. Paul, Thedford

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Rangeland health reference sheet

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

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Date	11/30/2024
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. Rills are not expected on this site.

2. **Presence of water flow patterns:** Typically, none. Water flow patterns may occur on steeper slopes (greater than 15 percent). Where they do occur, they are rare (less than 2 per 100 ft² or 9.3 m²), narrow (less than 6 inches wide), short (less than 1 foot or 0.3 m long), and disconnected, disrupted by perennial vegetation.

3. **Number and height of erosional pedestals or terracettes:** Typically, none. Occasionally, bunch grasses may be pedestalled (average of 2 or less / square meter) on steeper slopes (greater than 15 percent) with no exposed roots. Drought, wildfire, and prescribed burns should not increase the incidence of pedestals except on the steepest slopes (greater than 20 percent).

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 10 percent or less. Bare ground patches should be less than 2 inches (5.1cm) and scattered across the site. Bare ground is exposed mineral soil that is not covered by vegetation (basal and/or foliar canopy), litter, standing dead vegetation, gravel/rock, and visible biological crust (e.g., lichen, mosses, algae).

5. **Number of gullies and erosion associated with gullies:** None. Gullies are not expected on this site.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Wind scoured and depositional areas are not expected on this site.

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter may move short distances (less than 6 inches or 15 cm) following a significant run-off event; as interspaces are small, there is no difference between litter movement in interspaces and under canopy. Coarse litter generally does not move.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most**

sites will show a range of values): Soil stability ratings will be 5 to 6, typically 6.

Interspaces are quite small and there should be no difference between interspaces and under canopy. High root content and organic matter will be present in the soil surface.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon ranges from 5 to 18 inches (12.7 to 45.75 cm) thick. The A horizon is very pale brown (10YR 7/3) when dry and dark grayish brown (10YR 3/2) when moist. Structure weak, coarse, prismatic parting to weak fine granular or subangular blocky.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community composition of 70 to 85 percent perennial grasses and grass-likes, 5 to 10 percent forbs, and 5 to 10 percent shrubs will optimize infiltration on the site. The grass and grass-like component is made up of native, perennial, warm-season, mid-grasses (20-55%), native, perennial, warm-season, tall, rhizomatous grasses (25-40%), native, perennial, cool-season grasses (10-20%), native, perennial, warm-season, short grasses (5-10%), and grass-likes (1-5%).

Infiltration can be adversely impacted by the invasion of Kentucky bluegrass, smooth brome, and trees when present above 10 percent (subdominant designation).

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. No compaction layers occur naturally on this site.
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Phase 1.1

1. Native, perennial, warm-season, tallgrass, 781-1250#/ac, 25-40% (2 species minimum): big bluestem, Indiangrass, switchgrass.

2. Native, perennial, warm-season, midgrass, 625-1094 #/ac, 20-35% (2 species minimum): little bluestem, sideoats grama, composite dropseed, sand dropseed.

Phase 1.2

1. Native, perennial, warm-season, midgrass, 390-1040 #/ac, 15-40% (2 species minimum): little bluestem, sideoats grama, composite dropseed, sand dropseed.

2. Native, perennial, cool-season grass, 260-520#/ac, 10-25% (1 species minimum): needle and thread, porcupinegrass, prairie Junegrass, green needlegrass, Scribner's rosette grass, Canada wildrye, western wheatgrass.

Sub-dominant: Phase 1.1

1. Native, perennial, cool-season, rhizomatous grass, 313-469 #/ac, 10-15%, (1 species minimum): western wheatgrass.

Phase 1.2

1. Native, perennial, warm-season short-grass, 260-520 #/ac, 10-20% (1 species minimum): blue grama, plains muhly.

2. Native, perennial, warm-season, tallgrass, 130-520 #/ac, 5-20% (1 species minimum).

Other: Minor - Phase 1.1

1. Native, perennial, warm-season shortgrass, 156-313 #/ac, 5-10%: blue grama, plains muhly.

2. Forb, 156-313, 5-10%: species vary from location to location.

3. Shrub, 156-313 #/ac, 5-10%: leadplant, smooth sumac, prairie rose, western snowberry, soapweed yucca.

4. Native, cool-season, bunch grass, 63-156 #/ac, 2-5%: needle and thread, porcupinegrass, prairie Junegrass, green needlegrass, Scribner's rosette grass, Canada wildrye.

5. Grass-like, 31-156 #/ac, 1-5%: sedges, other grass-likes.

Minor - Phase 1.2

1. Native forbs (annual and perennial), 130-650 #/ac, 5-10%: species present vary from location to location.

2. Grass-likes, 26-130 #/ac, 1-5%: sedges, other grass-likes.

3. Shrubs, 26-130 #/ac, 1-5%: leadplant, smooth sumac, prairie rose, western snowberry, soapweed yucca.

4. Non-native grasses, 0-260 #/ac, 0-10%: smooth brome, cheatgrass, Kentucky bluegrass.

Additional: The Reference Community (1.1) includes eight F/S Groups. These groups in order of expected abundance are native, perennial, warm-season, tallgrass; native, perennial, warm-season, midgrass; native, perennial, cool-season, rhizomatous grass; native, perennial, warm-season, shortgrass; forbs (perennial and annual); shrubs, native perennial, cool-season bunch grass; and grass-likes.

The Degraded Native Grass Community (1.2) also includes eight F/S Groups. These groups in order of expected abundance are native, perennial, warm-season, midgrass; native, perennial, cool-season grass; native, perennial, warm-season, shortgrass; native, perennial, warm-season, tallgrass; forbs (perennial and annual); grass-likes; shrubs, and non-native grasses.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** A few (less than 3 percent) dead centers may occur in bunchgrasses. Shrubs may show some (less than 5 percent) dead branches as plants age.
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14. **Average percent litter cover (%) and depth (in):** Plant litter cover is evenly distributed throughout the site and is expected to be 85 to 95 percent and at a depth of 0.50 to 075 inches (1.25 to 1.9 cm). Kentucky bluegrass excessive litter and woody encroachment can negatively impact the functionality of this site.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production is shown in air-dry values. The Representative Value (RV) = 3,125 pounds per acre. Low production years = 2,250 pounds per acre. High production years = 4,000 pounds per acre.
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing**

what is NOT expected in the reference state for the ecological site: No non-native invasive species are present. Kentucky bluegrass, smooth brome, silver bluestem, Caucasian bluestem, tall fescue, eastern redcedar, honey locust, nodding plumeless thistle (musk thistle), common mullein, and sericea lespedeza are known invasives that have the potential to be dominant or co-dominant on the site. Consult the state noxious weed and state watch lists for potential invasive species on each ecological site. NOTE: Invasive plants (for the purposes of the IIRH protocol) are plant species that are typically not found on the ecological site or should only be in trace or minor categories under the natural disturbance regime and have the potential to become a dominant or codominant species on the site if their establishment and growth are not actively controlled by natural disturbances or management interventions. Species listed characterize degraded states AND have the potential to become a dominant or co-dominant species.

17. **Perennial plant reproductive capability:** All perennial species exhibit high vigor relative to climatic conditions. Perennial grasses should have vigorous rhizomes or tillers; vegetative and reproductive structures are not stunted. All perennial species should be capable of reproducing annually.
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