

Ecological site R064XY030NE Saline Lowland

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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.

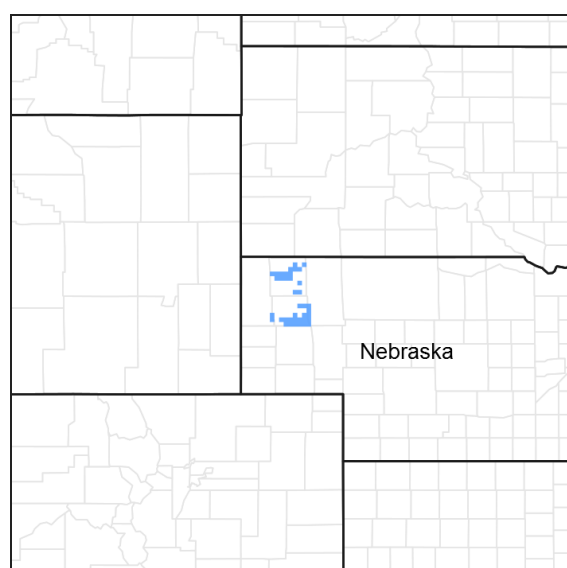


Figure 1. Mapped extent

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 is 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 Ogala 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: 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—311Fh.

Pine Ridge Escarpment—311Fj.

High Plains—311Fk.

Hartville Uplift—311Fm.

Western Nebraska Sandy and Silty Tablelands—311Fn.

Keye Paha Tablelands—331Ft.
Powder River Basin Section—311G:
Subsection: Powder River Basin—311Ge.

Ecological site concept

The Saline Lowland ecological site is found 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 thick and has texture ranging from silt loam to very fine sandy loam. The soils are somewhat poorly to moderately well drained and have moderately slow to very slow permeability. Sodium accumulation is in the subsoil in some place. A seasonal water table occurs within 4 feet of the surface.

Vegetation in the Reference State (1.0) consists of salt-tolerant, warm- and cool-season grasses, forbs, shrubs, and scattered trees.

Associated sites

R064XY025NE	Saline Subirrigated The Saline Subirrigated ecological site is in lower landscape positions than those of the Saline Lowland ecological site. It also has a season-long water table.
R064XY045NE	Dense Clay The Dense Clay ecological site is on upland landscapes above the Saline Lowland ecological site.
R064XY046NE	Thin Claypan The Thin Claypan ecological site is on low terraces adjacent the Saline Lowland ecological site.

Similar sites

R064XY025NE	Saline Subirrigated The Saline Subirrigated ecological site may occur on lower landscape positions than those of the Saline Lowland site. The water table is less than 4 feet from the soil surface and provides season-long ground water. The plant community has more alkali sacaton, less wheatgrass, and higher forage production than the Saline Lowland ecological site.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Spartina gracilis</i>

Physiographic features

The Saline Lowland ecological site is on nearly level to gently sloping alluvial fans and flood plains.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Flood plain
Runoff class	Low
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	122–183 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 per year. 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) CHADRON 3NE [USC00251578], Chadron, NE
- (11) GLENDON 6NE [USC00483936], Glendo, WY

Influencing water features

The Saline Lowland ecological site is adjacent to intermittent streams and drainageways.

Wetland description

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

Soil features

The soils of this site are very deep, are somewhat poorly drained to moderately well drained, and formed in alluvium of mixed origin. Surface horizons range from 2 to 18 inches in thickness and range from silt loam to very fine sandy loam in texture. These soils have moderately slow to very slow permeability and are moderately to strongly saline or alkaline. Higher concentrations of soluble salts are in the subsoil in some places. A fluctuating water table occurs in these areas within 4 feet of the surface.

Soil correlated to the Saline Lowland site: Janise.

These areas are subject to occasional overflow. This site has slight to no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

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–shale and siltstone (2) Alluvium–siltstone
Surface texture	(1) Very fine sandy loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately slow to very slow
Soil depth	203 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)	4–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–50
Soil reaction (1:1 water) (0-101.6cm)	6.1–9.6
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Saline Lowland 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.

The Great Plains climate plays an important role as sporadic heavy rainfall events cause fluctuating erosion and deposition to occur on this site. Recent grazing or browsing patterns do have an effect but only if the site is stable long enough to establish vegetation for an extended period of time. While the following descriptions describe more typical transitions between communities that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and species composition.

Shrubs such as greasewood and rubber rabbitbrush will occur in higher amounts on the western portions of where this site occurs.

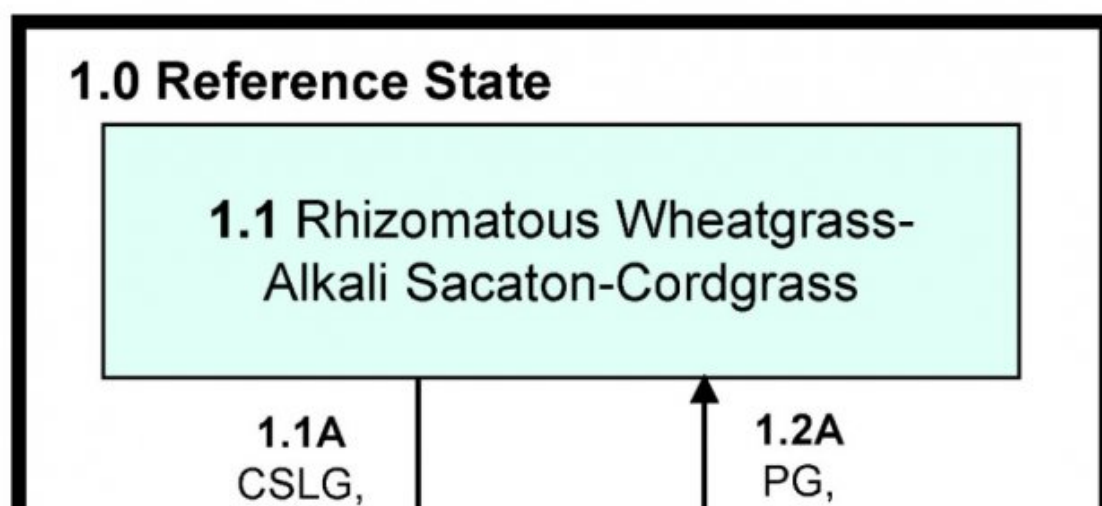
Continuous season-long grazing (during the typical growing season of May through October) or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence results in the site departing from the Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass Plant Community (1.1). Inland saltgrass and foxtail barley increase, and annual species may invade the site. Grasses, such as alkali sacaton, rhizomatous wheatgrasses, and Nuttall's alkaligrass, decrease in frequency and production. The high salt content of the soils greatly influences the plant species present. Plant vigor can vary on a year-to-year basis in relation to current amounts of precipitation, which influences the translocation of salts in the soil profile. Typically, only salt-tolerant plants grow on this site.

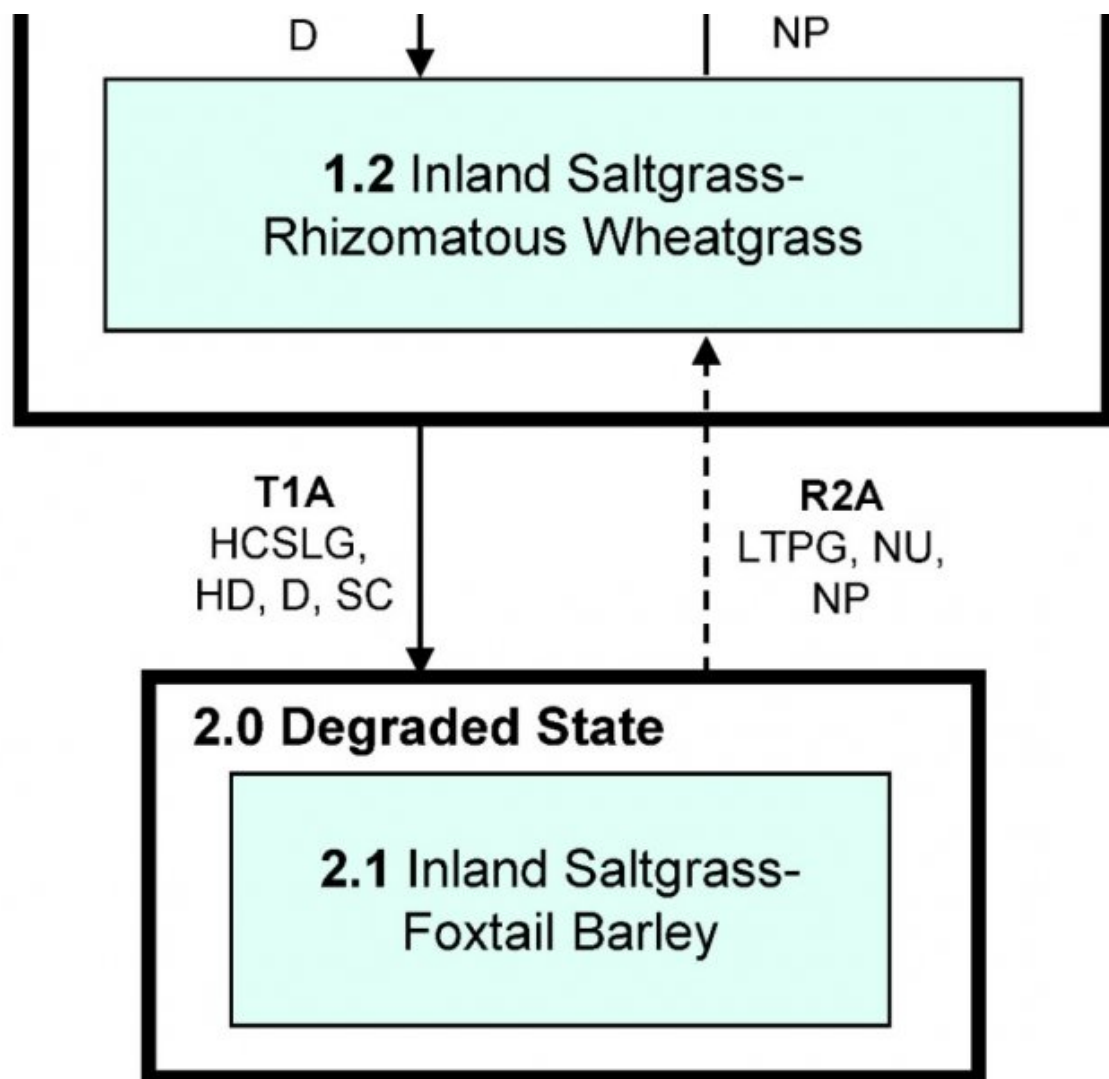
Interpretations are primarily based on the Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass Plant Community (1.1). The composition of the community was determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Also studied 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

Saline Lowland – R064XY030NE 2/21/19





D - Drought

HCSLG – Heavy, continuous season-long grazing

HD – Heavy disturbance

LTPG – Long-term prescribed grazing

CSLG – Continuous season-long grazing

NP – Return to normal precipitation patterns

NU – Non-use

PG – Prescribed grazing

SC – Soil Compaction

-- ➔ Recovery may not be fast or feasible

Diagram Legend: Saline Lowland - R064XY030NE

T1A	1.0 to 2.0	Heavy, continuous, season-long grazing, without change in season of use or adequate recovery; heavy disturbance; heavy grazing in combination with drought; or possible soil compaction.
R2A	2.0 to 1.0	Long-term prescribed grazing with proper stocking rates, change in season of use, and adequate recovery period; return to normal precipitation following drought. 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 drought.
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; return to normal precipitation following drought.

State 1 Reference State

The Reference State 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 occurred during the spring and the warm months of June through August. The Reference State is in areas that have a history of proper grazing management, including adequate recovery periods between grazing events.

Community 1.1 Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass

Interpretations are based primarily on the Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass Plant Community. This is also considered to be the Reference Plant Community (1.1). Potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent woody plants. Saline-tolerant grasses dominate the plant community. The major grasses include rhizomatous wheatgrasses, alkali sacaton, Nuttall's alkaligrass, alkali cordgrass, prairie cordgrass, and inland saltgrass. Woody plants are greasewood, fourwing saltbush, rubber rabbitbrush, cottonwood, and Gardner's saltbush. Shrubs such as greasewood and rubber rabbitbrush grow in higher amounts on the western portions of MLRA 64. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending upon growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow function properly. Plant litter is properly distributed with very little movement offsite. Natural plant mortality is very low. Drought tolerance is high because of the diversity in plant species. This plant community is productive and diverse. It is sustainable in regard to site stability, soil stability, watershed function, and biologic integrity as long as extreme erosion or depositional events do not occur.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2163	2432	2640
Shrub/Vine	151	392	673
Forb	151	235	336
Tree	—	78	163
Total	2465	3137	3812

Figure 9. Plant community growth curve (percent production by month).
NE6408, Pine Ridge/Badlands, lowland cool-season/warm-season co-dominant. Cool-season, warm-season co-dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	12	20	25	19	11	5	3		

Community 1.2

Inland Saltgrass-Rhizomatous Wheatgrass

This plant community is a result of continuous season-long grazing. Grasses comprise 85 percent, forbs 10, and shrubs 5. Dominant grasses include inland saltgrass, western wheatgrass, thickspike wheatgrass, alkali, or prairie cordgrass. Other secondary grasses and grass-like plants include blue grama and sedges. Forbs, such as asters and saltwort, may grow, and non-native forbs, such as cocklebur, may invade. When compared to the Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass Plant Community (1.1), saltgrass is increased. Alkali sacaton, Nuttall's alkaligrass, and woody vegetation are greatly diminished.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1009	1675	2309
Forb	95	202	336
Shrub/Vine	17	111	207
Tree	—	30	62
Total	1121	2018	2914

Figure 11. 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		

Pathway 1.1A

Community 1.1 to 1.2

Continuous season-long grazing or heavy grazing in combination with drought convert Plant Community 1.1 to the Inland Saltgrass-Rhizomatous Wheatgrass 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 and a return to normal precipitation patterns convert this plant community to the Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2

Degraded State

The Degraded State (2.0) is the result of heavy, continuous season-long grazing or the result of frequent and severe defoliation. In most cases, this state is dominated by grazing resistant grasses, pioneer perennials, and annual grasses and by forbs. The extent of bare ground is much higher than on any other plant community phase. This state is at-risk of water erosion.

Community 2.1

Inland Saltgrass-Foxtail Barley

This plant community is the result of long-term improper grazing. Inland saltgrass dominates this plant community.

Other grasses and grass-like plants include alkali bluegrass, foxtail barley, and sedges. Common forbs are Pursch seepweed, red saltwort, and povertyweed. The extent of bare ground is increased, and production is decreased. The soils of this plant community are not well protected. The biotic integrity is compromised by introduced species, loss of the dominant climax species, and bare ground. Excessive runoff may occur.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	824	1130	1429
Forb	62	135	207
Shrub/Vine	11	74	140
Tree	–	7	17
Total	897	1346	1793

Figure 13. 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		

Transition T1A
State 1 to 2

Heavy, continuous season-long grazing, heavy disturbance, heavy grazing in combination with drought, and possible soil compaction result in the Reference State (1.0) transitioning to the Degraded State (2.0).

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing, including periods of non-use, and normal precipitation patterns may eventually move the Degraded State (2.0) toward the Reference State (1.0). This transition is difficult to achieve because 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	Rhizomatous Wheatgrasses			628–1255	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	628–1255	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	157–471	–
2	Cordgrass			314–942	
	alkali cordgrass	SPGR	<i>Spartina gracilis</i>	314–942	–
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	157–471	–
3	Sacaton			314–785	
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	314–785	–

4	Other Native Grasses			314–628	
	Nuttall's alkaligrass	PUNU2	<i>Puccinellia nuttalliana</i>	314–628	—
	saltgrass	DISP	<i>Distichlis spicata</i>	157–471	—
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	0–157	—
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–157	—
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–157	—
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–157	—
5	Grass-Likes			63–157	
	sedge	CAREX	<i>Carex</i>	31–157	—
	rush	JUNCU	<i>Juncus</i>	0–157	—
	spikerush	ELEOC	<i>Eleocharis</i>	0–157	—
	bulrush	SCHOE6	<i>Schoenoplectus</i>	0–157	—
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–63	—
6	Non-Native Cool-Season Grasses			—	
Forb					
7	Forbs			157–314	
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–157	—
	annual marsh elder	IVAN2	<i>Iva annua</i>	0–157	—
	aster	ASTER	<i>Aster</i>	0–157	—
	povertyweed	IVAX	<i>Iva axillaris</i>	0–157	—
	Pursh seepweed	SUCA2	<i>Suaeda calceoliformis</i>	0–157	—
	red swampfire	SARU	<i>Salicornia rubra</i>	0–157	—
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–157	—
	lambquarters	CHAL7	<i>Chenopodium album</i>	—	—
	Forb, annual	2FA	<i>Forb, annual</i>	—	—
	cocklebur	XANTH2	<i>Xanthium</i>	—	—
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	—	—
Shrub/Vine					
8	Shrubs			157–628	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–314	—
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0–314	—
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–157	—
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–157	—
	greasewood	SARCO	<i>Sarcobatus</i>	0–63	—
Tree					
9	Trees			0–157	
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0–157	—

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			303–605	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	303–605	–

	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	101–202	–
2	Cordgrass			40–202	
	alkali cordgrass	SPGR	<i>Spartina gracilis</i>	40–202	–
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	0–101	–
3	Sacaton			0–202	
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–202	–
4	Other Native Grasses			404–807	
	saltgrass	DISP	<i>Distichlis spicata</i>	303–605	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	40–202	–
	Nuttall's alkaligrass	PUNU2	<i>Puccinellia nuttalliana</i>	0–101	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–101	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–61	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–40	–
5	Grass-Likes			101–303	
	sedge	CAREX	<i>Carex</i>	101–202	–
	rush	JUNCU	<i>Juncus</i>	20–101	–
	spikerush	ELEOC	<i>Eleocharis</i>	20–101	–
	bulrush	SCHOE6	<i>Schoenoplectus</i>	20–101	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–40	–
6	Non-Native Cool-Season Grasses			20–101	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–101	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	20–61	–
	field brome	BRAR5	<i>Bromus arvensis</i>	0–61	–
Forb					
7	Forbs			101–303	
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	20–101	–
	annual marsh elder	IVAN2	<i>Iva annua</i>	20–101	–
	aster	ASTER	<i>Aster</i>	20–101	–
	cocklebur	XANTH2	<i>Xanthium</i>	0–101	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	20–101	–
	povertyweed	IVAX	<i>Iva axillaris</i>	20–101	–
	Pursh seepweed	SUCA2	<i>Suaeda calceoliformis</i>	20–101	–
	red swampfire	SARU	<i>Salicornia rubra</i>	0–101	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–101	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–101	–
	lambquarters	CHAL7	<i>Chenopodium album</i>	0–61	–
Shrub/Vine					
8	Shrubs			20–202	
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–202	–
	greasewood	SARCO	<i>Sarcobatus</i>	0–101	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–101	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–61	–
	Cordoned saltbush	ATCA	<i>Atriplex cordata</i>	0–61	–

	Gardner's Sandbush	ATGA	<i>Amplex gardneri</i>	0-61	-
Tree					
9	Trees			0-61	
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0-61	-

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrasses			13-135	
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	13-135	-
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	13-135	-
2	Cordgrass			0-40	
	alkali cordgrass	SPGR	<i>Spartina gracilis</i>	0-40	-
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	0-40	-
3	Sacaton			0-13	
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0-13	-
4	Other Native Grasses			471-1076	
	saltgrass	DISP	<i>Distichlis spicata</i>	404-942	-
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	67-202	-
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0-67	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-27	-
	Nuttall's alkaligrass	PUNU2	<i>Puccinellia nuttalliana</i>	-	-
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	-	-
5	Grass-Likes			67-202	
	sedge	CAREX	<i>Carex</i>	67-202	-
	rush	JUNCU	<i>Juncus</i>	13-67	-
	spikerush	ELEOC	<i>Eleocharis</i>	13-67	-
	bulrush	SCHOE6	<i>Schoenoplectus</i>	13-67	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-13	-
6	Non-Native Grasses			13-135	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0-135	-
	cheatgrass	BRTE	<i>Bromus tectorum</i>	13-67	-
	field brome	BRAR5	<i>Bromus arvensis</i>	0-67	-
Forb					
7	Forbs			67-202	
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	13-67	-
	annual marsh elder	IVAN2	<i>Iva annua</i>	13-67	-
	aster	ASTER	<i>Aster</i>	13-67	-
	cocklebur	XANTH2	<i>Xanthium</i>	0-67	-
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	13-67	-
	povertyweed	IVAX	<i>Iva axillaris</i>	13-67	-
	Pursh seepweed	SUCA2	<i>Suaeda calceoliformis</i>	13-67	-
	red swampfire	SARU	<i>Salicornia rubra</i>	0-67	-

	Forb, swampy	2FP	<i>Forb, perennial</i>	0–67	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–67	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–67	–
	lambquarters	CHAL7	<i>Chenopodium album</i>	0–40	–
Shrub/Vine					
8	Shrubs			13–135	
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	13–135	–
	greasewood	SARCO	<i>Sarcobatus</i>	0–108	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–67	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	–	–
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	–	–
Tree					
9	Trees			0–13	
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0–13	–

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 Lowland ecological site provides upland grassland cover with associated forb, shrub, and tree components. It 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.

In places, this site has sufficient hydrology to support hydrophytic vegetation and wildlife species associated with saturated saline soil conditions. Due to high salinity concentrations, both plant and wildlife species diversity is limited.

Reference State (1.0): The predominance of saline-tolerant hydrophytic vegetation, including shrubs, does not favor any particular wildlife group. However, the site may receive limited shorebird use. This plant community provides habitat for limited invertebrate populations. Reptile use is either extremely limited or nonexistent. Raptors, such as northern harrier, short-eared owl, Swainson's hawk, and American kestrel, use this site. Prey populations are limited to small mammals, such as Hayden's shrew, masked shrew, and spotted ground squirrel, and invertebrates.

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: Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass (1.1)

Average Production (lb/acre, air-dry): 2,800

Stocking Rate (AUM/acre): 0.77

Plant Community: Inland Saltgrass-Rhizomatous Wheatgrass (1.2)

Average Production (lb/acre, air-dry): 1,800

Stocking Rate (AUM/acre): 0.49

*Plant Community: Inland Saltgrass-Foxtail Barley (2.1)

Average Production (lb/acre, air-dry): 1,200*

Stocking Rate (AUM/acre): 0.33*

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 groups B and C with 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.

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.

Other references

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C.A. Carpenter, and W.H McNab. 2007. Ecological subregions: Sections and subsections of the conterminous United States. USDA Forest Service, General Technical Report WO-76D. <https://www.fs.fed.us/research/publications/misc/73326-wo-gtr-76d-cleland2007.pdf> (accessed 31 January 2019).

U.S. Environmental Protection Agency. 2018. EPA level III and level IV ecoregions of the conterminous United States. <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-conterminous-united-states> (accessed 26 April 2018).

High Plains Regional Climate Center, University of Nebraska. 2018. <http://www.hprcc.unl.edu/> (accessed 6 April 2018).

Steele, Ken, M.P. Fisher, and D.D. Steele. 2018. Fort Laramie and the Hartville Uplift. In: Geology of Wyoming. <https://www.geowyo.com/fort-laramie--hartville-uplift.html> (accessed 14 November 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. Electronic field office technical guide. <https://efotg.sc.egov.usda.gov> (accessed 12 April 2018).

Soil Survey Staff. 2018. Official soil series descriptions. USDA Natural Resources Conservation Service. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053587 (accessed 12 April 2018).

Soil Survey Staff. 2018. Web Soil Survey. USDA Natural Resources Conservation Service.

<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx> (accessed 12 April 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. Agriculture Handbook 296. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050898.pdf (accessed 17 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2014. National ecological site handbook, 1st Ed. <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcseprd1291232> (accessed 27 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2012. National engineering handbook, part 630. Hydrology chapters from e-Directives. <https://directives.sc.egov.usda.gov/viewerFS.aspx?hid=21422> (accessed 17 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. Climate data. National Water and Climate Center. <http://www.wcc.nrcs.usda.gov/> (accessed 12 April 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 1997. National range and pasture handbook, rev. 1, 2003. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043055.pdf (accessed 7 November 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. National Soil Information System, Information Technology Center. <http://nasis.nrcs.usda.gov> (accessed 7 November 2017).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. PLANTS database. National Plant Data Team, Greensboro, NC. <http://plants.usda.gov> (accessed 12 April 2018).

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.

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(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.

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is normally less than 10 percent and scattered throughout the site. Bare ground patches are small and range in size from 2 to 3 inches (5 to 7.5 cm). The areas of bare ground may have high amounts of salt crusting.

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

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

-
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.
-
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability ratings are typically 3 or greater. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure for at least short periods when dipped in distilled water. Some fragments will dissolve in less than 1 minute.
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The surface horizon is a dark gray E-horizon that is 2 to 18 inches (5 to 45.75 cm) thick. Soil colors are light brownish gray (value of 6) when dry and dark gray to grayish brown (values of 4 to 5) when moist. Structure is platy parting to fine granular. A fluctuating water table occurs within 4 feet (1.22 m) of the surface.
-
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. Large amounts of foxtail barley or invasion of non-native trees such as Russian olive and saltcedar may have an adverse impact on infiltration and runoff.
- Relative composition is approximately 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs and trees. The grass and grass-like component is composed of C3, rhizomatous grasses (20-45%), C4, rhizomatous, tallgrasses (10-30%), C3, bunchgrasses (10-25%), C4, bunchgrasses (10-25%), C4, shortgrasses (5-15%), and grass-like (2-5%).
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. A platy structure can be present in the surface horizon or near the surface and can be mistaken for a compaction layer.
-
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, C3, rhizomatous grass, 560-1260 #/ac, 20-45% (2 species minimum): thickspike wheatgrass, western wheatgrass.
 2. Native, perennial, C4, rhizomatous, tallgrass, 280-840 #/ac, 10-30%, (2 species minimum): alkali cordgrass, prairie cordgrass.
 3. Native, perennial, C4, tall bunchgrass, 280-700 #/ac, 10-25% (1 species minimum): alkali sacaton.
 4. Native, perennial, C3, bunchgrass, 280-700 #/ac, 10-25% (1 species minimum): foxtail barley, squirreltail, Nuttall's alkaligrass, Sandberg bluegrass, slender wheatgrass.
- Phase 1.2
1. Native, perennial, C3, rhizomatous grass, 270-540 #/ac, 15-30% (2 species minimum): western wheatgrass, thickspike wheatgrass.
 2. Native, perennial, C4, shortgrass, 270-540 #/ac, 15-30% (1 species minimum): saltgrass.

Sub-dominant: Phase 1.1

1. Shrub, 140-560 #/ac, 5-20% (1 species minimum): fourwing saltbush, Gardner's saltbush, greasewood, rubber rabbitbrush.
2. Native, perennial, C4, shortgrass 140-420 #/ac, 5-15% (1 species minimum): saltgrass.

Phase 1.2

1. Native grass-like, 90-270, 5-15% (4 species minimum): sedge, rush, spikerush, bulrush.
2. Native forb, 90-270 #/ac, 5-15%: American licorice, annual marsh elder, aster, curlycup gumweed, poverty weed, Pursh seepweed, and other forbs which vary from location to location.

Other: Minor - Phase 1.1

1. Native forb, 40-280 #/ac, 5-10%: Forb species will vary from location to location.
2. Native grass-like, 56-140 #/ac, 2-5%: sedges, bulrushes, rushes, spikerushes.
3. Native, deciduous tree, 0-140 #/ac, 0-5%: plains cottonwood.

Minor - Phase 1.2

1. Native, perennial, C3 bunchgrass, 36-180 #/ac, 2-10%: Nuttall's alkaligrass, slender wheatgrass, squirreltail, foxtail barley.
2. Native, perennial, C4, rhizomatous tallgrass, 36-180 #/ac, 2-10%: alkali cordgrass, prairie cordgrass.
3. Shrub, 18-180 #/ac, 1-10%: rubber rabbit brush, fourwing saltbush, Gardner's saltbush, greasewood.
4. Native, perennial, C4, tall, bunchgrass, 0-180 #/ac, 0-10%: alkali sacaton.
5. Non-native, C3 grass, 18-90 #/ac, 1-5%: Kentucky bluegrass, cheatgrass, field brome.
6. Native, deciduous tree, 0-54 #/ac, 0-3%: plains cottonwood.

Additional: The Rhizomatous Wheatgrass-Alkali Sacaton-Cordgrass Community or Reference Community (1.1) includes nine F/S groups. These groups, in order of relative abundance, are native, perennial, C3, rhizomatous grass; native, perennial, C4, rhizomatous, tallgrass; native, perennial, C4, tall, bunchgrass; native, perennial, C3, bunchgrass; shrub; native, perennial, C4, shortgrass; native forb; native grass-like; and native, deciduous tree.

The Inland Saltgrass-Rhizomatous Wheatgrass Community (1.2) includes ten F/S groups. These groups, in order of relative abundance, are native, perennial, C3, rhizomatous grass; native, perennial, C4, shortgrass; native grass-like; native forb; native, perennial, C3 bunchgrass; native, perennial, C4, rhizomatous tallgrass; shrub; native, perennial, C4, tall, bunchgrass; non-native, C3 grass; native, deciduous tree.

-
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.
-
14. **Average percent litter cover (%) and depth (in):** Plant litter cover is evenly distributed throughout the site and is expected to be 50 to 70 percent and at a depth of 0.25 to 0.50 inch (0.65 to 1.3 cm). Foxtail barley excessive litter can negatively impact the functionality of this site.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 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.
-
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. Annual bromes, crested wheatgrass, Russian olive, saltcedar, 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.

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..
-