

Ecological site R071XY054NE Sandy

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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.

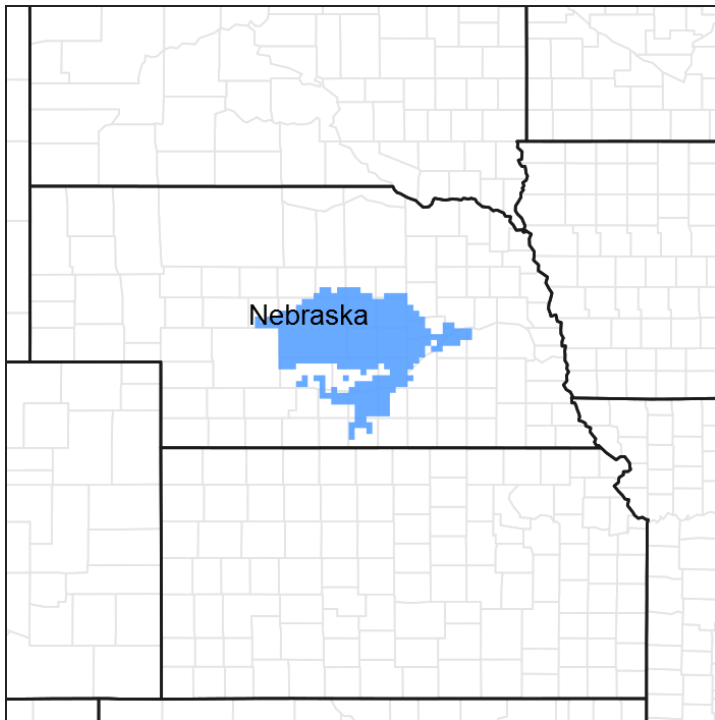


Figure 1. Mapped extent

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)

Ecoregions of Nebraska, Nebraska Natural Legacy Project: Mixed-grass Ecoregion

Ecological site concept

This site can occupy a dune or interdune position. The soil texture is sandy loam or finer and the dark colored surface layer is greater than 10 inches thick. When occupying dune positions, the slope is from 3 to 15 percent, and catsteps are not evident. Sandy sites that are interdune features have less than 3 percent slope.

Associated sites

R071XY024NE	Subirrigated The Subirrigated ecological site is often adjacent to, but lower on the landscape than the Sandy site.
R071XY055NE	Sands The Sands ecological site is often adjacent to but higher on the landscape than the Sandy site.

Similar sites

R071XY055NE	<p>Sands</p> <p>The Sands ecological site usually occupies a higher landscape position, has steeper slopes, a thinner soil surface layer, and lower vegetative production than the Sandy site.</p>
R071XY037NE	<p>Limy Upland</p> <p>The Limy Upland ecological site can be differentiated by a soil texture that is other than loamy fine sand, sandy loam, loamy sand, or sand and presence of carbonates at or near the soil surface which causes the soil to be effervescent.</p>
R071XY036NE	<p>Loamy Upland</p> <p>The Loamy Upland ecological site has soils with silt loam, loam, or silty clay loam surface textures while soils on Sandy sites have textures of loamy fine sand, sandy loam, loamy sand, or sand.</p>

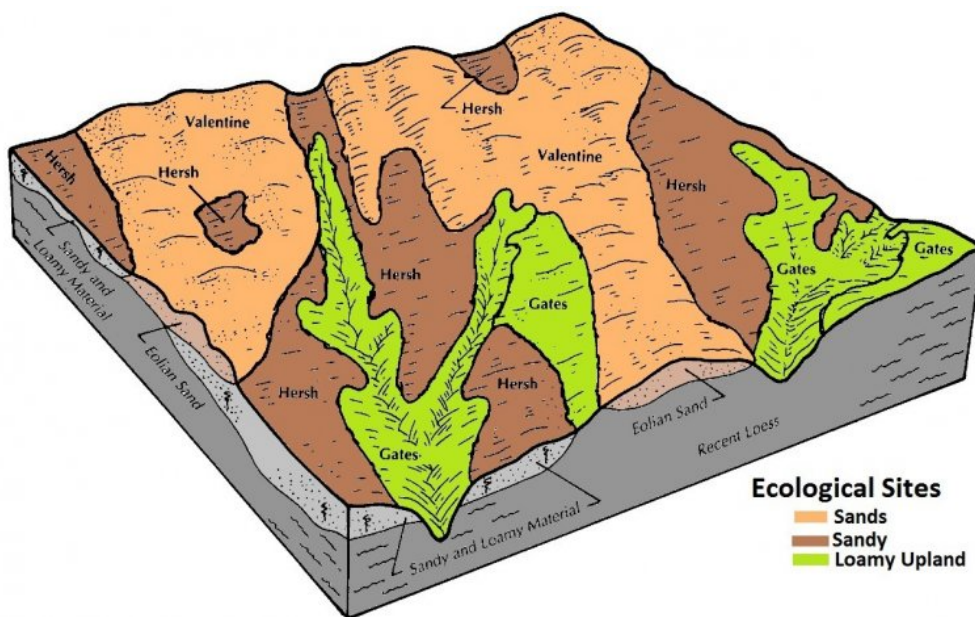


Figure 2. Block diagram

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon hallii</i> (2) <i>Calamovilfa longifolia</i>

Physiographic features

The Sandy site occurs on uplands with slopes ranging from nearly level to steep. Surface slip slopes known as “catsteps” are not characteristic of this site, and it produces runoff to areas lower on the landscape. In the absence of adequate vegetative cover, it is subject to both water and wind erosion. Livestock trailing or other disturbances can lead to the formation of blowouts.

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Stream terrace (3) Hillslope (4) Interdune
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	1,630–3,075 ft
Slope	0–15%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 22 to 26 inches per year. Winds are estimated to average about 14 miles per hour annually. 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.

Table 3. Representative climatic features

Frost-free period (average)	137 days
Freeze-free period (average)	156 days
Precipitation total (average)	26 in

Climate stations used

- (1) ANSELMO 2 SE [USC00250245], Anselmo, NE
- (2) BROKEN BOW 2 W [USC00251200], Broken Bow, NE
- (3) STAPLETON 5W [USC00258133], Stapleton, NE
- (4) BURWELL [USC00251345], Burwell, NE
- (5) CANADAY STEAM PLT [USC00251450], Lexington, NE
- (6) COMSTOCK [USC00251835], Comstock, NE
- (7) LOUP CITY [USC00254985], Loup City, NE
- (8) MASON CITY [USC00255250], Mason City, NE

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

Influencing water features

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

Soil features

The features common to all soils associated with the Sandy site are sandy loam to fine sand surface textures and slopes of 0 to 15 percent. They range from moderately well drained to excessively drained and were formed in eolian sand or alluvium. The surface layer is 3 to 10 inches thick. The texture of the subsurface generally ranges from loam to fine sand.

Major soil series correlated to this ecological site include Thurman, Ortello, O'Neill, Anselmo, Blendon and Hersh. More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.



Figure 7. Thurman series profile

Table 4. Representative soil features

Parent material	(1) Eolian sands (2) Alluvium
Surface texture	(1) Fine sandy loam (2) Loamy fine sand (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Moderately well drained to excessively drained
Permeability class	Moderate to rapid
Soil depth	80 in
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.9–7.8 in
Calcium carbonate equivalent (0-40in)	0–6%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–8.4
Subsurface fragment volume ≤3" (Depth not specified)	0–24%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Historically, large areas of blowing sand resulted in the active movement of the sand dunes. Evaporation from the soil surface was extremely high due to the large areas of bare ground, lack of litter, and sparse plant populations. The transpiration rate of these sparse plant populations was also high due to the harsh soil environment. Occasional wildfires, severe grazing by transient bison herds, and drought contributed to the lack of stability of the sand dunes. This lack of stability caused the dunes to go fluctuate through multiple stages of plant succession over the course of time. Early perennial plants such as sandhill muhly, blowout grass, and blowout penstemon were common due to their ability to tolerate the movement of the sand and dry conditions. As these plants began to colonize and stabilize the sand movement, other perennials such as prairie sandreed, sand

bluestem, hairy grama, lemon scurfpea, and rose slowly became evident. Annuals like as sandbur, Texas croton, and annual sunflower eventually colonized the areas between the perennials.

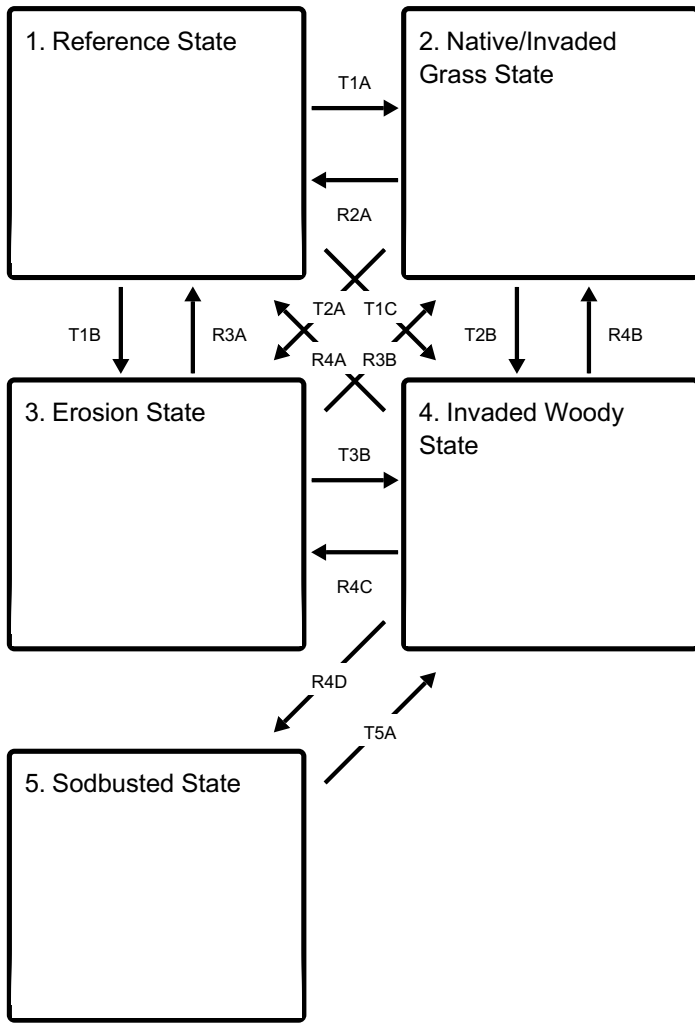
As this site deteriorates, prairie sandreed, little bluestem, sand dropseed, and blue grama initially increase, while grazing sensitive species like sand and big bluestem, switchgrass, and Indiangrass decrease. Without a change in management, prairie sandreed and little bluestem soon begin to decrease, and the more grazing evasive species begin to become dominant. The site is resilient and well adapted to the Northern Great Plains climatic conditions, and the diversity in plant species allows for high drought resistance.

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

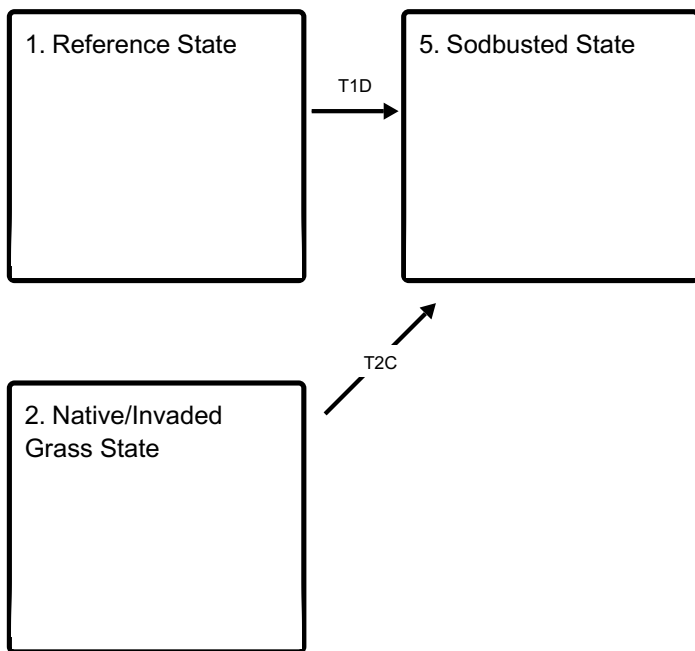
The State and Transition Model (STM) is depicted below, and includes a Reference State, a Native/Invaded Grass State, an Erosion State, Invaded Woody State and a Sodbusted State. Each state represents the crossing of a major ecological threshold due to the alteration of the functional dynamic properties 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. Within each state, communities may degrade or recover in response to natural and man caused disturbances such as variation in the degree and timing of herbivory, presence or absence of fire, and climatic and local fluctuations in the precipitation regime. 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

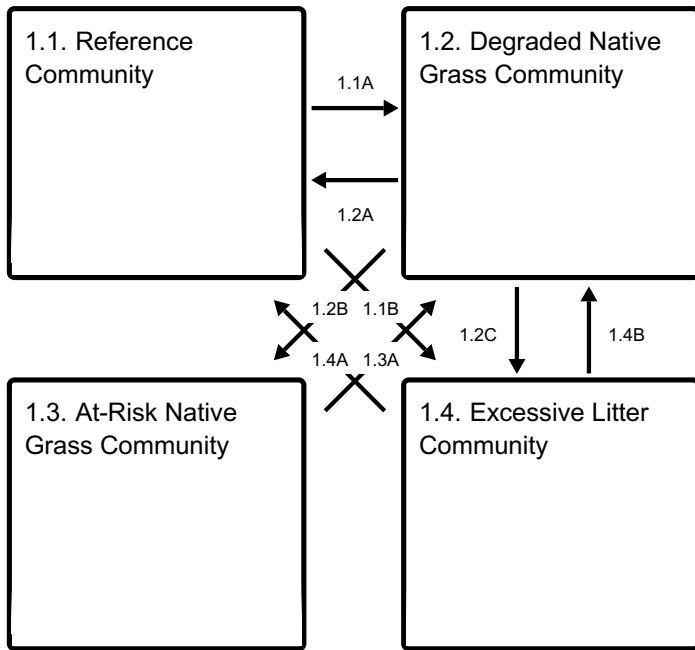
Ecosystem states



States 1, 5 and 2 (additional transitions)



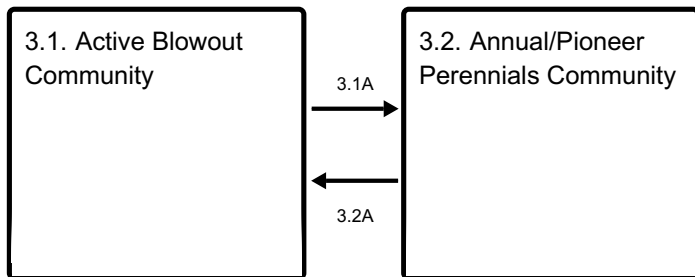
State 1 submodel, plant communities



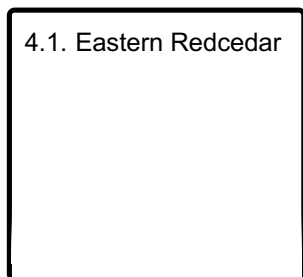
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 5 submodel, plant communities

5.1. Reseeded Native
Grass Community

5.2. Seeded Pasture
Community

5.3. Natural
Reclamation
Community

State 1 Reference State

The Reference State describes the range of vegetative communities that occur on the Sandy site where the range of natural variability under historic conditions and disturbance regimes is mostly intact. The Reference Community is a representation of the native plant community that occupies a site that has been minimally altered by management and that was historically maintained by frequent fire and herbivory (grazing) with adequate recovery periods. The Degraded Native Grass, At-Risk Native Grass, and Excessive Litter Communities are the phases that result from management decisions that are unfavorable for a Reference Community. High perennial grass cover and production facilitates increased soil moisture retention, high infiltration rates, plant vigor, and overall soil quality.

Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- western sandcherry (*Prunus pumila* var. *besseyi*), shrub
- prairie rose (*Rosa arkansana*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- sand bluestem (*Andropogon hallii*), grass
- prairie sandreed (*Calamovilfa longifolia*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- lemon scurfpea (*Psoralidium lanceolatum*), other herbaceous
- stiff sunflower (*Helianthus pauciflorus*), other herbaceous
- scaly blazing star (*Liatris squarrosa* var. *glabrata*), other herbaceous
- white heath aster (*Symphotrichum ericoides*), other herbaceous

Community 1.1

Reference Community

Interpretations are primarily based on the Reference Community. This site evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. This plant community can be found on areas that are well managed with grazing and prescribed burning. The Reference Community consists chiefly of warm-season tall- and midgrasses. The plant community is diverse, with about 85 percent grasses, 10 percent forbs, and 5 percent shrubs by weight. Principle dominants are sand bluestem, prairie sandreed, and little bluestem. Grasses of secondary importance are Indiangrass, needlegrasses, switchgrass, sand lovegrass, hairy grama and blue grama. Sedges occur in the understory. Forbs and shrubs such as scaly and dotted blazing star, stiff sunflower, leadplant, rose, and sandcherry are significant. Runoff as evidenced by patterns of rill, gully, or other water flow is generally low due to the moderate to gentle slope gradient and high intake rate of these soils. Some pedestalling of plants occurs, but it is not very evident on casual observation and occurs on less than 5 percent of the plants. This plant community is extremely resilient and well adapted to the Central Great Plains climatic conditions. It is sustainable in terms of site and soil stability, watershed function, and biologic integrity. Plant litter is evenly distributed with some movement off-site, and natural plant mortality is low. The diversity in plant species allows for high drought tolerance. Moderate or high available water capacity provides a favorable soil-water-plant relationship. Total annual production ranges from 2,200 to 3,200 pounds per acre of air-dried vegetation per acre with a representative value of 2,700 pounds per acre.

Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- western sandcherry (*Prunus pumila var. besseyi*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- prairie rose (*Rosa arkansana*), shrub
- sand bluestem (*Andropogon hallii*), grass
- prairie sandreed (*Calamovilfa longifolia*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- stiff sunflower (*Helianthus pauciflorus*), other herbaceous
- scaly blazing star (*Liatris squarrosa var. glabrata*), other herbaceous
- dotted blazing star (*Liatris punctata*), other herbaceous
- white heath aster (*Symphotrichum ericoides*), other herbaceous

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2045	2420	2760
Forb	130	200	300
Shrub/Vine	25	80	140
Total	2200	2700	3200

Figure 9. Plant community growth curve (percent production by month). NE7137, Central NE Loess Hills, warm-season dominant, cool-season sub-dominant. Warm-season grass dominant with cool-season plants sub-dominant.

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

Community 1.2 Degraded Native Grass Community

The Degraded Native Grass Community is resilient and can be found on areas that have been subject to season-long grazing for long periods of time. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs and 10 percent shrubs. Dominant grasses are the less palatable switchgrass, little bluestem, and prairie sandreed. The more palatable sand bluestem, and Indiangrass are still present, but are no longer dominant. The major forb component has been less affected, and is still dominated by white heath aster, scaly and dotted blazing star, and Cuman ragweed. The dominant shrubs are leadplant and rose. Big and sand bluestem and the needlegrasses have decreased, while prairie sandreed and switchgrass have increased. Forbs remain in balance similar to the Reference Community and shrubs, such as rose and leadplant, show a moderate increase under current management conditions. This plant community maintains diversity while sustaining production. Total annual production ranges from 1,800 to 3,200 pounds per acre of air-dried vegetation with representative value of 2,500 pounds per acre.

Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- prairie rose (*Rosa arkansana*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- prairie sandreed (*Calamovilfa longifolia*), grass
- switchgrass (*Panicum virgatum*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- stiff sunflower (*Helianthus pauciflorus*), other herbaceous
- dotted blazing star (*Liatris punctata*), other herbaceous
- scaly blazing star (*Liatris squarrosa var. glabrata*), other herbaceous
- white heath aster (*Symphotrichum ericoides*), other herbaceous

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1660	2175	2650
Forb	120	187	275
Shrub/Vine	20	138	275
Total	1800	2500	3200

Figure 11. Plant community growth curve (percent production by month). NE6534, NE/SD Sandhills, Native Grasslands. Warm-season dominant, cool-season subdominant, mid- and tallgrasses.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	5	15	25	30	10	7	3		

Community 1.3 At-Risk Native Grass Community

This plant community develops with heavy, usually season-long, livestock grazing. Plant diversity is diminished as the tallgrass species are removed from the plant community. Small, isolated plants may exist in a prostrate form to avoid defoliation. The potential vegetation is about 80 percent grasses or grass-like plants, 15 percent forbs, and 5 percent shrubs. Dominant grasses include blue grama and western wheatgrass. Other grasses or grass-likes include sand dropseed, needle and thread, prairie sandreed, and sedges. Dominant forbs include field sagewort, white heath aster, scaly and dotted blazing star, and Cuman ragweed. Dominant shrubs include rose and western sandcherry. Cool-season plants such as western wheatgrass, prairie junegrass, and Scribner's panicum increase. Blue grama also increases due to its ability to avoid grazing because of its short growth form. Forbs such as Cuman ragweed and field sagewort tend to increase, especially in periods of favorable moisture. Rose, leadplant, and western sandcherry diminish while soapweed yucca, cactus, and other less palatable shrubs increase. Total annual production ranges from 1,400 to 2,000 pounds per acre of air-dried vegetation with a representative value 1,700 pounds per acre.

Dominant plant species

- soapweed yucca (*Yucca glauca*), shrub
- brittle pricklypear (*Opuntia fragilis*), shrub
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- field sagewort (*Artemisia campestris*), other herbaceous
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- dotted blazing star (*Liatris punctata*), other herbaceous
- scaly blazing star (*Liatris squarrosa var. glabrata*), other herbaceous
- white heath aster (*Symphotrichum ericoides*), other herbaceous

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1305	1479	1635
Forb	80	170	275
Shrub/Vine	15	51	90
Total	1400	1700	2000

Figure 13. Plant community growth curve (percent production by month). NE6540, NE/SD Sandhills, Native Grass, Grama/Wheatgrass. Warm-season and cool-season co-dominant, short and mid grasses.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	25	20	15	5	0	0	0

Community 1.4 Excessive Litter Community

The Excessive Litter Community occurs after an extended period of non-use by domestic livestock and a disrupted fire regime. Litter has clearly increased and few sedges or shortgrasses are present. A significant amount of plant basal cover has been replaced by litter. Bunch grasses have become decadent, often with dead centers, and exhibit pedestalling. Vegetative reproduction is extremely limited. The potential vegetation is about 90 percent grasses or grass-like plants, 5 percent forbs, and 5 percent shrubs. The dominant grasses include sand bluestem, prairie sandreed, little bluestem, and needlegrasses. Other grasses present include sand dropseed, switchgrass, and prairie junegrass. The dominant forbs include Cuman ragweed and field sagewort. The shrubs present in this plant community include rose, leadplant, and western sandcherry. Plant diversity has decreased and native plants tend to occur in individual colonies. This plant community has a high amount of litter covering the soil between widely dispersed mature plants. Recovery can be rapid with the restoration of grazing or fire. Soil erosion is low, and infiltration and runoff are not significantly different than the Reference Community.

Dominant plant species

- Woods' rose (*Rosa woodsii*), shrub
- prairie rose (*Rosa arkansana*), shrub
- western sandcherry (*Prunus pumila* var. *besseyi*), shrub
- sand bluestem (*Andropogon hallii*), grass
- prairie sandreed (*Calamovilfa longifolia*), grass
- needle and thread (*Hesperostipa comata*), grass
- porcupinegrass (*Hesperostipa spartea*), grass
- field sagewort (*Artemisia campestris*), other herbaceous
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous

Figure 14. 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 season-long grazing, growing season haying, overstocking, and prolonged drought are all occurrences that will move this community to the Degraded Native Grass Community.

**Pathway 1.1B
Community 1.1 to 1.4**

Prolonged interruption of the natural disturbances of herbivory and fire will convert this community to the Excessive Litter Community.

**Pathway 1.2A
Community 1.2 to 1.1**

Managed grazing, reduced stocking rate, and appropriately timed prescribed fire will move this community to the Reference Community.

**Pathway 1.2B
Community 1.2 to 1.3**

Continuous season-long grazing, growing season haying, overstocking, and prolonged drought will further degrade this community, causing a shift to the At-Risk Native Grass Community.

**Pathway 1.2C
Community 1.2 to 1.4**

Prolonged interruption of the natural disturbances of herbivory and fire will convert this community to the Excessive Litter Community.

**Pathway 1.3A
Community 1.3 to 1.2**

Managed grazing, reduced stocking rate, and appropriately timed prescribed will allow this

community to recover to the Degraded Native Grass Community.

Pathway 1.4A

Community 1.4 to 1.1

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

Pathway 1.4B

Community 1.4 to 1.2

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

State 2

Native/Invaded Grass State

This state consists of one plant community that has deteriorated from the Reference State and is dominated by warm-season shortgrasses and cool-season grasses. It may be invaded by introduced species such as smooth brome and Kentucky bluegrass. The loss of native warm-season tall- and midgrasses and functional groups results in increased bare soil. This ultimately reduces forage productivity, soil moisture retention, organic matter, and plant vigor.

Dominant plant species

- soapweed yucca (*Yucca glauca*), shrub
- twistspine pricklypear (*Opuntia macrorhiza*), shrub
- blue grama (*Bouteloua gracilis*), grass
- Scribner's rosette grass (*Dichanthelium oligosanthes var. scribnerianum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- field sagewort (*Artemisia campestris*), other herbaceous
- common sunflower (*Helianthus annuus*), other herbaceous
- Rocky Mountain beeplant (*Cleome serrulata*), other herbaceous

Community 2.1

Native Shortgrass/Invaded Grass Community

With sustained heavy stocking during the summer months this plant community will become dominated by cool-season grasses and forbs. The potential vegetation is about 75 percent grasses or grass-like plants, 20 percent forbs, and 5 percent shrubs. Dominant grasses include Kentucky bluegrass, sand dropseed, and blue grama. Other grasses or grass-likes include Scribner's rosettegrass, sedges, and smooth brome. Dominant forbs

include field sagewort, Cuman ragweed, Rocky Mountain beeplant, common sunflower, and a variety of thistles. The palatable warm-season tall- and midgrasses are replaced by blue grama and sand dropseed. Cool-season grasses such as Scribner's panicum, field brome, and Kentucky bluegrass increase to fill the void left by the disappearing warm-season tallgrasses. Sedges will flourish in the understory. Cuman ragweed and field sagewort increase in abundance along with other less-palatable forbs. Invading thistles and annual forbs increase along with grazing resistant shrubs such as cactus and soapweed yucca. Once this plant community is reached, time and external resources will be needed to see any significant recovery. Total annual production ranges from 900 to 1,500 pounds per acre of air-dried vegetation with a representative value 1,200 pounds per acre.

Dominant plant species

- twistspine pricklypear (*Opuntia macrorhiza*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass
- Scribner's rosette grass (*Dichanthelium oligosanthos var. scribnerianum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- field sagewort (*Artemisia campestris*), other herbaceous
- common sunflower (*Helianthus annuus*), other herbaceous
- Rocky Mountain beeplant (*Cleome serrulata*), other herbaceous

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	835	1014	1185
Forb	55	150	250
Shrub/Vine	10	36	65
Total	900	1200	1500

Figure 16. Plant community growth curve (percent production by month). NE6541, NE/SD Sandhills, Native Grass, Cool Seasons/Forbs. Cool-season dominant, warm-season subdominant, short & mid grasses.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	30	25	15	5	5	5	0	0

State 3 Erosion State

This state includes two community phases that have very little plant cover, few native

warm or cool-season grasses and few perennial forbs. The vegetation that is present consists of pioneer species. The majority of the plants are annual forbs with a lesser amount of short-lived perennial species. Erosion has occurred and may still be occurring. There is very little plant cover, little forage production and poor soil quality.

Dominant plant species

- blowout grass (*Redfieldia flexuosa*), grass
- sandhill muhly (*Muhlenbergia pungens*), grass
- sand bluestem (*Andropogon hallii*), grass
- lemon scurfpea (*Psoralidium lanceolatum*), other herbaceous

Community 3.1

Active Blowout Community

This plant community can be reached from any other plant community with significant disturbance. Large areas of blowing sand result in movement and possible enlargement of the blowout. Evaporation and transpiration of existing plants are extremely high due to bare ground, lack of litter, and few plants. Drought tolerant species exemplified by sandhill muhly and blowout grass are present.

Dominant plant species

- blowout grass (*Redfieldia flexuosa*), grass
- sandhill muhly (*Muhlenbergia pungens*), grass

Community 3.2

Annual/Pioneer Perennials Community

As succession progresses, sandhill muhly, blowout grass, and sand bluestem begin to colonize. Sandbur, lemon scurfpea, and annual sunflower follow, with prairie sandreed, hairy grama, and rose slowly becoming evident in this plant community.

Dominant plant species

- Woods' rose (*Rosa woodsii*), shrub
- prairie rose (*Rosa arkansana*), shrub
- blowout grass (*Redfieldia flexuosa*), grass
- sandhill muhly (*Muhlenbergia pungens*), grass
- sand bluestem (*Andropogon hallii*), grass
- hairy grama (*Bouteloua hirsuta*), grass
- prairie sandreed (*Calamovilfa longifolia*), grass
- lemon scurfpea (*Psoralidium lanceolatum*), other herbaceous
- common sunflower (*Helianthus annuus*), other herbaceous

Pathway 3.1A

Community 3.1 to 3.2

With prescribed grazing, this plant community may move to the Annual/Pioneer Perennial Plant Community.

Pathway 3.2A

Community 3.2 to 3.1

Heavy grazing or overgrazing will eventually shift Annual/Pioneer Perennials to the Active Blowout community phase.

State 4

Invaded Woody State

This state includes one plant community that has been invaded by eastern redcedar. The woody species are present due to lack of prescribed fire and brush management. The sites typically have a loss of native warm-season grasses, reduced forage production and reduced soil quality.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- Kentucky bluegrass (*Poa pratensis*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 4.1

Eastern Redcedar

This plant community can develop whenever eastern redcedar is adjacent to the originating plant community, and encroachment occurs. This can occur in areas adjacent to a seed source, such as near windbreaks. With prescribed burning, encroachment can be controlled. This plant community has a canopy cover of 15% or more mature trees. Total tree canopy cover can exceed 40%. The herbaceous component decreases proportionately in relation to the increase in canopy cover. This plant community is resistant to change. In higher canopy cover situations, the soil erosion will increase. The water cycle is also significantly altered under higher canopy cover. Infiltration is reduced because of interception of rainfall by the canopy. Runoff is not greatly increased, as the soil is still capable of absorbing the rainfall that reaches the soil surface.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- blue grama (*Bouteloua gracilis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

State 5

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 5.1

Reseeded Native Grass Community

The Reseeded Native Grass Community does not contain native remnants and 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 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 5.2

Seeded Pasture Community

This plant 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 provide the relatively high yields for the site.

Community 5.3

Natural Reclamation Community

This plant 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. The vegetation on this plant community varies greatly, sometimes being dominated by little bluestem, threeawn, sand dropseed, prairie sandreed, Canadian horseweed (marestail), common sunflower, tarragon, and/or Cuman ragweed. Other plants that occur on this plant community include rose, soapweed yucca, sand bluestem, switchgrass, and needle and thread. Compared to the Reference Community, warm-season natives have decreased and may be absent. Annual forbs and grasses have become established in the plant community. 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

- soapweed yucca (*Yucca glauca*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- prairie rose (*Rosa arkansana*), shrub
- Fendler threeawn (*Aristida purpurea* var. *longiseta*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- tarragon (*Artemisia dracuncululus*), other herbaceous
- Canadian horseweed (*Conyza canadensis*), other herbaceous
- common sunflower (*Helianthus annuus*), other herbaceous
- prairie sunflower (*Helianthus petiolaris*), other herbaceous

Transition T1A

State 1 to 2

Heavy grazing and inadequate rest periods can convert this plant state to the Native/Invaded Grass State. Continuous heavy grazing tends to accelerate this movement.

Transition T1B

State 1 to 3

Heavy grazing, prolonged drought, and soil disturbance can cause the site to transition from the Reference State to Erosion State.

Transition T1C **State 1 to 4**

Encroachment from lack of disturbance and disruption of the fire regime causes a transition from the Reference State to the Invaded Woody State.

Transition T1D **State 1 to 5**

Tillage followed by abandonment of cropping causes a transition from the Reference State to the Sodbusted State.

Restoration pathway R2A **State 2 to 1**

With long-term prescribed grazing and adequate recovery periods, this plant community will move through the successional stages leading to the Reference State. This change will require a long period of time and may be difficult to attain if the grama sod is extensive.

Transition T2A **State 2 to 3**

Heavy grazing, wildfires, and other disturbance causes transition from Native/Invaded Grass State to Erosion State.

Transition T2B **State 2 to 4**

Encroachment of eastern redcedar due to lack of disturbance and the disruption of the fire regime causes a transition from the Native/Invaded Grass State to the Invaded Woody State.

Transition T2C **State 2 to 5**

Tillage and abandonment of cropping causes transition from the Native/Invaded Grass State to the Sodbusted State

Restoration pathway R3A **State 3 to 1**

Under long-term prescribed grazing, including adequate rest periods, succession will progress leading to the Reference State. The slope, aspect, size, and relative abundance of perennial plants will influence the rate that change will occur.

Restoration pathway R3B State 3 to 2

Under long-term prescribed grazing, including adequate rest periods, succession will progress returning the site to the Native/Invaded Grass State. The slope, aspect, size, and relative abundance of perennial plants will influence the rate that change will occur.

Transition T3B State 3 to 4

Encroachment of eastern redcedar due to lack of mechanical disturbance and the disruption of the fire regime converts the Erosion State to the Invaded Woody State.

Restoration pathway R4A State 4 to 1

Adequate management that includes prescribed burning, brush management and prescribed grazing can restore this state to the previous state.

Restoration pathway R4B State 4 to 2

Adequate management that includes prescribed burning, brush management, and prescribed grazing can restore this state to the previous state.

Restoration pathway R4C State 4 to 3

Adequate management that includes prescribed burning, brush management and prescribed grazing can restore this state to the previous state.

Transition R4D State 4 to 5

Adequate management that includes prescribed burning, brush management and prescribed grazing can restore this state to the previous state.

Restoration pathway T5A State 5 to 4

Encroachment of eastern redcedar due to disruption of the fire regime and lack of mechanical treatment causes a transition to the Invaded Woody State.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Warm-season Tallgrass			945–1350	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	540–945	20–35
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	540–810	20–30
	switchgrass	PAVI2	<i>Panicum virgatum</i>	270–540	10–20
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	135–270	5–10
2	Warm-season Midgrass			540–810	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	405–675	15–25
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	135–270	5–10
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–135	0–5
3	Warm-season Shortgrass			135–270	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	27–135	1–5
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–135	0–5
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	0–81	0–3
4	Native Cool-season Grass			27–270	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	135–270	5–10
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	135–270	5–10
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	27–81	1–3
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	27–81	1–3
	Scribner's rosette grass	DIOLS	<i>Dichantherium oligosanthes</i> var. <i>scribnerianum</i>	27–81	1–3
5	Grass-likes			0–54	
	sedge	CAREX	<i>Carex</i>	0–54	1–3
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–27	–
Forb					
6	Forbs			135–270	

	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-54	0-2
	Forb, perennial	2FP	<i>Forb, perennial</i>	27-54	1-2
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0-54	0-2
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0-54	0-2
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0-54	0-2
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0-54	0-2
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0-54	0-2
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-54	0-2
	scaly blazing star	LISQG	<i>Liatris squarrosa var. glabrata</i>	0-54	0-2
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-54	0-2
	fourpoint evening primrose	OERH	<i>Oenothera rhombipetala</i>	0-54	0-2
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0-54	0-2
	large beardtongue	PEGR7	<i>Penstemon grandiflorus</i>	0-54	0-2
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	0-54	0-2
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-54	0-2
	goldenrod	SOLID	<i>Solidago</i>	0-27	0-1
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-27	0-1
Shrub/Vine					
7	Shrubs			27-135	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	27-81	1-3
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-81	0-3
	pricklypear	OPUNT	<i>Opuntia</i>	0-54	0-2
	western sandcherry	PRPUB	<i>Prunus pumila var. besseyi</i>	0-27	0-1
	rose	ROSA5	<i>Rosa</i>	0-27	0-1

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
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Grass/Grasslike					
1	Warm-season Tallgrass			875–1250	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	500–750	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	250–500	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	125–375	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–250	–
2	Warm-season Midgrass			500–750	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	500–750	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–250	–
3	Cool-season Bunchgrass			250–375	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	125–250	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–125	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	25–125	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	25–125	–
4	Warm-season Shortgrass			25–250	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	25–250	–
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	0–125	–
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	0–125	–
5	Cool-season Rhizomatous Grass			25–250	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	25–250	–
6	Grass-like			25–125	
	sedge	CAREX	<i>Carex</i>	25–125	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–50	–
7	Non-Native Grasses			0–125	
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–125	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–125	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–50	–
Forb					
8	Forbs			125–250	
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–50	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–50	–

	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–50	–
	scaly blazing star	LISQG	<i>Liatris squarrosa</i> var. <i>glabrata</i>	0–50	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–25	–
	large beardtongue	PEGR7	<i>Penstemon grandiflorus</i>	0–25	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0–25	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–25	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0–25	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–25	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–25	–
	thistle	CIRSI	<i>Cirsium</i>	0–25	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0–25	–
	hoary verbena	VEST	<i>Verbena stricta</i>	0–25	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–25	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–25	–
Shrub/Vine					
9	Shrubs			25–250	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–125	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–125	–
	western sandcherry	PRPUB	<i>Prunus pumila</i> var. <i>besseyi</i>	0–25	–
	rose	ROSA5	<i>Rosa</i>	0–15	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Warm-season Shortgrass			425–595	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	340–510	–
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	85–170	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–85	–
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	0–85	–
2	Cool-season Rhizomatous Grass			170–340	

	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	170–340	–
3	Warm-season Tallgrass			85–340	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	85–255	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–85	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–85	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–85	–
4	Cool-season Bunchgrass			85–340	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–170	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	17–170	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthos</i> var. <i>scribnerianum</i>	85–170	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–85	–
5	Non-Native Grasses			85–340	
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–170	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–170	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–85	–
6	Warm-season Midgrass			170–255	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	85–255	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	85–255	–
7	Grass-likes			85–170	
	sedge	CAREX	<i>Carex</i>	85–170	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–85	–
Forb					
8	Forbs			85–255	
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0–51	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–51	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–34	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–34	–
	scaly blazing star	LISQG	<i>Liatris squarrosa</i> var. <i>glabrata</i>	0–34	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–34	–
	rock spurge	LYHU	<i>Lycodesmia juncea</i>	0–17	–

	rusn skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0-17	-
	fourpoint evening primrose	OERH	<i>Oenothera rhombipetala</i>	0-17	-
	scurfpea	PSORA2	<i>Psoralidium</i>	0-17	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-17	-
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0-17	-
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0-17	-
	hoary verbena	VEST	<i>Verbena stricta</i>	0-17	-
	thistle	CIRSI	<i>Cirsium</i>	0-17	-
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	0-17	-
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0-17	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-17	-
Shrub/Vine					
9	Shrubs			17-85	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-85	-
	western sandcherry	PRPUB	<i>Prunus pumila var. besseyi</i>	0-17	-
	rose	ROSA5	<i>Rosa</i>	0-17	-

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Warm-Season Midgrass			120-240	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0-60	-
2	Warm-Season Shortgrass			60-240	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0-120	-
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	60-120	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-60	-
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0-60	-
3	Cool-Season Bunch Grass			60-180	

	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	120–240	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–60	–
4	Cool-Season Rhizomatous Grass			12–120	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	60–180	–
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	0–120	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–60	–
5	Grass-Like			60–120	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	12–120	–
6	Warm-Season Tallgrass			0–60	
7	Non-Native Grass			120–420	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	120–240	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–180	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–120	–
Forb					
8	Forb			60–240	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–60	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–60	–
	thistle	CIRSI	<i>Cirsium</i>	0–36	–
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	0–36	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	0–36	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–36	–
	hoary verbena	VEST	<i>Verbena stricta</i>	0–36	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–36	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–24	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–12	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–12	–
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	0–12	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0–12	–
Shrub/Vine					
9	Shrub			12–60	

	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–60	–
	Woods' rose	ROWO	<i>Rosa woodsii</i>	0–12	–
	prairie rose	ROAR3	<i>Rosa arkansana</i>	0–12	–

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, goats, and horses. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein allows ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. 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 the following stocking rate information along with animal preference data and actual stocking records, 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.

Plant Community - Production - AUM/ac*

Community 1.1, Reference Community: 2,700 lbs/ac, 0.74 AUM/Ac

Community 1.2, Degraded Native Grass Community: 2,500 lbs/ac, 0.69 AUM/Ac

Community 1.3, At-Risk Native Grass Community: 1,700 lbs/ac, 0.47 AUM/Ac

Community 2.1, Native Shortgrass/Invaded Grass Community: 1,200 lbs/ac, 0.33 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 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

Hydrology Functions

Water is the principal factor limiting forage production on this site. Normal rainfall is 18-25 inches per year. Soils on this site are in Hydrologic Soil Group A (low runoff and high infiltration even when thoroughly wetted). Water transmission through Group A soils is normally greater than 0.30 inches per hour. 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 Bluestem/Prairie Sandreed 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. Overall, this site has the appearance of being very 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

Seed harvest of native plant species can provide additional income on this site.

Inventory data references

Information presented here has been derived from field observations, NRCS clipping data, and other inventory data.

Field Offices:

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

Other references

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Approval

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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:** None. Water flow patterns are not expected on this site.

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

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):** None. Litter movement is not expected on this site.

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 5 to 14 inches (12 to 36 cm) thick. Soils are predominantly loamy fine sand and fine sandy loam. Color of A-horizon is dark grayish brown (10YR 4/2) dry and very dark gray (10YR/3/1) moist for loamy fine sand soils to grayish brown (10YR 5/2) dry, and very dark grayish brown (10YR 3/2) moist with fine sandy loams. Structure ranges from weak coarse blocky, weak coarse subangular blocky to weak medium granular.

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 90 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, tall, rhizomatous grasses (35-50%), native, perennial, warm-season, mid-grasses (20-30%), native, perennial, cool-season grasses (5-10%), native, perennial, warm-season, short grasses (5-10%), and grass-likes (0-2%).

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

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.

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, 945-1350#/ac, 35-50% (4 species minimum): sand bluestem, Indiangrass, switchgrass, prairie sandreed.

Phase 1.2

1. Native, perennial, warm-season, tallgrass, 875-1250#/ac, 35-50% (3 species minimum): sand bluestem, Indiangrass, switchgrass, big bluestem.

Phase 1.3

1. Native, Warm-season, Shortgrass, 425-595, 25-35% (2 species minimum): blue grama, hairy grama, thin paspalum, purple lovegrass.

Sub-dominant: Phase 1.1

1. Native, perennial, warm-season midgrass, 540-810 #/ac, 20-30% (2 species minimum): little bluestem, sand dropseed, sand lovegrass.

Phase 1.2

1. Native, perennial, warm-season midgrass, 500-750 #/ac, 20-30% (1 species minimum): little bluestem, sand dropseed.

2. Native, cool-season, bunchgrass, 250-375 #/ac, 10-15% (3 species minimum): needle and thread, porcupinegrass, prairie Junegrass, Scribner's rosette grass

Phase 1.3

1. Native, Cool-Season, Rhizomatous Grass, 170-340 #/ac, 10-20% (1 species minimum): western wheatgrass.

2. Native, warm-season, tallgrass, 85-340 #/ac, 5-a 20%, (2 species minimum) - big bluestem, sand bluestem, prairie sandreed, switchgrass.

3. Cool-season, bunchgrass, 85-340, 5-20%, (3 species minimum) - needle and thread, porcupinegrass, prairie Junegrass, Scribner's rosette grass.

4. Non-native grasses, 85-340 #/ac, 0-20%, (0 species minimum): smooth brome, Kentucky bluegrass, cheatgrass.

5. Native, warm-season, midgrass, 170-255 #/ac, 10-15%, (2 species minimum): little bluestem, sand dropseed.

6. Forbs, 85-255 #/ac, 5-15% (0 species minimum): forbs present vary from location to location.

Other: Minor - Phase 1.1

1. Native, perennial, warm-season, shortgrasses, 135-270 #/ac, 5-10%: blue grama, hairy grama, sandhill muhly.

2. Native forbs (perennial and annual), 135-270 #/ac, 5-10%: species vary from location to location.

3. Native, perennial, cool-season grass, 27-270 #/ac, 1-10%: western wheatgrass, needle and thread, porcupinegrass, prairie Junegrass, Scribner's rosette grass.

4. Shrubs, 27-135 #/ac, 1-5%: leadplant, prickly pear, western sandcherry, rose.

Minor - Phase 1.2

1. Native forbs (perennial and annual), 125-250 #/ac, 5-10%: species vary from location to location.

2. Native, warm-season, shortgrass, 25-250 #/ac, 1-10%: blue grama, thin paspalum, purple lovegrass;

3. Native, cool-season, rhizomatous grass, 25-250 #/ac, 1-10%: western wheatgrass.

4. Shrubs, 25-250 #/ac, 1-10%: leadplant, western sandcherry, other shrubs.

5. Grass-likes, 25-125 #/ac, 1-5%: sedges.

6. Non-native Grasses, 0-125 #/ac, 0-5%: smooth brome, Kentucky bluegrass, cheatgrass.

Minor - Phase 1.3

1. Grass-likes, 85-170 #/5-10%: sedges.

2. Shrubs, 17-85 #/ac, 1-5%: western sandcherry, rose, other shrubs.

Trace - Phase 1.1

1. Grass-likes, 0-54 #/ac, 0-2%: sedges, other grass-likes.

Additional: The Reference Community (1.1) includes seven F/S Groups. These groups in order of expected abundance are native, perennial, warm-season tallgrass; native, perennial, warm-season midgrass; native, perennial, warm-season short grass; native forb (perennial

and annual); native, perennial, cool-season grass; shrub; and grass-likes.

The Degraded Native Grass Community includes nine 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 bunchgrass; native forb; native, perennial, warm-season short grass; native, perennial, cool-season, rhizomatous grass; shrub; grass-likes; and non-native grass.

The At-Risk Native Grass Community (1.3) also includes nine groups.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** A few (less than 3%) dead centers may occur in bunchgrasses. Shrubs may show some dead branches as plants age.

14. **Average percent litter cover (%) and depth (in):** Plant litter cover is evenly distributed throughout the site and is expected to be 80-90% and a depth of 0.25 inches. Kentucky bluegrass excessive litter can negatively impact the functionality of this site.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Low: 2,200 lbs/ac, Normal: 2,700 lbs/ac, High 3,200 lbs/ac
Annual-production is 2,700 pounds per acre in a year with normal precipitation and temperatures. Low and High production years should yield 2,200 and 3,200 pounds per acre respectively.

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:** Kentucky bluegrass, smooth brome, silver bluestem, Caucasian bluestem, tall fescue, eastern redcedar, honey locust, musk thistle, common mullein, Sericea lespedeza, and others as they become known.

See Nebraska Invasive Species website: <https://neinvasives.com/plants>.

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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