USDA Natural Resources
Conservation Service

# Ecological site R065XY025NE
# Saline Subirrigated

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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.

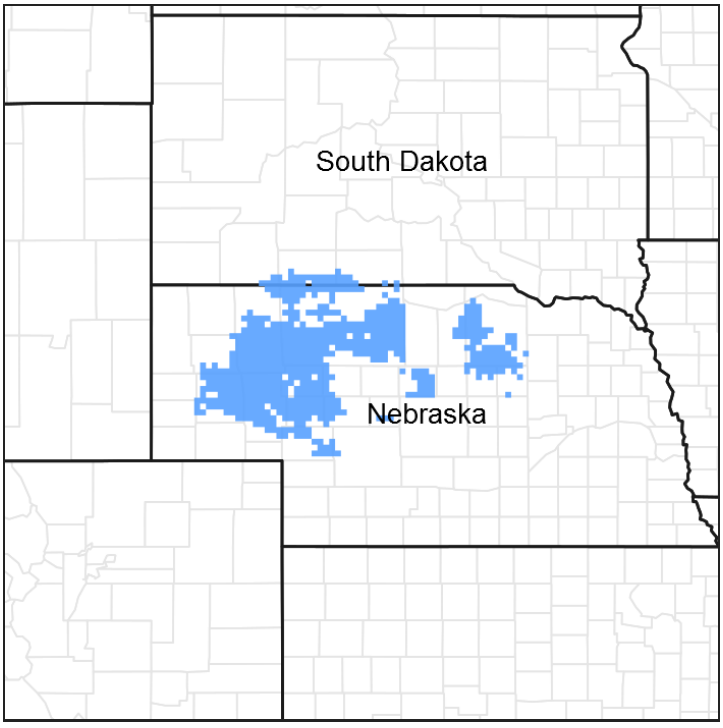



**Figure 1. Mapped extent**

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): 065X–Nebraska Sand Hills

The Nebraska Sand Hills (MLRA 65) is located in Nebraska (98 percent) and South Dakota (2 percent) and encompasses approximately 13.2 million acres (534,201 hectares)

or 20,625 square miles (53,420 square kilometers). The largest town in the MLRA is North Platte, Nebraska and numerous small towns and villages are located within the MLRA, including the county seats of Arthur, Bartlett, Bassett, Brewster, Greeley, Hyannis, Mullen, Thedford, and Tryon, Nebraska. The Niobrara River is near the northern boundary while the North Platte River flows along the southwest boundary of the area. The North Loup, Middle Loup, Calamus, Snake, and Dismal Rivers and Long Pine Creek occur in the central and eastern portion of the area.

Fort Niobrara, Crescent Lake, and Valentine National Wildlife Refuges and portions of the Nebraska National Forest, including the Bessey Ranger District and Samuel R. McKelvie National Forest, are located within this MLRA. The Bessey Ranger District includes the largest human-planted forest in the United States and is home to the Bessey Tree Nursery which is listed on the National Register of Historic Places.

This MLRA is defined by an 8,000 year-old landscape of sand hills dominated by rolling to steep sand dunes with narrow, elongated, nearly level to steeply sloping valleys between the dunes. Dune heights range from 10 to 400 feet (3 to 130 meters) and slopes may exceed twenty-five percent. Dune complexes often extend for several miles in a northwest to southeast direction. These Quaternary sand dunes are derived from the underlying Tertiary Ogallala and Arikaree Group which formed when rivers deposited sediments from erosional detritus after the uplift of the Rocky Mountains to the west. The Nebraska Sand Hills are the largest sand dune area in the Western Hemisphere and one of the largest grass-stabilized dune regions in the world. The soils of the MLRA are principally derived from deep eolian sand.

The Ogallala aquifer underlies the MLRA and is the most extensive and heavily used aquifer of the high plains between the Rocky Mountains and Mississippi River. The aquifer is at its thickest in the Sand Hills which are a primary recharge are for the aquifer. Numerous small permanent and intermittent lakes and wetlands occur in the MLRA. While the dominant source of water for these lakes is precipitation, groundwater discharge is important to maintaining these lakes especially in drier years. A number of these lakes, especially in the western portion of the MLRA are alkaline.

Considered to be a western extension of the tallgrass prairie, the matrix vegetation is a unique mix of species that is sometimes identified as Sandhills Prairie. Sand bluestem, prairie sandreed, Indiangrass, switchgrass, sand lovegrass, little bluestem, and needle and thread are the primary grasses. Porcupinegrass is a significant cool-season grass in the eastern portion of the MLRA while blue grama and hairy grama are important warm-season grasses in the western portion due to differences in precipitation. Soils which have a high water table support a tallgrass prairie dominated by big bluestem, switchgrass, Indiangrass, prairie cordgrass, and a variety of grass-likes. The endangered plant blowout penstemon (Penstemon haydenii) is found in this MLRA.

More than ninety percent of the land in MLRA 65 is native grassland utilized by grazing livestock. Areas along streams and in subirrigated valleys are utilized for prairie hay.

Wetlands, legume hay, and irrigated cropland make up the balance of the land area with corn being the principal irrigated crop.

Wildlife flourishes in this native grassland environment. Historically large bison herds occupied the landscape. White-tailed deer, mule deer, pronghorn, black tailed jackrabbit, and coyote are now the major mammalian species. Upland sandpiper, lark bunting, grasshopper sparrow, western meadowlark, long-billed curlew, sharp-tailed grouse, and greater prairie chicken are common avian species. The mosaic of grassland and wetlands provide excellent habitat for wading and shorebird species as well.

This landscape serves as a backdrop for a disturbance-driven ecosystem, which developed under the influences of herbivory, fire, and periodic long-term drought. Historically, these processes created a heterogeneous mosaic of plant communities and vegetative structure across the region. Any given site in this landscape experienced fire every six to ten years. Fires were caused by lightning strikes and also were set by Native Americans, who used fire for warfare, signaling, and to refresh the native grasses. Indigenous peoples 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 animals such as bison, elk, and pronghorn.

The natural fire regime has been disrupted by aggressive fire suppression policies which have facilitated woody species encroachment by both native and introduced shrubs and trees into the native prairie. The most common encroacher is eastern redcedar. While eastern redcedar is native to the landscape, it was present only in trace amounts due to the periodic fires. Widespread plantings of windbreaks with eastern redcedar as a primary component have provided a seed source for this aggressive woody plant causing encroachment into native grasslands, especially in the eastern and central Sand Hills. This encroachment causes significant forage loss for domestic livestock and degrades the native wildlife habit. Since it is not a root-sprouter, eastern redcedar is very susceptible to fire when under six feet tall making management with prescribed fire very effective when applied before trees reach this stage.

## Classification relationships

►USDA-NRCS (2022)◄
Land Resource Region – G, Central Feed Grains and Livestock Region
Major Land Resource Area (MLRA) –65, Nebraska Sand Hills

►Fenneman (1916) Physiographic Regions ◄
Division – Interior Plains
Province – Great Plains
Section – High Plains

►USDA-USFS (2007) Ecoregions◄
Domain – Dry

Division – Temperate Steppe
Province – Great Plains Steppe (332)
Section – Mixed Grass Steppe

►EPA Ecoregions (Omernik 1997)◄
I – Great Plains (9)
II – West-Central Semi-Arid Prairies (9.3)
III – Nebraska Sandhills (44)
IV – Sandhills (44a), Alkaline Lakes Area (44b), Wet Meadow and Marsh Plain (44c), Lakes Area (44d)

## Ecological site concept

The Saline Subirrigated ecological site typically occurs on swales of interdunes in sandhills and on flood plains of stream valleys. Slopes range from 0 to 3 percent. Soils are deep to very deep and formed from sandy eolian deposits, sandy alluvium over eolian deposits, or alluvium. Soil surface textures are fine sand and loamy fine sand while subsurface textures range from fine sand to fine sandy loam. The distinguishing characteristics of this site are a seasonally high water table at 18 to 36 inches during a portion of the growing season, highly alkaline soils, and the presence of visible salts at or near the soil surface.

The historic native vegetation of the Saline Subirrigated ecological site is mixed grass prairie. Vegetation in the Reference Community (1.1) consists of a mixture of warm-season tall- and midgrasses and cool-season grasses. Common grasses include alkali sacaton, inland saltgrass, western wheatgrass, alkali cordgrass, little bluestem, and foxtail barley. Sedges and spike rushes occur in the understory.

## Associated sites

| | |
|---|---|
| R065XY029NE | **Sandy Lowland**<br>Sandy Lowland ecological sites are often found adjacent to Saline Subirrigated ecological sites but on a slightly higher landscape position. |
| R065XY022NE | **Wet Land**<br>Wet Land ecological sites are often interspersed on the landscape with Saline Subirrigated ecological sites, but Wet Land sites occur on a slightly lower landscape position. |
| R065XY023NE | **Wet Subirrigated**<br>Wet Subirrigated ecological sites are often interspersed on the landscape with Saline Subirrigated ecological sites, but Wet Subirrigated sites occur on a slightly lower landscape position. |

## Similar sites

| | |
|---|---|
| R065XY024NE | **Subirrigated**<br>The Subirrigated Saline Subirrigated ecological sites both have a seasonally high water table during a portion of the growing season at 18 to 36 inches but Subirrigated sites do not have visible salts at or near the soil surface. |
| R065XY022NE | **Wet Land**<br>Wet Land and Saline Subirrigated ecological sites are often found in the same landscape, but water is at or near the surface of Wetland Sites and at 18 to 36 inches on Saline Subirrigated sites. Wet Land sites do not have visible salts at the surface. |
| R065XY023NE | **Wet Subirrigated**<br>Wet Subirrigated and Saline Subirrigated ecological sites are found on similar landscape positions, but the seasonal water table is at 6 to 18 inches on Wet Subirrigated sites and at 18 to 36 inches on Saline Subirrigated sites. Wet Subirrigated sites do not have visible salts at the surface. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | Not specified |
| Herbaceous | (1) *Sporobolus airoides*<br>(2) *Pascopyrum smithii* |

## Physiographic features

The Saline Subirrigated ecological site occurs on interdunal swales in the sandhills and on nearly level flood plains adjacent to streams and rivers. Soil water is moderately close to the soil surface and the site has a seasonal high water table at 18 to 36 inches during a portion of the growing season. This site receives run-off from areas higher on the landscape. Sites located on interdunes do not experience flooding while sites located on floodplains occasionally experience flooding for brief periods of time.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Sandhills > Interdune > Swale<br>(2) Valley > Flood plain |
| Runoff class | Negligible to medium |
| Flooding duration | Brief (2 to 7 days) |
| Flooding frequency | None to occasional |
| Ponding frequency | None |
| Elevation | 1,970–3,940 ft |
| Slope | 0–3% |

| | |
|---|---|
| Water table depth | 18–36 in |
| Aspect | Aspect is not a significant factor |

## Climatic features

The mean average annual precipitation in MLRA 65 is typically 18 to 27 inches but precipitation has varied from 13 to 36 inches in the driest to wettest season. Approximately 70 percent of the annual precipitation occurs during the growing season from mid- April to late September. The average annual snowfall varies from about 34 inches to about 42 inches. The wind velocity is high throughout the year, averaging 10 to 12 miles per hour. Maximum wind velocities generally occur in the spring.

The average date of first frost in the fall is September 25, and the last frost in the spring is about May 8. July is the hottest month and January is the coldest. It is not uncommon for the temperature to reach 100 degrees Fahrenheit during the summer. Summer humidity is low, and evaporation is high. The winters are characterized with frequent northerly winds, producing severe cold with temperatures dropping to as low as negative 30 degrees Fahrenheit.

Growth of native cool-season plants begins in late March and continues to late June. Native warm-season plants begin growth in mid-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) | 109-126 days |
| Freeze-free period (characteristic range) | 131-143 days |
| Precipitation total (characteristic range) | 19-26 in |
| Frost-free period (actual range) | 103-129 days |
| Freeze-free period (actual range) | 129-146 days |
| Precipitation total (actual range) | 18-27 in |
| Frost-free period (average) | 118 days |
| Freeze-free period (average) | 137 days |
| Precipitation total (average) | 22 in |

## Climate stations used

- (1) ALLIANCE MUNI AP [USW00024044], Alliance, NE
- (2) ARTHUR [USC00250365], Arthur, NE

- (3) ATKINSON 3SW [USC00250420], Atkinson, NE
- (4) BARTLETT 1S [USC00250525], Bartlett, NE
- (5) BREWSTER [USC00251130], Brewster, NE
- (6) CHAMBERS [USC00251590], Chambers, NE
- (7) CRESCENT LAKE NWR [USC00252000], Oshkosh, NE
- (8) ELLSWORTH 15 NNE [USC00252647], Ellsworth, NE
- (9) ELSMERE 9 ENE [USC00252680], Johnstown, NE
- (10) ERICSON 8 WNW [USC00252770], Burwell, NE
- (11) GREELEY [USC00253425], Greeley, NE
- (12) HYANNIS [USC00254100], Hyannis, NE
- (13) KILGORE 1NE [USC00254432], Kilgore, NE
- (14) KINGSLEY DAM [USC00254455], Keystone, NE
- (15) MERRIMAN [USC00255470], Merriman, NE
- (16) MULLEN [USC00255700], Mullen, NE
- (17) MULLEN 21 NW [USC00255702], Whitman, NE
- (18) NEWPORT [USC00255925], Newport, NE
- (19) NORTH PLATTE RGNL AP [USW00024023], Maxwell, NE
- (20) PURDUM [USC00256970], Purdum, NE
- (21) ROSE 10 WNW [USC00257318], Long Pine, NE
- (22) SWAN LAKE [USC00258360], Amelia, NE
- (23) VALENTINE NWR [USC00258755], Valentine, NE
- (24) WHITMAN 5 ENE [USW00094079], Whitman, NE

## Influencing water features

The Saline Subirrigated ecological site has a combination of physical and hydrological features that provide season-long ground water within 3.5 feet of the surface, allow relatively free movement of water and air in the upper part of the soil, and that when located on floodplains are occasionally flooded.

## Soil features

The soils associated with the Saline Subirrigated ecological site are deep to very deep soils formed in sandy eolian deposits, sandy alluvium over eolian deposits, or alluvium. Slopes range from 0 to 3 percent. Soil surface textures are primarily fine sand and loamy fine sand surface textures. Subsurface soil textures are sandy, fine sand, loamy fine sand, or fine sandy loam. The combined thickness of the A horizon is typically 4 to 11 inches but may be thicker. Soils are strongly alkaline and there is often a presence of salts at the surface.

Runoff is generally low due to the moderate to low slope gradient and the high intake rate of the soils. Rills, gullies, and waterflow patterns should not be present. Some pedestalling of plants occurs, but it is not very evident on casual observation and occurs on less than 5 percent of the plants.

Wildhorse is the major soil series correlated to this ecological site. Other soils correlated to this site include Clawhammer, Janise, and Selia. Additional information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more details specific to your location or visit Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov).

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Eolian deposits<br>(2) Alluvium |
| Surface texture | (1) Fine sand<br>(2) Loamy fine sand |
| Family particle size | (1) Sandy |
| Drainage class | Poorly drained to moderately well drained |
| Permeability class | Moderately slow to rapid |
| Soil depth | 80 in |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-40in) | 3–6 in |
| Calcium carbonate equivalent (0-40in) | 0–15% |
| Electrical conductivity (0-40in) | 0–8 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0–70 |
| Soil reaction (1:1 water) (0-40in) | 8.5–9.9 |
| 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 fire, 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 in the plant communities occur due to short-term weather variations, impacts of native and exotic plant and animal

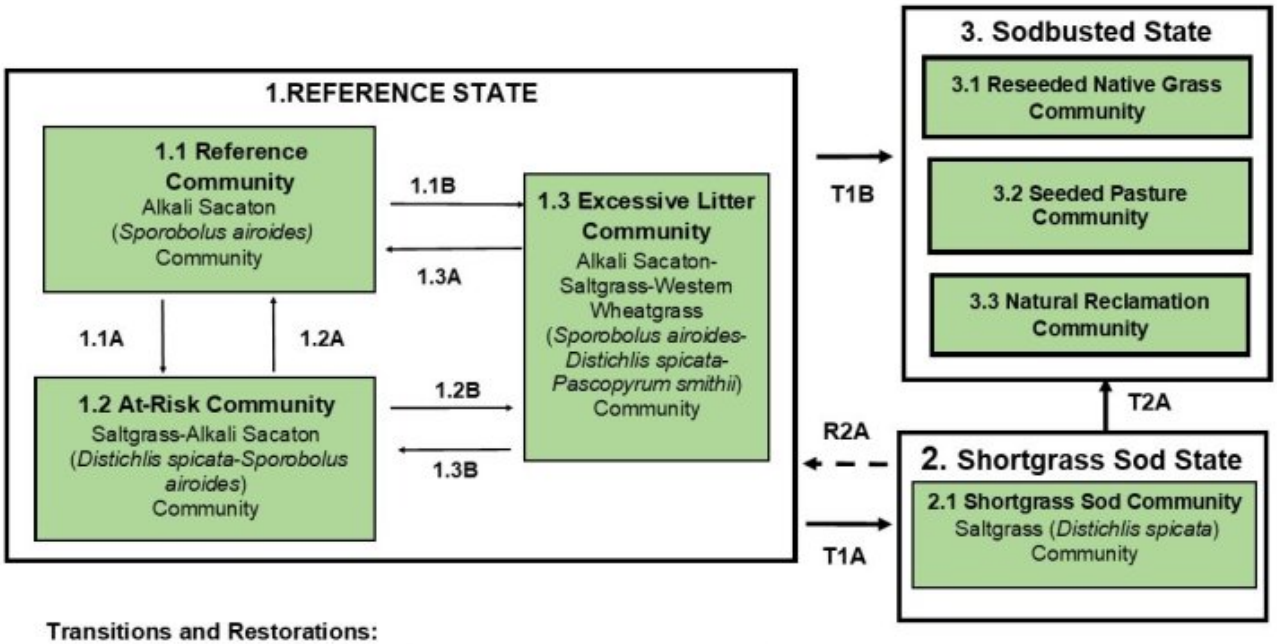
species, and management actions. The plant diversity and high water table allow for high resistance to drought. The site is extremely resilient and well adapted to Northern Great Plains climatic conditions.

The introduction of domestic livestock by European settlers along with season-long, continuous grazing and annual late summer haying 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 the more palatable warm-season tallgrasses, reducing the ability of the plants to harvest sunlight thereby depleting root reserves and 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, species such as inland saltgrass and foxtail barley increase while more palatable grasses such as alkali sacaton, alkali cordgrass, western wheatgrass and slender wheatgrass decrease in frequency and production.

The State and Transition Model (STM) is depicted below and includes a Reference State (1), a Shortgrass Sod State (2) and an 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 function. 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 local climatic fluctuations, especially 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 description following the model diagram.

Interpretations are primarily based on the Reference Community (1.1) which 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: Continuous season long grazing or continuous seasonal grazing in the summer. Annual haying.

T1B: Tillage to facilitate production agriculture or seeding

T2A: Tillage to facilitate production agriculture or seeding

R2A: Long-term (>15 years) rotational haying or prescribed grazing with adequate growing season recovery periods. This restoration will take an extended amount of time and may not be feasible.

**Community Pathways:**

1.1A: Continuous season long grazing, rotational grazing with inadequate growing season recovery periods. Annual haying.

1.1B: Prolonged (< 5 years) absence of herbivory and fire.

1.2A: Prescribed grazing with adequate growing season recovery periods. Haying with adequate growing season recovery time between cuttings.

1.2B: Prolonged (< 5 years) absence of herbivory and fire.

1.3A: Prescribed grazing, prescribed burning.

1.3B: Prescribed grazing, prescribed burning.

**Figure 8. State and Transition Model Diagram, Saline Subirrigated ecological site, MLRA 65.**

## State 1

## Reference State

The Reference State (1) describes the range of vegetative communities that occur on the Subirrigated ecological site where the range of natural variability under historic conditions and disturbance regimes is 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 and Excessive Litter Communities result from management actions that are unfavorable for a healthy Reference Community.

### Dominant plant species

- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- slender wheatgrass (*Elymus trachycaulus*), grass
- saltgrass (*Distichlis spicata*), grass
- foxtail barley (*Hordeum jubatum*), grass
- switchgrass (*Panicum virgatum*), grass

## Community 1.1
## Reference Community

Interpretations are primarily based on the Reference or Alkali Sacaton (*Sporobolus airoides*) Community. This plant community serves as a description of the native plant community that occurs on the site when the historic disturbance regimes are intact or are 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. This plant community can be found on areas that are managed with prescribed grazing, prescribed burning, or rotational haying. This plant community consists mainly of warm-season midgrasses and cool-season grasses. Alkali sacaton is the dominant grass. Inland saltgrass and western wheatgrass are also significant. Grasses of secondary importance include alkali cordgrass, slender wheatgrass, little bluestem, and foxtail barley. Sedges and spike rushes occur as in understory. Forbs such as heath aster and prairie gentian are significant. The potential vegetative composition is 80 to 90 percent grasses, 5 to 15 percent grass-likes, and 0 to 5 percent forbs by air-dry weight. This plant community is adapted to high salt content inherent to the soils. Visible salts in the form of a white crust can occupy many areas of the soil surface due to seasonal fluctuations in the water table.

This resilient community is well adapted to the Northern Great Plains climatic conditions. Plant diversity promotes drought tolerance, 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
- slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), grass

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

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Grass/Grasslike | 2100 | 2830 | 3355 |
| Forb | 0 | 70 | 145 |
| **Total** | **2100** | **2900** | **3500** |

**Figure 10. Plant community growth curve (percent production by month). NE6546, NE/SD Sandhills, Saline Subirrigated. Warm-season dominant, cool-season subdominant, short & mid grasses.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 5 | 10 | 20 | 30 | 15 | 10 | 5 | 5 | 0 | 0 |

## Community 1.2
## At-Risk Community

The At-Risk or Saltgrass-Alkali Sacaton (*Distichlis spicata- Sporobolus airoides*) Community (1.2) develops with continuous seasonal grazing, continuous season-long grazing, or rotational grazing with inadequate growing season recovery time. As compared to the Reference Community (1.1), alkali sacaton and saltgrass have increased as a proportion of the plant community. Warm-season tall- and midgrasses have become less productive due to continued defoliation during their critical growth periods. The more palatable plants such as western wheatgrass, slender wheatgrass, and alkali cordgrass remain the community but production from these grasses is significantly reduced. Alkali sacaton and saltgrass are the dominant grasses. Foxtail barley and grass-likes are of secondary importance. The potential vegetative composition is 80 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, and 1 to 10 percent shrubs. As compared to the Reference Community, plant species diversity is reduced. Although the amount of litter is reduced and the amount of bare ground is increased, the soil remains stable. Hydrologic function and biotic integrity have been reduced but remain functional. Increased disturbance can easily move the community to a more degraded scenario. With continuation of the management that caused this community to develop or with heavy

continuous season long grazing, the warm-season tall- and midgrasses and cool-season grasses will be further reduced while saltgrass will continue to increase. With the increase in saltgrass, increased bare ground accompanied by a decrease in litter will increase erosion and reduce water infiltration causing the community to be at risk of crossing an ecological threshold and transitioning to the Shortgrass Sod State (2).

### Dominant plant species

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

**Table 6. Annual production by plant type**

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Grass/Grasslike | 1300 | 1655 | 2010 |
| Forb | 0 | 45 | 85 |
| **Total** | **1300** | **1700** | **2095** |

**Figure 12. Plant community growth curve (percent production by month). NE6547, NE/SD Sandhills, Saline Subirrigated, Hayed & Grazed. Warm-season dominant, cool-season subdominant, short & mid grasses.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 3 | 15 | 35 | 20 | 20 | 5 | 2 | 0 | 0 |

## Community 1.3
## Excessive Litter Community

The Excessive Litter or Alkali Sacaton-Saltgrass-Western Wheatgrass (*Sporobolus airoides-Distichlis spicata-Pascopyrum smithii*) Community (1.3) develops when the natural disturbances of livestock grazing and fire have been removed from the land for a prolonged period (more than five years). Plant litter accumulates rapidly. As the undisturbed duff layer deepens, infiltration of the precipitation is interrupted and evaporation increases significantly, simulating drought-like conditions. Bunchgrasses typically develop dead centers and rhizomatous grasses form small colonies due to a lack of tiller stimulation. Plant frequency and production decrease. Pedestalling is usually evident, but roots are not exposed. As grazing and fire continue to be excluded from the land, litter levels will increase to the point that few plants remain. As the accumulated litter decays, large areas of bare ground develops and salt crusts form. Salt tolerant, non-native forbs such as burningbush (kochia) and Russian thistle may fill in these bare areas. The dominant grasses include alkali sacaton, saltgrass, and western wheatgrass. Other grasses present may include switchgrass, little bluestem, and plains bluegrass The potential vegetative composition is 75 to 85 percent grasses, 10 to 20 percent grass-likes, and 1 to 5 percent forbs. As compared to the Reference Community (1.1), plant diversity has decreased, and native plants tend to occur in individual colonies. Litter amounts are

excessively high, and litter covers the soil in the areas 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. Initially, infiltration and runoff are not significantly different from the Reference Community. As non-use continues, precipitation is held within the litter which decreases infiltration and increases evaporation causing reduced soil moisture. This plant community will change rapidly when grazing by domestic livestock or fire are reintroduced. If the intensity and duration of the disturbance is inadequate, the plant community will easily return to the Excessive Litter Community.

### Dominant plant species

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

**Table 7. Annual production by plant type**

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Grass/Grasslike | 1400 | 1855 | 2300 |
| Forb | 0 | 45 | 100 |
| **Total** | **1400** | **1900** | **2400** |

**Figure 14. Plant community growth curve (percent production by month). NE6536, NE/SD Sandhills, Native Grass, Non-Use. Warm-season dominant, cool-season subdominant, excessive litter.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 5 | 15 | 20 | 20 | 20 | 10 | 7 | 3 | 0 | 0 |

## Pathway 1.1A
## Community 1.1 to 1.2

Grazing management that includes continuous season long grazing or rotational grazing with inadequate growing season recovery time between grazing events will move the Reference Community (1.1) to the At-Risk Community (1.2). Continued annual haying at the same time during the growing season will also cause this shift.

## Pathway 1.1B
## Community 1.1 to 1.3

Prolonged (greater than five years) absence of the natural disturbances of herbivory and fire will move the Reference Community (1.1) to the Excessive Litter Community (1.3).

## Pathway 1.2A

### Community 1.2 to 1.1

At-Risk Community (1.2) can return to the Reference Community (1.1) with implementation of prescribed grazing with adequate growing season recovery periods. When the land is utilized as hayland, haying with adequate recovery between cuttings will facilitate the return to Reference Community.

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

Prolonged (more than five years) absence of the natural disturbances of herbivory and fire will move 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). If grazing and fire were absent for extensive periods of time, their reintroduction will move the plant community to the At-Risk Community (1.2) and several additional years of prescribed grazing will be needed for the community to return to the Reference Community.

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

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

## State 2
## Shortgrass Sod State

The Shortgrass Sod State (2) transitioned from the Reference State (1) and much of the native warm-season tall- and midgrass components have been replaced by shortgrasses. This transition occurs with long term grazing management that did not provide adequate recovery time for warm-season tall- and midgrasses. This management is typically heavy, continuous, season long grazing but heavy, rotational grazing with inadequate growing season recovery periods can also cause this transition. Over time, repeated annual haying during the rapid growth period of warm-season tallgrasses will also cause this transition. The loss of the tall- and midgrasses negatively impacts energy flow, nutrient cycling, and hydrologic function. Runoff is higher and infiltration is lower than the Reference State. This state is very resistant to change. The Shortgrass Sod State includes the Shortgrass Sod Community (2.1).

#### Dominant plant species

- saltgrass (*Distichlis spicata*), grass

- foxtail barley (*Hordeum jubatum*), grass

## Community 2.1
## Shortgrass Sod Community

The Shortgrass Sod Community (2.1) develops with extended heavy, continuous, season long grazing or with heavy, continuous, seasonal grazing during the summer. Heavy, rotational grazing with inadequate growing season recovery periods between grazing events will also lead to the Shortgrass Sod Community. This community is very similar to communities in areas that have been tilled and abandoned (Community 3.3). Saltgrass dominates this sodbound community. Compared to the Reference Community (1.1), alkali sacaton is greatly reduced. Slender and western wheatgrass, if present, are remnants in the plant community, having been replaced by foxtail barley. Pricklypear has increased and non-native annual forbs such as Russian thistle and burningbush (kochia) have replaced many of the native forbs. The potential vegetative composition is 75 to 85 percent grasses, 10 to 15 percent grass-likes, and 5 to 10 percent forbs. Plant diversity is extremely low. Plant litter is low. The combination of low litter levels and the sod-bound nature of the plant community causes increased evaporation. The soil surface layer has a higher salt content due to the increased evaporation and reduced infiltration. Organic matter and carbon reserves are severely diminished. An extended period of time is required to restore this community to the Reference State (1) and restoration may not be feasible. Renovation of the site through seeding is costly due to the limited number of commercially available species that can tolerate both the high salt content of the soil and the high water table. The feasibility of restoration depends upon the amount of tall- and midgrass remnants and the level of degradation to soils and hydrologic function while the success of renovation is dependent upon the degradation of soils and hydrologic function.

### Dominant plant species

- saltgrass (*Distichlis spicata*), grass
- foxtail barley (*Hordeum jubatum*), grass
- burningbush (*Bassia scoparia*), other herbaceous
- prickly Russian thistle ( *Salsola tragus*), other herbaceous

**Table 8. Annual production by plant type**

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Grass/Grasslike | 800 | 975 | 1155 |
| Forb | 0 | 25 | 55 |
| **Total** | **800** | **1000** | **1210** |

**Figure 16. Plant community growth curve (percent production by month). NE6548, NE/SD Sandhills, Saline Subirrigated, Sod Bound. Warm season dominant, short grasses.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 5 | 10 | 40 | 25 | 15 | 5 | 0 | 0 | 0 |

## State 3
## Sodbusted State

The threshold to the Sodbusted State (3) is crossed as a result of mechanical disturbance to facilitate production agriculture. If farming operations are suspended, the site can be seeded to native grasses 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 resulting 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.

## 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 rangeland 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 annual and perennial early successional species. Perennial threeawns, sand dropseed, and annual grasses are common species. 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, reducing 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

The Reference State (1) will transition to the Shortgrass Sod State (2) with long-term continuous season long grazing, long-term continuous seasonal grazing in the summer, or rotational grazing with inadequate growing season recover time between grazing occupations. Heavy grazing will accelerate this process. Annual haying during the same time frame each year will also cause this transition.

## Transition T1B
## State 1 to 3

The Reference State (1) has been significantly altered by tillage to facilitate production agriculture. When the land is no longer cropped, the resulting state is the Sodbusted State (3). The disruption to the plant community, the soil, and the hydrology of the system prevent restoration to a true Reference State.

## Restoration pathway R2A
## State 2 to 1

Long-term (greater than 15 years) prescribed grazing with adequate growing season recovery periods between grazing events may move the Shortgrass Sod State (2) to the

Reference State (1). This restoration may not be feasible. The feasibility of the restoration depends upon the amount of tall- and midgrasses remaining in the plant community and the extent of degradation to the soil and site stability and hydrologic function.

## Transition T2A
## State 2 to 3

The Shortgrass Sod State (2) has been significantly altered by tillage to facilitate production agriculture. When the land is no longer cropped, the resulting state is the Sodbusted State (3). The disruption to the plant community, the soil, and the hydrology of the system prevent restoration to a true Reference 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** | | | 145–725 | |
| | switchgrass | PAVI2 | *Panicum virgatum* | 145–435 | – |
| | alkali cordgrass | SPGR | *Spartina gracilis* | 0–290 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–58 | – |
| 2 | **Warm-Season Midgrass** | | | 580–1160 | |
| | alkali sacaton | SPAI | *Sporobolus airoides* | 580–1160 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 0–290 | – |
| | little bluestem | SCSC | *Schizachyrium scoparium* | 0–145 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–58 | – |
| 3 | **Warm-Season Shortgrass** | | | 290–580 | |
| | saltgrass | DISP | *Distichlis spicata* | 290–580 | – |
| | scratchgrass | MUAS | *Muhlenbergia asperifolia* | 0–145 | – |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 0–145 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–58 | – |
| 4 | **Native Cool-Season Grass** | | | 290–580 | |
| | slender wheatgrass | ELTRT | *Elymus trachycaulus ssp. trachycaulus* | 145–290 | – |
| | foxtail barley | HOJU | *Hordeum jubatum* | 0–145 | – |
| | plains bluegrass | POAR3 | *Poa arida* | 0–145 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–58 | – |
| 5 | **Grass-like** | | | 145–435 | |

| | | | | | |
|---|---|---|---|---|---|
| 5 | **Grass-like** | | | 145–435 | |
| | sedge | CAREX | *Carex* | 29–290 | – |
| | spikerush | ELEOC | *Eleocharis* | 0–145 | – |
| | rush | JUNCU | *Juncus* | 0–145 | – |
| | bulrush | SCIRP | *Scirpus* | 0–145 | – |
| **Forb** | | | | | |
| 6 | **Forb** | | | 0–145 | |
| | Forb, perennial | 2FP | *Forb, perennial* | 0–58 | – |
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–29 | – |
| | white sagebrush | ARLU | *Artemisia ludoviciana* | 0–29 | – |
| | milkvetch | ASTRA | *Astragalus* | 0–29 | – |
| | scouringrush horsetail | EQHY | *Equisetum hyemale* | 0–29 | – |
| | showy prairie gentian | EUEXR | *Eustoma exaltatum ssp. russellianum* | 0–29 | – |
| | Pursh seepweed | SUCA2 | *Suaeda calceoliformis* | 0–29 | – |
| | white heath aster | SYER | *Symphyotrichum ericoides* | 0–29 | – |

**Table 10. Community 1.2 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Lb/Acre) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |
| 1 | **Warm-Season Tallgrass** | | | 0–85 | |
| | alkali cordgrass | SPGR | *Spartina gracilis* | 0–85 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–34 | – |
| | switchgrass | PAVI2 | *Panicum virgatum* | 0–34 | – |
| 2 | **Warm-Season Mldgrass** | | | 340–680 | |
| | alkali sacaton | SPAI | *Sporobolus airoides* | 340–680 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 0–85 | – |
| | little bluestem | SCSC | *Schizachyrium scoparium* | 0–34 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–34 | – |
| 3 | **Warm-Season Shortgrass** | | | 510–680 | |
| | saltgrass | DISP | *Distichlis spicata* | 510–680 | – |
| | scratchgrass | MUAS | *Muhlenbergia asperifolia* | 0–85 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–34 | – |

| | | | | | |
|---|---|---|---|---|---|
| | blue grama | BOGR2 | *Bouteloua gracilis* | 0–34 | – |
| 4 | **Native Cool-Season Grass** | | | 85–255 | |
| | foxtail barley | HOJU | *Hordeum jubatum* | 85–170 | – |
| | western wheatgrass | PASM | *Pascopyrum smithii* | 0–85 | – |
| | slender wheatgrass | ELTRT | *Elymus trachycaulus ssp. trachycaulus* | 0–85 | – |
| | plains bluegrass | POAR3 | *Poa arida* | 0–34 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–34 | – |
| 5 | **Grass-like** | | | 85–255 | |
| | sedge | CAREX | *Carex* | 17–170 | – |
| | spikerush | ELEOC | *Eleocharis* | 0–85 | – |
| | rush | JUNCU | *Juncus* | 0–85 | – |
| | bulrush | SCIRP | *Scirpus* | 0–85 | – |
| 6 | **Non-Native Cool-Season Grass** | | | 0–85 | |
| | Kentucky bluegrass | POPR | *Poa pratensis* | 0–85 | – |
| **Forb** | | | | | |
| 7 | **Forb** | | | 0–85 | |
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–34 | – |
| | white sagebrush | ARLU | *Artemisia ludoviciana* | 0–34 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–34 | – |
| | milkvetch | ASTRA | *Astragalus* | 0–17 | – |
| | scouringrush horsetail | EQHY | *Equisetum hyemale* | 0–17 | – |
| | showy prairie gentian | EUEXR | *Eustoma exaltatum ssp. russellianum* | 0–17 | – |
| | Pursh seepweed | SUCA2 | *Suaeda calceoliformis* | 0–17 | – |
| | white heath aster | SYER | *Symphyotrichum ericoides* | 0–17 | – |
| | common dandelion | TAOF | *Taraxacum officinale* | 0–17 | – |

**Table 11. Community 1.3 plant community composition**

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

| | | | | | |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |
| 1 | **Warm-Season Tallgrass** | | | 95–285 | |
| | switchgrass | PAVI2 | *Panicum virgatum* | 95–385 | – |
| | alkali cordgrass | SPGR | *Spartina gracilis* | 0–95 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–38 | – |
| 2 | **Warm-Season Midgrass** | | | 380–760 | |
| | alkali sacaton | SPAI | *Sporobolus airoides* | 285–570 | – |
| | little bluestem | SCSC | *Schizachyrium scoparium* | 95–190 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 0–95 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–38 | – |
| 3 | **Warm-Season Shortgrass** | | | 285–570 | |
| | saltgrass | DISP | *Distichlis spicata* | 285–570 | – |
| | scratchgrass | MUAS | *Muhlenbergia asperifolia* | 0–95 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–38 | – |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 0–38 | – |
| 4 | **Native Cool-Season Grass** | | | 475–855 | |
| | western wheatgrass | PASM | *Pascopyrum smithii* | 190–380 | – |
| | slender wheatgrass | ELTRT | *Elymus trachycaulus ssp. trachycaulus* | 190–285 | – |
| | plains bluegrass | POAR3 | *Poa arida* | 95–190 | – |
| | foxtail barley | HOJU | *Hordeum jubatum* | 0–95 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–38 | – |
| 5 | **Grass-like** | | | 190–380 | |
| | sedge | CAREX | *Carex* | 95–285 | – |
| | spikerush | ELEOC | *Eleocharis* | 0–190 | – |
| | rush | JUNCU | *Juncus* | 0–190 | – |
| | bulrush | SCIRP | *Scirpus* | 0–190 | – |
| 6 | **Non-Native Cool-Season Grass** | | | 0–38 | |
| | Kentucky bluegrass | POPR | *Poa pratensis* | 0–38 | – |
| **Forb** | | | | | |
| 7 | **Forb** | | | 0–95 | |
| | Forb, annual | 2FA | *Forb, annual* | 0–57 | – |
| | Forb, perennial | 2FP | *Forb, perennial* | 0–38 | – |
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–19 | – |

| | | | | | |
|---|---|---|---|---|---|
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–19 | |
| | white sagebrush | ARLU | *Artemisia ludoviciana* | 0–19 | – |
| | milkvetch | ASTRA | *Astragalus* | 0–19 | – |
| | scouringrush horsetail | EQHY | *Equisetum hyemale* | 0–19 | – |
| | showy prairie gentian | EUEXR | *Eustoma exaltatum ssp. russellianum* | 0–19 | – |
| | Pursh seepweed | SUCA2 | *Suaeda calceoliformis* | 0–19 | – |
| | white heath aster | SYER | *Symphyotrichum ericoides* | 0–19 | – |
| | common dandelion | TAOF | *Taraxacum officinale* | 0–19 | – |

**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** | | | 0–100 | |
| | alkali sacaton | SPAI | *Sporobolus airoides* | 0–100 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 0–20 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–20 | – |
| 2 | **Warm-Season Shortgrass** | | | 600–950 | |
| | saltgrass | DISP | *Distichlis spicata* | 600–900 | – |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 0–50 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–30 | – |
| | scratchgrass | MUAS | *Muhlenbergia asperifolia* | 0–20 | – |
| 3 | **Native Cool-Season Grass** | | | 50–150 | |
| | foxtail barley | HOJU | *Hordeum jubatum* | 50–150 | – |
| | plains bluegrass | POAR3 | *Poa arida* | 0–20 | – |
| | Grass, perennial | 2GP | *Grass, perennial* | 0–20 | – |
| 4 | **Grass-like** | | | 50–150 | |
| | sedge | CAREX | *Carex* | 50–150 | – |
| | spikerush | ELEOC | *Eleocharis* | 0–50 | – |
| | rush | JUNCU | *Juncus* | 0–50 | – |
| | bulrush | SCIRP | *Scirpus* | 0–50 | – |
| 5 | **Non-Native Cool-Season Grass** | | | 0–20 | |

| | | | | | |
|---|---|---|---|---|---|
| | Kentucky bluegrass | POPR | *Poa pratensis* | 0–20 | – |
| **Forb** | | | | | |
| 6 | **Forb** | | | 0–50 | |
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–20 | – |
| | white sagebrush | ARLU | *Artemisia ludoviciana* | 0–20 | – |
| | scouringrush horsetail | EQHY | *Equisetum hyemale* | 0–10 | – |
| | showy prairie gentian | EUEXR | *Eustoma exaltatum ssp. russellianum* | 0–10 | – |
| | Pursh seepweed | SUCA2 | *Suaeda calceoliformis* | 0–10 | – |
| | white heath aster | SYER | *Symphyotrichum ericoides* | 0–10 | – |
| | common dandelion | TAOF | *Taraxacum officinale* | 0–10 | – |
| | Russian thistle | SAKA | *Salsola kali* | 0–10 | – |
| | burningbush | BASC5 | *Bassia scoparia* | 0–10 | – |
| | Forb, perennial | 2FP | *Forb, perennial* | 0–10 | – |
| | Forb, annual | 2FA | *Forb, annual* | 0–10 | – |

## Animal community

LIVESTOCK - GRAZING INTERPRETATIONS:
Grazing by domestic livestock is the major income-producing industry 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*
►Reference Community (1.1)
Average Production (lb./acre, air-dry): 2,900

Stocking Rate (AUM/acre): 0.79
►At-Risk Community (1.2)
Average Production (lb./acre, air-dry): 1,700
Stocking Rate (AUM/acre): 0.52
►Excessive Litter Community (1.3)
Average Production (lb./acre, air-dry): 1,900
Stocking Rate (AUM/acre): 0.33
►Shortgrass Sod Community (1.3)
Average Production (lb./acre, air-dry): 1,000
Stocking Rate (AUM/acre): 0.27
*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:
The Sandhills Prairie ecosystem consists of diverse grassland habitats interspersed with varying densities of Sandhills lakes and limited woody riparian corridors. The majority of this ecosystem is intact. 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 Sandhills Prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbances. Following European settlement, elimination of fire and overgrazing altered the appearance and functionality of the 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 influenced the character of the remaining native grasslands and the habitats that they provide. Fragmentation in MLRA 65 is limited and area sensitive grassland birds such as greater prairie chicken and sharp-tailed grouse continue to thrive here. The mosaic of sites continues to provide habitat for species requiring unfragmented grasslands, 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.

In the absence of fire and grazing, heavy litter buildup can occur on this site hindering the movement of young birds, especially quail and prairie chickens. Increased litter buildup results in decreased forb abundance and diversity and an accompanying decrease in insects, a critical food source for young birds. Introduced species such as cheatgrass, Kentucky bluegrass, and introduced forbs may be present but degradation of the biotic integrity from non-native species on this ecological site is limited.

Disruption of the natural fire regime and accompanying woody encroachment is the

greatest threat to ecosystem dynamics in this MLRA. Lack of fire facilitates tree and shrub encroachment which degrades grassland habitats and creates habitats that favor generalist species such as American robin and mourning dove. Woody species provide perches for raptors, increasing the predation mortality on native bird populations. Woody encroachment is most severe in the eastern half of the MLRA but is a threat across the MLRA.

## Hydrological functions

Forage production on the Saline Subirrigated ecological site is limited by saline conditions. Proper management is critical to the continued productivity of these sites. Grass reestablishment 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 Wildhorse soils on this site are in Hydrologic Soil Group A but may include localized areas of other soils in Groups B and C. Infiltration rates for Wildhorse soils are extremely high, but high water tables provide subirrigation of 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 esthetic 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

Revision Notes: “This PROVISIONAL ecological site concept has been through the quality control and quality assurance process to ensure that the site meets the NESH standards for a provisional ecological site that provides basic compiled information in on location.

This site should not be considered an Approved ESD until further data entry and editing is completed.

Site Development and Testing Plan:
Future work is needed to validate the information in this Provisional Ecological Site Description. Additional data collection and evaluation may also be needed to develop this ESD to the Approved, then Correlated level. This could include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Field reviews of the project plan should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team. The project plan is ES-R065XY013NE - MLRA 65.

## Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel was also used. Those involved in developing this site include Dave Cook, Rangeland Management Specialist, NRCS; Dwight Hale, Engineer, NRCS; Sheila Luoma, Resource Conservationist, NRCS; Marla Shelbourn, Rangeland Management Specialist, NRCS; Dave Steffen, Rangeland Management Specialist, NRCS.

Two SCS-RANGE-417 records are available from Garden and Morrill counties in Nebraska. The sample period was from 1969 through 1980.

## Other references

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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.

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

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3. **Number and height of erosional pedestals or terracettes:** None. Pedestals and terracettes are not expected on this site. Alkali sacaton tends to have a hummocky growth form that may appear pedestalled.

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

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

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

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

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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

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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 from gray (values of 5 to 6) dry and dark gray, dark grayish brown, very dark grayish brown to black (values of 2 to 4) moist. Soil surface structure is typically single grain to weak fine granular in the A-horizon, however, Clawhammer soils have a moderate medium subangular blocky parting to moderate thin platy structure . These soils are slightly to strongly saline and moderately to very strongly alkaline which adversely impacts plant

species composition and growth.

Wildhorse is the major soil series correlated to this site, Clawhammer, Janise, and Selia are also correlated to this site.

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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 80 to 90 percent grasses, 5 to 15 percent grass-likes, and 0 to 5 percent forbs. The perennial grass component is made up of warm-season tallgrass (5-25%), warm-season midgrass (20-40%), warm-season shortgrass (10-20%), and cool-season grass (10-20%).

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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. Compaction layers 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, warm-season midgrass, 580-1160 #/ac, 20-40% (1 species minimum: alkali sacaton, little bluestem, sand dropseed.
    2. Native, perennial, warm-season tallgrass, 145-725 #/ac, 5-25% (1 species minimum): alkali cordgrass, switchgrass.

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

Phase 1.3
1. Native, perennial, cool-season grass, 475-855 #/ac, 25-45% (2 species minimum): foxtail barley, plains bluegrass, slender wheatgrass, western wheatgrass.
2. Native, perennial, warm-season midgrass, 380-760 #/ac, 20-40% (2 species minimum: alkali sacaton, little bluestem, sand dropseed.
3. Native, perennial, warm-season shortgrass, 285-570 #/ac, 15-30% (1 species minimum): blue grama, saltgrass, scratchgrass.

Sub-dominant: Phase 1.1
1. Native, perennial, warm-season shortgrass, 290-580 #/ac, 10-20% (1 species minimum): blue grama, saltgrass, scratchgrass.
2. Native, cool-season grass, 145-435 #/ac, 5-15% (1 species minimum): foxtail barley, plains bluegrass, slender wheatgrass.
3. Native grass-likes, 145-435 #/ac, 5-15% (1 species minimum): sedges, spikerushes, rush, bulrush.

Phase 1.2
1. Native, cool-season grass, 85-255 #/ac, 5-15% (1 species minimum): foxtail barley, plains bluegrass, slender wheatgrass.
2. Native grass-likes, 85-255 #/ac, 5-15% (1 species minimum): sedges, spikerushes, rush, bulrush.

Phase 1.3
1. Native grass-likes, 190-285 #/ac, 10-15 (1 species minimum): sedges, spikerushes, rush, bulrush.
2. Native, perennial, warm-season tallgrass, 95-285 #/ac, 5-15% (1 species minimum): alkali cordgrass, switchgrass.

Other: Minor - Phase 1.1
1. Native forb, 0-145 #/ac, 0-5%: forbs present vary from location to location.

Minor - Phase 1.2
1. Native, perennial, warm-season tallgrass, 0-85 #ac, 0-5%: switchgrass, alkali cordgrass.
2. Native forb, 0-145 #/ac, 0-5%: forbs present vary from location to location.

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

Trace - Phase 1.2
1. Non-native, cool-season grass, 0-38 #/ac, 0-2%.

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

Additional: The Reference Community (1.1) includes six F/S groups. These groups are, in order of relative abundance, native, perennial, warm-season midgrass; native, perennial, warm-season tallgrass; native, perennial, warm-season shortgrass=native, perennial, cool-season grass; grass-likes; native forb.

The At-Risk Community (1.2) includes seven F/S groups which are in order of relative abundance native, perennial, warm-season shortgrass, native, perennial, warm-season midgrass, grass-likes=native, perennial, cool-season grass; native, perennial warm-season tallgrass=native forb; non-native, cool-season grass..

The Excessive Litter Community (1.3) includes seven F/S groups which are native, perennial, cool-season grass; native, perennial, warm-season midgrass; native, perennial, warm-season shortgrass; grass-like; native, perennial warm-season tallgrass; native forb; and non-native cool-season 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 2,900 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.

NOTE: Invasive plants (for the purposes of the IIRH protocol) are plant species that are typically not found on the ecological site or should only be in trace or minor categories under the natural disturbance regime and have the potential to become a dominant or codominant species on the site if their establishment and growth are not actively controlled by natural disturbances or management interventions. Species listed characterize degraded states AND have the potential to become a dominant or co-dominant species.

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

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