Ecological site R063AY019SD
Closed Depression

Accessed: 04/19/2024

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.

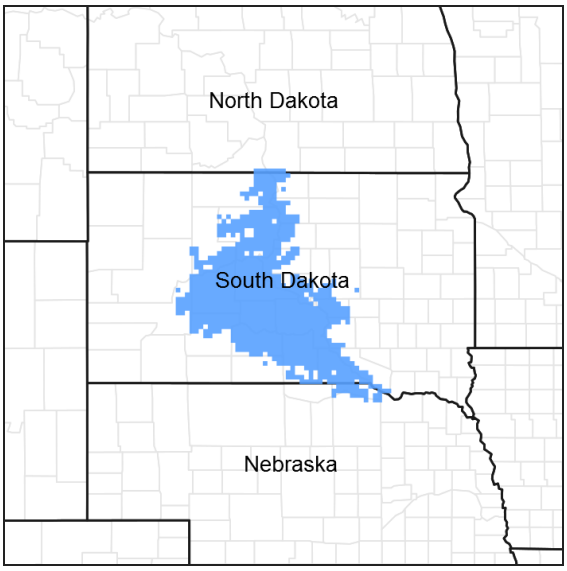


Figure 1. Mapped extent

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): 063A–Northern Rolling Pierre Shale Plains

MLRA 63A is approximately 10,160 square miles in size, the majority of which is in South Dakota and a very small portion in North Dakota. The MLRA extends west of the northern half of the South Dakota reach of the Missouri River. All five of the major rivers draining western South Dakota cross this area. From north to south, these are the Grand, Moreau, Cheyenne, Bad, and White Rivers.

Elevation range from 1,300 to 1,640 feet on the bottom land along the Missouri River to 1,640 to 2,950 feet on the shale plain uplands. Cretaceous Pierre Shale underlies almost all of this area. This is a marine sediment having layers of volcanic ash that has been altered to smectitic clays. These clays shrink as they dry and swell as they get wet. Tertiary and Quaternary river deposits, remnants of erosion from the Black Hills uplift, cap isolated highlands in this area. Deposits of alluvial sand and gravel occur on the valley floors adjacent to the major streams in the area. The average annual precipitation in this area is 15 to 20 inches.
The vegetation in this area is a transition from eastern tall grass prairie to a western mixed grass prairie, (USDA-NRCS, Ag Handbook 296).

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA): 63A Northern Rolling Pierre Shale Plains, (USDA-NRCS, Ag Handbook 296).

Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Closed Depression ecological site occurs throughout the MLRA. It is located on level or nearly level upland landscapes with slopes ranging from 0 to 2 percent. The site is poorly to very poorly drained and will pond water from 15 to 60 days in the spring and after heavy rain events. Soils are formed from clayey alluvium. The texture of the surface layer is silty clay to clay. The high clay content of the subsurface soil layers are restrictive to water movement and root penetration. Depending on climatic cycles, the vegetation can range from nearly pure stands of western wheatgrass in dry years to rushes, sedges and smartweed during wet years.

Associated sites

R063AY002SD	**Wet Land**
R063AY011SD	**Clayey**
R063AY013SD	**Claypan**
R063AY015SD	**Thin Claypan**

Similar sites

R063AY015SD	**Thin Claypan** Thin Claypan [more blue grama but less western wheatgrass, far less production, different landscape position, no dock or smartweed, does have a sodic soil layer at similar depths but will not flood]
R063AY013SD	**Claypan** Claypan [more green needlegrass and blue grama, less production, different landscape position, no dock or smart weed, does have a sodic soil layer, nor will flood]
R063AY002SD	**Wet Land** Wet Land [similar landscape position, more production, no western wheatgrass and far more prairie cordgrass and slough sedge, no restrictive sodic layer or evidence of salts within the soil profile]
R063AY007SD	**Saline Lowland** Saline Lowland [similar species and production, less western wheatgrass, more prairie cordgrass, and a water table]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii*

Physiographic features

This site occurs on level uplands.

Table 2. Representative physiographic features

Landforms	(1) Depression (2) Basin floor
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Rare to frequent
Elevation	1,600–2,700 ft

Slope	0–1%
Ponding depth	0–12 in
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 63A is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and abundant sunshine. Extreme temperature fluctuations are also common. 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 ranges from 16 to 20 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 11°F (Pollock, South Dakota (SD)), to about 22°F (Cedar Butte, SD). July is the warmest month with temperatures averaging from about 72°F (Pollock, SD), to about 76° F (Cedar Butte, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°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 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 and occasional strong storms may 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. Green up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	151 days
Precipitation total (average)	19 in

Climate stations used

- (1) POLLOCK [USC00396712], Pollock, SD
- (2) COTTONWOOD 2 E [USC00391972], Kadoka, SD
- (3) KENNEBEC [USC00394516], Kennebec, SD
- (4) CEDAR BUTTE 1NE [USC00391539], White River, SD

Influencing water features

At times this site exhibits wetland characteristics.

Soil features

Soils in this site are very deep and poorly to very-poorly drained. They form in local clayey alluvium in closed upland basins on level to nearly level slopes (0-2%). Microrelief is pronounced in some of the more depressed areas. Permeability is slow to very slow except after dry periods when initial intake may be rapid due to cracks. These soils are ponded from surface runoff after heavy rains and snow melt and no surface runoff occurs unless artificially drained. The surface layer can have a silt loam to clay texture and the subsoils is typically clay, however silty clay, silty clay loam, and clay loam can occur. Natric horizons, (Btn) with columnar structure and high sodium can occur in some soils, restricting water movement and root penetration. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact.

Soil correlated to the Close Depression ecological site: Hoven

Access Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) for specific local soils information.

Table 4. Representative soil features

Parent material	(1) Alluvium–clayey shale
Surface texture	(1) Silt loam (2) Clay (3) Silty clay
Family particle size	(1) Clayey
Drainage class	Poorly drained
Permeability class	Very slow
Soil depth	60 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4–7 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–16 mmhos/cm
Sodium adsorption ratio (0-40in)	0–20
Soil reaction (1:1 water) (0-40in)	5.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

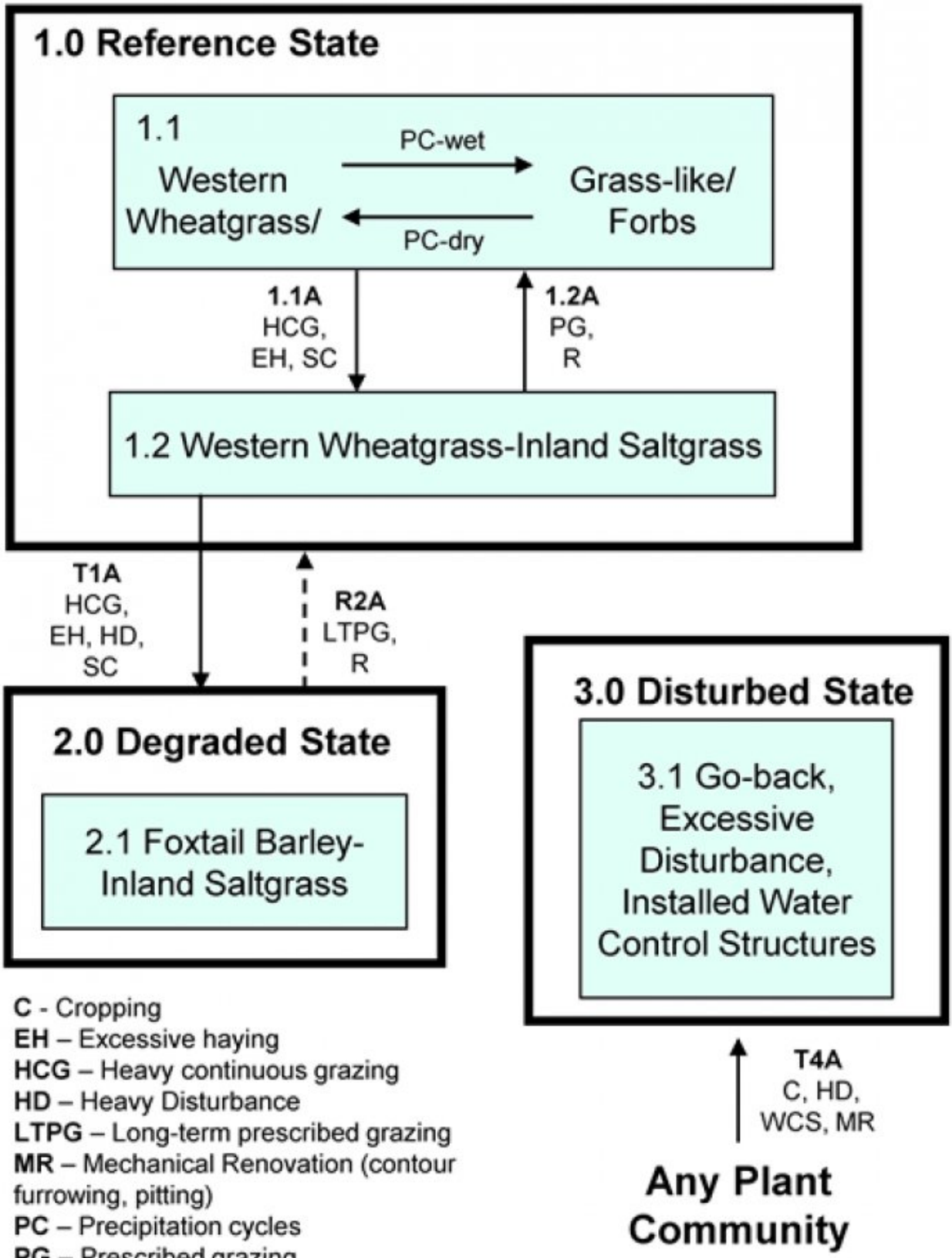
This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts 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.

This site is very sensitive to precipitation fluctuations from year-to-year. Interpretations are primarily based on the Western Wheatgrass/Grass-likes/Forbs Plant Community. 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 communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between plant communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Closed Depression - R063AY019SD 6/20/16



C - Cropping
EH – Excessive haying
HCG – Heavy continuous grazing
HD – Heavy Disturbance
LTPG – Long-term prescribed grazing
MR – Mechanical Renovation (contour furrowing, pitting)
PC – Precipitation cycles
PG – Prescribed grazing
R - Rest
SC – Soil Compaction
WCS Water Control Structure (terraces)
-----> Transition may not be feasible or achievable

Figure 6. Closed Depression - R063AY019SD

Diagram Legend - Closed Depression - R063AY019SD		
T1A	Heavy continuous grazing without change in season of use or adequate recovery time, or excessive haying, heavy disturbance, and soil compaction.	
T4A	Abandoned cropland, excessive disturbance, installation of water control structures or mechanical range renovation.	
R2A	Long-term prescribed grazing with change is season of use and adequate recovery, long or short-term rest (non-use). Recovery may not be fast and/or meet management goals.	
CP 1.1A	1.1 - 1.2	Heavy continuous grazing without adequate recovery, excessive haying, soil compaction.
CP 1.2A	1.2 - 1.1	Prescribed grazing including change in season of use, proper stocking and adequate time for rest and recovery, long or short-term rest (non-use).

Figure 7. Closed Depression - R063AY019SD

State 1
Reference State

This State represents what is believed to show the natural range of variability that dominated the dynamics of the ecological site prior to European settlement. This site, in reference, is dominated by a mix of cool-season wheatgrasses and grass-like species. Variations in annual precipitation, and length of time the site is ponded, greatly influence the species composition from year to year. During wet years the plant community will be dominated by grass-like species and forbs. During dryer years the plant community will be dominated by cool-season wheatgrasses. This variability is independent of grazing pressure and is considered a distinct plant community. Grassing pressure on this site and surrounding sites also influence the plant community dynamics. Hoof action during wet periods can cause soil compaction and salts to accumulate on the surface causing an increase in salt tolerant species. Grazing on upland can increase or decrease runoff into the site creating a dryer or wetter site.

Community 1.1
Western Wheatgrass/Grass-Like/Forb Plant Community

Interpretations are based primarily on the Western Wheatgrass/Grass-likes/Forb Plant Community, which is also considered to be the reference plant community. The western wheatgrass and grass-like, forb plant community can appear as separate communities because the two are influenced strongly by annual precipitation, runoff and ponding. This plant community evolved with grazing by large herbivores and occasional fire, and can be maintained with prescribed grazing, prescribed burning, or occasional periods of rest. The Western Wheatgrass Phase is expressed following several years of average to slightly below average precipitation and shorter ponding periods. The plant community is dominated by western wheatgrass. Other grasses and grass-likes present include Nuttall's alkaligrass, sedge, rush, slender wheatgrass and inland saltgrass. The occurrence of forbs will be considerably lower, including some species such as American licorice, Pursh seepweed, western dock, lambsquarters, evening-primrose, and New England aster. The plant community is made up of about 80-90 percent grasses and grass-likes and about 10-20 percent forbs. The total annual production (air-dry weight) of this plant community is typically about 3,500 lbs./acre The Grass-likes, Forbs Phase occurs after a period of higher precipitation and longer periods of ponding. Grasses and grass-likes that commonly occur include; sedge, spikerush, rush, foxtail barley, and western wheatgrass. Forbs commonly found include western dock, mint, Pursh seepweed, knotweed, buttercup, curlycup knotweed, New England aster and Pennsylvannia smartweed. The plant community is made up of about 5-10 percent grasses, 30-40 percent grass-likes, and about 50-60 percent forbs. The total annual production (air-dry weight) is about 2,200 lbs./acre.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1845	2362	3050
Forb	155	1138	1450
Total	**2000**	**3500**	**4500**

Figure 9. Plant community growth curve (percent production by month). SD6006, Pierre Shale Plains, lowland cool season dominant. Cool season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Community 1.2
Western Wheatgrass-Inland Saltgrass Plant Community

This plant community is the result of heavy continuous grazing or excessive haying. Soil compaction, lack of litter and reduced plant vigor result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration which increases salt concentrations on the surface. This gives inland saltgrass and other salt tolerant species a competitive advantage over less tolerant species. Inland saltgrass increases and competes with western wheatgrass as the dominant species. Other grasses and grass-likes will include; Nuttall's alkaligrass, plains bluegrass, common spikerush, needle spikerush, and other sedges and rushes. Early cool-season grasses including foxtail barley and fowl bluegrass begin to invade. Forbs that will invade are curly dock and cocklebur. Common forbs to the site include lambsquarters, Pennsylvannia smartweed, curlytop knotweed, erect knotweed, plantain, and povertyweed. This plant community is relatively stable and well adapted to increased salinity. Plant vigor, litter, frequency, and production have decreased. The biological integrity, water, and nutrient cycles of this plant community are becoming impaired. This plant community is less productive than the Western Wheatgrass/Grass-like/Forb Plant Community and is considered at risk.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1400	1760	1875
Forb	100	440	925
Total	**1500**	**2200**	**2800**

Figure 11. Plant community growth curve (percent production by month). SD6306, Pierre Shale Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Pathway 1.1A
Community 1.1 to 1.2

Heavy continuous grazing, or excessive haying can shift this plant community to the Western Wheatgrass-Inland Saltgrass plant community. Soil compaction caused by hoof action or mechanical harvesting activities can increase bulk density, reduce water holding capacity, increase salinity on the surface and increase salt tolerant plant species.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that includes change in season of use, and timing of use to reduce potential for soil compaction and possible extended periods of rest or non-use will move this plant community back to plant community phase

(PCP) 1.1. Adapting haying practices that leave adequate residual cover and avoids potential for soil compaction will also move this plant community phase towards PCP 1.1.

State 2
Degraded State

This State is dominated by salt tolerant plant species and is the result of soil compaction and salt accumulations at the surface. This state is very resilient and resistant to change.

Community 2.1
Foxtail Barley-Inland Saltgrass Plant Community

This plant community developed with heavy continuous grazing, or excessive haying, where adequate recovery periods were not allowed. Patches of inland saltgrass sod are typical, and foxtail barley and fowl bluegrass are well distributed throughout the community. Nuttall's alkaligrass and western wheatgrass have been greatly reduced in production and vigor, and may only persist in remnant amounts. 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 the Reference State. Loss of key cool-season grasses and increased bare ground has negatively impacted energy flow and nutrient cycling. Water infiltration is reduced significantly due to the massive shallow root system "root pan," characteristic 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	745	1020	1455
Forb	55	180	345
Total	**800**	**1200**	**1800**

Figure 13. Plant community growth curve (percent production by month). SD6308, Pierre Shale Plains, 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

State 3
Disturbed State

This State developed through mechanical manipulation of the watershed causing the loss of hydrologic function, biotic integrity and soil site stability. On existing rangeland hydrologic function is disrupted through terracing, contour furrowing or pitting the area surrounding the closed depression. Other causes include severe mechanical disturbance through tillage and conversion to cropland or pastureland.

Community 3.1
Go-back, Excessive Disturbance, Installed Water Control Structures

During the early successional stages, on go-back lands (abandon cropland), the species that dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn, bluegrass, smooth bromegrass, annual brome, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, deathcamas, prickly lettuce, marestail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health. Excessive disturbance can be reached when long duration flooding events and/or excessive defoliation occurs. This can result from heavy livestock or wildlife concentration, enduring wet cycles, and cropping abandonment (Go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include foxtail barley, which may become dominant along with fowl bluegrass, Nuttall's alkaligrass, and western wheatgrass. The dominant forbs include curly dock, curlycup gumweed, kochia,

and other early successional salt tolerant species. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to nonnative species due to severe soil disturbances and relatively high percent of bare ground. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. When runoff reaching this site is eliminated though construction of water control structures such as terraces or mechanical range renovation practices such as contour furrowing or pitting. This is likely to resemble, and have similar ecological dynamics, as the Claypan or Thin Claypan ecological site.

Transition 1A
State 1 to 2

Heavy continuous grazing, excessive haying, heavy disturbance and soil compaction will shift the Western Wheatgrass-Inland Saltgrass Plant Community to the Degraded State.

Transition 4A
State 1 to 3

Heavy disturbance, installation of water control structures, mechanical renovation practices, or land use conversion to crop or pasture.

Restoration pathway 2A
State 2 to 1

Long-term prescribed grazing that includes changing season of use and allowing for adequate recovery periods between grazing events or extended periods of rest (non-use) and above average precipitation may lead this plant community back to the Reference State. This restoration may take a long period of time with management alone and may not meet management goals. Renovation (mechanical and/or chemical inputs) is not recommended due to high salt content of the soil and the persistence of inland saltgrass.

Transition 4A
State 2 to 3

Heavy disturbance, installation of water control structures, mechanical renovation practices, or land use conversion to crop or pasture.

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	**Wheatgrasses**			700–2975	
	western wheatgrass	PASM	*Pascopyrum smithii*	700–2975	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–175	–
2	**Cool-Season Bunchgrasses**			175–1400	
	foxtail barley	HOJU	*Hordeum jubatum*	70–1225	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	70–525	–
3	**Short Warm-Season Grasses**			35–350	
	saltgrass	DISP	*Distichlis spicata*	35–350	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–175	–
4	**Other Native Grasses**			70–350	
	Graminoid (grass or grass-	2GRAM	*Graminoid (grass or grass-like)*	0–350	–

	Graminoid (grass or grass-like)	2GRAM	Graminoid (grass or grass-like)	[illegible]	
	plains bluegrass	POAR3	*Poa arida*	35–175	–
	fowl bluegrass	POPA2	*Poa palustris*	35–175	–
5	**Grass-likes**			350–1575	
	common spikerush	ELPA3	*Eleocharis palustris*	175–1400	–
	needle spikerush	ELAC	*Eleocharis acicularis*	35–525	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–350	–
	sedge	CAREX	*Carex*	70–350	–
	rush	JUNCU	*Juncus*	0–175	–
Forb					
7	**Forbs**			175–2100	
	Forb, native	2FN	*Forb, native*	0–700	–
	curlytop knotweed	POLA4	*Polygonum lapathifolium*	0–525	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–525	–
	pale dock	RUAL4	*Rumex altissimus*	0–525	–
	western dock	RUAQ	*Rumex aquaticus*	0–350	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–350	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–350	–
	lambsquarters	CHAL7	*Chenopodium album*	0–350	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–175	–
	golden tickseed	COTI3	*Coreopsis tinctoria*	0–175	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–175	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–175	–
	povertyweed	IVAX	*Iva axillaris*	0–175	–
	bushy knotweed	PORA3	*Polygonum ramosissimum*	0–175	–
	cinquefoil	POTEN	*Potentilla*	0–175	–
	plantain	PLANT	*Plantago*	0–175	–
	mint	MENTH	*Mentha*	0–175	–
	evening primrose	OENOT	*Oenothera*	0–175	–
	creeping woodsorrel	OXCO	*Oxalis corniculata*	0–105	–
	tall fringed bluebells	MECI3	*Mertensia ciliata*	0–105	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–105	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			330–880	
	western wheatgrass	PASM	*Pascopyrum smithii*	330–880	–
2	**Cool-Season Bunchgrasses**			110–440	
	foxtail barley	HOJU	*Hordeum jubatum*	66–330	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	22–220	–
3	**Short Warm-Season Grasses**			220–880	
	saltgrass	DISP	*Distichlis spicata*	220–880	–

	buffalograss	BODA2	*Bouteloua dactyloides*	0–66	–
4	**Other Native Grasses**			0–110	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–110	–
	plains bluegrass	POAR3	*Poa arida*	0–66	–
	fowl bluegrass	POPA2	*Poa palustris*	0–66	–
5	**Grass-likes**			110–550	
	common spikerush	ELPA3	*Eleocharis palustris*	44–330	–
	sedge	CAREX	*Carex*	0–176	–
	needle spikerush	ELAC	*Eleocharis acicularis*	0–110	–
	rush	JUNCU	*Juncus*	0–110	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–110	–
6	**Non-Native Grasses**			22–220	
	bluegrass	POA	*Poa*	0–220	–
	cheatgrass	BRTE	*Bromus tectorum*	22–110	–
Forb					
7	**Forbs**			110–770	
	lambsquarters	CHAL7	*Chenopodium album*	0–220	–
	Forb, introduced	2FI	*Forb, introduced*	0–220	–
	curlytop knotweed	POLA4	*Polygonum lapathifolium*	0–220	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–220	–
	bushy knotweed	PORA3	*Polygonum ramosissimum*	0–110	–
	creeping woodsorrel	OXCO	*Oxalis corniculata*	0–110	–
	plantain	PLANT	*Plantago*	0–110	–
	Forb, native	2FN	*Forb, native*	0–110	–
	povertyweed	IVAX	*Iva axillaris*	0–110	–
	cocklebur	XANTH2	*Xanthium*	0–110	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–110	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–66	–
	evening primrose	OENOT	*Oenothera*	0–66	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–66	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–66	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–66	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–66	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–66	–
	pale dock	RUAL4	*Rumex altissimus*	0–66	–
	western dock	RUAQ	*Rumex aquaticus*	0–66	–
	curly dock	RUCR	*Rumex crispus*	0–66	–
	cinquefoil	POTEN	*Potentilla*	0–22	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			0–60	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–60	–
2	**Cool-Season Bunchgrasses**			240–600	
	foxtail barley	HOJU	*Hordeum jubatum*	240–600	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	0–36	–
3	**Short Warm-Season Grasses**			120–480	
	saltgrass	DISP	*Distichlis spicata*	120–480	–
4	**Other Native Grasses**			0–60	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–60	–
5	**Grass-likes**			60–240	
	common spikerush	ELPA3	*Eleocharis palustris*	24–180	–
	sedge	CAREX	*Carex*	0–60	–
	needle spikerush	ELAC	*Eleocharis acicularis*	0–60	–
	rush	JUNCU	*Juncus*	0–36	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–36	–
6	**Non-Native Grasses**			12–96	
	cheatgrass	BRTE	*Bromus tectorum*	12–60	–
	bluegrass	POA	*Poa*	0–60	–
Forb					
7	**Forbs**			60–300	
	lambsquarters	CHAL7	*Chenopodium album*	0–180	–
	Forb, introduced	2FI	*Forb, introduced*	0–120	–
	curly dock	RUCR	*Rumex crispus*	0–120	–
	cocklebur	XANTH2	*Xanthium*	0–60	–
	Forb, native	2FN	*Forb, native*	0–60	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–60	–
	povertyweed	IVAX	*Iva axillaris*	0–36	–
	creeping woodsorrel	OXCO	*Oxalis corniculata*	0–36	–
	plantain	PLANT	*Plantago*	0–36	–
	curlytop knotweed	POLA4	*Polygonum lapathifolium*	0–36	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–36	–
	bushy knotweed	PORA3	*Polygonum ramosissimum*	0–36	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–36	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–24	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–12	–

Animal community

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 ecological site 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.

Western Wheatgrass-Grass-like-Forb Plant Community (1.1)
Average Annual Production (lbs./acre, air-dry): 3500 to 2200
Stocking Rate* (AUM/acre): 0.96 to 0.60

Western Wheatgrass-Inland Saltgrass Plant Community (1.2)
Average Annual Production (lbs./acre, air-dry): 2200
Stocking Rate* (AUM/acre): 0.60

Foxtail Barley-Inland Saltgrass Plant Community (2.1)
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 USDA 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 group D. Infiltration is very slow to slow and runoff potential is very high depending on 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 aesthetic 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.

Other information

Revision Notes: “Previously Approved Provisional
This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site. This is an updated “Previously Approved” ESD which represents a first generation tier of documentation that prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirement as an Approved ESD as laid out in the 2003 National Range and Pasture Handbook (NRPH). The document fully describe 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 does not contain all tabular and narrative entries as required in the current Approved level of documentation but it is expected that the “Previously Approved” ESD will continue refinement towards an Approved status.

Site Development and Testing Plan:
Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

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: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. There are no SCS-RANGE-417 clipping records for this site in the database.

Other references

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Contributors

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ESD updated by Rick L. Peterson, 6/20/16

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
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/08/2010
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

2. **Presence of water flow patterns:** None.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 10 percent is typical during normal precipitation cycles. Considerably higher amounts can occasionally occur after flooding/drying cycles, up to 50%.

5. **Number of gullies and erosion associated with gullies:** None.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter falls in place. Little movement occurs.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability ratings can range widely. Readings of 2-3 are not uncommon, but can range up to 5-6. Surface organic matter adheres to the soil surface, but due to the inherent content of soluble salts in these soils, flocculation can readily occur. Soil surface fragments can dissolve quickly when dipped in distilled water.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 4 to 16 inches thick with dark gray colors when moist. Structure typically is thin platy to subangular blocky in the A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration is greatly reduced on this site due to the nature of the soils. Plant composition changes have little effect. Default rating of none to slight is acceptable.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** A-horizon naturally has some platy structure. Compaction layers, if formed by management, do not typically persist. Compaction will be difficult to determine. Evidence of compaction can be confirmed by signs of recent concentration of livestock.

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:

    Sub-dominant:

    Other:

    Additional: Functional/structural groups can be highly variable due to periodic flooding and drying cycles. Cool-season rhizomatous grasses can dominate during normal precipitation periods. Forbs may dominate following wet periods, and rushes, sedges, and spikerushes can be sub-dominant during and after wet periods.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 2,000-4,500 lbs./acre (air-dry weight). Reference value production is 3,500 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:** State and local noxious weeds

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17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses should have vigorous rhizomes or tillers.
