USDA Natural Resources
Conservation Service

Ecological site R102AY036SD
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): 102A–Rolling Till Prairie

The Rolling Till Prairie (102A) is located within the Central Feed Grains and Livestock Land Resource Region. It spans 3 states (Minnesota 58 percent, South Dakota 42 percent,

and small part in North Dakota), encompassing over 16,000 square miles (Figure 1). The elevation ranges from approximately over 2,000 feet above sea level (ASL) on the Prairie Coteau in Northeastern South Dakota to about 1,000 feet ASL on lowlands. The dominate landform in this area are stagnation moraines, end moraines, glacial outwash plains, terraces, and flood plains. The area is dominated by till covered moraines. The stagnation moraines are gently undulating to steep and have many depressions and poorly defined drainages. Small outwash areas are adjacent to the watercourses. The Cretaceous Pierre Shale underlies the till in the most of the area. Precambrian rocks also occur at depth. Granite is quarried near Milbank, South Dakota and outcrops of Sioux Quartzite are common. (USDA-NRCS 2006).

The dominant soil order in this MLRA is Mollisols. The soils in the area dominantly have a frigid soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. They generally are very deep, well drained to very poorly drained. This area supports true prairie vegetation characterized by big bluestem (Andropogon gerardii), little bluestem (*Schizachyrium scoparium*), porcupinegrass (Hesperostipa spartea), and green needlegrass (Nassella viridula). Prairie cordgrass (*Spartina pectinata*) commonly grows in wet areas. (USDA-NRCS 2006).

Classification relationships

Major Land Resource Area (MLRA): Rolling Till Prairie (102A) (USDA-NRCS 2006)

USFS Subregions: North Central Glaciated Plains Section (251B); Upper Minnesota River-Des Moines Lobe Subsection (251Ba); Outer Coteau des Prairies Subsection (251Bb); Northwest Iowa Plains Subsection (251Bd); Minnesota and Northeast Iowa Morainal-Oak Savannah Section (222M); Alexandria Moraine-Hardwood Hills Subsection (222Ma) (Cleland et al. 2007).

US EPA Level IV Ecoregion: Tewaukon/Big Stone Stagnation Moraine (46e), Prairie Coteau (46k), Prairie Coteau Escarpment (46l), Big Sioux Basin (46m), Minnesota River Prairie (46o), Des Moines Lobe (47b) , Lake Agassiz Plains (48d), Alexandria Moraines and Detroit Lakes Outwash Plain (51j) (USEPA 2013)

Ecological site concept

The Saline Subirrigated ecological site typically occurs along the edges of drainageways or closed depressions. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The soils will have visible salts within 16 inches of the soil surface. Dominant vegetation is adapted to the high salinity. Vegetation in the Reference State includes big bluestem, Indiangrass, and Switchgrass. Forbs include Pursh seepweed, goldenrods, cudweed sagewort, and cinquefoil. The site my become degraded due to change in disturbance regime, and vegetation may shift to community dominated by foxtail barley, inland saltgrass, and bareground.

Associated sites

R102AY007SD	**Saline Lowland** These sites typically occur in drainageways, but can occur along the edges of larger closed depressions. Soils are poorly and very poorly drained which have a water table within 0 to 2 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The soils will have visible salts within 16 inches of the soil surface. The central concept soil series is Ludden, saline; Playmoor, and Vallers, saline but other series are included.
R102AY004SD	**Wet Meadow** These sites occur in a basin or closed depression. Soils are poorly drained and the site ponds water for 4 to 8 weeks in the spring of the year or after a heavy rain. The central concept soil series is Tonka, but other series are included.
R102AY003SD	**Subirrigated** These sites occur in drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The central concept soil series is Badger, but other series are included.
R102AY006SD	**Limy Subirrigated** These sites occur along the edges of drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. Soils will effervesce with acid at or near the surface. The central concept soil series is Cubden, Hamerly, McKranz, but other series are included.
R102AY002SD	**Linear Meadow** These sites occur in drainageways. Soils are poorly and very poorly drained which have a water table within 0 to 2 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The central concept soil series are Vallers and Colvin, but other series are included.

Similar sites

R102AY006SD	**Limy Subirrigated** The Limy Subirrigated site is in a similar landscape position, but will not have visible salts within 16 inches of the soil surface. The Limy Subirrigated site will have less switchgrass and prairie cordgrass, and more needlegrasses than the Saline Subirrigated site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	(1) *Andropogon gerardii* (2) *Sorghastrum nutans*

Physiographic features

The Saline Subirrigated ecological site typically occurs along the edges of drainageways or closed depressions.

Table 2. Representative physiographic features

Landforms	(1) Lowland > Closed depression (2) Lowland > Drainageway
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Elevation	1,000–2,000 ft
Slope	1–2%
Water table depth	12–60 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 102A is considered to have a continental climate – cold winters and relatively hot summers, low to moderate humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 25 to 28 inches per year. The average annual temperature is about 43°F. January is the coldest month with average temperatures ranging from about 5°F (Mahnomen 1 W, Minnesota (MN)), to about 14°F (Tracy, MN). July is the warmest month with temperatures averaging from about 69°F (Mahnomen 1 W, MN), to about 73°F (Tracy, MN). The range of normal average monthly temperatures between the coldest and warmest months is about 62°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

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. Greenup of cool-season plants may occur in September and October when

adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	117-129 days
Freeze-free period (characteristic range)	139-152 days
Precipitation total (characteristic range)	25-28 in
Frost-free period (actual range)	109-132 days
Freeze-free period (actual range)	135-159 days
Precipitation total (actual range)	24-29 in
Frost-free period (average)	122 days
Freeze-free period (average)	146 days
Precipitation total (average)	26 in

Climate stations used

- (1) FOSSTON 1 E [USC00212916], Fosston, MN
- (2) MAHNOMEN [USC00215012], Mahnomen, MN
- (3) ROTHSAY [USC00217149], Rothsay, MN
- (4) WADENA 3 S [USC00218579], Deer Creek, MN
- (5) FERGUS FALLS [USC00212768], Fergus Falls, MN
- (6) ORWELL DAM [USC00216228], Fergus Falls, MN
- (7) DALTON 3S [USC00212015], Dalton, MN
- (8) ALEXANDRIA MUNI AP [USW00014910], Alexandria, MN
- (9) MELROSE [USC00215325], Melrose, MN
- (10) GLENWOOD 2 WNW [USC00213174], Glenwood, MN
- (11) MORRIS WC EXP STN [USC00215638], Hancock, MN
- (12) ARTICHOKE LAKE [USC00210287], Correll, MN
- (13) BENSON [USC00210667], Benson, MN
- (14) NEW LONDON [USC00215842], New London, MN
- (15) MILAN 1 NW [USC00215400], Milan, MN
- (16) MONTEVIDEO 1 SW [USC00215563], Dawson, MN
- (17) SISSETON [USC00397742], Sisseton, SD
- (18) SISSETON MUNI AP [USW00094993], Sisseton, SD
- (19) BROWNS VALLEY [USC00211063], Beardsley, MN
- (20) WILMOT [USC00399337], Wilmot, SD
- (21) MILBANK 4 NW [USC00395536], Milbank, SD

Influencing water features

No riparian areas or wetland features are directly associated with this site.

Soil features

The Saline Subirrigated ecological site typically occurs along the edges of drainageways or closed depressions. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The soils will have visible salts within 16 inches of the soil surface. The central concept soil series is Mckranz, moderately saline.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silty clay loam
Drainage class	Somewhat poorly drained
Permeability class	Slow to moderately slow
Soil depth	80 in
Surface fragment cover <=3"	0–2%
Available water capacity (0-40in)	6–7 in
Calcium carbonate equivalent (0-40in)	5–35%
Electrical conductivity (0-40in)	4–16 mmhos/cm
Sodium adsorption ratio (0-40in)	2–10
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–5%

Ecological dynamics

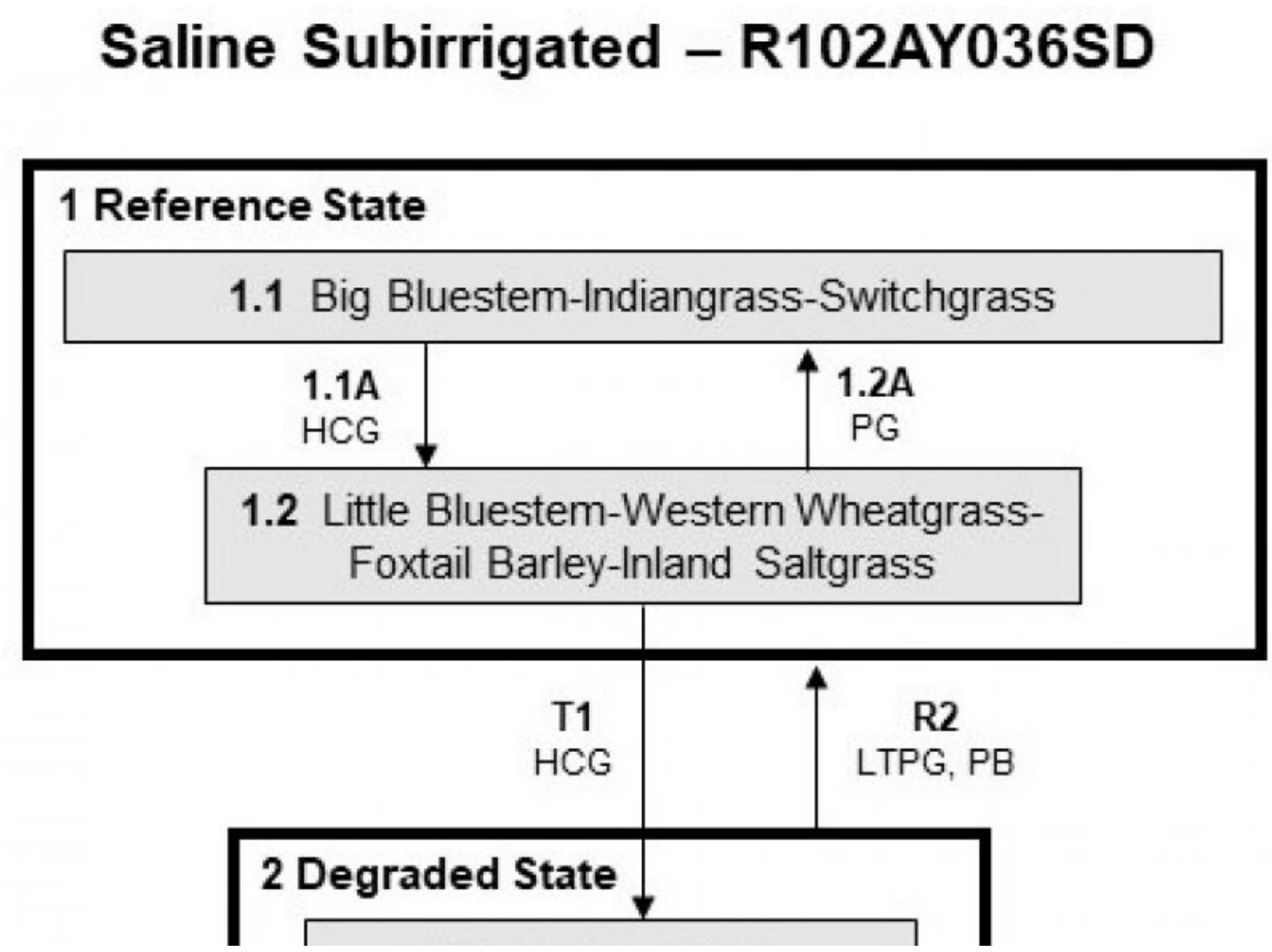
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), fluctuating water tables and flooding events, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition that may not be described within this document.

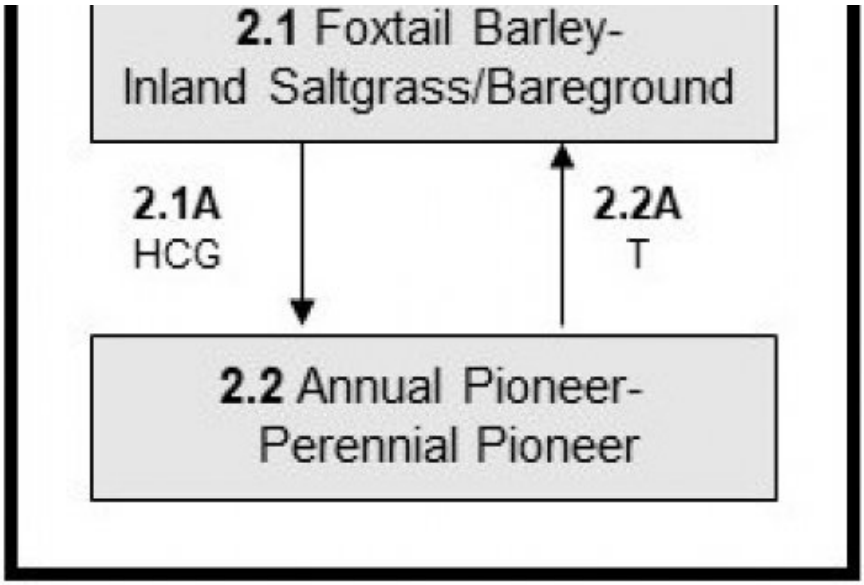
Heavy continuous grazing without adequate recovery periods following each grazing

occurrence over several years causes this site to depart from the interpretive plant community. Species such as little bluestem (*Schizachyrium scoparium*) and sedge (Carex) will initially increase. Big bluestem, Indiangrass, and switchgrass will decrease in frequency and production. Heavy, continuous grazing causes inland saltgrass (*Distichlis spicata*) to increase and eventually develop into a sod condition. Extended periods of nonuse and no fire will result in a plant community having high litter levels which favors an increase in species such as spikerush (*Eleocharis palustris*), sedge, foxtail barley (*Hordeum jubatum*), and prairie cordgrass (*Spartina pectinata*). Grazing, especially if adequate recovery periods are not allowed may be more detrimental on this site than haying. Biotic integrity on this site may be maintained more readily through periodic haying than through grazing.

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

State and transition model





LEGEND
Saline Subirrigated – R102AY036SD

HCG – Heavy continuous grazing
LTPG – Long-term prescribed grazing
PB – Prescribed burning
PG – Prescribed grazing
T – Time w/wo disturbances

Code	Process
T1	Heavy continuous grazing
1.1A	Heavy continuous grazing
1.2A	Prescribed grazing with recovery periods
2.1A	Heavy continuous grazing
2.2A	Time w/wo disturbance
R2	Long term prescribed grazing, Prescribed Burning

State 1
Reference State

The Reference State represents the natural range of variability that dominates the dynamics of this ecological site (ES). This state is dominated by warm-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and/or above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined, and shorter-statured grass and grass-likes would have increased. Today, this state can be found on areas that are properly managed with grazing and/or prescribed burning and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Big Bluestem-Indiangrass-Switchgrass

Interpretations are based primarily on the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase (this is also considered to be climax). The potential vegetation is about 85 percent grasses or grass-like plants and 15 percent forbs. The community is dominated by warm-season grasses. The major grasses include big bluestem, little bluestem, Indiangrass, and switchgrass. Other grass or grass-like species include prairie cordgrass (*Spartina pectinata*), slender wheatgrass (*Elymus trachycaulus*), western wheatgrass (*Pascopyrum smithii*), sideoats grama (*Bouteloua curtipendula*), alkali sacaton (*Sporobolus airoides*), plains bluegrass (*Poa arida*), and sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3210	3960	4410
Forb	190	440	790
Total	**3400**	**4400**	**5200**

Figure 9. Plant community growth curve (percent production by month). SD0210, Rolling Till Prairie, lowland warm-season dominant.. Warm-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	8	15	21	26	15	8	5	0	0

Community 1.2
Little Bluestem-Western Wheatgrass-Foxtail Barley-Inland Saltgrass

This plant community evolves under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 90 percent grasses and grass-like species and 10 percent forbs. Dominant grass and grass-like species include little bluestem, western wheatgrass, foxtail barley, inland saltgrass, and slender wheatgrass. Grass and grass-like species of secondary importance include big bluestem, sedge, spikerush, plains bluegrass, prairie cordgrass, and switchgrass. Forbs commonly found in this plant community include Pursh seepweed (*Suaeda calceoliformis*), goldenrod (Solidago), cudweed sagewort (*Artemisia ludoviciana*), silverleaf cinquefoil (*Potentilla argentea*), alkali plantain (*Plantago eriopoda*), western ragweed (*Ambrosia psilostachya*), and annual marshelder (*Iva annua*). When compared to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase, slender

wheatgrass, western wheatgrass, foxtail barley, inland saltgrass, sedge, and grass-like species increase. Production of tall warm-season grasses is reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. Most of the components of the ecological processes will be functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses will be reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allows for an increase in shorter-statured (and shallower rooted) species.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2540	3330	3980
Forb	160	270	420
Total	**2700**	**3600**	**4400**

Figure 11. Plant community growth curve (percent production by month). SD0208, Rolling Till Prairie, lowland cool-season/warm-season codominant.. Cool-season, warm-season codominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Pathway 1.1A
Community 1.1 to 1.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Little Bluestem-Western Wheatgrass-Foxtail Barley-Inland Saltgrass Plant Community Phase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 2
Degraded State

This state is characterized by the dominance of the shorter-statured, more saline tolerant species such as foxtail barley and inland saltgrass, the increase in bare ground, and the increased presence of salt accumulations on the soil surface. Infiltration is reduced, which allows the moisture and the salts carried by the moisture to be wicked up to the soil surface. The short-statured and shallow rooted species are more capable of withstanding the higher concentrations of salts in the soil surface. As the disturbance level increases, plant density decreases even more, giving way to annual species and invasive perennial species, as well as, a further increase in bare ground.

Community 2.1
Foxtail Barley-Inland Saltgrass/Bareground

This plant community developed with heavy continuous season-long grazing where adequate recovery periods between grazing events were not allowed. Patches of inland saltgrass sod are typical and foxtail barley is well distributed throughout the community. Tall warm-season grasses are nearly absent, and little bluestem, slender wheatgrass, and western wheatgrass have been greatly reduced and may persist in remnant amounts, reduced in vigor. Bare ground may develop in micro lows where salt concentrations are highest. A white salt crust may form on the soil surface. The forb component is comprised of salt tolerant species such as Pursh seepweed and silverleaf cinquefoil. This plant community is resistant to change due to the grazing tolerance of inland saltgrass and increased surface salts. A significant amount of production and diversity has been lost when compared to 1.1 Big Bluestem-Indiangrass-Switchgrass Plant Community Phase. Loss of key warm-season grasses and increased bare ground has negatively impacted energy flow and nutrient cycling. Water infiltration is reduced significantly due to the shallow rooting depth of inland saltgrass and increased bare ground.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1365	1880	2375
Forb	35	120	225
Total	**1400**	**2000**	**2600**

Figure 13. Plant community growth curve (percent production by month). SD0208, Rolling Till Prairie, lowland cool-season/warm-season codominant.. Cool-season, warm-season codominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Community 2.2
Annual Pioneer-Pioneer Perennial

This plant community developed under continuous heavy grazing or other excessive disturbances. The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species and 20 to 60 percent forbs. The species present in this phase are highly variable but often include nonnative invasive and/or early seral species. Plant diversity is low (plant richness may be high but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites.

Pathway 2.1A
Community 2.1 to 2.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 2.2 Annual Pioneer-Perennial Pioneer Plant Community Phase.

Pathway 2.2A
Community 2.2 to 2.1

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will lead to the 2.1 Foxtail Barley-Inland Saltgrass/Bareground Plant Community Phase.

Transition T1
State 1 to 2

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season and often at the same time of year each year), will likely lead this 1.2 Little Bluestem-Western Wheatgrass-Foxtail Barley-Inland Saltgrass Plant Community Phase within the Reference State (State 1) over a threshold leading to the 2.1

Foxtail Barley-Inland Saltgrass-Bareground Plant Community Phase within the Degraded State (State 2). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Restoration pathway R2
State 2 to 1

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) coupled with prescribed burning may lead this plant community phase over a threshold to the Reference State (State 1). Wetland restoration techniques may be necessary to restore biotic integrity and plant diversity and productivity.

Conservation practices

Prescribed Grazing

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			1100–2420	
	big bluestem	ANGE	*Andropogon gerardii*	440–1320	–
	switchgrass	PAVI2	*Panicum virgatum*	220–660	–
	Indiangrass	SONU2	*Sorghastrum nutans*	220–660	–
	prairie cordgrass	SPPE	*Spartina pectinata*	44–440	–
2	**Mid Warm-season Grasses**			660–1320	
	little bluestem	SCSC	*Schizachyrium scoparium*	660–1320	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–220	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–220	–
3	**Cool-season Grasses**			220–440	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	44–440	–
	western wheatgrass	PASM	*Pascopyrum smithii*	44–440	–
	plains bluegrass	POAR3	*Poa arida*	44–220	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–44	–
4	**Short Warm-season Grasses**			44–88	

	saltgrass	DISP	*Distichlis spicata*	44–88	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–44	–
5	**Other Native Grasses**			44–220	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–220	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	44–132	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–44	–
6	**Grass-likes**			88–352	
	sedge	CAREX	*Carex*	44–352	–
	spikerush	ELEOC	*Eleocharis*	0–132	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–88	–
Forb					
7	**Forbs**			220–660	
	Forb, native	2FN	*Forb, native*	44–220	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	44–132	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	44–132	–
	goldenrod	SOLID	*Solidago*	44–132	–
	white heath aster	SYER	*Symphyotrichum ericoides*	44–88	–
	silver cinquefoil	POAR8	*Potentilla argentea*	44–88	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	44–88	–
	Indianhemp	APCA	*Apocynum cannabinum*	44–88	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	44–88	–
	tall blazing star	LIAS	*Liatris aspera*	44–88	–
	western marbleseed	ONBEO	*Onosmodium bejariense var. occidentale*	44–88	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	44–88	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	44–88	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	44–88	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–44	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–44	–
	bluebell bellflower	CARO2	*Campanula rotundifolia*	0–44	–
	redwool plantain	PLER	*Plantago eriopoda*	0–44	–

	palespike lobelia	LOSP	*Lobelia spicata*	0–44	–
	rough bugleweed	LYAS	*Lycopus asper*	0–44	–
	annual marsh elder	IVAN2	*Iva annua*	0–44	–
	western dock	RUAQ	*Rumex aquaticus*	0–44	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–44	–
	prairie violet	VIPE2	*Viola pedatifida*	0–44	–
	meadow zizia	ZIAP	*Zizia aptera*	0–44	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–44	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			72–540	
	big bluestem	ANGE	*Andropogon gerardii*	36–360	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–252	–
	switchgrass	PAVI2	*Panicum virgatum*	0–180	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–108	–
2	**Mid Warm-season Grasses**			180–1260	
	little bluestem	SCSC	*Schizachyrium scoparium*	180–1260	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–108	–
3	**Cool-season Grasses**			360–1080	
	western wheatgrass	PASM	*Pascopyrum smithii*	180–720	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	72–540	–
	foxtail barley	HOJU	*Hordeum jubatum*	36–360	–
	plains bluegrass	POAR3	*Poa arida*	0–144	–
4	**Short Warm-season Grasses**			180–540	
	saltgrass	DISP	*Distichlis spicata*	180–540	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–108	–
5	**Other Native Grasses**			0–180	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–144	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–36	–
6	**Grass-likes**			180–720	

	sedge	CAREX	*Carex*	108–540	–
	spikerush	ELEOC	*Eleocharis*	36–360	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–108	–
Forb					
7	**Forbs**			40–200	
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	36–108	–
	Forb, native	2FN	*Forb, native*	36–108	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–108	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	36–72	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–72	–
	redwool plantain	PLER	*Plantago eriopoda*	0–72	–
	silver cinquefoil	POAR8	*Potentilla argentea*	36–72	–
	annual marsh elder	IVAN2	*Iva annua*	0–72	–
	Forb, introduced	2FI	*Forb, introduced*	0–72	–
	goldenrod	SOLID	*Solidago*	0–72	–
	tall blazing star	LIAS	*Liatris aspera*	0–36	–
	western marbleseed	ONBEO	*Onosmodium bejariense var. occidentale*	0–36	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–36	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–36	–
	western dock	RUAQ	*Rumex aquaticus*	0–36	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–36	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–36	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–36	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–36	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–36	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–36	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			0–100	

	prairie cordgrass	SPPE	*Spartina pectinata*	0–100	–
2	**Mid Warm-season Grasses**			0–100	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–100	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–40	–
3	**Cool-season Grasses**			200–700	
	foxtail barley	HOJU	*Hordeum jubatum*	200–700	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–160	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–100	–
	plains bluegrass	POAR3	*Poa arida*	0–60	–
4	**Short Warm-season Grasses**			600–1100	
	saltgrass	DISP	*Distichlis spicata*	500–1000	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	20–160	–
5	**Other Native Grasses**			0–40	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–40	–
6	**Grass-likes**			20–160	
	spikerush	ELEOC	*Eleocharis*	20–140	–
	sedge	CAREX	*Carex*	0–100	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–40	–
Forb					
7	**Forbs**			40–200	
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	20–100	–
	Forb, introduced	2FI	*Forb, introduced*	0–60	–
	Forb, native	2FN	*Forb, native*	20–60	–
	annual marsh elder	IVAN2	*Iva annua*	0–60	–
	redwool plantain	PLER	*Plantago eriopoda*	20–60	–
	silver cinquefoil	POAR8	*Potentilla argentea*	20–60	–
	Norwegian cinquefoil	PONO3	*Potentilla norvegica*	0–20	–
	goldenrod	SOLID	*Solidago*	0–20	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–20	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–20	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–20	–

	smooth horsetail	EQLA	*Equisetum laevigatum*	0–20	–

Animal community

Animal Community – Grazing Interpretations
The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ES description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Bluestem/Indiangrass/Switchgrass (1.1)
Average Annual Production (lbs./acre, air-dry): 4400
Stocking Rate* (AUM/acre): 1.21

Little Bluestem/Wheatgrass/Foxtail Barley/Inland Saltgrass (1.2)
Average Annual Production (lbs./acre, air-dry): 3600
Stocking Rate* (AUM/acre): 0.99

Foxtail Barley/Inland Saltgrass, Bare Ground (2.1)
Average Annual Production (lbs./acre, air-dry): 2000
Stocking Rate* (AUM/acre): 0.55

Annual/Pioneer, Non-Native Perennial, Bare Ground (2.2)
Average Annual Production (lbs./acre, air-dry): 1200
Stocking Rate* (AUM/acre): 0.33

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), National Range and Pasture Handbook).

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements and added protein will allow 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 forage production on this site. This site is dominated by soils in hydrologic groups C and D. Infiltration is typically moderate to moderately slow and runoff potential for this site varies from negligible to low depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong 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 Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Inventory data references

Information presented here has been derived from 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, NRCS; and Bruce Kunze, Soil Scientist, NRCS.

Other references

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Contributors

Megan Baxter
Stan Boltz

Approval

Suzanne Mayne-Kinney, 5/05/2025

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)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/04/2007
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.

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2. **Presence of water flow patterns:** Barely observable.

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3. **Number and height of erosional pedestals or terracettes:** Essentially, non-existent.

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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 less than 5% and less than 2 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.

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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):** Stability class usually 6. Typically high root content, organic matter, and granular structure. Soil surface is very resistant to erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.

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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):** No compaction layer should be evident.

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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: Mid warm-season bunch grass >> tall warm-season rhizomatous grass

    Sub-dominant: > mid cool-season rhizomatous grass > short warm-season rhizomatous grass = short cool-season grass = forb

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality.

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14. **Average percent litter cover (%) and depth (in):** 85-90%, roughly 0.5 inch thick or less. Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3800 – 5000 lbs./acre air-dry weight, average 4,400 lbs./acre air-dry weight

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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:** Refer to State and Local Noxious Weed List

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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
