USDA Natural Resources Conservation Service

# Ecological site R071XY029NE
# Loamy Overflow

Last updated: 1/08/2025
Accessed: 05/10/2025

## 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.

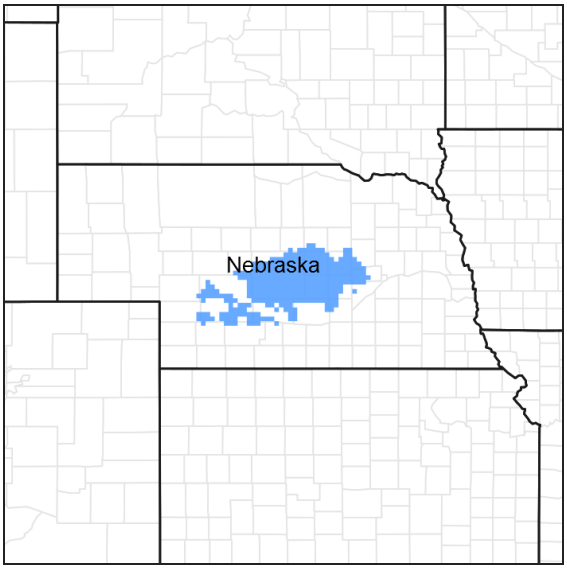



**Figure 1. Mapped extent**

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 71 (USDA-Natural Resources Conservation Service, 2006)

## Ecological site concept

This site is found on active floodplains subject to inundation. Additional moisture is received as run-on originating from higher on the landscape. Occasional to frequent flooding redistributes soil and plant materials through erosion and deposition and can locally affect production and species composition.

## Associated sites

| | |
|---|---|
| R071XY028NE | **Loamy Lowland**<br>The Loamy Lowland ecological site is a run-off site and is positioned upslope and adjacent to Loamy Overflow sites. |

## Similar sites

| | |
|---|---|
| R071XY028NE | **Loamy Lowland**<br>The Loamy Lowland ecological site is positioned higher on the landscape and is not subject to the sedimentation or flooding that is common on Loamy Overflow sites. |

| | |
|---|---|
| R071XY024NE | **Subirrigated**<br>The Subirrigated ecological site is located in a similar landscape position as Loamy Overflow but has a seasonally high water table which is not present on Loamy Overflow sites. |

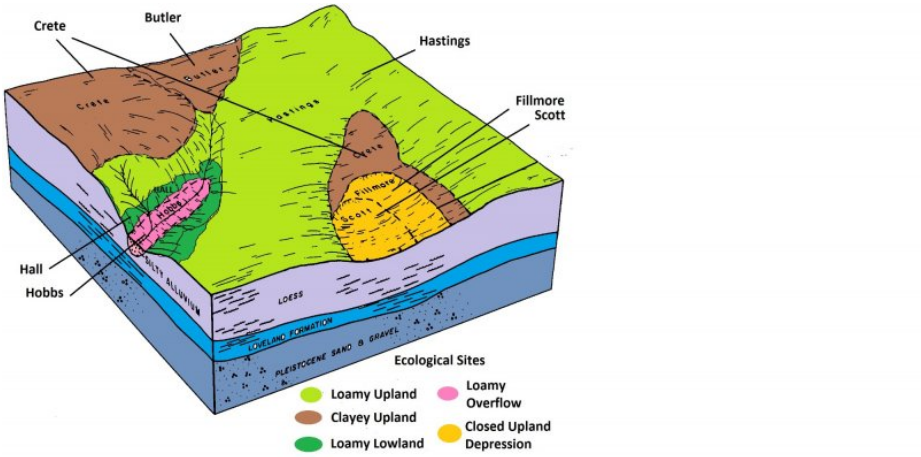



**Figure 2. Block Diagram.**

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | Not specified |
| Herbaceous | (1) *Andropogon gerardii*<br>(2) *Schizachyrium scoparium* |

## Physiographic features

This site occurs on flood plains of river valleys and in narrow drainage ways of uplands. This site receives runoff from areas higher on the landscape. Flooding is occasional to frequent and sedimentation is common on this site.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Flood plain<br>(2) Drainageway |
| Runoff class | Low |
| Flooding duration | Brief (2 to 7 days) |
| Flooding frequency | Very rare to frequent |
| Ponding frequency | None |
| Elevation | 1,200–3,190 ft |
| Slope | 0–6% |
| Water table depth | 48–72 in |
| Aspect | Aspect is not a significant factor |

## Climatic features

Annual precipitation averages around 26 inches per year. Occasional strong storms may bring brief periods of high winds with gusts to more than 60 miles per hour. 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) CANADAY STEAM PLT [USC00251450], Lexington, NE
- (2) KEARNEY 4 NE [USC00254335], Kearney, NE
- (3) LOUP CITY [USC00254985], Loup City, NE
- (4) GRAND ISLAND AP [USW00014935], Grand Island, NE
- (5) ARNOLD [USC00250355], Arnold, NE
- (6) CENTRAL CITY [USC00251560], Central City, NE
- (7) GOTHENBURG [USC00253365], Gothenburg, NE
- (8) NORTH LOUP [USC00256040], North Loup, NE
- (9) RAVENNA [USC00257040], Ravenna, NE
- (10) SAINT PAUL [USC00257515], Saint Paul, NE
- (11) ANSELMO 2 SE [USC00250245], Anselmo, NE
- (12) COMSTOCK [USC00251835], Comstock, NE
- (13) MASON CITY [USC00255250], Mason City, NE
- (14) BROKEN BOW 2 W [USC00251200], Broken Bow, NE
- (15) BURWELL [USC00251345], Burwell, NE
- (16) OCONTO [USC00256167], Oconto, NE
- (17) OVERTON 3 W [USC00256439], Overton, NE
- (18) STAPLETON 5W [USC00258133], Stapleton, NE
- (19) TAYLOR [USC00258455], Taylor, NE

### Influencing water features

This site occurs on nearly level areas that receive additional water from overflow of intermittent or perennial streams, or runoff from adjacent slopes.

### Soil features

These very deep soils are subject to inundation by floodwaters and subsequent sedimentation. Most soils are stratified. Textures are dominantly loamy and silty, but sandy textures may occur in the lower part of the root zone. Free water is usually very deep but may be present in the lower part of some profiles during part of the growing season. Organic matter is generally low to moderate in the surface layer.

The major soil series correlated to this ecological site is Hobbs. More information can be found in the various soil survey reports. Contact the local USDA Service Center for internet links to soil survey data that includes more details specific to your location.

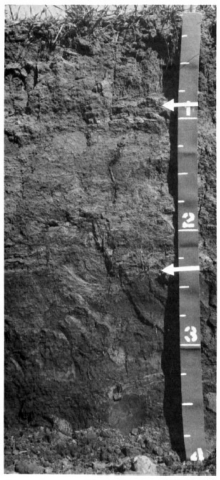


**Figure 9. Hobbs series profile.**

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium |
| Surface texture | (1) Silt loam<br>(2) Loam<br>(3) Sandy loam |
| Family particle size | (1) Loamy |
| Drainage class | Moderately well drained to well drained |
| Permeability class | Moderate to moderately rapid |
| Soil depth | 80 in |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-40in) | 5.1–9.1 in |
| Calcium carbonate equivalent (0-40in) | 0–10% |
| Electrical conductivity (0-40in) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0–2 |
| Soil reaction (1:1 water) (0-40in) | 6.1–8.4 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–4% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

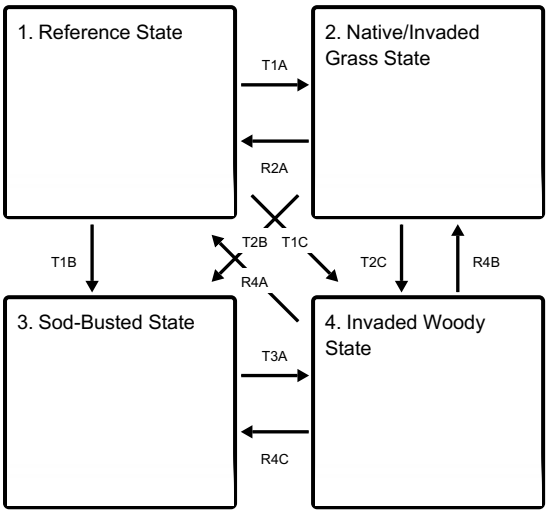
Loamy Overflow sites developed under Central Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire, and other biotic and abiotic factors that typically influence soil/site development. This is a disturbance driven site, with the disturbances being herbivory, fire, and variable climate. The landscape position and association with streams make this site somewhat less susceptible to fire, which allowed woody species to become more abundant than less sheltered sites in the MLRA.

The State and Transition Model (STM) is depicted below, and is made up of a Reference State, a Native/Invaded Grass State, an Invaded Grass State, and an Invaded Woody State. Each state represents the crossing of a major

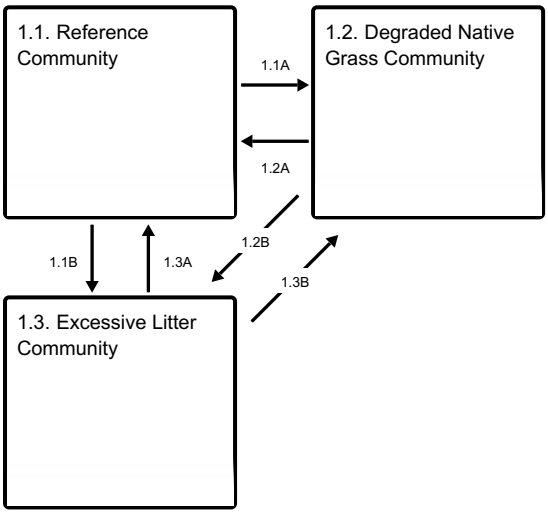
ecological threshold due to the alteration of the functional dynamic properties of the ecosystem. The primary properties observed to determine this change are soil stability, vegetative communities, and the hydrologic cycle. Each state may have one or more plant communities that fluctuate in species composition and abundance within the normal parameters of the state. Periodic flooding and deposition events can cause a wide variability in plant communities and production on this site. 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

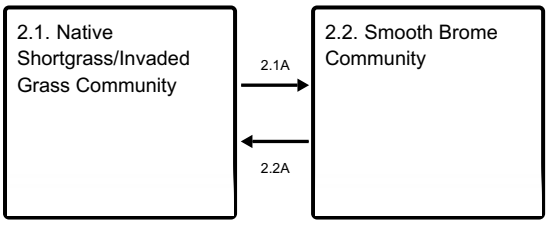
**Ecosystem states**




**State 1 submodel, plant communities**




**State 2 submodel, plant communities**



**State 3 submodel, plant communities**

3.1. Reseeded Native Grass Community

3.2. Seeded Pasture Community

3.3. Natural Reclamation Community

**State 4 submodel, plant communities**

4.1. Deciduous Trees/Eastern Redcedar Community

## State 1
## Reference State

The Reference State describes the range of vegetative communities that occur on the Loamy Overflow site where the range of natural variability under historic conditions and disturbance regimes is mostly intact. 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 and Excessive Litter Communities result 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

- eastern cottonwood (*Populus deltoides*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- rose (*Rosa*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- blue grama (*Bouteloua gracilis*), grass

## Community 1.1
## Reference Community

The Reference Plant Community is primarily warm-season tallgrasses with scattered pockets of deciduous trees. Potential vegetation averages 80 to 90 percent grasses and grass-like plants, 3 to 10 percent forbs, 1 to 5 percent shrubs, and 0 to 1 percent trees. The major grasses include big bluestem, little bluestem, and Indiangrass. Other grasses and grass-likes include switchgrass and sedges. Forbs are diverse and include sunflowers, goldenrods, and native legume species. Woody species included in the plant community are western snowberry and rose. Some pockets of native trees such as green ash and plains cottonwood occurred on this site. This plant community is productive and diverse. The diversity in plant species allows for high drought tolerance and moderate flooding tolerance. The potential for tree encroachment is very high. This is a sustainable plant community in regard to site/soil stability, watershed function, and biologic integrity. The Reference Plant Community should exhibit slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are broken, irregular in appearance

or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration. These soils are susceptible to wind and water erosion where vegetative cover is inadequate. Channel cutting, deposition, and removals may occur adjacent to streams. The total annual production ranges from 3,500 to 4,500 pounds per acre of air dry vegetation with a representative value of 4,000 pounds. Production can be affected by flooding events on some sites.

**Dominant plant species**

- eastern cottonwood (*Populus deltoides*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- leadplant (*Amorpha canescens*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- rose (*Rosa*), shrub
- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass

**Table 5. Annual production by plant type**

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Grass/Grasslike | 3425 | 3740 | 4050 |
| Forb | 75 | 140 | 205 |
| Shrub/Vine | 0 | 100 | 205 |
| Tree | 0 | 20 | 40 |
| **Total** | **3500** | **4000** | **4500** |

**Figure 11. Plant community growth curve (percent production by month). NE7507, Central Loess Plains, native - receiving water flow site. Warm-season dominant on sites receiving runoff water.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 4 | 9 | 27 | 29 | 15 | 8 | 5 | 2 | 1 | 0 |

## Community 1.2
## Degraded Native Grass Community

The Degraded Native Grass Community is considered an at-risk community which shows a significant loss of yield in the production due to continuous season long grazing with inadequate recovery periods. The major grasses include big bluestem and little bluestem. Indiangrass has been significantly reduced in the plant community composition. Warm-season shortgrasses including blue grama, increase in the plant composition. The forb composition remains diverse. Pockets of trees occurred naturally on this site and the potential is high for tree encroachment or regeneration. This plant community is less productive and the diversity of grasses is lower than the Reference Community and can be impacted by flooding on some sites. This site remains a sustainable plant community in regard to site and soil stability, hydrologic function, and biotic integrity. The total annual production ranges from 3,000 to 4,000 pounds per acre of air dry vegetation with a representative value of 3,500 pounds per acre.

**Dominant plant species**

- eastern cottonwood (*Populus deltoides*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- common hackberry (*Celtis occidentalis*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- rose (*Rosa*), shrub
- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass

- blue grama (*Bouteloua gracilis*), grass

## Community 1.3
## Excessive Litter Community

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

**Dominant plant species**

- eastern cottonwood (*Populus deltoides*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass
- Indiangrass (*Sorghastrum nutans*), grass

**Figure 12. Plant community growth curve (percent production by month). NE7143, Central NE Loess Hills, lowland warm-season dominant. Warm-season grass dominant on lowlands.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 3 | 7 | 15 | 25 | 25 | 17 | 6 | 2 | 0 | 0 |

## Pathway 1.1A
## Community 1.1 to 1.2

A shift from the Reference Community to the Degraded Native Grass Community occurs with continuous season long grazing and inadequate recovery periods during the growing season. Repeated grazing of the growing point of warm-season tallgrasses and grazing below recommended heights are other common reasons for this reduction in tallgrass species.

## Pathway 1.1B
## Community 1.1 to 1.3

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

## Pathway 1.2A
## Community 1.2 to 1.1

A shift from the Degraded Native Grass Community back to the Reference Community is achieved with prescribed grazing early and late in the growing season to reduce cool-season grasses. Targeting high-intensity grazing events during the peak growth period of cool-season grasses followed by a 60 day deferment will allow for the native, warm-season tallgrass component to increase. Grazing should not remove more than 50 percent of annual growth.

**Conservation practices**

| |
|---|
| Access Control |
| Prescribed Grazing |

## Pathway 1.2B
## Community 1.2 to 1.3

Interruption of the natural disturbances of herbivory and fire will result in conversion of the Degraded Native Grass Community to the Excessive Litter Community.

### Pathway 1.3A
### Community 1.3 to 1.1

Reintroduction of the natural processes of herbivory and fire will allow the vegetation to return to the Reference Community.

### Pathway 1.3B
### Community 1.3 to 1.2

Reintroduction of the natural processes of herbivory and fire will allow the vegetation to return to the Degraded Native Grass Community.

## State 2
## Native/Invaded Grass State

The Native/Invaded Grass State has been degraded from the Reference State. Very few native, warm-season, tallgrasses remain. Significant amounts of native, mid- and shortgrasses persist with encroachment by introduced grasses and less desirable forbs such as western ironweed and Cuman ragweed. Other undesirable forbs will be present that indicate degraded forage productivity, reduced plant vigor, and poor soil quality.

**Dominant plant species**

- eastern cottonwood (*Populus deltoides*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

### Community 2.1
### Native Shortgrass/Invaded Grass Community

The Native Shortgrass/Invaded Grass Community occurs when the threshold between native mixed-grass prairie to shortgrass prairie has been crossed. With continued grazing pressure, blue grama, Kentucky bluegrass, smooth brome, and other cool-season grasses will become the dominant plant species, with only trace remnants of the warm-season tall- and midgrasses such as big and little bluestem. Continuous and heavy grazing pressure will maintain this plant community in a sod-bound condition. Forb richness and diversity will decrease. Grazing management practices that allow for adequate periods of recovery between grazing events will add in restoration of warm-season tall- and midgrasses. Total annual production ranges from 2,200 to 2,800 pounds per acre of air dry vegetation with a representative value of 2,500 pounds per acre.

**Dominant plant species**

- eastern cottonwood (*Populus deltoides*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- smooth brome (*Bromus inermis*), grass

**Figure 13. Plant community growth curve (percent production by month). NE7503, Central Loess Plains, warm season/cool season co-dominant. Native warm-season plant community encroached with cool-season grasses, MLRA 75.**

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

### 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 on 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**

- eastern cottonwood (*Populus deltoides*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- smooth brome (*Bromus inermis*), grass

**Figure 14. Plant community growth curve (percent production by month). NE7506, Central Loess Plains, cool season dominant, warm season remnants - receiving water flow site. Cool-season, smooth brome with native warm season remnants, sites receiving water runoff, MLRA 75.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 2 | 13 | 27 | 17 | 9 | 12 | 13 | 6 | 1 | 0 |

## Pathway 2.1A
## Community 2.1 to 2.2

Transition to the Smooth Brome Community may occur with management actions that promote cool-season grasses such as smooth brome and that reduce the amount of native grasses. These actions include seeding introduced grasses, excessive summer grazing, inadequate rest during the summer, multi-season haying, and nitrogen fertilization in the spring and/or fall. Smooth brome and/or other introduced plants dominate the site and there is limited plant species diversity.

## Pathway 2.2A
## Community 2.2 to 2.1

A return to the Native Shortgrass/Invaded Grass Community may be achieved with herbicide treatment and reseeding. If native remnants are present, appropriately timed prescribed fire with a prescribed grazing program may achieve the desired results.

## State 3
## Sod-Busted State

The Sod-Busted State occurs when a threshold is crossed as a result of mechanical disturbance to facilitate production agriculture. If farming operations are suspended, the site can be abandoned, which will result in the Natural Reclamation Community, or seeded. When seeded the resulting community will be 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 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. 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 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 and abandoned without being reseeded. These sites experience degraded soil quality, increased runoff, and reduced water infiltration. This plant community is not stable during the early successional stages. Total annual production during an average year varies significantly depending on the successional stage of the plant community and any management applied to the system.

## State 4
## Invaded Woody State

The Invaded Woody State is a result of the disruption of the natural fire regime, woody encroachment, and lack of management in response to an increase in woody species. The native component of woody species increases, as do invading introduced exotic species. Once the canopy cover reaches 15 percent with an average tree height exceeding 5 feet, the threshold is crossed to the Invaded Woody State.

**Dominant plant species**

- eastern cottonwood (*Populus deltoides*), tree
- eastern redcedar (*Juniperus virginiana*), tree
- common hackberry (*Celtis occidentalis*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- Siberian elm (*Ulmus pumila*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- blue grama (*Bouteloua gracilis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

### Community 4.1
### Deciduous Trees/Eastern Redcedar Community

The Deciduous Trees/Eastern Redcedar Community is the result of woody encroachment. Shrubs and trees will establish readily on this site. Some sites may originally have been savannahs that contained pockets of trees and shrubs which have increased over time. Typical native trees include eastern cottonwood, green ash, hackberry, eastern redcedar, and honeylocust. Siberian elm and eastern redcedar are invasive on these sites.

**Dominant plant species**

- eastern cottonwood (*Populus deltoides*), tree

- Siberian elm (*Ulmus pumila*), tree
- eastern redcedar (*Juniperus virginiana*), tree
- common hackberry (*Celtis occidentalis*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- blue grama (*Bouteloua gracilis*), grass

**Figure 15. Plant community growth curve (percent production by month). NE7505, Central Loess Plains, woody encroachment. Woody plant encroachment with warm- and cool-season grasses MLRA 75.**

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

## Transition T1A
## State 1 to 2

Heavy grazing during the summer, inadequate rest during the summer, repeated grazing of growing point, and grazing below recommended heights which allows for encroachment of non-native species and species more tolerant to heavy summer grazing are management actions which will cause the Reference State to cross a threshold to the Native/Invaded Grass State which is characterized by the predominance of introduced cool-season grasses and/or lower succession species such as dropseeds, blue grama, and Kentucky bluegrass.

## Transition T1B
## State 1 to 3

The Reference State is significantly altered by mechanical tillage to allow the site to be placed into production agriculture. The disruption to the plant community, the soil, and the hydrology of the system make restoration to a true reference state unlikely.

## Transition T1C
## State 1 to 4

Disruption of the natural fire regime, woody encroachment, and the introduction of exotic species causes a major shift in the vegetative community. The resulting impacts to the system cross the threshold from the Reference State into the Invaded Woody State.

## Restoration pathway R2A
## State 2 to 1

Restoration from the Native/Invaded Grass State to the Reference State is achieved by deferring grazing during the summer in conjunction with planned grazing events in the early spring and late fall to reduce cool-season grasses and to provide native remnants an opportunity to increase. Prescribed fire timed to improve native warm-season grasses once fuel loads are increased and grasses have an adequate root system. Use of burn down herbicides in the early spring and late fall when native warm-season grasses are dormant can also reduce competition from introduced and naturalized cool-season grasses. Once warm-season grasses have adequately recovered, ongoing prescribed grazing with adequate rest and recovery during the summer months is important.

**Conservation practices**

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

### Transition T2B
### State 2 to 3

The site has been significantly altered by mechanical tillage to allow the site to be placed into production agriculture. The disruption to the plant community, the soil and the hydrology of the system make restoration unlikely.

### Transition T2C
### State 2 to 4

Disruption of the natural fire regime, woody encroachment, and the introduction of exotic species can cause this Native/Invaded Grass State to shift to the Invaded Woody State.

### Transition T3A
### State 3 to 4

Disruption of the natural fire regime, woody encroachment, and the introduction of exotic species causes a major shift in the vegetative community. The resulting impacts to the system cross the threshold from the Sod-Busted State into the Invaded Woody State.

### Restoration pathway R4A
### State 4 to 1

Restoration to the Reference State from the Invaded Woody State can be achieved with brush management for woody plant control. If resprouting brush such as honeylocust or Siberian elm is present, stumps must be treated after mechanical removal. Ongoing brush management such as hand cutting and chemical spot treatments, or periodic prescribed burning is required. If the site has a healthy warm-season grass component, once the woody species have been removed, the site could quickly return to the Reference State with the addition of prescribed grazing with adequate recovery periods.

**Conservation practices**

| |
|---|
| Brush Management |
| Prescribed Burning |
| Prescribed Grazing |

### Restoration pathway R4B
### State 4 to 2

Restoration from the Invaded Woody State to the Native/Invaded State can be achieved with brush management for woody plant control. If resprouting brush such as honeylocust or Siberian elm is present, stumps must be treated after mechanical removal. Ongoing brush management such as hand cutting and chemical spot treatments, or periodic prescribed burning is required.

### Restoration pathway R4C
### State 4 to 3

Restoration from the Invaded Woody State can be achieved with brush management for woody plant control. If resprouting brush such as honeylocust or Siberian elm is present, stumps must be treated after mechanical removal. Ongoing brush management, such as hand cutting and chemical spot treatments, or periodic prescribed burning is required.

## Additional community tables

**Table 6. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Lb/Acre) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |
| 1 | **Warm-season Tallgrass** | | | 1400–2000 | |
| | big bluestem | ANGE | *Andropogon gerardii* | 1000–1600 | – |
| | Indiangrass | SONU2 | *Sorghastrum nutans* | 200–600 | – |
| | switchgrass | PAVI2 | *Panicum virgatum* | 200–400 | – |
| 2 | **Warm-season Midgrass** | | | 1000–1400 | |
| | little bluestem | SCSC | *Schizachyrium scoparium* | 800–1200 | – |
| | sideoats grama | BOCU | *Bouteloua curtipendula* | 200–400 | – |
| | composite dropseed | SPCOC2 | *Sporobolus compositus var. compositus* | 0–200 | – |
| 3 | **Native Cool-season Grass** | | | 200–400 | |
| | western wheatgrass | PASM | *Pascopyrum smithii* | 80–400 | – |
| | needle and thread | HECOC8 | *Hesperostipa comata ssp. comata* | 40–200 | – |
| | porcupinegrass | HESP11 | *Hesperostipa spartea* | 0–200 | – |
| | Scribner's rosette grass | DIOLS | *Dichanthelium oligosanthes var. scribnerianum* | 0–120 | – |
| | Canada wildrye | ELCA4 | *Elymus canadensis* | 0–80 | – |
| | prairie Junegrass | KOMA | *Koeleria macrantha* | 0–80 | – |
| 4 | **Warm-season Shortgrass** | | | 40–200 | |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 40–200 | – |
| 5 | **Grass-like** | | | 40–80 | |
| | sedge | CAREX | *Carex* | 40–80 | – |
| | Grass-like (not a true grass) | 2GL | *Grass-like (not a true grass)* | 0–40 | – |
| **Forb** | | | | | |
| 6 | **Forb** | | | 120–400 | |
| | large beardtongue | PEGR7 | *Penstemon grandiflorus* | 0–80 | – |
| | Forb, perennial | 2FP | *Forb, perennial* | 40–80 | – |
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–80 | – |
| | white heath aster | SYER | *Symphyotrichum ericoides* | 0–80 | – |
| | longbract spiderwort | TRBR | *Tradescantia bracteata* | 0–80 | – |
| | purple prairie clover | DAPU5 | *Dalea purpurea* | 0–80 | – |
| | scarlet beeblossom | GACO5 | *Gaura coccinea* | 0–80 | – |
| | hairy false goldenaster | HEVI4 | *Heterotheca villosa* | 0–80 | – |
| | dotted blazing star | LIPU | *Liatris punctata* | 0–80 | – |
| | Nuttall's sensitive-briar | MINU6 | *Mimosa nuttallii* | 0–80 | – |
| | evening primrose | OENOT | *Oenothera* | 0–80 | – |
| | silverleaf Indian breadroot | PEAR6 | *Pediomelum argophyllum* | 0–80 | – |
| | lilac penstemon | PEGR5 | *Penstemon gracilis* | 0–80 | – |
| | slimflower scurfpea | PSTE5 | *Psoralidium tenuiflorum* | 0–80 | – |
| | upright prairie coneflower | RACO3 | *Ratibida columnifera* | 0–80 | – |
| | prairie groundsel | PAPL12 | *Packera plattensis* | 0–40 | – |
| | goldenrod | SOLID | *Solidago* | 0–40 | – |
| | white sagebrush | ARLU | *Artemisia ludoviciana* | 0–40 | – |
| **Shrub/Vine** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Shrub/Vine** | | | | | |
| 7 | **Shrub** | | | 40–200 | |
| | Shrub (>.5m) | 2SHRUB | *Shrub (>.5m)* | 0–120 | – |
| | leadplant | AMCA6 | *Amorpha canescens* | 0–120 | – |
| | prairie rose | ROAR3 | *Rosa arkansana* | 0–80 | – |
| | western snowberry | SYOC | *Symphoricarpos occidentalis* | 0–40 | – |
| | smooth sumac | RHGL | *Rhus glabra* | 0–40 | – |
| **Tree** | | | | | |
| 8 | **Deciduous Tree** | | | 0–40 | |
| | eastern cottonwood | PODE3 | *Populus deltoides* | 0–40 | – |
| | green ash | FRPE | *Fraxinus pennsylvanica* | 0–40 | – |

## 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.

Carrying capacity and production estimates 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 to document plant composition and production. More precise carrying capacity estimates can be calculated based on actual site information along with animal preference data, particularly when livestock other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

The following table lists annual, suggested initial stocking rates with average growing conditions.
Plant Community: Production, AUM/ac
Community 1.1, Reference Community: 4,000 lbs./acre, 1.10 AUM/acre
Community 1.2, Degraded Native Grass Community: 3,500 lbs./acre, 0.88 AUM/acre
Community 2.1, Native Shortgrass/Invaded Grass Community: 2,500 lbs./acre, 0.68 AUM/ac
Community 2.2, Smooth Brome Community (dryland, unfertilized, >50% of plant composition): 2,750 lbs./ac, 0.75 AUM/Ac*

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. (Refer to USDA NRCS, National Range and Pasture Handbook).

WILDLIFE INTERPRETATIONS:
Major Land Resource Area (MLRA) 71 lies primarily within the loess mixed-grass prairie ecosystem mixed with tallgrass prairie in lower elevations. Prior to European settlement, this area consisted of diverse grassland habitats interspersed with varying densities of depressional wetlands and limited woody riparian corridors. These habitats provided critical life cycle components for many of its users. Many species of grassland birds, prairie dogs and herds of roaming bison, elk, and pronghorn were among the historic inhabitants. Small mammal and plentiful insect species provided for prey in the lower part of the food chain benefitting large predators such as wolves, and mountain lions, as well as smaller carnivores such as coyotes, bobcats, foxes, and raptors. In addition, a wide variety of small mammals, reptiles, amphibians, and insects were adapted to this habitat.

Historically, the loess mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement, widespread conversion to cropland, elimination of fire, and habitat fragmentation influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. Bison and prairie dogs were historically keystone species but bison and nearly all prairie dogs have been extirpated from the site. The loss of bison and fire as ecological drivers greatly influenced the character of the remaining native plant community

and the habitats that they provide. Fragmentation has reduced habitat quality for area-sensitive species such as greater prairie chicken.

Within MLRA 71, most Loamy Overflow ecological sites provide grassland or tree cover with an associated forb and limited shrub component. Some of these sites have increased in tree cover including various deciduous trees and eastern redcedar. This site was part of an expansive grassland landscape that included combinations of Loamy Upland, Closed Upland Depressions, Loamy Lowland, and Loamy Overflow sites. This site provided habitat for species requiring unfragmented grassland. Important habitat features and components found commonly or exclusively on this site may include upland nesting habitat for grassland birds and game birds, nesting and escape cover for waterfowl; forbs and insects for brood habitat; and a forage source for small and large herbivores. Many grassland nesting bird populations are declining such as dickcissel and Henslow's sparrow. Extirpated species include free-ranging American bison, pronghorn, wolves, and swift fox.

Many Loamy Overflow ecological sites have been converted to cropland unless they are subject to frequent flooding. Remaining prairies provide increasingly important habitat for grassland nesting birds, small rodents, small mammals, and a variety of reptiles, amphibians, and insects. Introduced species such as smooth brome, reed canarygrass, Kentucky bluegrass, nodding plumeless thistle (musk thistle), and Canada thistle have impacted biological integrity of many sites and habitat for some grassland birds such as Baird’s sparrow. Invasive birds are present such as European starling and house sparrows severely compete with native birds for nests and brown-headed cowbirds parasitize nests. Tree encroachment on this site favors generalist species such as American robin and mourning dove.

1. REFERENCE STATE: The predominance of tall- and mid-grasses plus high diversity of forbs and shrubs in this state favors grazers and mixed-feeders, such as deer. Insects such as pollinators play a large role in maintaining the forb community and provide habitat for grassland birds and other grassland dependent species. Sound management of this plant community maintains proper ecological processes preventing impacts to off-site aquatic habitats. This plant community provides habitat for frog, toad, and snake species. The complex plant structural diversity provides habitat for a wide array of migratory and resident birds. Henslow's sparrow, Western meadowlark, northern bobwhite, and ringneck pheasants are examples of common birds that benefit from the structure and composition this plant community provides. Diverse prey populations are available for grassland raptors such as Swainson’s hawk, burrowing owl, short-eared owl and great horned owl. Some bird species over-winter in this habitat, such as western meadowlark, and American crow.

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

As the plant community degrades to more midgrasses and less tallgrasses, less winter and escape cover are provided. It also provides less cover for predators. As the plant community shifts from warm-season tallgrasses to mid-grasses the site will favor grassland birds that prefer shorter vegetation. This provides for more vision and better habitat for species such as greater prairie chicken, lark bunting, and lark sparrows. Habitat in plant community 1.2 is much the same as 1.1 but provides less winter protection because of the reduced plant height and cover.

2. NATIVE/INVADED GRASS STATE: Although the amount of Kentucky bluegrass in this plant community varies, the lower structural diversity favor grassland birds that prefer lower plant heights and more vision such as greater prairie chickens, lark bunting, and lark sparrows. Increased dominance by Kentucky bluegrass with a lower diversity provides less habitat for ringneck pheasant, Northern bob-white and mixed-feeders, such as white-tailed deer and small mammals. Insect populations are somewhat reduced but still play a large role in maintaining the forb community and provide a forage base for grassland birds and other species.

The diversity of grasses, forbs and shrubs provide high nutrition levels for small and large herbivores including voles, mice, ground squirrels, black-tailed jackrabbit (better suited to this plant community than white-tailed jackrabbit), and white-tailed deer. The increase in litter accumulation benefits small mammals such as voles and mice. The moderate stature of this plant community provides suitable thermal, protective and escape cover for small herbivores and grassland birds. Many wide-ranging predators utilize this plant community including coyote,

badger, red fox, racoon, and weasel (least and long-tailed).

3. SOD-BUSTED STATE: As the vegetation recovers from previous farming activities, management practices heavily influence the process. Typically resulting from continued heavy continuous season-long grazing without adequate recovery periods between grazing events or from continued non-use and no fire for extended periods of time, Kentucky bluegrass will dominate. Smooth brome may also become prevalent in the non-use situation. The forb component exhibits lower diversity than the reference state and shifts towards increaser/ introduced forbs including sweetclover, western yarrow, Cuman ragweed, Missouri goldenrod, hoary verbena, and ironweed. Pollinator insects will still be prevalent, but a shift to generalists.

The earlier green-up associated with Kentucky bluegrass and smooth brome and lower structural diversity provide habitat for those species that tolerate litter buildup, and shorter stature and increased woody cover typically occurs with this plant community).

Savannah sparrow, American robin, western meadowlark are common birds that can benefit from the structure and composition of this plant community. The shorter stature of this plant community provides habitat for killdeer, horned lark, black-tailed jackrabbit (better suited to this plant community than white-tailed jackrabbit), and thirteen-lined ground squirrel. Prey populations are reduced and are more vulnerable to predation by raptors and mammalian predators. Burrowing owls may be associated with Richardson’s ground squirrel or other mammal burrows. The short stature of this plant community does not provide suitable thermal/protective cover and escape cover.

4. INVADED WOODY STATE
This state provides habitat for white-tailed deer, racoon, raptors, and birds that favor woody cover. Several raptors or birds of prey, such as the Cooper’s hawk, and sharp-shinned hawk use coniferous forests and woodlands for nesting, nesting materials, and for perching.

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

The woody cover in this plant community state provide habitat for wild turkey and white-tailed deer as long as canopy cover is 25 percent or less or significant open areas exist where grassland or other open habitats are nearby. Raptors or birds of prey, such as the Cooper’s hawk, and sharp-shinned hawk use woody cover for nesting, nesting materials, and for perching. Opossum, woodland vole, bobcat, racoons are provided excellent habitat as well.

## Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B, with localized areas in hydrologic group C. Infiltration rate is moderate to moderately slow. Runoff potential for this site varies from very low to moderate depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where rhizomatous grasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

## Recreational uses

This site provides hunting for upland game species along with hiking, photography, bird watching and other opportunities. The wide varieties of plants which bloom from spring until fall have an aesthetic value that appeals to visitors.

## Wood products

Local or individual firewood can be utilized from this site. Eastern redcedar pulpwood can be utilized for veneer or cedar furniture. Eastern cottonwood can be harvested for pallets.

## Other products

None of appreciable value.

## 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

## Other references


High Plains Regional Climate Center, University of Nebraska. (http://hpcc.unl.edu, accessed 12/05/16)

Johnsgaard, P.A. 2001. “The Nature of Nebraska.” University of Nebraska Press.

LaGrange, T.G. 2015. Final Report submitted to EPA for the project entitled: Nebraska’s Wetland Condition Assessment: An Intensification Study in Support of the 2011 National Survey (CD# 97714601), and the related project entitled: Nebraska's Supplemental Clean Water Act §106 Funds, as Related to Participation in National Wetland Condition Assessment (I – 97726201). Nebraska Game and Parks Commission, Lincoln.

Muhs, Daniel R., E. Bettis III, J. Aleinikoff, J. McGeehin, J. Beann, G. Skipp, B. Marshall, H. Roberts, W. Johnson, and R. Benton.
"Origin and paleoclimatic significance of late Quaternary loess in Nebraska: Evidence from stratigraphy, chronology, sedimentology, and geochemistry" (2008). USGS Staff -- Published Research. Paper 162.
http://digitalcommons.unl.edu/usgsstaffpub/162 Accessed 12/05/16.

U.S. Dept. of Agriculture. NRCS National Ecological Site Handbook. January, 2014.

U.S. Dept. of Agriculture. NRCS National Engineering Handbook, Section 4. August, 2011.

Personal communications with professional ecologists and wildlife experts.

Rolfsmeier, S.B. and G. Steinauer. 2010. "Terrestrial Ecological Systems and Natural Communities of Nebraska", (version IV)
Nebraska Natural Heritage Program.

USDA, NRCS. National Water and Climate Center, Portland, OR. http://wcc.nrcs.usda.gov Accessed 12/05/16.

USDA, NRCS.1997. National Range and Pasture Handbook.

USDA, NRCS. National Soil Information System, Information Technology Center, Fort Collins, CO.
http://nasis.nrcs.usda.gov Accessed 12/05/16.

USDA, NRCS. 2002. The PLANTS Database, Version 3.5 http://plants.usda.gov Accessed 12/05/16. National Plant Data Center, Baton Rouge, LA.

USDA, NRCS, various published soil surveys.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## Approval

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## Acknowledgments

Many thanks to the soils, local practitioner, and state technical teams for your input and expertise, as well as to the editor.


## 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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| 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.

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2. **Presence of water flow patterns:** None. Water flow patterns are not expected on this site.

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3. **Number and height of erosional pedestals or terracettes:** None. Pedestals and terracettes are not expected to occur on this site.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 5 percent or less. 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).

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

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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):** The A-horizon is 7 inches thick, grayish brown (10YR 5/2) to very dark grayish brown (10YR 3/2) moist with a weak medium granular structure.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community composition of 80 to 90 percent perennial grasses and grass-likes, 3 to 10 percent forbs, 1 to 5 percent shrubs, and 0 to 1 percent trees will optimize infiltration on the site. The grass and grass-like component is made up of native, perennial, warm-season, tall, rhizomatous grasses (35-50%), native, perennial, warm-season, mid-grasses (25-35%), native, perennial, cool-season grasses (5-10%), native, perennial, warm-season, short grasses (1-5%), and grass-likes (1-2%).

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

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** 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, 1400--2000 #/ac, 35-50%, (3 species minimum): big bluestem, switchgrass, Indiangrass, composite (tall) dropseed.

    Phase 1.2
    1. Native, perennial, warm-season midgrass, (2 species minimum): little bluestem, sideoats grama.

    2. Native, perennial, warm-season tallgrass, (2 species minimum): big bluestem, switchgrass, Indiangrass, composite (tall) dropseed.

    Phase 1.3
    1. Native, perennial, warm-season tallgrass, (2 species minimum): big bluestem, switchgrass, Indiangrass, composite (tall) dropseed.

    2. Native, perennial cool-season grass, (1 species minimum): western wheatgrass, needle and thread, porcupinegrass, Scribner's rosette grass, Canada wildrye, prairie Junegrass.

    Sub-dominant: Phase 1.1

1. Native, perennial, warm-season midgrass, 1000-1400 #/ac, 25-35%, (2 species minimum): little bluestem, sideoats grama.

Phase 1.2
1. Native, perennial, warm-season shortgrass, (1 species minimum): blue grama.

2. Native, perennial cool-season grass, (1 species minimum): western wheatgrass, needle and thread, porcupinegrass, Scribner's rosette grass, Canada wildrye, prairie Junegrass.

Phase 1.3
1. Native, perennial, warm-season midgrass, (2 species minimum): little bluestem, sideoats grama.

Other: Minor - Phase 1.1
1. Native, perennial, cool-season grass, 200-400 #/ac, 5-10%: western wheatgrass, needle and thread, porcupinegrass, Scribner's rosette grass, Canada wildrye, prairie Junegrass.

2. Native, perennial, warm-season shortgrass, 40-200 #/ac, 1-5%): blue grama.

3. Native forb (perennial and annual), 120-400 #/ac, 3-10%: species present will vary from location to location.

4. Shrub, 40-200 #/ac, 1-5%: leadplant, prairie rose, western snowberry, smooth sumac.

Minor - Phase 1.2
1. Native forb: species present will vary from location to location.

2. Shrubs: prairie rose, western snowberry, smooth sumac.

Minor - Phase 1.3
1. Native, perennial, warm-season shortgrass: blue grama.

2. Native forb: species present will vary from location to location.

3. Grass-likes: sedges.

Trace - Phase 1.1
1. Grass-like, 40-80 #/ac, 1-2%: sedges.

2. Deciduous trees, 0-40 #/ac, 0-1%: eastern cottonwood, green ash.

Trace - Phase 1.2
1. Grass-likes: sedges.

2. Deciduous trees: eastern cottonwood, green ash.

Trace - Phase 1.3
1. Shrubs: western snowberry, smooth sumac.

2. Deciduous trees: eastern cottonwood, green ash.

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

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

The Excessive Litter Community (1.3) includes eight S/F Groups. These groups in order of abundance are native, perennial, warm-season, tallgrass; native, perennial, cool-season grass; native, perennial, warm-season, midgrass; native, perennial, warm-season, shortgrass; native forbs, grass-likes, sedges, shrubs, and deciduous trees

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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 90 to 95 percent and at a depth of 0.75 inches (1.9 cm). Kentucky bluegrass excessive litter or tree 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) = 4,000 pounds per acre. Low production years = 3,500 pounds per acre. High production years = 4,500 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, Caucasian bluestem, eastern redcedar, honey locust, nodding plumeless thistle (musk thistle), Canada 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

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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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