USDA Natural Resources Conservation Service

Ecological site R063AY015SD
Thin Claypan

Accessed: 05/19/2024

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 tall grass prairie to a mixed grass prairie.

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 Thin Claypan site occurs throughout the MLRA. It is located on level to gently undulating or rolling uplands. Slopes range from 0 to 15 percent. Soil surface textures are silt loam to silty clay loam, 1 to 3 inches thick. The Btn horizon occurs within 4 inches of the surface and is extremely hard clay. The columnar or prismatic structured subsoil has a rounded or “biscuit-shaped” top. The Btn horizon is high in sodium and can have a whitish coloration. The vegetation in reference is a mix of cool and warm-season grasses, mostly rhizomatous wheatgrass, buffalo grass and blue grama. Prickly pear or fragile cactus are often present. Bare ground will increase with erosion, resulting in exposed whitish “biscuit-tops”.

Associated sites

R063AY011SD	**Clayey**
R063AY013SD	**Claypan**
R063AY018SD	**Dense Clay**

Similar sites

R063AY013SD	**Claypan** Claypan [more western wheatgrass and green needlegrass; higher production]
R063AY011SD	**Clayey** Clayey [more green needlegrass; higher production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Bouteloua gracilis*

Physiographic features

This site occurs on nearly level to gently undulating or rolling sedimentary uplands, alluvial fans, fan remnants, fan terraces and hillslopes.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Alluvial flat (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	488–823 m
Slope	0–15%
Water table depth	203 cm
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)	483 mm

Climate stations used

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

Influencing water features

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

Soil features

The common features of soils in this site are: clay or silty clay textured subsoils and slopes of 0 to 9 percent. The soils in this site are moderately well to well drained and formed in residuum derived from shale. The silt loam to silty clay loam surface layer is one to three inches thick. The extremely hard clayey natric (Btn) horizon has round-topped or “biscuit shaped” columnar or prismatic structured subsoil. These natric horizons are high in sodium. The soils have a very slow infiltration rate. Wet surface compaction can occur with heavy traffic. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. The soil surface is stable and intact. These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about four percent. Loss of 30 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

The commonly occurring soils for this site include: Capa, Hisle and Hurley.

Table 4. Representative soil features

Parent material	(1) Residuum–clayey shale
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Clayey

Drainage class	Moderately well drained to well drained
Permeability class	Very slow
Soil depth	51–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–25
Soil reaction (1:1 water) (0-101.6cm)	5.6–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

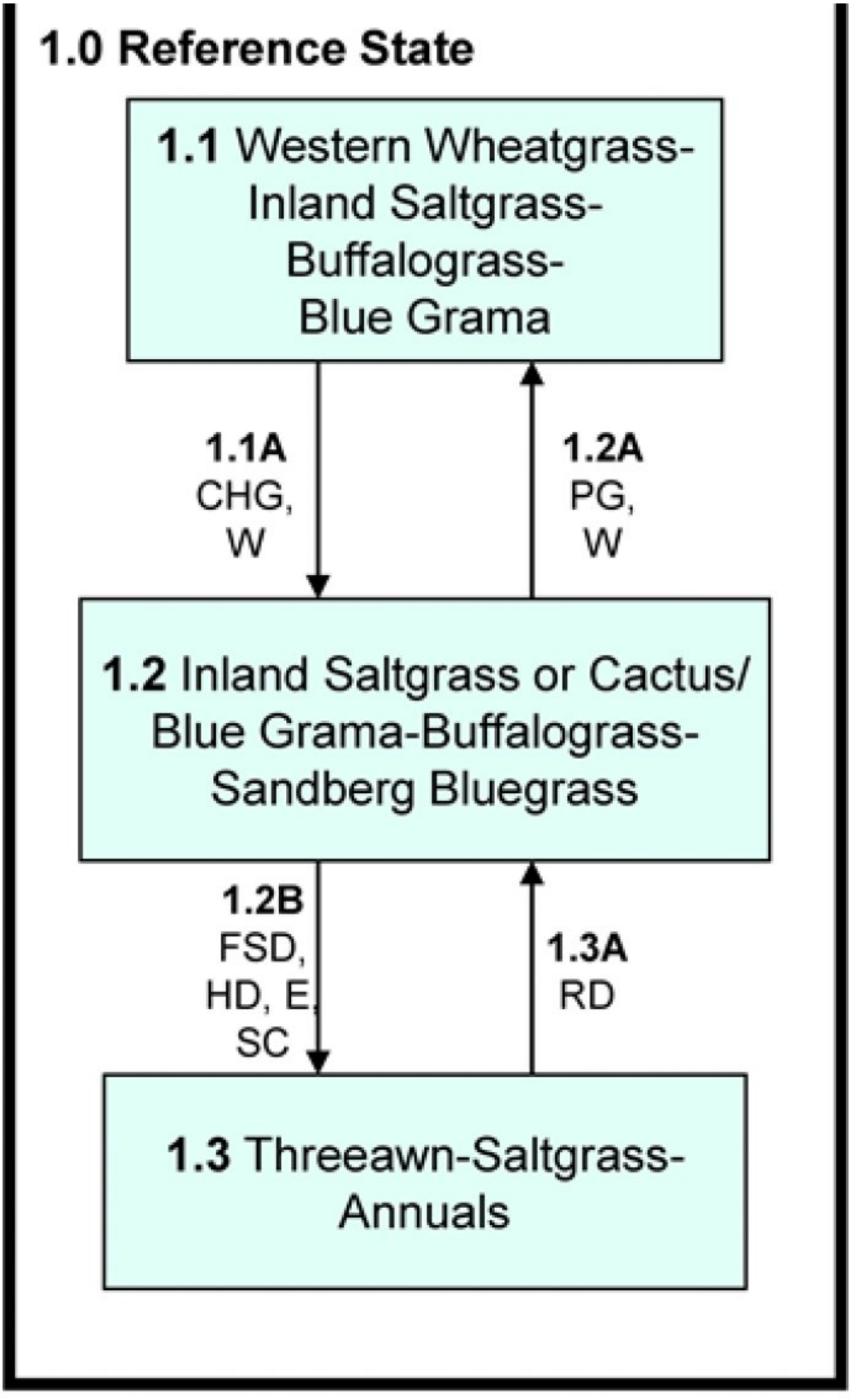
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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.

"Slick spots" are often found in association with this site. They usually have considerably more bare ground, and are typically dominated by cactus. "Slick spots" are bare ground areas that are affected by high sodium concentrations. The soil factors are the dominant influence and grazing management is not necessarily the primary influence of these areas. These areas can occur as a complex with this site, sometimes being difficult to differentiate between the two.

Interpretations are primarily based on the Western Wheatgrass-Inland Saltgrass-Buffalograss-Blue Grama 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 communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model


1.0 Reference State
1.1 Western Wheatgrass-Inland Saltgrass-Buffalograss-Blue Grama
1.1A CHG, W
1.2A PG, W
1.2 Inland Saltgrass or Cactus/ Blue Grama-Buffalograss-Sandberg Bluegrass
1.2B FSD, HD, E, SC
1.3A RD
1.3 Threeawn-Saltgrass-Annuals

CHG – Continuous heavy grazing (heavy levels of grazing of a unit during most or all of the growing season)
E – Erosion, loss of soil surface layer
FSD – Frequent and severe defoliation
PG – Prescribed grazing with proper stocking, change in season of use and adequate recovery.
SC – Soil compaction
RD – Removal of disturbance
W – Significantly below or above average precipitation

Figure 6. Thin Claypan - R063AY015SD

Diagram Legend - Thin Claypan - R063AY015SD

CP 1.1A	1.1 - 1.2	Continuous heavy grazing throughout most if not all the growing season without adequate recovery, significantly above or below normal precipitation.
CP 1.2A	1.2 - 1.1	Prescribed grazing including change in season of use, proper stocking and adequate rest and recovery, normal precipitation following drought or flooding.
CP 1.2B	1.2 - 1.3	Frequent and severe defoliation, heavy disturbance, erosion, soil compaction.
CP 1.3A	1.3 - 1.2	Removal of disturbance, proper stocking rates.

Figure 7. Thin Claypan - R063AY015SD

State 1
Reference State

This state represents what is believed to show the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site, in reference, is dominated by a mix of warm-season short-grasses and cool-season wheatgrasses. Because of the influence of salts in the soil, salt tolerant species, such as inland saltgrass, are almost always present but in minor amounts. Excessive grazing will cause the plant community to transition to a community dominated by salt tolerant species. Erosion of the surface horizon is also a likely outcome with heavy grazing. In pre-European times the primary disturbances included grazing by large ungulates and small mammals and drought. Favorable growing conditions occurred during the spring, and warm months of June through August. Today a similar state can be found in areas where proper livestock use has occurred.

Community 1.1
Western Wheatgrass-Inland Saltgrass-Buffalograss-Blue Grama Plant Community

Interpretations are based primarily on the Western Wheatgrass-Inland Saltgrass-Buffalograss-Blue Grama Plant Community, which is considered to be the reference plant community. This site evolved with grazing by large herbivores, occasional prairie fires and drought. This plant community can be found on areas having a history of proper grazing management, including adequate recovery periods between grazing events. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The wheatgrasses dominate the plant community, while inland saltgrass, blue grama, and buffalograss are also prevalent. Other grasses and grass-like plants occurring on the site include green needlegrass, needleandthread, Sandberg bluegrass, and sedges. Significant forbs include slimflower scurfpea, scarlet globemallow, cudweed sagewort, and white prairie aster. Shrubs occurring in this plant community include cactus, saltbush, and fringed sagewort. This

plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning at the sites potential. Plant litter is properly distributed with some movement offsite and natural plant mortality is low. Low to moderate available water capacity coupled with high accumulations of sodium and slow permeability strongly influences the soil-water-plant relationships.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	594	1066	1536
Shrub/Vine	22	74	129
Forb	56	93	129
Total	**672**	**1233**	**1794**

Figure 9. Plant community growth curve (percent production by month). SD6302, Pierre Shale Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 1.2
Inland Saltgrass or Cactus/Blue Grama-Buffalograss-Sandberg Bluegrass Plant Community

This plant community can develop from the adverse effects of continuous heavy grazing and/or annual, spring seasonal grazing. Shortgrasses and cactus increase to dominate the site and annual production decreases dramatically. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation; which gives blue grama a competitive advantage over cool-season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Inland saltgrass, blue grama, and cactus are the dominant species. Other grasses and grass-likes occurring include buffalograss, Sandberg bluegrass, western wheatgrass, sedge, and annual grasses. Forbs such as cudweed sagewort and white prairie aster may also be present. Some nonnative species will begin to invade this plant community including western salsify, sweetclover, and cheatgrass. There is usually more than 25 percent bare ground. This plant community is quite resilient. The thick sod and competitive advantage prevents other species from establishing. This plant community is less productive than the Western Wheatgrass-Inland Saltgrass-Buffalograss-Blue Grama Plant Community. Runoff increases and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of blue grama.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	370	695	1020
Shrub/Vine	39	135	230
Forb	39	67	95
Total	**448**	**897**	**1345**

Figure 11. Plant community growth curve (percent production by month). SD6305, Pierre Shale Plains, warm-season dominant.. Warm-season dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	5	15	25	30	15	7	1	0	0

Community 1.3

Threeawn-Saltgrass-Annuals Plant Community

This community develops from frequent and severe defoliation; e.g. prairie dog activity, heavy disturbance areas or livestock concentration, excessive human and/or animal traffic. The vegetation is highly variable, but often dominated by threeawn. Erosion is typically higher than usual.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	263	464	661
Forb	62	151	241
Shrub/Vine	11	57	106
Total	**336**	**672**	**1008**

Figure 13. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous heavy grazing will convert the plant community to the Inland Saltgrass or Cactus/Blue Grama-Buffalograss-Sandberg Bluegrass Community. The mid-grasses will be replaced by blue grama, buffalograss, and saltgrass. Cactus becomes more prevalent. Continuous overgrazing will cause a considerable amount of bare ground during dry cycles and an increase in weeds during wet cycles.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing and favorable climatic conditions, which allows for adequate plant recovery time, can shift this plant community back to the Western Wheatgrass-Inland Saltgrass-Buffalograss-Blue Grama Plant Community. Periods of nonuse or deferment may be a management option to reach the climax plant community.

Pathway 1.2B
Community 1.2 to 1.3

Frequent and severe defoliation, without adequate recovery time, heavy disturbance, loss of soil surface layer and or soil compaction.

Pathway 1.3A
Community 1.3 to 1.2

Removal of disturbance should lead to the Inland Saltgrass or Cactus/Blue Grama-Buffalograss-Sandberg Bluegrass Plant Community. This may take an extended period of time and in the end may not fully meet management goals.

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	**Wheatgrass**			123–370	

	western wheatgrass	PASM	*Pascopyrum smithii*	123–370	–
2	**Short Warm Season Grasses**			185–370	
	blue grama	BOGR2	*Bouteloua gracilis*	62–308	–
	saltgrass	DISP	*Distichlis spicata*	62–308	–
	buffalograss	BODA2	*Bouteloua dactyloides*	62–247	–
3	**Cool-Season Grasses**			62–247	
	green needlegrass	NAVI4	*Nassella viridula*	12–123	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	12–123	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	12–62	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–62	–
4	**Other Native Grasses**			25–62	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	12–62	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–62	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–62	–
	dropseed	SPORO	*Sporobolus*	0–25	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–12	–
5	**Grass-likes**			12–62	
	needleleaf sedge	CADU6	*Carex duriuscula*	12–62	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–37	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–37	–
Forb					
7	**Forbs**			62–123	
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	12–25	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	12–25	–
	Forb, native	2FN	*Forb, native*	0–25	–
	onion	ALLIU	*Allium*	0–12	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–12	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–12	–
	povertyweed	IVAX	*Iva axillaris*	0–12	–
	desertparsley	LOMAT	*Lomatium*	0–12	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–12	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–12	–
	spiny phlox	PHHO	*Phlox hoodii*	0–12	–
	plantain	PLANT	*Plantago*	0–12	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–12	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–12	–
	deathcamas	ZIGAD	*Zigadenus*	0–12	–
	western dock	RUAQ	*Rumex aquaticus*	0–12	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–12	–
Shrub/Vine					
8	**Shrubs**			25–123	
	brittle pricklypear	OPFR	*Opuntia fragilis*	12–62	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–37	–

	plains pricklypear	OPPO	*Opuntia polyacantha*	0–37	
	silver sagebrush	ARCA13	*Artemisia cana*	0–37	–
	snow arnica	ARFR2	*Arnica frigida*	12–37	–
	saltbush	ATRIP	*Atriplex*	0–25	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–25	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–25	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–25	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–12	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			0–90	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–90	–
2	**Short Warm-Season Grasses**			179–493	
	saltgrass	DISP	*Distichlis spicata*	45–314	–
	blue grama	BOGR2	*Bouteloua gracilis*	90–269	–
	buffalograss	BODA2	*Bouteloua dactyloides*	18–135	–
	threeawn	ARIST	*Aristida*	9–72	–
3	**Cool-Season Grasses**			27–90	
	Sandberg bluegrass	POSE	*Poa secunda*	18–90	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–36	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–27	–
	green needlegrass	NAVI4	*Nassella viridula*	0–18	–
4	**Other Native Grasses**			0–27	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–27	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–27	–
	dropseed	SPORO	*Sporobolus*	0–27	–
5	**Grass-likes**			9–27	
	needleleaf sedge	CADU6	*Carex duriuscula*	9–27	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–18	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–18	–
6	**Non-Native Grasses**			9–45	
	cheatgrass	BRTE	*Bromus tectorum*	9–45	–
	bluegrass	POA	*Poa*	0–27	–
Forb					
7	**Forbs**			45–90	
	Forb, introduced	2FI	*Forb, introduced*	0–27	–
	sweetclover	MELIL	*Melilotus*	0–27	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–18	–
	Forb, native	2FN	*Forb, native*	0–18	–
	woolly plantain	PLPA2	*Plantago patagonica*	9–18	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	9–18	–

	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–9	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–9	–
	deathcamas	ZIGAD	*Zigadenus*	0–9	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–9	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–9	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–9	–
	povertyweed	IVAX	*Iva axillaris*	0–9	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–9	–
	spiny phlox	PHHO	*Phlox hoodii*	0–9	–
	plantain	PLANT	*Plantago*	0–9	–
Shrub/Vine					
8	**Shrubs**			45–224	
	brittle pricklypear	OPFR	*Opuntia fragilis*	9–135	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	9–72	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–45	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	9–45	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–9	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–9	–

Table 10. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			0–20	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–20	–
2	**Short Warm-Season Grasses**			135–336	
	threeawn	ARIST	*Aristida*	101–269	–
	saltgrass	DISP	*Distichlis spicata*	34–135	–
	blue grama	BOGR2	*Bouteloua gracilis*	7–47	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–27	–
3	**Cool-Season Grasses**			0–20	
	Sandberg bluegrass	POSE	*Poa secunda*	0–20	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–13	–
4	**Other Native Grasses**			0–20	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–13	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–13	–
	dropseed	SPORO	*Sporobolus*	0–7	–
5	**Grass-likes**			0–13	
	needleleaf sedge	CADU6	*Carex duriuscula*	0–13	–
6	**Non-Native Grasses**			7–54	
	cheatgrass	BRTE	*Bromus tectorum*	7–54	–
Forb					
7	**Forbs**			67–235	
	Forb, introduced	2FI	*Forb, introduced*	13–135	–
	fetid marigold	DYPA	*Dyssodia papposa*	13–135	–
	sweetclover	MELIL	*Melilotus*	0–27	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	7–20	–
	Forb, native	2FN	*Forb, native*	0–20	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	7–20	–
	woolly plantain	PLPA2	*Plantago patagonica*	7–13	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–7	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–7	–
	deathcamas	ZIGAD	*Zigadenus*	0–7	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–7	–
	povertyweed	IVAX	*Iva axillaris*	0–7	–
	spiny phlox	PHHO	*Phlox hoodii*	0–7	–
Shrub/Vine					
8	**Shrubs**			13–101	
	brittle pricklypear	OPFR	*Opuntia fragilis*	13–54	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–27	–
	prairie sagewort	ARFR4	*Artemisia frigida*	7–20	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–20	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–13	–

Animal community

Animal Community – Grazing Interpretations
The following table lists annual, suggested initial stocking rates during 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.

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.

Western Wheatgrass-Inland Saltgrass-Buffalograss-Blue Grama (1.1)
Average Annual Production (lbs./acre, air-dry)1100
Stocking Rate*(AUM/acre) .30

Inland Saltgrass or Cactus/Blue Grama-Buffalograss-Sandberg Bluegrass (1.2)
Average Annual Production (lbs./acre, air-dry)800
Stocking Rate*(AUM/acre) .22

Threeawn-Saltgrass-Annuals (2.1)
Average Annual Production (lbs./acre, air-dry) 600
Stocking Rate*(AUM/acre) .16

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency of preferred and desirable species (refer to USDA NRCS, National Range and Pasture Handbook).

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration and runoff potential for this site varies from moderate to high 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.

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 is one SCS-RANGE-417 collected in 1982 in Jackson County, South Dakota.

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://www.hprcc.unl.edu/)
USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://www.wcc.nrcs.usda.gov/)
USDA, NRCS. National Range and Pasture Handbook, September 1997
USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (http://nasis.nrcs.usda.gov)
USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA
USDA, NRCS, Various Published Soil Surveys

Contributors

Betty Bisch
Stan Boltz

Acknowledgments

Peterson, Rick L. - Updated ESD to Provisional Level 5/11/16

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	05/09/2010
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:** Broken or irregular in appearance or discontinuous with numerous debris dams.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are somewhat common, but few exposed roots would occur.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5 to 20 percent is typical; this does not include associated slickspots that are not a soil/ecological site.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short distances, some medium size class litter will move very short distances. Litter debris dams are occasionally present.

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 should typically be 3 or greater. Surface organic matter adheres to the soil surface in most cases. Soil surface fragments will typically retain structure for 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):** A-horizon

not present at the surface, but has light colored E-horizon 1 to 4 inches thick. Structure is thin platy parting to fine granular.

---

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 & tall rhizomatous and tufted perennial cool-season grasses) with fine and coarse roots positively influences infiltration.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None – natural pan appears at roughly 1 to 4 inches with “biscuit-top” appearance at top of pan.

---

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 cool-season rhizomatous grasses = Short warm-season grasses >

    Sub-dominant: Cool-season bunchgrasses >

    Other: Forbs = Shrubs > Mid warm-season grasses = Grass-likes

    Additional:

---

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.

---

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 600-1,600 lbs./acre (air-dry weight). Reference value production is 1,100 lbs./acre (air-dry weight).

---

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, cactus

---

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.