USDA Natural Resources Conservation Service

Ecological site R064XY025NE
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.

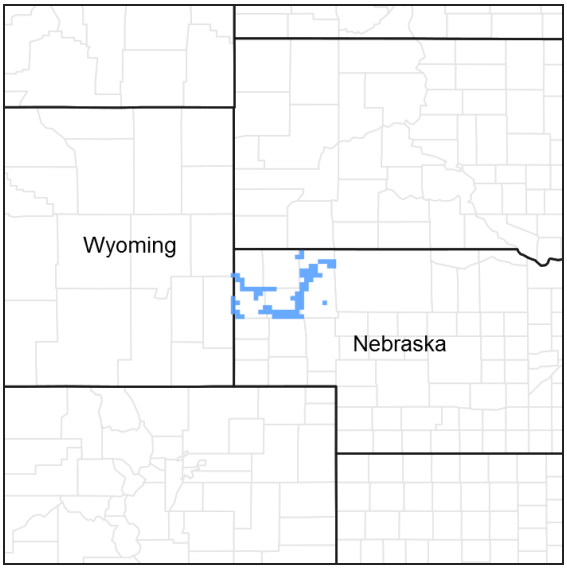


Figure 1. Mapped extent

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): 064X–Mixed Sandy and Silty Tableland and Badlands

The Mixed Sandy and Silty Tableland and Badlands (MLRA 64) is shared almost equally between South Dakota (42 percent) and Nebraska (41 percent). A small portion is in Wyoming (17 percent). The MLRA consists of 11,895 square miles. The towns of Kadoka and Pine Ridge, South Dakota; Chadron and Alliance, Nebraska; and Lusk, Wyoming, are all within the boundaries of this MLRA.

The following areas of special interest are in this MLRA: Agate Fossil Beds National Monument, Chadron State Park, Fort Robinson State Park, and the Pine Ridge Indian Reservation; parts of the Oglala and Buffalo Gap National Grasslands, which are in the Nebraska National Forest; and nearly all of Badlands National Park. The Badlands are internationally renowned for their Oligocene vertebrate fossils.

The northern section of the MLRA consists of old plateaus and terraces that have been deeply eroded by wind, water, and time. The southern section consists of nearly level to broad intervalley remnants of smooth fluvial plains. These two sections are separated by the Pine Ridge escarpment. Elevations gradually increase from 2,950 to 5,073 feet from east to west. The main drainageway through Badlands National Park is the White River. The headwaters of both the White and Niobrara Rivers are in MLRA 64. The Pine Ridge escarpment is at the northernmost extent of the Ogallala Aquifer.

Tertiary continental sediments consisting of sandstone, siltstone, and claystone underlie most of the area. Many of the bedrock units in the southern third of the MLRA are covered by loess. Soils range from shallow to very deep and from generally well drained to excessively drained. They are loamy or sandy. The Badlands consist of stream-laid layers of silt, clay, and sand mixed with layers of volcanic ash.

Average annual precipitation for the area is 14 to 20 inches. Most of the rainfall occurs as frontal storms in the spring and early summer. This area supports a mixture of short-, mid-, and tall-statured warm- and cool-season grasses. On the Pine Ridge escarpment, these plants grow in association with ponderosa pine, Rocky Mountain juniper, western snowberry, skunkbush sumac, common chokecherry, and rose. Wyoming big sagebrush grows in minor amounts in the drier, far western portion of the MLRA; however, small remnant stands can be found in the eastern portion of the Oglala National Grassland in Nebraska.

Sixty percent of the MLRA is grassland, 11 percent of which is under Federal management. Twenty-two percent of the area is used as cropland, and 4 percent is forested. Major resource concerns include wind erosion, water erosion, and surface water quality (USDA-NRCS, 2006, Ag Handbook 296).

For development of ecological sites, MLRA 64 is divided into two precipitation zones (PZ): 14 to 17 inches per year and 17 to 20 inches per year. The wetter zone extends from the western end of the Pine Ridge escarpment near Lusk, Wyoming, eastward along the escarpment through Nebraska and into the Big Badlands area of South Dakota. The drier zone extends from Wyoming eastward to Alliance and Oshkosh, Nebraska, south of the Pine Ridge escarpment. MLRA 64 stops at the western edge of the Nebraska Sand Hills (MLRA 65).

A unique geologic area known as the Hartville Uplift is in the far southwest corner of the 14 to 17 inch precipitation zone. The Hartville Uplift is an elongated, north-northwest-oriented, broad domal arch of Laramide age (70-50 million years ago). It extends approximately 45 miles between Guernsey and Lusk, Wyoming, and is 15 miles wide at its widest point. Erosion has exposed a core of granite and Precambrian metasedimentary and metavolcanic rocks (Steele et al., 2018). In addition to the ecological sites in the 14 to 17 inch precipitation zone of MLRA 64, three unique ecological site descriptions were developed to describe the soils and plant community dynamics in the Hartville Uplift.

Classification relationships

USDA Land Resource Region G—Western Great Plains Range and Irrigated Region:
Major Land Resource Area (MLRA) 64—Mixed Sandy and Silty Tableland and Badlands

U.S. Environmental Protection Agency (EPA)
Level IV Ecoregions of the Conterminous United States:
High Plains—25:
Pine Ridge Escarpment—25a.
Flat to Rolling Plains—25d.
Pine Bluffs and Hills—25f.
Sandy and Silty Tablelands—25g.
Northwestern Great Plains—43:
White River Badlands—43h.
Keya Paha Tablelands—43i.

USDA Forest Service
Ecological Subregions: Sections and Subsections of Conterminous United States:
Great Plains and Palouse Dry Steppe Province—331:
Western Great Plains Section—331F:
Subsections:
Shale Scablands—331Fb.
White River Badlands—331Fh.
Pine Ridge Escarpment—331Fj.
High Plains—331Fk.
Hartville Uplift—331Fm.
Western Nebraska Sandy and Silty Tablelands—331Fn.
Keye Paha Tablelands—331Ft.

Powder River Basin Section—331G:
Subsection: Powder River Basin—331Ge.

Ecological site concept

The Saline Subirrigated ecological site is throughout MLRA 64. It is a run-in site on nearly level to gently sloping alluvial fans and flood plains. Slopes range from 0 to 3 percent. The soils are very deep and formed in alluvium of mixed origin. The surface layer is 2 to 18 inches in depth and has a texture of loam to loamy fine sand. The soils are somewhat poorly drained and have moderately slow or moderate permeability. The texture of the subsurface ranges from loamy sand to silty clay loam. Sodium accumulation can be found in the subsoil. A seasonal water table occurs within a depth of 1 to 4 feet.

Vegetation in the Reference State (1.0) consists of salt-tolerant, warm- and cool-season grasses and forbs. Shrubs and trees are unlikely to grow in areas of this site.

Associated sites

R064XY030NE	**Saline Lowland** The Saline Lowland ecological site is on low terraces above the Saline Subirrigated ecological site.
R064XY022NE	**Wet Land** The Wet Land ecological site is adjacent to the Saline Subirrigated ecological site but is subject to permanent or seasonal flooding.
R064XY024NE	**Subirrigated** The Subirrigated ecological site is in landscape position similar to those of the Saline Subirrigated ecological site, but the soils are not saline-affected.

Similar sites

R064XY024NE	**Subirrigated** The Subirrigated ecological site is in landscape positions similar to those of the Saline Subirrigated site. The Subirrigated plant community has more big bluestem and Indiangrass and less cordgrass. Forage production is higher in the Subirrigated site than in the Saline Subirrigated site.

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 on nearly level to gently sloping alluvial fans and flood plains. A water table is generally within reach of the plants for some portion of the growing season.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Flood plain
Runoff class	Negligible to medium
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	884–1,524 m
Slope	0–3%

Water table depth	30–122 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 64 has a continental climate consisting of cold winters and hot summers, low humidity, light rainfall, and ample sunshine. Extremes in temperature are common in some years. The climate results from MLRA 64 being near the geographic center of North America. There are few natural barriers on the Northern Great Plains. Air masses move freely across the plains and account for rapid changes in temperature.

Average annual precipitation ranges from 14 to 20 inches. The normal average annual temperature is about 47 °F. January is the coldest month with average temperatures ranging from about 21 °F (Wood, SD) to about 25 °F (Hemingford, NE). July is the warmest month with average temperatures ranging from about 70 °F (Keeline 3 W, WY: 1953–1986) to about 76 °F (Wood, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 55 °F. This large annual range attests to the continental nature of the climate of this area. Wind speed averages about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime winds. Occasionally, strong storms bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Cool-season plants may green-up in September and October if adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	92-120 days
Freeze-free period (characteristic range)	119-139 days
Precipitation total (characteristic range)	406-483 mm
Frost-free period (actual range)	87-122 days
Freeze-free period (actual range)	110-149 days
Precipitation total (actual range)	381-508 mm
Frost-free period (average)	107 days
Freeze-free period (average)	130 days
Precipitation total (average)	432 mm

Climate stations used

- (1) HARRISON 20 SSE [USW00094077], Harrison, NE
- (2) ALLIANCE 1WNW [USC00250130], Alliance, NE
- (3) HARRISON [USC00253615], Harrison, NE
- (4) HEMINGFORD [USC00253755], Hemingford, NE
- (5) INTERIOR 3 NE [USC00394184], Interior, SD
- (6) MARTIN [USC00395281], Martin, SD
- (7) WOOD [USC00399442], Wood, SD
- (8) LUSK 2 SW [USC00485830], Lusk, WY
- (9) TORRINGTON 29N [USC00488997], Jay Em, WY
- (10) GLENDO 6NE [USC00483936], Glendo, WY
- (11) CHADRON 3NE [USC00251578], Chadron, NE

Influencing water features

The Saline Subirrigated ecological site is adjacent to intermittent streams and drainageways. It has a combination of physical and hydrological features that: (1) provide season-long ground water within 3.5 feet of the surface, (2)

allow relatively free movement of water and air in the upper part of the soil, and (3) are rarely or occasionally flooded.

Wetland description

System: Palustrine
Class: Emergent Wetland
Subclass: Persistent
(Cowardin et al., 1979)

Soil features

The soils in this site commonly have a surface layer of loam to loamy fine sand. Slopes range from 0 to 3 percent. The soils are somewhat poorly drained and formed in mixed alluvium. The surface layer is 2 to 18 inches thick. Subsurface layers typically have sodium accumulation and range from loamy sand to silty clay loam. A fluctuating water table occurs within a depth of 1 to 3 feet.

Soils Correlated to the Saline Subirrigated Site: Janise, Lisco, and Lute.

Janise soils are also correlated to the Saline Lowland ecological site (R064XY030NE) in areas that are rarely flooded.

The Saline Subirrigated site typically has slight to no evidence of rills, wind-scoured areas, or pedestalled plants. Waterflow paths are broken, irregular in appearance, or discontinuous and obstructed by numerous debris dams or vegetative barriers. The surface of the soil is stable and intact.

More information regarding the soil is available in soil survey reports. Contact the local USDA Service Center or use the Web Soil Survey online for details specific to your area of interest.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Alluvium–siltstone
Surface texture	(1) Loam (2) Very fine sandy loam (3) Loamy fine sand
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained
Permeability class	Moderately slow to moderate
Soil depth	183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–90
Soil reaction (1:1 water) (0-101.6cm)	6.6–9.9
Subsurface fragment volume <=3" (Depth not specified)	0–5%

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

Ecological dynamics

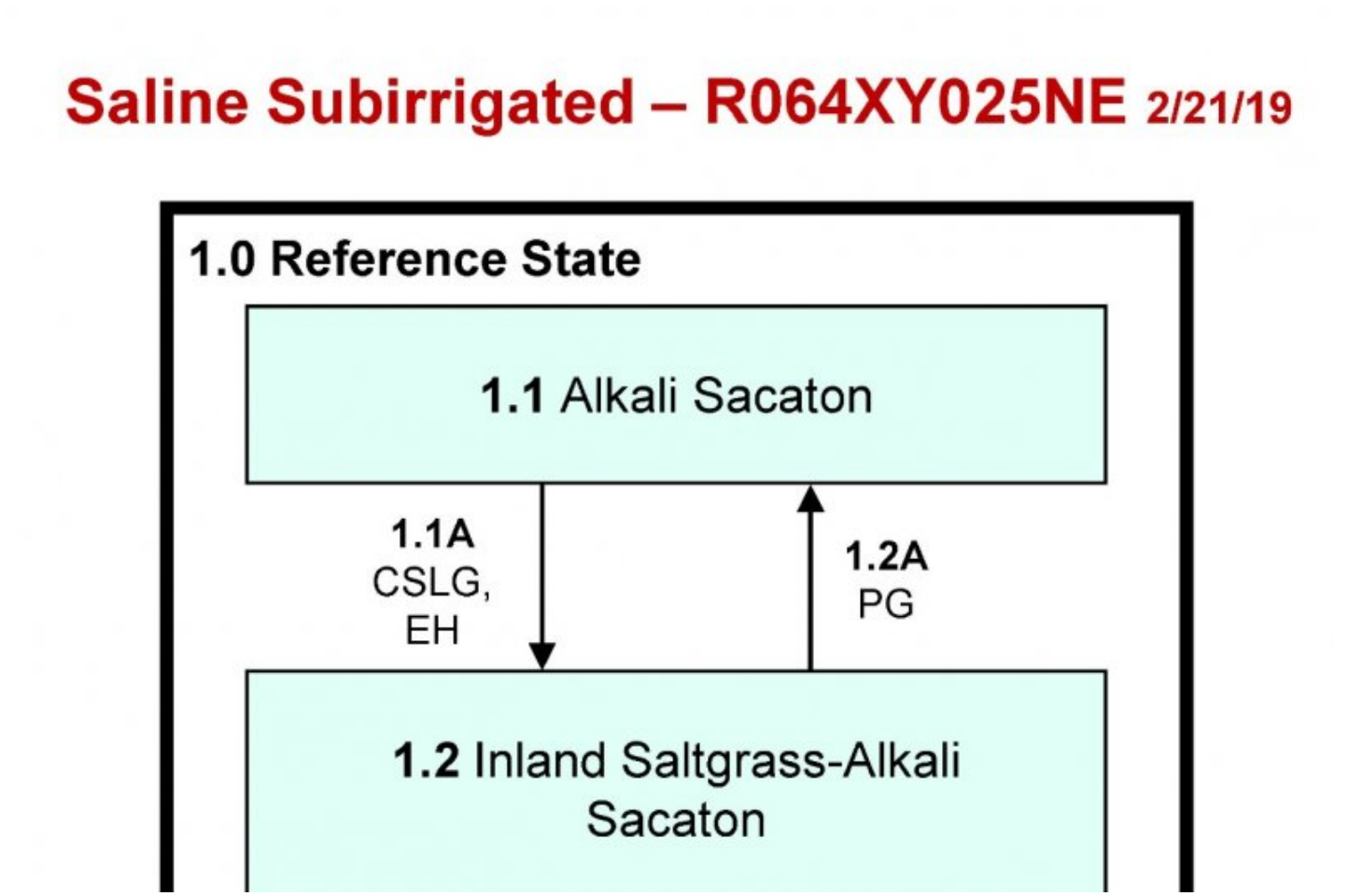
The Saline Subirrigated ecological site developed under Northern Great Plains climatic conditions; light to severe grazing by bison and other large herbivores; sporadic, natural or human-caused wildfire (often of light intensities); and other biotic and abiotic factors that typically influence soil and site development. Changes occur in the plant communities due to short-term weather variations, effects of native and exotic plant and animal species, and management actions. Although the following plant community descriptions are typical of the transitions between communities, severe disturbances, such as periods of well below average precipitation and the introduction of non-native cool-season grasses, can cause significant shifts in plant communities and species composition.

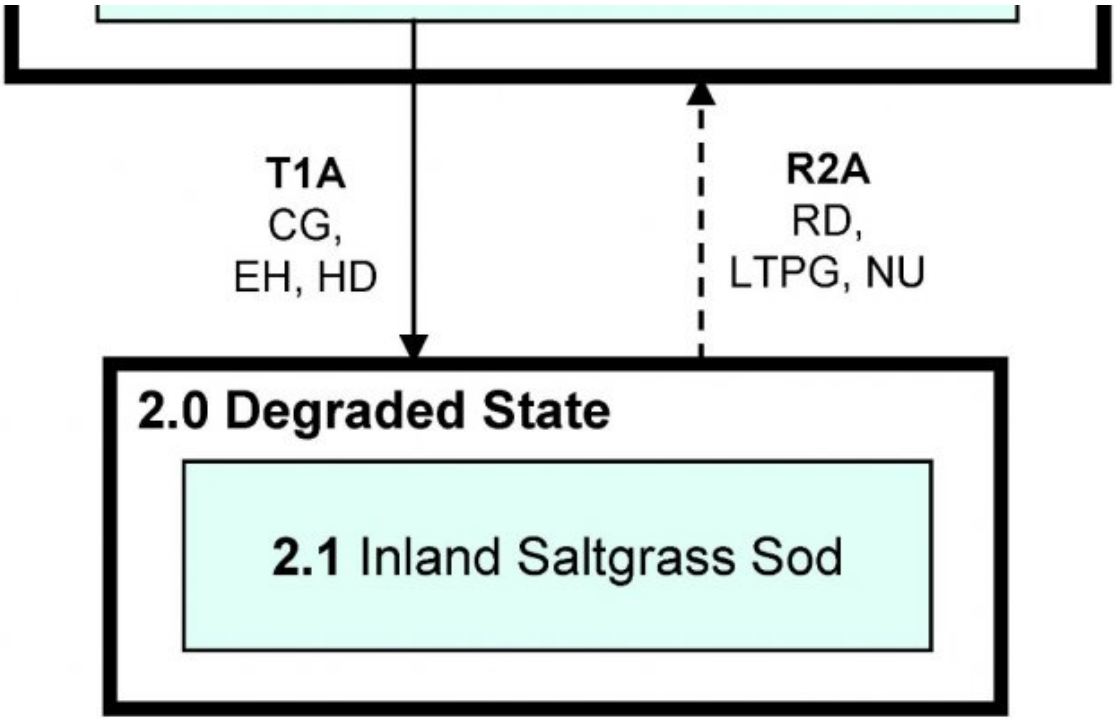
Continuous season-long grazing (during the typical growing season of May through October), or repeated seasonal grazing (e.g., every spring, every summer), without adequate recovery periods following each grazing occurrence, causes this site to depart from the Alkali Sacaton Plant Community (1.1). Species such as inland saltgrass and foxtail barley increase in frequency and production. Grasses such as alkali sacaton, alkali cordgrass, western wheatgrass, and slender wheatgrass decrease in frequency and production.

Interpretations are primarily based on the Alkali Sacaton Plant Community (1.1). The community was determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Also studied were trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts. Plant communities, states, transitional pathways, and thresholds were determined through similar studies and experience.

The following state-and-transition diagram illustrates the common plant communities on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model





CG – Continuous grazing
CSLG – Continuous season-long grazing
EH – Excessive haying
HD – Heavy disturbance
LTPG – Long-term prescribed grazing
NU – Non-use
PG – Prescribed grazing
RD – Removal of disturbance
- - → Recovery may not be fast or feasible

Diagram Legend: Saline Subirrigated - R064XY025NE

T1A	1.0 to 2.0	Continuous grazing without change in season of use or adequate recovery period; excessive haying; or heavy disturbance.
R2A	2.0 to 1.0	Removal of management induced disturbance followed by long-term prescribed grazing, including proper stocking rates, change in season of use, and adequate recovery periods. Long- or short-term rest (non-use) may be required. Recovery may not be fast or meet management objectives.
1.1A	1.1 to 1.2	Continuous, season-long grazing without change in season of use or adequate recovery time; or excessive haying.
1.2A	1.2 to 1.1	Prescribed grazing including proper stocking rates, change in season of use, and adequate time for rest and recovery.

State 1
Reference State

The Reference State (1.0)represents the best estimate of the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site is dominated by warm- and cool-season grasses. In pre-European times, the primary disturbances included natural erosion, fire, and grazing by large

ungulates, small mammals, and insects. Favorable growing conditions occur during the spring and the warm months of June through August. This state is in areas that have a history of proper grazing management, including adequate recovery periods between grazing events.

Community 1.1
Alkali Sacaton

Interpretations are primarily based on the Alkali Sacaton Plant Community. This is considered the Reference Plant Community (1.1). This plant community can be found in areas that are properly managed with grazing or prescribed burning and in some areas that received occasional short periods of rest. This plant community consists mainly of mid-statured warm- and cool-season grasses. The principal dominant plants are alkali sacaton, inland saltgrass, and western wheatgrass. Grasses of secondary importance are alkali cordgrass, slender wheatgrass, little bluestem, and foxtail barley. Blue grasses, sedges, and spike rushes form an understory. Forbs such as heath aster, milkvetch, and prairie gentian are significant. By air-dry weight, this plant community is about 80 percent grasses, 15 percent grass-like species, and 5 percent forbs. This plant community is adapted to the high salt content inherent in the soils. White crusts can occupy many areas of the soil surface due to seasonal fluctuations in the water table. This plant community is healthy and sustainable in terms of soil stability, watershed function, and biological integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2292	3029	3760
Forb	62	110	163
Total	**2354**	**3139**	**3923**

Figure 9. Plant community growth curve (percent production by month). NE6409, Pine Ridge/Badlands, warm-season dominant, cool-season sub-dominant. Warm-season dominant, cool-season sub-dominant, lowlands.

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

Community 1.2
Inland Saltgrass-Alkali Sacaton

This plant community developed due to relatively short term, continuous grazing without periodic rest or due to excessive haying. Plants that are resistant to removal maintain vigor. The potential vegetation is about 80 percent grasses, 15 percent grass-like species, and 5 percent forbs. Inland saltgrass increases in abundance, and alkali sacaton decreases. Most of the palatable plants, such as western wheatgrass, slender wheatgrass, and alkali cordgrass, are present but in lesser amounts. The soil is stable. Water cycle, nutrient cycle, and energy flow are altered but continue to adequately function. The presence of this community indicates key management concerns. Proper grazing management techniques can stabilize the community at or near the Alkali Sacaton Plant Community (1.1). Increased disturbance can easily move the community to a more degraded scenario.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1423	1838	2253
Forb	34	67	101
Total	**1457**	**1905**	**2354**

Figure 11. Plant community growth curve (percent production by month). NE6410, Pine Ridge/Badlands, lowland warm-season dominant. Warm-season dominant, lowland.

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

Pathway 1.1A
Community 1.1 to 1.2

Continuous grazing without adequate recovery periods, excessive haying, or heavy disturbance convert the Alkali Sacaton Plant Community (1.1) to the Inland Saltgrass-Alkali Sacaton Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that includes proper stocking rates, change in season of use, and adequate time for plant recovery shift the Inland Saltgrass-Alkali Sacaton Plant Community (1.2) to the Alkali Sacaton Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2
Degraded State

The Degraded State (2.0) is the result of continuous grazing, excessive haying, or heavy disturbance, which could include usage as animal feeding areas or possibly tillage and abandonment. In most cases, this state is dominated by inland saltgrass, pioneer perennials, and annual grasses and by forb species. The extent of bare ground is also much higher than in any other plant community phase.

Community 2.1
Inland Saltgrass Sod

This plant community developed from further continuous grazing or haying or in areas that have heavy disturbance, including areas that were tilled and abandoned. Inland saltgrass dominates and develops into a sod bound condition. Alkali sacaton is greatly reduced. Slender wheatgrass and western wheatgrass are replaced by increased amounts of foxtail barley and non-native plants, such as kochia and Russian thistle. The potential vegetation is about 80 percent grasses, 15 percent grass-like plants, and 5 percent forbs. The plant community lacks diversity. Evaporation is increased, resulting in a higher salt content on the soil surface. Organic matter and carbon reserves are severely diminished. Renovation of this plant community is very costly due to the high salt content and high water table.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	880	1054	1227
Forb	17	67	118
Total	**897**	**1121**	**1345**

Figure 13. Plant community growth curve (percent production by month). NE6410, Pine Ridge/Badlands, lowland warm-season dominant. Warm-season dominant, lowland.

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

Transition T1A

State 1 to 2

Continuous grazing with no recovery opportunity, excessive haying with no recovery opportunity, or heavy disturbance, transition this state to the Degraded State (2.0).

Restoration pathway R2A
State 2 to 1

Removal of a management induced disturbance coupled with long-term prescribed grazing, including periods of non-use, may eventually move the Degraded State (2.0) toward the Reference State (1.0). This transition is difficult to achieve because the inland saltgrass and foxtail barley are persistent and competitive.

Conservation practices

Prescribed Grazing

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Bunch Grasses**			628–1255	
	alkali sacaton	SPAI	*Sporobolus airoides*	628–1255	–
2	**Short Warm-Season Grasses**			314–628	
	saltgrass	DISP	*Distichlis spicata*	314–628	–
3	**Rhizomatous Wheatgrass**			314–628	
	western wheatgrass	PASM	*Pascopyrum smithii*	314–628	–
4	**Warm-Season Grasses**			157–785	
	switchgrass	PAVI2	*Panicum virgatum*	0–471	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–314	–
	alkali cordgrass	SPGR	*Spartina gracilis*	0–314	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–157	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–157	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–157	–
5	**Other Native Grasses**			314–628	
	plains bluegrass	POAR3	*Poa arida*	157–314	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	157–314	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–157	–
	Grass, perennial	2GP	*Grass, perennial*	0–157	–
6	**Grass-Like**			157–471	
	sedge	CAREX	*Carex*	63–314	–
	rush	JUNCU	*Juncus*	31–157	–
	spikerush	ELEOC	*Eleocharis*	31–157	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	31–63	–
7	**Non-Native Cool-Season Grasses**			–	
Forb					
8	**Forbs**			63–157	
	white sagebrush	ARLU	*Artemisia ludoviciana*	31–63	–
	white heath aster	SYER	*Symphyotrichum ericoides*	31–63	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	31–63	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	31–63	–
	Forb, perennial	2FP	*Forb, perennial*	31–63	–
	milkvetch	ASTRA	*Astragalus*	0–31	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–31	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–31	–
	common dandelion	TAOF	*Taraxacum officinale*	0–31	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Bunchgrasses**			286–381	
	alkali sacaton	SPAI	*Sporobolus airoides*	286–381	–
2	**Short Warm-Season Grasses**			572–762	
	saltgrass	DISP	*Distichlis spicata*	572–762	–
3	**Rhizomatous Wheatgrass**			19–95	
	western wheatgrass	PASM	*Pascopyrum smithii*	19–95	–
4	**Warm-Season Grasses**			38–191	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–95	–
	alkali cordgrass	SPGR	*Spartina gracilis*	19–95	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	19–95	–
	switchgrass	PAVI2	*Panicum virgatum*	0–38	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–38	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–38	–
5	**Other Native Grasses**			95–286	
	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	**Grass-Like**			95–286	
	sedge	CAREX	*Carex*	19–191	–
	rush	JUNCU	*Juncus*	19–95	–
	spikerush	ELEOC	*Eleocharis*	38–95	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–38	–
7	**Non-Native Cool-Season Grasses**			0–95	
	Kentucky bluegrass	POPR	*Poa pratensis*	0–95	–
	cheatgrass	BRTE	*Bromus tectorum*	0–19	–
	field brome	BRAR5	*Bromus arvensis*	0–19	–
Forb					
8	**Forbs**			38–95	
	white sagebrush	ARLU	*Artemisia ludoviciana*	19–38	–
	white heath aster	SYER	*Symphyotrichum ericoides*	19–38	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	19–38	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	19–38	–
	Forb, perennial	2FP	*Forb, perennial*	19–38	–
	Forb, annual	2FA	*Forb, annual*	0–38	–
	common dandelion	TAOF	*Taraxacum officinale*	0–19	–
	milkvetch	ASTRA	*Astragalus*	0–19	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–19	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–19	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Bunchgrasses**			0–112	
	alkali sacaton	SPAI	*Sporobolus airoides*	0–112	–
2	**Short Warm-Season Grasses**			673–1009	
	saltgrass	DISP	*Distichlis spicata*	673–1009	–
3	**Rhizomatous Wheatgrass**			11–22	
	western wheatgrass	PASM	*Pascopyrum smithii*	11–22	–
4	**Warm-Season Grasses**			11–56	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–22	–
	alkali cordgrass	SPGR	*Spartina gracilis*	11–22	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–22	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–22	–
	little bluestem	SCSC	*Schizachyrium scoparium*	–	–
	switchgrass	PAVI2	*Panicum virgatum*	–	–
5	**Other Native Grasses**			56–168	
	foxtail barley	HOJU	*Hordeum jubatum*	56–168	–
	Grass, perennial	2GP	*Grass, perennial*	0–22	–
	plains bluegrass	POAR3	*Poa arida*	0–22	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–22	–
6	**Grass-Like**			56–168	
	sedge	CAREX	*Carex*	11–56	–
	rush	JUNCU	*Juncus*	11–56	–
	spikerush	ELEOC	*Eleocharis*	11–56	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	11–22	–
7	**Non-Native Cool-Season Grasses**			11–56	
	cheatgrass	BRTE	*Bromus tectorum*	11–56	–
	field brome	BRAR5	*Bromus arvensis*	11–34	–
	Kentucky bluegrass	POPR	*Poa pratensis*	0–22	–
Forb					
8	**Forbs**			22–112	
	Forb, annual	2FA	*Forb, annual*	11–56	–
	common dandelion	TAOF	*Taraxacum officinale*	11–34	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	11–34	–
	Forb, perennial	2FP	*Forb, perennial*	11–22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	11–22	–
	white heath aster	SYER	*Symphyotrichum ericoides*	11–22	–
	scouringrush horsetail	EQHY	*Equisetum hyemale*	11–22	–
	milkvetch	ASTRA	*Astragalus*	0–11	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–11	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–11	–

Animal community

Wildlife Interpretations:
MLRA 64 is in the drier areas of a northern mixed-grass prairie ecosystem in which sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this MLRA consisted of diverse grassland and shrubland habitats interspersed with varying densities of depressional, instream wetlands and woody riparian corridors. These habitats provided critical life cycle components for many users. Many species of grassland birds, small mammals, reptiles, and amphibians and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as several species of small mammals and insects, were the primary consumers linking the grassland resources to large predators, such as the wolf, mountain lion, and grizzly bear, and to smaller carnivores, such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant and remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox are associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem in which fire, herbivory, and climate functioned as the primary disturbance factors, either singly or in combination. Following European settlement, livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors influenced species composition and abundance. Introduced and invasive species further affected plant and animal communities. The bison was a historical keystone species but has been extirpated in this area as a free-ranging herbivore. The loss of the bison and the reduction of prairie dog populations and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development reduced habitat quality for area-sensitive species.

Within MLRA 64, the Saline Subirrigated ecological site includes upland grassland cover and an associated forb and shrub component. The site was typically part of an expansive grassland landscape that included combinations of Thin Breaks, Clayey, Claypan, Dense Clay, Loamy, Saline, Sandy, Shallow, Overflow, Subirrigated, and Terrace ecological sites.

This site may have sufficient hydrology to support hydrophytic vegetation and wildlife species associated with saturated saline soil conditions. Due to high salinity concentrations, diversity is limited for both plant and wildlife species.

Reference State (1.0): The predominance of grasses and grass-like plants provides adequate forage for grazers and mixed-feeders, such as deer, pronghorn, and small mammals. Insects, including pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. Chestnut-collared longspur, vesper sparrow, long-billed curlew, western meadowlark, and sharp-tailed grouse benefit from the shorter structure and composition this plant community provides. Greater sage-grouse may use the site for brood rearing if big sagebrush is on adjacent sites. Prey populations are likely less dense but may be more available for grassland raptors, such as ferruginous hawk, Swainson’s hawk, and northern harrier. This plant community provides lower quality habitat for Great Plains toad, bull snake, and western rattlesnake.

Inland saltgrass and alkali sacaton dominate in areas that are subject to continuous season-long grazing or annual haying. Under such conditions, inland saltgrass increases and provides suboptimal forage opportunity for herbivores. Both forb diversity and abundance increase, providing a suitable forage base for insects, small mammals, and their predators.

Inland Saltgrass Sod (2.1): This state results from further continuous grazing or from repeated annual haying. Inland saltgrass sod dominates. Inland saltgrass significantly increases and provides suboptimal forage opportunity for herbivores. Other grasses and grass-like species comprise a small component of the plant community. The lack of seed producing plants decreases forage opportunities for small mammals. Forb diversity and abundance remain at the same low levels but provide a suitable forage base for insects. Insects, including pollinators, play a large role in maintaining the forb community and provide a forage base for grassland birds and other species. Chestnut-collared longspur, vesper sparrow, long-billed curlew, and western meadowlark benefit from the structure and composition this plant community provides. Prey populations are likely less dense than in the reference community but may be more available for grassland raptors, such as ferruginous hawk, Swainson’s hawk, and northern harrier. This plant community provides lower quality habitat for Great Plains toad, bull snake, and western rattlesnake.

Grazing Interpretations:

The following list suggests annual, initial stocking rates for average growing conditions. These estimates are conservative and should be used only as guidelines in the initial stages of conservation planning. Commonly, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Therefore, a resource inventory is necessary to document plant composition and production. More accurate estimates of carrying capacity should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. In consultation with the land manager, a more intensive grazing management program that results in improved harvest efficiencies and increased carrying capacity may be developed.

The following suggested initial stocking rates are based on 912 lb/acre (air-dry weight) per animal-unit-month (AUM) with a 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA-NRCS National Range and Pasture Handbook). An AUM is defined as the equivalent amount of forage required by a 1,000-pound cow, with or without calf, for one month.

Plant Community: Alkali Sacaton (1.1)
Average Production (lb/acre, air-dry): 2,800
Stocking Rate (AUM/acre): 0.77

Plant Community: Inland Saltgrass-Alkali Sacaton (1.2)
Average Production (lb/acre, air-dry): 1,700
Stocking Rate (AUM/acre): 0.47

*Plant Community: Inland Saltgrass Sod (2.1)
Average Production (lb/acre, air-dry): 1,000
Stocking Rate (AUM/acre): Variable

Plant Community: All other plant communities identified in this document have variable annual production values and require onsite sampling to determine initial stocking rates.

* Total annual production and stocking rates are highly variable and require onsite sampling.

Total onsite annual production may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been reduced to reflect only preferred or desirable forage species.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for livestock. During the dormant period, the forage for livestock likely has insufficient protein to meet livestock requirements. Added protein allows ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic group C and has localized areas of D. The infiltration rate is moderate. Runoff potential varies from moderate to high depending on soil hydrologic group and ground cover. In many cases, areas that have greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception occurs where shortgrasses form a dense sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Forage production is limited by saline conditions. Proper management is critical to the continued productivity of these sites. Re-establishment of grasses on overgrazed or tilled sites is commonly slow and difficult because increased evaporation (from exposed soil surfaces) causes increased salt concentration at the soil surface.

Recreational uses

This site provides opportunities for hunting upland game species. The wide variety of plants that bloom from spring until fall have aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

Harvesting the seeds of native plants can provide additional income on this site.

Other information

Revision Notes: “Previously Approved” Provisional

This Provisional ecological site description (ESD) has passed Quality Control (QC) and Quality Assurance (QA) to ensure the it meets the 2014 NESH standards for a Provisional ecological site description.

This ESD is an updated “Previously Approved” ESD that represented a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirements as an “Approved” ESD as laid out in the 1997 National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and-Transition model. All other alternative states are at least described in narrative form. The “Previously Approved” ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The “Previously Approved” ESD may not contain all tabular and narrative entries as required in the current “Approved” level of documentation, but it is expected that it will continue refinement toward an “Approved” status.

Site Development and Testing Plan:
Future work, as described in an official project plan, is necessary to validate the information in this provisional ecological site description. The plan will include field activities for low-, medium-, and high-intensity sampling, soil correlations, and analysis of the data. Annual field reviews should be done by soil scientists and vegetation specialists. Final field review, peer review, quality control, and quality assurance reviews are required to produce the final document.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, range management specialist (RMS), NRCS; Jill Epley, RMS, NRCS; Rick Peterson, RMS, NRCS; David Steffen, RMS, NRCS; Jeff Vander Wilt; RMS, NRCS; Phil Young, soil scientist, NRCS; and George Gamblin, RMS, NRCS.

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Contributors

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Approval

Suzanne Mayne-Kinney, 12/16/2024

Acknowledgments

This ecological site was reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS on 2/15/2019.

Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, available online at https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer and at any USDA office, or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632- 9992. Submit your completed form or letter to USDA by:
(1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410;
(2) fax: (202) 690-7442; or
(3) email: program.intake@usda.gov.

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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.

Author(s)/participant(s)	Stan Boltz, Mitch Faulkner, Emily Helms, John Hartung, Ryan Murray, George Gamblin, Rick Peterson, Nadine Bishop, Jeff Nichols
Contact for lead author	jeffrey.nichols@usda.gov
Date	12/12/2024
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. Erosional pedestals or 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 less than 5 percent.

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5. **Number of gullies and erosion associated with gullies:** None. Gullies should not be present

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Wind scoured areas and depositional areas should not be present.

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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 typically 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):** Surface horizon should be 2 to 18 inches (5 to 45.5 cm) thick. Soil colors are light brownish gray, gray and grayish brown (values of 5 to 6) when dry and dark gray, grayish brown, to very dark grayish brown (values of 3 to 5) when moist. Soil structure is typically medium granular.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid and tall rhizomatous and tufted perennial cool season grasses) with fine and coarse roots positively influences infiltration. Excessive amounts of foxtail barley and/or introduced cool-season grasses such as Kentucky bluegrass may have an adverse impact infiltration and runoff.

    Relative composition is approximately 80 percent grasses, 15 percent grass-like plants, and 5 percent forbs. The grass component is made up of C4, tall and mid bunchgrasses (20-45%), C3, rhizomatous grasses (10-20%), C3 bunch grasses (10-20%), C4, short grasses (10-20%), grass-likes (5-15%), and C4 tall, and mid rhizomatous grasses (0-15%).

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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.

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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, 20-45% (1 species minimum): alkali sacaton, little bluestem.

    Phase 1.2
    1. Native, perennial, C4, shortgrass, 510-680 #/ac, 30-40% (1 species minimum): saltgrass, blue grama.

    Sub-dominant: Phase 1.1
    1. Native, perennial, C3, rhizomatous grass, 280-560, 10-20% (1 species minimum): western wheatgrass.
    2. Native, perennial, C3 bunchgrass, 280-560, 10-20% (2 species minimum): plains bluegrass, foxtail barley, slender wheatgrass.
    3. Native, perennial, C4, shortgrass, 280-560 #/ac, 10-20% (1 species minimum): blue grama, inland saltgrass.
    4. Native grass-likes, 140-420 #/ac, 5-15% (4 species minimum): sedge, rush, spikerush.

Phase 1.2
1. Native, perennial, C4, tall and mid bunchgrass, 255-340 #/ac, 15-20% (1 species minimum): alkali sacaton, little bluestem.
2. Native, perennial, C3, bunchgrass, 85-255 #/ac, 5-15% (1 species minimum): foxtail barley, plains bluegrass, slender wheatgrass, foxtail barley.
3. Native grass-likes, 85-255 #/ac, 5-15% (3 species minimum): sedge, rush, spikerush.

Other: Minor - Phase 1.1
1. Native, perennial, C4, rhizomatous, tall- and midgrass, 0-420 #/ac, 0-15%: alkali cordgrass, switchgrass, alkali muhly (scratchgrass), sand dropseed.
2. Native forbs, 56-140 #/ac, 2-5%: Forbs present vary from location to location.

Minor - Phase 1.2
1. Native, perennial, C4, rhizomatous, tall- and midgrass, 34-170 #/ac, 2-10%: switchgrass, sand dropseed, alkali cordgrass, scratchgrass.
2. Native forbs, 34-85 #/ac, 2-5%: forbs present vary from location to location.
3. Native, perennial, C3, rhizomatous grass, 17-85 #/ac, 1-5%: western wheatgrass.
4. Non-native, C3 grass, 0-85 #/ac, 0-5%: Kentucky bluegrass, cheatgrass, field brome.

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

The Inland Saltgrass-Alkali Sacaton Community (1.2) includes eight F/S groups. These groups, in order of abundance, include native, perennial, C4, shortgrass; native, perennial, C4 bunchgrass; native, perennial, C3 bunchgrass = native grass-likes; native, perennial, C4, rhizomatous tall- and midgrass; native forbs; native, perennial, C3 rhizomatous grass; 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):** Bunchgrasses 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 50 to 80 percent and at a depth of 0.25 to 0.50 inch (0.65 to 1.3 cm). Foxtail barley and/or Kentucky bluegrass excessive litter can negatively impact the functionality of this site.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production is 2,800 pounds per acre in a year with normal precipitation and temperatures. 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. Kentucky bluegrass, Russian olive, and saltcedar 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.
