USDA Natural Resources Conservation Service

Ecological site R066XY047NE
Saline Subirrigated

Last updated: 11/18/2024
Accessed: 05/13/2025

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

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): 066X–Dakota-Nebraska Eroded Tableland

The Dakota-Nebraska Eroded Tableland (MLRA 66) occurs in north-central Nebraska (56 percent) and south-central South Dakota (44 percent). MLRA 66 is approximately 3.6 million acres and covers all or parts of twelve counties between the two states. The northern border of the MRLA bisects Tripp County, South Dakota, just south of the town of Winner. Valentine is in the northeastern corner of Cherry County, Nebraska and is located on the MLRA's southwestern border. From there, the MLRA stretches southeast to the northwestern corner of Antelope County, Nebraska and the town of O'Neil, Nebraska in Holt County its southeastern border.

The MLRA occupies a smooth fluvial plain primarily consisting of broad intervalley areas with terraces, river breaks, and local badlands along the well-defined major drainages. The slopes range from nearly level tablelands to steep ridges and drainages. The elevation ranges from 1,970 to 2,950 feet. The Keya Paha, Elkhorn, and the Niobrara Rivers flow through the MLRA. The Niobrara is a designated National Scenic River.

Layers of shaly chalk and limestone marine sediments overlaying the Cretaceous Niobrara Formation make up the bulk of the MLRA, though the western and southwestern portions exhibit surface eolian deposits. The floors of the major drainages are underlain by deposits of alluvial sand and gravel. The dominant soil orders in this MLRA are mesic, ustic or aridic Mollisols and Entisols. Loamy and sandy are the primary soil textures in this landscape.

Twenty-seven percent of the land in this MLRA has been broken out of native prairie and farmed, while sixty-six percent of the grasslands remain intact. The remaining acres are divided between forest, urban development, and other uses. Livestock grazing, primarily by cattle, is a major industry. Corn, winter wheat, and grain sorghum are the primary commodity crops but a significant number of acres are planted to forage sorghum and alfalfa for harvest as hay. With limited irrigation available, and annual precipitation averaging from 18 inches in the west to 25 inches in the east, crop production is marginal across most of the MLRA.

The historical matrix vegetation type is mixed-grass prairie. Big bluestem, sand bluestem, prairie sandreed, little bluestem, sideoats grama, and blue grama make up the bulk of the warm-season species. Western wheatgrass, green needlegrass, and needle and thread are the dominant cool-season grasses. Large- and small-patch vegetative communities are found primarily along the riparian zones, on lowland sites, and in closed depressions. Woodlands make up about 3 percent of MLRA 66 and consist primarily of green ash, bur oak, and hackberry. Ponderosa pines can be found on steeper sites in the western portion of the landscape.

Wildlife flourishes in this combination of crop and grassland environments. In a landscape historically occupied by bison herds, white-tailed and mule deer are now the most abundant wild ungulates. Pronghorns also number among the remaining native grazers. A variety of smaller species, including coyote, raccoon, opossum, porcupines, muskrat, beaver, squirrel, prairie dogs, and mink, thrive in the region. Grassland birds, including several upland game birds, are common across the MLRA.

This landscape serves as a backdrop for a disturbance-driven ecosystem, evolving under the influences of herbivory, fire, and variable climate. Historically, these processes created a heterogeneous mosaic of plant communities and structure heights across the region. Any given site in this landscape burned every six to ten years, with most of the MLRA experiencing a six to eight year fire regime. The fires were caused by lightning strikes and were also set by Native Americans, who used fire for warfare, signaling, and to refresh the native grasses. Indigenous inhabitants understood the value of fire as a tool, and that the highly palatable growth following a fire provided excellent forage for their horses and attracted grazing game animals such as bison and elk.

Land use patterns by post-European settlers have greatly altered the historical fire regime, allowing the expansion of woody species. Fragmentation of the native grasslands by conversion to cropland, transportation corridors, and other developments has contributed to disruption of the natural fire regime of this ecosystem. The most common encroaching woody species is eastern redcedar. While eastern redcedar is native to the landscape, the historic population in MLRA 66 was limited to isolated pockets in rugged river drainageways that were protected from wildfire. Widespread plantings of windbreaks with eastern redcedar as a primary component provide a seed source for the aggressive woody plant which further facilitates woody encroachment. Encroachment of native and introduced shrubs and trees into the native grasslands degrades wildlife habit and causes significant forage loss for domestic livestock. Aggressive fire suppression policies have exacerbated this process to the point that shrub and tree encroachment is a major ecological threat to grasslands throughout most of the MLRA.

Classification relationships

►EPA◄
Level IV Ecoregions of the Conterminous United States
43—Northwestern Great Plains:
43i—Keya Paha Tablelands.

►USDA◄
Land Resource Regions and Major Land Resource Areas (USDA-NRCS, 2006)
Land Resource Region: G—Western Great Plains Range and Irrigated Region:
Major Land Resource Area (MLRA): 66 Dakota-Nebraska Eroded Tableland.

Ecological site concept

The Saline Subirrigated site is a run-on site that occurs on nearly level floodplains adjacent to streams and rivers or interdunal areas. This site is subject to flooding and consists of alluvial soils with varying degrees of seasonal moisture. Distinguishing features include surface salts, and a seasonal or perennial water table that is within 12 to 36 inches of the surface.

Vegetation in the Reference Plant Community (1.1) consists of a mix of cool- and warm-season midgrasses. Dominant grasses include alkali sacaton, saltgrass, and western wheatgrass. Grasses of secondary importance include alkali cordgrass, slender wheatgrass, little bluestem, and foxtail barley.

Associated sites

R066XY033NE	**Sands 18-22" P.Z.** The Sands 18-22 PZ ecological site may be found adjacent to the Saline Subirrigated ecological site but on a higher landscape position.
R066XY055NE	**Sands 22-25" P.Z.** The Sands 22-25 PZ ecological site may be found adjacent to the Saline Subirrigated ecological site but on a higher landscape position.
R066XY044NE	**Wet Land** The Wet Land ecological site is often located adjacent to the Saline Subirrigated ecological site but on a lower landscape position.
R066XY032NE	**Sandy 18-22" P.Z.** The Sandy 18-22 PZ ecological site may be found adjacent to the Saline Subirrigated ecological site but on a higher landscape position.
R066XY054NE	**Sandy 22-25 P.Z.** The Sandy 22-25 PZ ecological site may be found adjacent to the Saline Subirrigated ecological site but on a higher landscape position.

Similar sites

R066XY046NE	**Subirrigated** The Subirrigated and Saline Subirrigated ecological sites are located on a similar landscape positions and both sites have a seasonal or perennial high water table. The primary difference between these two sites is the presence of surface salts found on Saline Subirrigated ecological sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Sporobolus airoides* (2) *Distichlis spicata*

Physiographic features

The Saline Subirrigated ecological site is a run-on site that occurs on nearly level floodplains adjacent to streams and rivers and on interdunes in sandhills. It is subject to occasional flooding.

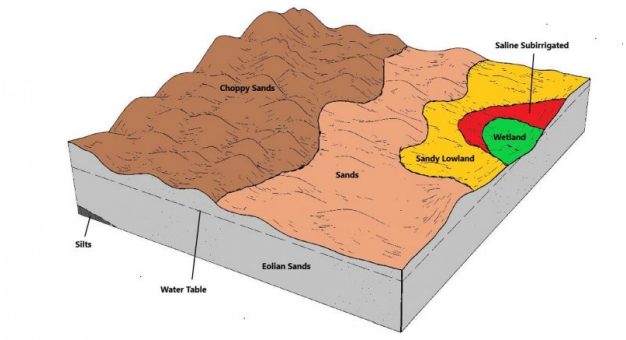


Figure 2. Block diagram of the Saline Subirrigated site.

Table 2. Representative physiographic features

Landforms	(1) Sandhills > Alluvial fan (2) Sandhills > Flood plain (3) Sandhills > Interdune
Runoff class	Negligible to very low
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare
Elevation	579–914 m
Slope	0–2%
Water table depth	30–91 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 66 is considered to have a continental climate with cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 18 to 25 inches per year. The normal average annual temperature is about 48°F. January is the coldest month with average temperatures ranging from about 19°F (Bonesteel, SD) to about 23°F (Ainsworth, NE). July is the warmest month with temperatures averaging from about 73°F (Harrington, SD) to about 75°F (Gregory, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 54°F. This large annual range attests to the continental nature of the climate this area. Hourly winds average about ten miles per hour annually, ranging from about 11 miles per hour during the spring to about nine miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of native cool-season plants begins mid to late March and continues to late June. Native warm-season plants begin growth in early May and continue to late August. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	115-117 days
Freeze-free period (characteristic range)	135-137 days
Precipitation total (characteristic range)	533 mm
Frost-free period (actual range)	114-118 days
Freeze-free period (actual range)	135-137 days
Precipitation total (actual range)	533 mm
Frost-free period (average)	116 days
Freeze-free period (average)	136 days
Precipitation total (average)	533 mm

Climate stations used

- (1) KILGORE 1NE [USC00254432], Kilgore, NE
- (2) MISSION 14 S [USC00395638], Mission, SD
- (3) MISSION [USC00395620], Mission, SD

Influencing water features

The Saline Subirrigated site has a combination of physical and hydrological features that provide season-long ground water within 3 feet of the surface, allow relatively free movement of water and air in the upper part of the soil, and are rarely flooded.

Wetland description

System Subsystem Class Sub-class
Cowardin, et al., 1979 Palustrine N/A Emergent Wetland Persistent

Stream Type: None
(Rosgen System)

Soil features

The soil series associated with the Saline Subirrigated ecological site are deep, somewhat poorly drained soils formed in sandy alluvium or eolian sands. Soil surface textures are fine sandy loam and loam. The surface layer is typically 2 to 4 inches thick. Soil structure ranges from weak fine, moderate fine, and medium granular to weak thin platy. These sites are located on either bottom lands or in Sandhills basins. The slopes generally are less than 1 percent but be up to 2 percent.

Runoff as evidenced by patterns of rills, gullies or other water flow is negligible due to the low 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.

The primary soil series correlated to the Saline Subirrigated ecological site is Lute. Additional 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 or visit Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov).

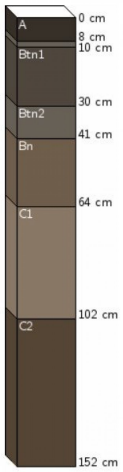


Figure 9. Selia series profile

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Fine sandy loam (2) Loam
Drainage class	Somewhat poorly drained
Permeability class	Very slow to slow
Soil depth	102–152 cm
Surface fragment cover <=3"	0%

Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	6.35–14.99 cm
Calcium carbonate equivalent (Depth not specified)	0–15%
Electrical conductivity (Depth not specified)	0–16 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–40
Soil reaction (1:1 water) (Depth not specified)	6.6–9.8
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

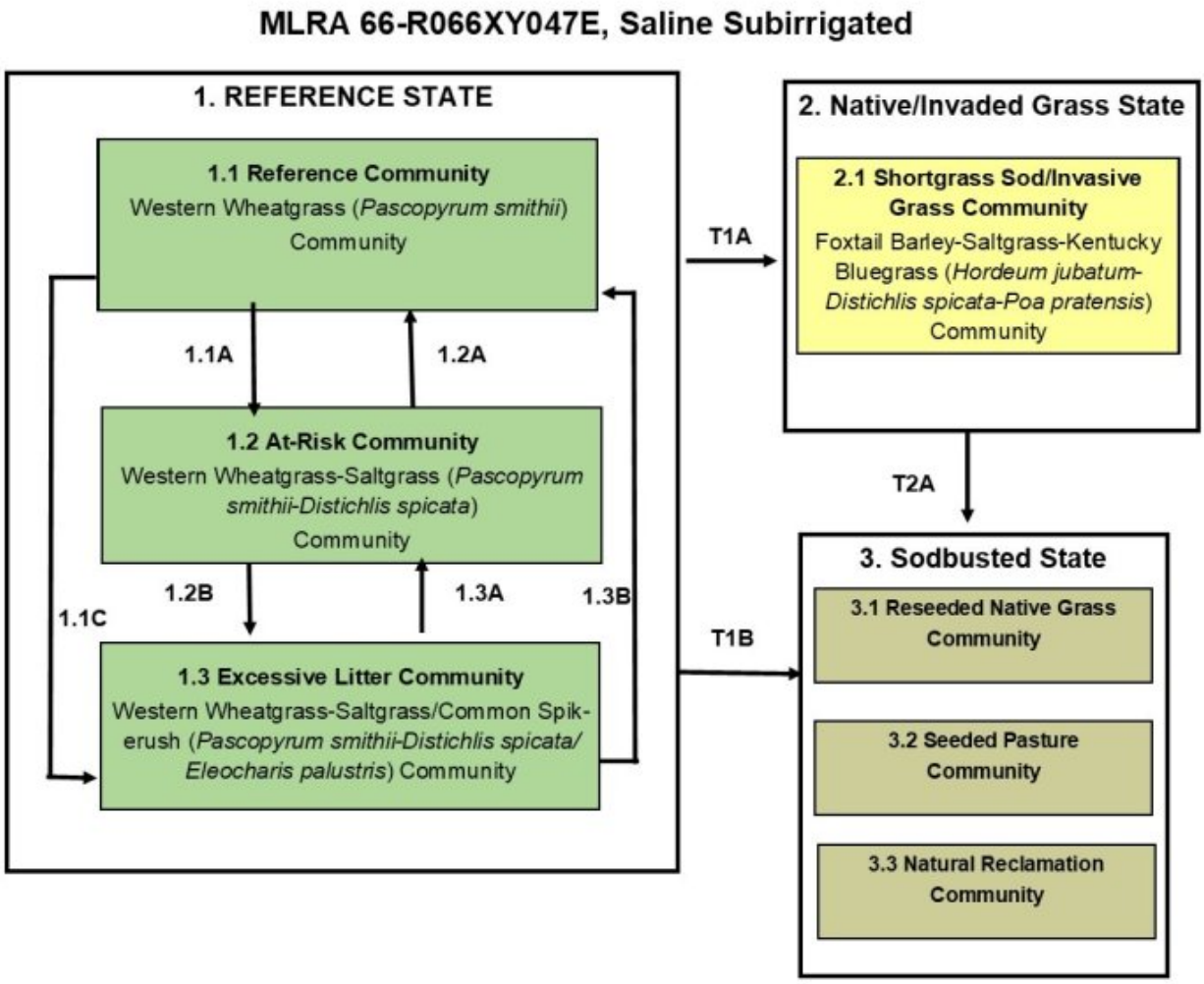
Saline Subirrigated ecological sites developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire, and other biotic and abiotic factors that typically influence soil and site development. This continues to be a disturbance-driven site with herbivory, fire, and variable climate being the primary disturbances. Changes occur in the plant communities due to short-term weather variations, impacts of native and exotic plant and animal species, and management actions.

The introduction of domestic livestock by European settlers along with season-long, continuous grazing and repetitive haying of these meadow sites had a profound impact on the vegetation of the Saline Subirrigated ecological site. Season-long, continuous grazing causes a repeated removal of the growing point and excessive defoliation of the leaf area of individual warm-season tallgrasses; repetitive annual haying during the same part of the growing season has a similar impact. The resulting reduction in the ability of the plants to harvest sunlight depletes root reserves, subsequently decreasing root mass. The ability of the plants to compete for nutrients is impaired, resulting in decreased vigor and eventual mortality. Species that evade negative grazing impacts through mechanisms such as a growing season adaptation (i.e., cool-season), growing points located near the soil surface, a shorter structure, or reduced palatability will increase. As this site deteriorates, alkali sacaton, alkali cordgrass, western wheatgrass, and slender wheatgrass will decrease in frequency and production while saltgrass and foxtail barley increase.

The State and Transition Model (STM) is depicted below and includes a Reference State (1), a Native/Invaded Grass State (2), and a Sodbusted State (3). 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.

Interpretations are primarily based on the Reference Community (1.1). It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts have been used as well. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

State and transition model



Transitions and Restorations:
T1A: Heavy, continuous grazing or repetitive haying with inadequate recovery periods.
T1B: Tillage to facilitate production agriculture.
T2A: Tillage to facilitate production agriculture.

Community Pathways:
1.1A: Continuous season-long grazing, rotational grazing with inadequate growing season recovery time, or repetitive haying.
1.1B: Prolonged absence (>5 years) of herbivory and fire.
1.2A: Prescribed grazing or haying with adequate growing season recovery periods.
1.2B: Prolonged absence (>5 years) of herbivory and fire.
1.3A: Prescribed grazing, prescribed burning.
1.3B: Prescribed grazing, prescribed burning.

Figure 10. State and Transition Model Diagram. MLRA 66, Saline Subirrigated Ecological Site.

State 1
Reference State

The Reference State (1) describes the range of vegetative community phases that occur on the Saline Subirrigated site where the natural processes are mostly intact. The Reference State developed under the combined influences of climatic conditions, periodic fire activity, grazing by large herbivores, and impacts from small mammals and insects. High perennial grass cover and production allows for increased soil moisture retention, vegetative production and overall soil quality. The Reference State includes three community phases which are the Reference Community (1.1), the At-Risk Community (1.2) and the Excessive Litter Community (1.3), The Reference Community serves as a description of the native plant community that naturally occurs on the site when the natural disturbance regimes are intact or closely mimicked by management practices. The At-Risk Community results from management actions that are unfavorable for a healthy Reference Community. The Excessive Litter Community occurs when herbivory and fire are eliminated from the landscape.

Dominant plant species

- alkali sacaton (*Sporobolus airoides*), grass
- saltgrass (*Distichlis spicata*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1
Reference Community

Interpretations are primarily based on the Reference or Alkali Sacaton-Western Wheatgrass-Saltgrass (*Sporobolus airoides-Pascopyrum smithii-Distichlis spicata*) Community (1.1). This community serves as a description of the native plant community that occurs on the site when the natural disturbance regimes are intact, or closely mimicked by management practices. This phase is dynamic, with fluid relative abundance and spatial boundaries between the dominant structural vegetative groups. These fluctuations are primarily driven by different responses of the species to changes in precipitation timing and abundance, and to fire and grazing events. This site developed with grazing by large herbivores and is well suited for grazing by domestic livestock. The plant community is dominated by warm- and cool-season midgrasses and the dominant plants are alkali sacaton, saltgrass, and western wheatgrass. Grasses of secondary importance include alkali cordgrass, slender wheatgrass, little bluestem, and foxtail barley. Plains bluegrass, sedges, and spike rushes occur as an understory. Forbs such as heath aster, milkvetch, and prairie gentian are significant. This plant community is 75 to 85 percent grasses, 10 to 20 percent grass-likes, and 1 to 5 percent forbs by air-dry weight. This plant community is adapted to high salt content inherent of the soils. White crusts can occupy many areas of the soil surface due to seasonal fluctuations in the water table. Natural fire played a significant role in the succession of this site by limiting the extent of eastern redcedar and other woody species. Wildfires have been actively controlled in recent times, allowing woody encroachment. This plant community can be found on areas that are managed with prescribed grazing, prescribed burning, and may be found on areas receiving occasional periods of short-term rest. This resilient community is well adapted to the Northern Great Plains climatic conditions. Plant diversity promotes strong tolerance to drought, site and soil stability, a functional hydrologic cycle, and a high degree of biotic integrity. These factors create a suitable environment for a healthy and sustainable plant community.

Dominant plant species

- alkali sacaton (*Sporobolus airoides*), grass
- saltgrass (*Distichlis spicata*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2354	3060	3760
Forb	–	78	163
Total	**2354**	**3138**	**3923**

Figure 12. Plant community growth curve (percent production by month). NE6642, Eroded Tableland, warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	8	18	27	23	12	6	3		

Community 1.2
At-Risk Community

In the At-Risk or Alkali Sacaton-Saltgrass (*Sporobolus airoides-Distichlis spicata*) Community (1.2), the more palatable warm-season grasses have been reduced due to continued defoliation during their critical growth periods. Warm-season shortgrasses and cool-season grasses have increased significantly. Plants which maintain low growing points are maintaining vigor. This plant community developed with continuous season-long grazing or rotational grazing with inadequate growing season recovery periods. This community will also develop with repetitive haying when adequate growing season recover is not allowed. Saltgrass and alkali sacaton have increased in abundance as compared to the Reference Community (1.1). Most of the palatable plants such as western wheatgrass, slender wheatgrass, and alkali cordgrass are present but occur in reduced amounts. This plant community is 75 to 85 percent grasses, 10 to 20 percent grass-likes, and 1 to 5 percent forbs by air-dry weight. While the soil is stable, soil health is affected by reduced efficiency in the nutrient and mineral cycles caused by decreases in plant litter and rooting depths. Hydrologic function is also impacted by this change in the plant community. Plant diversity has been reduced and total annual vegetative production has declined significantly. Although the water and nutrient cycles and energy flow are slightly reduced, they continue to adequately function. Appropriate grazing management techniques will stabilize the community and return the community to the Reference Community (1.1). Without a management change, this community is at-risk to degrade to the Native/Invaded Grass State (2).

Dominant plant species

- alkali sacaton (*Sporobolus airoides*), grass
- saltgrass (*Distichlis spicata*), grass

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1457	1858	2253
Forb	–	47	101
Total	**1457**	**1905**	**2354**

Figure 14. Plant community growth curve (percent production by month). NE6642, Eroded Tableland, warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	8	18	27	23	12	6	3		

Community 1.3
Excessive Litter Community

The Excessive Litter or Western Wheatgrass-Saltgrass/Common Spikerush (*Pascopyrum smithii-Distichlis spicata*/*Eleocharis palustris*) Community (1.3) develops when the natural disturbances of livestock grazing and fire have been removed from the land for a prolonged period of time (more than five years). Periodic fire may extend the amount of time it will take to reach this community. The litter amount has clearly increased and few or no sedges or understory shortgrasses are present. As the undisturbed duff layer deepens, infiltration of the precipitation is interrupted and evaporation increases significantly, simulating drought-like conditions. Typically, bunchgrasses have developed dead centers and rhizomatous grasses have formed small colonies due to a lack of tiller stimulation. Plant frequency and production have decreased. Pedestalling is usually evident. Salt crusts and annual plant species such as kochia and Russian thistle commonly fill bare ground areas. Plant frequency and production have decreased. The potential vegetation is 70 to 80 percent grasses, 15 to 25 percent grass-like plants, and 5 percent forbs. As compared to the Reference Community (1.1), 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. As the litter layer thickens, the health and vigor of native, warm-season, tall- and midgrasses declines. Soil erosion is low and infiltration and runoff are not significantly different than the Reference Community. This plant community will change rapidly when grazing or fire is returned to the landscape.

Dominant plant species

- western wheatgrass (*Pascopyrum smithii*), grass
- saltgrass (*Distichlis spicata*), grass
- common spikerush (*Eleocharis palustris*), grass

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1569	2077	2578
Forb	–	53	112
Total	**1569**	**2130**	**2690**

Figure 16. Plant community growth curve (percent production by month). NE6642, Eroded Tableland, warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	8	18	27	23	12	6	3		

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing, rotational grazing with inadequate growing season recovery periods, or repetitive haying with inadequate growing-season recovery periods will convert the Reference Community (1.1) to the At-Risk Community 1.2).

Pathway 1.1B
Community 1.1 to 1.3

Prolonged interruption (more than 5 years) of the natural disturbances of herbivory and fire will convert the Reference Community (1.1) to the Excessive Litter Community (1.3).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing with adequate recovery periods during the growing season will move the At-Risk Community (1.2) to the Reference Community (1.1). Rotational haying or haying with adequate growing season recovery periods will also facilitate this change.

Pathway 1.2B
Community 1.2 to 1.3

Prolonged interruption (more than 5 years) of the natural disturbances of herbivory and fire will result in conversion of the At-Risk Community (1.2) to the Excessive Litter Community (1.3).

Pathway 1.3A
Community 1.3 to 1.1

Reintroduction of the natural processes of herbivory and fire will return the Excessive Litter Community (1.3) to the Reference Community (1.1).

Pathway 1.3B
Community 1.3 to 1.2

Reintroduction of the natural processes of herbivory and fire will allow the vegetation to return the Excessive Litter Community (1.3) to the At-Risk Community (1.2).

State 2
Native/Invaded Grass State

The Native/Invaded Grass State (2) has been degraded from the Reference State (1) and much of the native warm-season tall- and midgrass component has been replaced by warm-season shortgrass and non-native cool-season grass. The Native/Invaded Grass State develops with long-term (more than 15 years) continuous heavy grazing or repetitive haying. The Native/Invaded Grass State includes the Shortgrass Sod/Invasive Grass Community (2.1). The biotic community, soils and hydrology have been degraded to the extent that a return to the Reference State (1) is unlikely.

Dominant plant species

- saltgrass (*Distichlis spicata*), grass
- foxtail barley (*Hordeum jubatum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- cheatgrass (*Bromus tectorum*), grass
- Grass-like, perennial (*Grass-like, perennial*), other herbaceous

Community 2.1
Shortgrass Sod/Invasive Grass Community

The Shortgrass Sod/Invasive Grass or Foxtail Barley-Saltgrass-Kentucky Bluegrass (*Hordeum jubatum-Distichlis spicata-Poa pratensis*) Community (2.1) develops with long-term (more than fifteen years), heavy, continuous grazing. Saltgrass dominates this plant community and has developed into a sod bound condition. Alkali sacaton has been greatly reduced. Slender and western wheatgrass are either remnants or no longer in the plant community and have been replaced by increased amounts of foxtail barley and non-native cool-season grasses. Pricklypear has increased. Cheatgrass is a common invasive grass; in areas where the soil has a lower salt content, Kentucky bluegrass may be also common. Forbs such as kochia and Russian thistle have also increased. This plant community is 75 to 85 percent grasses, 10 to 20 percent grass-likes, and 1 to 5 percent forbs by air-dry weight. The plant community lacks species diversity. Evaporation has increased resulting in a higher salt content on the soil surface. Organic matter and carbon reserves are severely diminished. Renovation by interseeding and chemical control of existing sod-forming grasses while possible, would be quite costly, due to the high salt content and high water table which together limit species selection for seedings.

Dominant plant species

- saltgrass (*Distichlis spicata*), grass
- foxtail barley (*Hordeum jubatum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- cheatgrass (*Bromus tectorum*), grass
- Grass-like, perennial (*Grass-like, perennial*), other herbaceous

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	897	1093	1283
Forb	–	28	62
Total	**897**	**1121**	**1345**

Figure 18. Plant community growth curve (percent production by month). NE6642, Eroded Tableland, warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	8	18	27	23	12	6	3		

State 3
Sodbusted State

The threshold to the Sodbusted State (3) is crossed as a result of tillage to facilitate production agriculture. When the land is no longer cropped, the resulting state is the Sodbusted State. When farming operations are suspended, the site can seeded to native grasses and forms resulting in the Reseeded Native Grass Community (3.1), be seeded to a tame pasture forage mixture resulting in the Seeded Pasture Community (3.2) or be abandoned with no seeding which will result in the Natural Reclamation Community (3.3). Permanent alterations of the soil, plant community, and hydrologic cycle make restoration to the Reference State (1) extremely difficult, if not impossible. Formation of a compacted plowpan in the soil profile is likely.

Community 3.1
Reseeded Native Grass Community

The Reseeded Native Grass Community (3.1) does not contain native remnants, and varies considerably depending upon the seed mixture, the degree of soil erosion, the age of the stand, fertility management, and past grazing management. Native range and grasslands seeded to native species are ecologically different and should be managed separately. Factors such as functional group, species, stand density, and improved varieties all impact the production level and palatability of the seedings. Species diversity is often limited, and when grazed in conjunction with native rangelands, uneven forage utilization may occur. Total annual production during an average year varies significantly depending upon precipitation, management, and grass species seeded. Prescribed grazing including appropriate utilization levels, adequate growing-season recovery periods, and timing of grazing that favor the productivity, health, and vigor of the seeded species is required to maintain this community. Periodic prescribed burning and brush management may also be needed.

Community 3.2
Seeded Pasture Community

The Seeded Pasture Community (3.2) does not contain native remnants and varies considerably depending upon the extent of soil erosion, the species seeded, the quality of the stand that was established, the age of the stand, and management of the stand since establishment. There are several factors that make seeded tame pasture a different grazing resource than native rangeland and land seeded to a native grass mixture. Factors such as species selected, stand density, improved varieties, and harvest efficiency all impact production levels and palatability. Species diversity on seeded tame 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 and stand longevity 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 species seeded. Improved varieties of warm-season or cool-season grasses are recommended for optimum forage production. Fertilization, weed management, and prescribed grazing including appropriate utilization levels, adequate growing-season recovery periods, and timing of grazing that favor the productivity, health, and vigor of the seeded species are required to maintain this community. Periodic prescribed burning and brush management may also be needed.

Community 3.3
Natural Reclamation Community

The Natural Reclamation Community (3.3) consists of early successional annual and perennial forbs and less desirable grasses. These sites have been farmed and abandoned without being reseeded. Soil organic matter and carbon reserves are reduced, soil structure is changed, and a plowpan or compacted layer can form, which decreases water infiltration. Residual synthetic chemicals may remain from farming operations. In early successional stages, this community is not stable. The hazard of erosion is a resource concern. 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.

Transition T1A
State 1 to 2

Heavy, continuous season-long grazing or repetitive haying with inadequate recovery time will cause the Reference State (1) to transition to the Shortgrass Sod State (2). Heavy rotational grazing without allowing adequate growing season recover time will also facilitate this transition.

Transition T1B
State 1 to 3

The Reference State (1) has been significantly altered by tillage to allow the site to be placed into production agriculture resulting in the Sodbusted State (3). Permanent alterations of the soil, plant community, and the hydrologic cycle make restoration to the Reference State (1) extremely difficult, if not impossible. Formation of a compacted plowpan in the soil profile is likely.

Transition T2A
State 2 to 3

The Shortgrass Sod State (2) has been significantly altered by tillage to allow the site to be placed into production agriculture resulting in the Sodbusted State (3). The disruption to the plant community, the soil, and the hydrology of the system make restoration to the Shortgrass Sod State unlikely.,

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Tall and Mid Bunchgrass**			628–1412	
	alkali sacaton	SPAI	*Sporobolus airoides*	628–1412	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–314	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–157	–
	Grass, perennial	2GP	*Grass, perennial*	0–31	–
2	**Warm-Season Shortgrass**			314–785	
	saltgrass	DISP	*Distichlis spicata*	314–628	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–157	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–157	–
	Grass, perennial	2GP	*Grass, perennial*	0–31	–
3	**Cool-Season Rhizomatous Grass**			314–628	
	western wheatgrass	PASM	*Pascopyrum smithii*	314–628	–
4	**Warm-Season, Rhizomatous Tallgrass**			157–471	
	switchgrass	PAVI2	*Panicum virgatum*	0–471	–
	alkali cordgrass	SPGR	*Spartina gracilis*	157–314	–
	Grass, perennial	2GP	*Grass, perennial*	0–31	–
5	**Cool-Season Bunchgrass**			63–314	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	157–314	–
	plains bluegrass	POAR3	*Poa arida*	157–314	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–157	–
	Grass, perennial	2GP	*Grass, perennial*	0–31	–
6	**Grasslike**			157–471	
	sedge	CAREX	*Carex*	63–314	–
	rush	JUNCU	*Juncus*	0–157	–
	spikerush	ELEOC	*Eleocharis*	94–157	–
	bulrush	SCHOE6	*Schoenoplectus*	0–157	–
	Grass-like, perennial	2GLP	*Grass-like, perennial*	0–157	–
Forb					
7	**Forb**			0–157	
	Forb, perennial	2FP	*Forb, perennial*	0–63	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–31	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–31	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–31	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–31	–
	milkvetch	ASTRA	*Astragalus*	0–31	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–31	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Tall and Mid Bunchgrass**			381–762	
	alkali sacaton	SPAI	*Sporobolus airoides*	381–762	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–95	–
	Grass, perennial	2GP	*Grass, perennial*	0–38	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–38	–
2	**Warm-Season Shortgrass**			572–762	
	saltgrass	DISP	*Distichlis spicata*	572–762	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–95	–
	Grass, perennial	2GP	*Grass, perennial*	0–38	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–38	–
3	**Cool-Season Rhizomatous Grass**			0–95	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–95	–
4	**Warm-Season Rhizomatous Tallgrass**			0–95	
	alkali cordgrass	SPGR	*Spartina gracilis*	0–95	–
	switchgrass	PAVI2	*Panicum virgatum*	0–38	–
5	**Cool-Season Bunchgrass**			95–191	
	foxtail barley	HOJU	*Hordeum jubatum*	95–191	–
	plains bluegrass	POAR3	*Poa arida*	0–95	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–95	–
	Grass, perennial	2GP	*Grass, perennial*	0–38	–
6	**Non-Native Cool-Season Grass**			0–95	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–95	–
7	**Grasslike**			95–286	
	sedge	CAREX	*Carex*	95–191	–
	rush	JUNCU	*Juncus*	0–95	–
	spikerush	ELEOC	*Eleocharis*	0–95	–
	bulrush	SCHOE6	*Schoenoplectus*	0–95	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–95	–
Forb					
8	**Forb**			0–95	
	Forb, perennial	2FP	*Forb, perennial*	0–38	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–38	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–38	–
	milkvetch	ASTRA	*Astragalus*	0–19	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	0–19	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–19	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–19	–
	common dandelion	TAOF	*Taraxacum officinale*	0–19	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–19	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Tall and Mid Bunchgrass**			319–639	
	alkali sacaton	SPAI	*Sporobolus airoides*	319–639	–
	little bluestem	SCSC	*Schizachyrium scoparium*	106–213	–
2	**Warm-Season Shortgrass**			319–639	
	saltgrass	DISP	*Distichlis spicata*	319–639	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–106	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–43	–
	Grass, perennial	2GP	*Grass, perennial*	0–43	–
3	**Cool-Season Rhizomatous Grass**			213–426	
	western wheatgrass	PASM	*Pascopyrum smithii*	213–426	–
4	**Warm-Season Rhizomatous Tallgrass**			106–319	
	switchgrass	PAVI2	*Panicum virgatum*	106–319	–
	alkali cordgrass	SPGR	*Spartina gracilis*	0–106	–
	Grass, perennial	2GP	*Grass, perennial*	0–43	–
5	**Cool-Season Bunchgrass**			319–426	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	213–319	–
	plains bluegrass	POAR3	*Poa arida*	106–213	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–106	–
	Grass, perennial	2GP	*Grass, perennial*	0–43	–
6	**Non-Native Cool-Season Grass**			0–43	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–43	–
7	**Grass-like**			213–426	
	sedge	CAREX	*Carex*	106–319	–
	rush	JUNCU	*Juncus*	0–213	–
	spikerush	ELEOC	*Eleocharis*	0–213	–
	bulrush	SCHOE6	*Schoenoplectus*	0–213	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–106	–
Forb					
8	**Forb**			0–106	
	Forb, perennial	2FP	*Forb, perennial*	0–43	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–21	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–21	–
	milkvetch	ASTRA	*Astragalus*	0–21	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	0–21	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–21	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–21	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–21	–
	common dandelion	TAOF	*Taraxacum officinale*	0–21	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–21	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Tall and Mid Bunchgrass**			0–112	
	alkali sacaton	SPAI	*Sporobolus airoides*	0–112	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–22	–
	Grass, perennial	2GP	*Grass, perennial*	0–22	–
2	**Warm-Season Shortgrass**			673–1009	
	saltgrass	DISP	*Distichlis spicata*	673–1009	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–22	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–22	–
	Grass, perennial	2GP	*Grass, perennial*	0–22	–
3	**Cool-Season Bunchgrass**			56–168	
	foxtail barley	HOJU	*Hordeum jubatum*	56–168	–
	plains bluegrass	POAR3	*Poa arida*	0–22	–
	Grass, perennial	2GP	*Grass, perennial*	0–22	–
4	**Grass-like**			56–168	
	sedge	CAREX	*Carex*	56–112	–
	spikerush	ELEOC	*Eleocharis*	0–56	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	0–56	–
	rush	JUNCU	*Juncus*	0–56	–
	bulrush	SCHOE6	*Schoenoplectus*	0–56	–
	Grass-like, perennial	2GLP	*Grass-like, perennial*	0–56	–
5	**Non-Native Cool-Season Grass**			0–22	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–22	–
Forb					
6	**Forb**			0–56	
	Forb, perennial	2FP	*Forb, perennial*	0–22	–
	Forb, annual	2FA	*Forb, annual*	0–22	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–22	–
	milkvetch	ASTRA	*Astragalus*	0–11	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	0–11	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–11	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–11	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–11	–
	common dandelion	TAOF	*Taraxacum officinale*	0–11	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–11	–

Animal community

LIVESTOCK - GRAZING INTERPRETATIONS:
Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area

may provide year-long forage for cattle, sheep, or horses. During the dormant period, the protein levels of the forage may be lower than the minimum needed to meet livestock (primarily cattle and sheep)requirements.

The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Production and Carrying Capacity*
Community 1.1, Reference Community: 2,800 lbs/acre, 0.77 AUM/acre
Community 1.2, At-Risk Community: 1,700 lbs/ac, 0.47 AUM/acre
Community 1.3, Excessive Litter Community: 1,900 lbs/acre, 0.52 AUM/acre

*Based upon the following conditions: continuous season-long grazing by cattle under average growing conditions, 25 percent harvest efficiency. Air dry forage requirements based on 3 percent of animal body weight, or 912 lbs/AU/month.

WILDLIFE INTERPRETATIONS:
Major Land Resource Area (MLRA) 66 lies primarily within the Mixed-grass prairie ecosystem. Though European settlers have converted about a quarter of this landscape to farmland, the majority 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 bromegrass, Kentucky bluegrass, nodding plumeless thistle (musk thistle), and Canada thistle further degrade the biological integrity of many areas of the prairie.

Hydrological functions

Forage production on the saline Subirrigated site is limited by saline conditions. Appropriate management is critical to the continued productivity of these sites. Grass re-establishment on overgrazed or tilled sites is often slow and difficult because increased evaporation (from exposed soil surfaces) causes increased salt concentration at the soil surface. The soils on this site are in Hydrologic Soil Group A. The high water tables provide subirrigation for salt

tolerant vegetation. Surrounding upland areas tend to have permeable soils and surface inflow peaks on these sites are often muted. These sites do not flood or are flooded only occasionally for brief periods.

Rills, gullies and water flow patterns are not present. Pedestals are only slightly present. Litter falls in place, and signs of movement are not common. Chemical and physical crusts are rare, and not significant for hydrologic considerations. Cryptogamic crusts may be present but are not significant for hydrologic considerations. Overall, this site has the appearance of being stable and productive except areas of white crust (salts) may be present.

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.

Other information

Field Offices (Counties)
Nebraska:
Ainsworth, (Brown, Keya Paha, and Rock)
Bloomfield, (Knox,)
Spencer (Boyd)
Neligh (Antelope)
O'Neill, (Holt)
Valentine, (Cherry)

South Dakota:
Burke, (Gregory)
Martin, (Bennett and Shannon)
Winner, (Tripp)
White River, (Mellette and Todd)

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range- trained personnel also were used. Those involved in developing this site include Wayne Bachman, Soil Scientist, NRCS; Stan Boltz, Range Management Specialist, NRCS; Anna Ferguson, Soil Conservationist, NRCS; Roger Hammer, Soil Scientist, NRCS; Dana Larsen, Range Management Specialist, NRCS; Dave Schmidt, Rangeland Management Specialist, NRCS; Kim Stine, Rangeland Management Specialist, NRCS.

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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	11/18/2024
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 terracettes are not expected on this site. Alkali sacaton tends to have a hummocky growth form that may appear pedestalled.

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

   Bare ground is exposed mineral soil that is not covered by vegetation (basal and/or foliar canopy), 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 areas and depositional areas are not expected on this site.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Litter movement is not expected.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability ratings should typically be 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The surface layers range from a depth of 3 to 4 inches (7.6-10.2 cm) thick. Soil color ranges from gray to dark gray (values of 4 to 5) dry and dark grayish brown, dark gray, very dark gray, dark grayish brown, to very dark grayish brown (values of 3 to 4) moist. Lute is the soil series correlated to this ecological site.

   Soil surface structure is typically weak fine granular in the A-horizon and single grained in the E-horizon. These soils are slightly to strongly saline and moderately to very strongly alkaline which adversely impacts plant species composition

and growth.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The functional/structural groups provide a combination of rooting depths and structure which positively influences infiltration. Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool season grasses) with fine and coarse roots positively influences infiltration. Woody encroachment may adversely impact infiltration on this site.

    The expected composition of the plant community is 75 to 85 percent grasses, 10 to 20 percent grass-likes, and 1 to 5 percent forbs. The perennial grass component is made up of warm-season, tall and mid, bunchgrasses (20-45%); warm-season, short grasses (10-25%); cool-season, rhizomatous grasses (10-20%), tall, warm-season, rhizomatous grasses (0-15%); and cool-season, bunchgrasses (2-10%).

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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. A compaction layer should not be present.

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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, C4, tall and mid bunchgrass, 560-1260 #/ac, 20-45% (1 species minimum): alkali sacaton, little bluestem, sand dropseed.
    2. Native, perennial, C4, shortgrass, 280-700 #/ac, 10-25% (1 species minimum): saltgrass, blue grama, scratchgrass

    Phase 1.2
    1. Native, perennial, C4, shortgrass, 510-680 #/ac, 30-40% (1 species minimum): blue grama, scratchgrass, saltgrass.
    2. Native, perennial, C4, tall and mid bunchgrass, 340-680 #/ac, 20-40% (1 species minimum): alkali sacaton, little bluestem, sand dropseed.

    Phase 1.3
    1. Native, perennial, C4, tall and mid bunchgrass, 285-570 #/ac, 15-30% (2 species minimum): alkali sacaton, little bluestem.
    2. Native, perennial, C4, shortgrass, 285-570 #/ac, 15-30% (1 species minimum): blue grama, scratchgrass, saltgrass.

    Sub-dominant: Phase 1.1
    1. Native, perennial, C3, rhizomatous grass, 280-560 #/ac, 10-20% (1 species minimum): western wheatgrass
    2. Grass-like, 140-420 #/ac, 5-15% (2 species minimum): sedge, rush, spikerush, bulrush, other grass -likes.
    3. Native, perennial, C4, rhizomatous tallgrass, 140-420 #/ac, 5-15% (1 species minimum): switchgrass, alkali cordgrass.

    Phase 1.2
    1. Grass-likes, 85-255 #/ac, 5-15% (1 species minimum): sedge, rush, spikerush, bulrush

    Phase 1.3
    1. Native, perennial, C3, bunchgrass, 285-380 #/ac, 15-20% (2 species minimum): foxtail barley, plains bluegrass, slender wheatgrass.
    2. Native, perennial, C3, rhizomatous grass, 190-380 #/ac, 10-20% (1 species minimum): western wheatgrass.
    3. Grass-likes, 190-380 #/ac, 10-20% (1 species minimum): sedge, rush, spikerush, bulrush.

4. Native, perennial, C4, rhizomatous, tallgrass, 95-285 #/ac, 5-15% (1species minimum): switchgrass, alkali cordgrass.

Other: Minor - Phase 1.1
1. Native, perennial, C3, bunchgrass, 56-280 #/ac, 2-10%: slender wheatgrass, plains bluegrass, foxtail barley
2. Native forbs, 0-140 #/ac, 0-5%: forbs present vary from location to location.

Minor - Phase 1.2
1. Native, perennial, C3, bunchgrass, 85-170 #/ac, 5-10%: foxtail barley, plains bluegrass, slender wheatgrass.
2. Native, perennial, C3, rhizomatous grass, 0-85 #/ac, 0-5%: western wheatgrass.
3. Native, perennial, C4, rhizomatous, tallgrass, 0-85 #/ac, 0-5%: alkali cordgrass, switchgrass.
4. Native forbs, 0-85 #/ac, 0-5%: forbs present vary from location to location.
5. Non-native C3 grass, 0-85 #/ac, 0-5%: Kentucky bluegrass.

Minor - Phase 1.3
1. Native forbs, 0-95 #/ac, 0c-5%: forbs present vary from location to location.

Trace - Phase 1.3
1. Non-native, C3 grass, 0-38 #/ac, 0-2%: Kentucky bluegrass.

Additional: The Reference Community (1.1) includes seven F/S groups. These groups are, in order of relative abundance, native, perennial, C4, tall and mid bunchgrass; native, perennial, C4, shortgrass; native, perennial, C3, rhiz. grass; grass-likes = native, perennial, C4, tall and mid rhizomatous grass; native, perennial, C3 bunchgrass; native forbs.

The Degraded Native Community (1.2) includes eight F/S groups. These groups are, in order of relative abundance, native, perennial, C4, shortgrass; native, perennial, C4, tall and mid bunchgrass; grass-likes; native, perennial, C3, bunchgrass; native, perennial, C3 rhizomatous grass = native, perennial, C4, rhiz. tallgrass = native forb = non-native, C3 grass.

The Excessive Litter Community (1.3) includes: native, perennial, C4, tall and mid bunchgrass = native, perennial, C4 shortgrass; native, perennial C3 bunchgrass; native, perennial, C3, rhiz. grass = native, perennial, C4, rhiz., tallgrass; grass-like, forb and non-native, C3 grass.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Bunch grasses have strong, healthy centers with few (less than 3 percent) dead centers. Shrubs may show some dead branches (less than 5 percent) 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 60 to 80 percent and at a depth of approximately 0.25 to 0.5 inch (0.64-1.27 cm).

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** The representative value (RV) for annual production is 2,800 pounds per acre on an air dry weight basis. Low and High production years should yield 2,100 and 3,500 pounds per acre respectively.

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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. Canada thistle, Russian olive, and eastern redcedar are known invasives that have the potential to become dominant or co-dominant on this site. Consult the state noxious weed and state watch lists for potential invasive species. Note: species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants.

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17. **Perennial plant reproductive capability:** All perennial species exhibit high vigor relative to recent weather 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.
