USDA Natural Resources Conservation Service

Ecological site R063BY015SD
Thin Claypan

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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): 063B–Southern Rolling Pierre Shale Plains

MLRA Notes:
The Southern Rolling Pierre Shale Plains (MLRA 63B) is approximately 4,460 square miles in size. The majority of the MLRA is located in South Dakota (82 percent), and the remaining 18 percent is located in Nebraska. Interstate 90 crosses the northern portion through Chamberlin, SD. There are several Indian Reservations, including the Lower Brule, Crow Creek, Santee, and Yankton Reservations.
This MLRA is an area of old plateaus and terraces that have been deeply eroded, with nearly level to rolling long slopes and well-defined dendritic drainage systems. The rivers and creek valleys have smooth floors and steep walls. The majority of the MLRA is located in the unglaciated section of the Missouri Plateau, Great Plains Province. The northeast corner of the MLRA, east of the Missouri River, is located in the glaciated section with higher areas having deposits of glacial drift. The southwestern tip is located in the High Plains Section.
Elevations range from 1,310 feet to 1,640 feet on the bottom lands along the Missouri River, and from 1,310 feet to 1,970 feet on the shale plains uplands.
The Missouri and Niobrara Rivers, and the confluence of the White and Missouri Rivers, occur within this MLRA. Lake Francis Case, Fort Randall Dam, and Lewis and Clark Lake are also within MLRA's borders.
Cretaceous Pierre Shale underlies most of the area. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clays. These clays shrink as they dry and swell as they become wet, causing significant problems for road and structural foundations.

Younger Niobrara chalk occurs in the southern part of the MLRA. Alluvial sand and gravel underlie the valley floors along major streams.

Soils are shallow to very deep, generally well drained, and with loamy or clayey textures. Annual precipitation is 19 to 26 inches, mostly falling during the growing season, as frontal storms during the spring and convective thunderstorms in summer. The average annual temperature is 45°-50°F. The freeze-free period averages 165 days, and ranges from 145 to 185 days.

Vegetation is a transition between tall prairie grasses and mixed prairie grasses. Western whetgrass, green needlegrass, porcupinegrass, and big bluestem are the major species. Little bluestem, buffalograss, sideoats grama, and sedges are dominant on the shallow soils. Buffaloberry, skunkbush sumac, and prairie rose are common on steep slopes along the major streams. Prairie cottonwood and a variety of willow species are common on flood plains along the major streams. Green ash, boxelder, chokecherry, bur oak, and buffaloberry occur in draws and narrow valleys. Encroachment of Rocky Mountain juniper and eastern redcedar on to the river breaks is becoming a concern.
The majority of the land is utilized for ranching (60 percent) and farming (27 percent). Major resource concerns for the area are wind erosion, water erosion, maintenance of the content of organic matter and soil productivity, and management of soil moisture.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 63B – Southern Rolling Pierre Shale Plains (USDA-NRCS, Ag Handbook 296).

EPA - Level IV Ecoregions of the Continental United States:

Northwestern Glaciated Plains - 42f – Southern Missouri Coteau Slopes, 42g – Ponca Plains, 42h – Southern River Breaks, 42p – Holt Tablelands

North Western Great Plains - 43C – River Breaks, 43f – Subhumid Pierre Shale Plains, 43r – Niobrara River Breaks.

Ecological site concept

The Thin Claypan site occurs throughout the MLRA. It is located on level to gently undulating or rolling uplands, stream terraces, and flood plains. Slopes range from 1 to 4 percent. The typical soils surface textures are silt loam, 1 to 4 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, blue grama and buffalograss. Prickly pear or fragile cactus are often present. Bare ground will increase with erosion, resulting in exposed whitish “biscuit-tops”.

Slick spots (Non-Site) are typically associated with the Thin Claypan ecological site but technically are not a Plant Community Phase or State within the Thin Claypan site. The Soils definition of a slick spot; a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Associated sites

R063BY010SD	**Loamy** The Thin Claypan site can be found adjacent to the Loamy site.
R063BY011SD	**Clayey** The Thin Claypan site can be found adjacent to the Clayey site.
R063BY013SD	**Claypan** The Thin Claypan site can be found adjacent to or intermingled with the Claypan site.

Similar sites

R063BY013SD	**Claypan** The Thin Claypan site will have less western wheatgrass, more short warm-season grasses, and lower production than the Claypan site.

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 sloping uplands, stream terraces, and flood plains.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Stream terrace (3) Flood plain
Flooding frequency	None
Elevation	1,300–2,000 ft
Slope	1–4%
Water table depth	24–80 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 63B is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and ample 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 18 to 25 inches per year. The average annual temperature is about 48°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, SD), to about 22°F (Winner, SD). July is the warmest month with temperatures averaging from about 73°F (Stephan, SD), to about 76°F (Winner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 56°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. 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 (characteristic range)	113-122 days
Freeze-free period (characteristic range)	130-154 days
Precipitation total (characteristic range)	21-24 in
Frost-free period (actual range)	110-126 days
Freeze-free period (actual range)	127-155 days
Precipitation total (actual range)	20-25 in

Frost-free period (average)	118 days
Freeze-free period (average)	141 days
Precipitation total (average)	23 in

Climate stations used

- (1) LYNCH [USC00255040], Lynch, NE
- (2) NIOBRARA [USC00255960], Niobrara, NE
- (3) GANN VALLEY 4NW [USC00393217], Gann Valley, SD
- (4) WOOD [USC00399442], Wood, SD
- (5) PICKSTOWN [USC00396574], Lake Andes, SD
- (6) STEPHAN 2 NW [USC00397992], Highmore, SD
- (7) WINNER [USC00399367], Winner, 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 have a silt loam textured surface layer, with slopes ranging from 1 to 4 percent. The soils in this site typically moderately well to well-drained and formed in residuum or alluvium derived from shale. The surface layer is 1 to 4 inches thick.
Subsoil textures are clay to silty clay. The soils have a very slow infiltration rate. The Btn horizon is an extremely hard clayey that is round- topped or “bun shaped” with a columnar or prismatic structured subsoil. These Btn horizons are high in sodium. When wet, surface compaction can occur with heavy traffic. When dry these soils crack. 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 where vegetation is removed or severely disturbed. 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.

Major soils correlated to the Thin Claypan ecological site include: Capa, Hurley, Jerauld, and Minatare. 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 (2) Residuum–clayey shale
Surface texture	(1) Silt loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow
Depth to restrictive layer	0–4 in
Soil depth	30–80 in
Available water capacity (0-10in)	3–5 in
Calcium carbonate equivalent (0-10in)	0–25%
Electrical conductivity (0-10in)	0–30 mmhos/cm

Sodium adsorption ratio (0-10in)	5–30
Soil reaction (1:1 water) (0-10in)	5.6–9.6
Subsurface fragment volume <=3" (Depth not specified)	0–4%

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 specify more typical transitions between communities that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition.

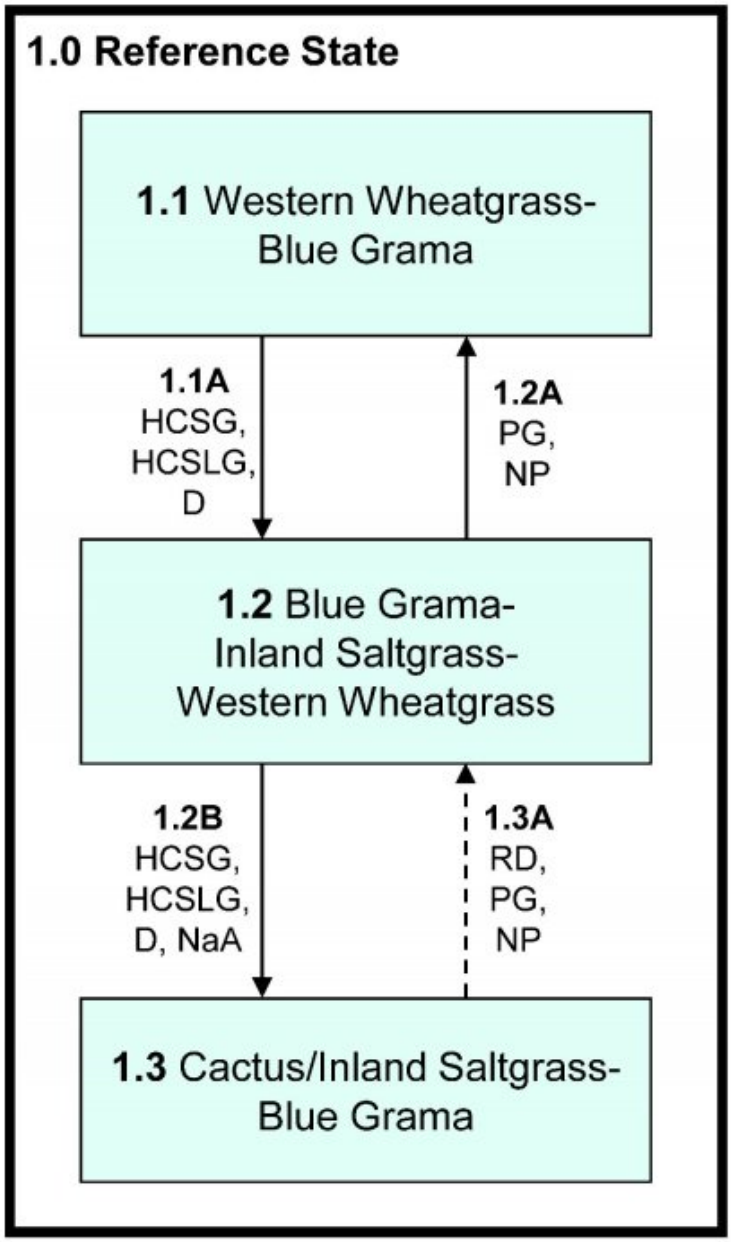
In association with this site there are also areas of slick spots that usually have considerably more bare ground and are typically dominated by cactus. Slick spots are bare ground areas that are affected by high sodium concentrations. The soil factors are the dominant influence and grazing management 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-Blue Grama Plant Community (1.1), also considered the Reference Plant Community. This Plant Community 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 is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model

Thin Claypan – R063BY015SD 8/06/18



D – Drought
HCSG – Heavy, continuous seasonal grazing
HCSLG – Heavy, continuous season-long grazing
NaA – Sodium accumulation in soil surface layer
NP – Return to normal precipitation patterns
PG – Prescribed grazing
RD – Removal of disturbance
– –▶Transition may not be rapid and/or feasible

Diagram Legend - Thin Claypan - R063BY015SD

CP 1.1A	1.1 - 1.2	Heavy, continuous seasonal grazing or heavy, continuous season-long grazing and/or drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing and a return to normal precipitation following drought.
CP 1.2B	1.2 - 1.3	Heavy, continuous seasonal grazing or heavy, continuous season-long grazing and/or drought and an accumulation of sodium (Na) in the soil surface layer.
CP 1.3A	1.3 - 1.2	Removal of disturbance, prescribed grazing, and a return to normal precipitation patterns. Transition may not be fast, or in the end, meet management goals.

State 1
Reference State

This State represents the natural range of variability that dominates the dynamics of this ecological site. This State

is dominated by cool- season grasses, with warm-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included precipitation cycles and grazing by large herding ungulates. Fire was not a major factor influencing vegetation as this site does not typically have sufficient fuel loads to carry a fire. Timing of grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Today, this state can be found on areas that are properly managed with grazing and sometimes on areas receiving occasional short periods of rest. Cool-season species can decline and a corresponding increase in short, warm-season grasses will occur. Non-native cool-season grasses typically will not make up more than 15 percent of any plant community within this State.

Community 1.1
Western Wheatgrass-Blue Grama

Figure 8. Thin Claypan - R063BY015SD - PCP 1.1.

Interpretations are based primarily on the Western Wheatgrass-Blue Grama Plant Community, which is also considered to be the Reference Plant Community (1.1). This plant community evolved with grazing by large herbivores and variations in precipitation cycles, and can be maintained with prescribed grazing, or by occasional short periods of rest or deferment. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. Cool-season grasses dominate the plant community, while warm-season grasses are subdominant. The major grasses include western wheatgrass and blue grama. Other grasses and grass-likes occurring on this site include buffalograss, inland saltgrass, needle and thread, and sedge. The dominant forbs include scarlet globemallow, cudweed sagewort, heath aster, and woolly Indianwheat. Shrubs that can occur in this plant community are brittle cactus, saltbush, and plains pricklypear. 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	860	1274	1670
Shrub/Vine	70	113	165
Forb	70	113	165
Total	**1000**	**1500**	**2000**

Figure 10. 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
Blue Grama-Inland Saltgrass-Western Wheatgrass

This plant community can develop from the adverse effects of heavy, continuous seasonal grazing and/or heavy, continuous season-long grazing. Short grasses tend to 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. Blue grama and inland saltgrass are the dominant species. Other grasses and grass-likes occurring include western wheatgrass, buffalograss, Sandberg bluegrass, sedge, and sometimes annual grasses. Forbs such as cudweed sagewort, scarlet globemallow, and woolly Indianwheat may also be present. Some nonnative species will begin to invade this plant community including western salsify, sweetclover, and annual bromegrass. 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-Blue Grama Plant Community (1.1). 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	545	756	1055
Shrub/Vine	40	90	150
Forb	15	54	95
Total	**600**	**900**	**1300**

Figure 12. 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

Community 1.3
Cactus/Inland Saltgrass-Blue Grama

This plant community can develop from the adverse effects of heavy, continuous seasonal grazing and/or heavy, continuous season-long grazing. Brittle cactus and plains pricklypear, as well as, short warm-season grasses tend to increase to dominate the site and annual production decreases further. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives cactus and short warm-season grasses a competitive advantage. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Brittle cactus, plains pricklypear, inland saltgrass, and blue grama are the dominant species. Other grasses and grass-likes occurring include western wheatgrass, buffalograss, Sandberg bluegrass, and sedge. Forbs such as cudweed sagewort, common dandelion, sweetclover, and woolly Indianwheat may also be present. In addition to the cactus, fringed sagewort is also a prevalent shrub. There is usually more than 25 percent bare ground. This plant community is quite resilient. The thick sod and competitive advantage of the short-grasses prevents other species from establishing. This plant community is the least productive plant community phase. Runoff increases, and infiltration will decrease. Soil erosion will be minimal due to the sod forming habit of the short warm-season grasses. This plant community is not a Slick Spot however it may resemble a one.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	335	474	605
Shrub/Vine	55	90	130
Forb	10	36	65
Total	**400**	**600**	**800**

Figure 14. 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

Pathway 1.1A
Community 1.1 to 1.2

Heavy, continuous seasonal grazing (heavy stocking levels at the same time of year each year), or heavy, continuous season-long grazing will shift this community to the Blue Grama-Inland Saltgrass-Western Wheatgrass Plant Community Phase (1.2). Drought can greatly influence this change.

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 and a return to normal precipitation patterns will convert this plant community to the Western Wheatgrass-Blue Grama Plant Community (1.1).

Conservation practices

Prescribed Grazing

Pathway 1.2B
Community 1.2 to 1.3

Heavy, continuous seasonal grazing (heavy stocking levels at the same time of year each year), or heavy, continuous season-long grazing will shift this community to the Cactus/Inland Saltgrass-Blue Grama Plant Community (1.3). This change can also be influenced by drought and the accumulation of sodium in the soil surface layer.

Pathway 1.3A
Community 1.3 to 1.2

Removal of management induced disturbance followed by prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the Blue Grama-Inland Saltgrass-Western Wheatgrass Plant Community (1.2). Depending on the amount of sodium at the soil surface, this transition may not be fast or, in the end, meet management goals.

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	**Wheatgrass**			375–675	
	western wheatgrass	PASM	*Pascopyrum smithii*	375–675	–
2	**Short Warm-Season Grasses**			300–525	
	blue grama	BOGR2	*Bouteloua gracilis*	225–375	–
	saltgrass	DISP	*Distichlis spicata*	30–225	–
	buffalograss	BODA2	*Bouteloua dactyloides*	30–225	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–75	–
3	**Needlegrass**			30–150	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	30–150	–
	green needlegrass	NAVI4	*Nassella viridula*	0–150	–
4	**Mid Warm-Season Grasses**			0–75	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–75	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–75	–
5	**Other Native Grasses**			30–75	
	prairie Junegrass	KOMA	*Koeleria macrantha*	15–75	–
	Sandberg bluegrass	POSE	*Poa secunda*	15–45	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–45	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–15	–
6	**Grass-Likes**			30–150	
	needleleaf sedge	CADU6	*Carex duriuscula*	15–120	–
	threadleaf sedge	CAFI	*Carex filifolia*	15–75	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–45	–
Forb					
8	**Forbs**			75–150	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	15–45	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	15–45	–
	Forb, native	2FN	*Forb, native*	15–45	–
	textile onion	ALTE	*Allium textile*	15–30	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–30	–
	spiny phlox	PHHO	*Phlox hoodii*	15–30	–
	woolly plantain	PLPA2	*Plantago patagonica*	15–30	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	15–30	–
	white heath aster	SYER	*Symphyotrichum ericoides*	15–30	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–15	–
	deathcamas	ZIGAD	*Zigadenus*	0–15	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–15	–
	povertyweed	IVAX	*Iva axillaris*	0–15	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–15	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–15	–
Shrub/Vine					

9	**Shrubs**			75–150	
	prairie sagewort	ARFR4	*Artemisia frigida*	15–60	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–45	–
	saltbush	ATRIP	*Atriplex*	0–30	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	15–30	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	15–30	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	15–30	–
	rose	ROSA5	*Rosa*	15–30	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			90–180	
	western wheatgrass	PASM	*Pascopyrum smithii*	90–180	–
2	**Short Warm-Season Grasses**			270–450	
	blue grama	BOGR2	*Bouteloua gracilis*	180–360	–
	saltgrass	DISP	*Distichlis spicata*	45–270	–
	buffalograss	BODA2	*Bouteloua dactyloides*	45–225	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–27	–
3	**Needlegrass**			0–45	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–45	–
	green needlegrass	NAVI4	*Nassella viridula*	0–27	–
5	**Other Native Grasses**			18–45	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–36	–
	Sandberg bluegrass	POSE	*Poa secunda*	9–36	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–27	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–18	–
6	**Grass-Likes**			45–135	
	needleleaf sedge	CADU6	*Carex duriuscula*	18–90	–
	threadleaf sedge	CAFI	*Carex filifolia*	9–63	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–27	–
7	**Non-Native Grasses**			0–90	
	cheatgrass	BRTE	*Bromus tectorum*	0–90	–
	bluegrass	POA	*Poa*	0–27	–
Forb					
8	**Forbs**			18–90	
	Forb, introduced	2FI	*Forb, introduced*	0–45	–
	sweetclover	MELIL	*Melilotus*	0–45	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–27	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–27	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–18	–
	Forb, native	2FN	*Forb, native*	0–18	–

	white heath aster	SYER	*Symphyotrichum ericoides*	0–18	–
	common dandelion	TAOF	*Taraxacum officinale*	0–18	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–18	–
	spiny phlox	PHHO	*Phlox hoodii*	0–18	–
	woolly plantain	PLPA2	*Plantago patagonica*	9–18	–
	curly dock	RUCR	*Rumex crispus*	0–18	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–9	–
	deathcamas	ZIGAD	*Zigadenus*	0–9	–
	textile onion	ALTE	*Allium textile*	0–9	–
	field sagewort	ARCA12	*Artemisia campestris*	0–9	–
	povertyweed	IVAX	*Iva axillaris*	0–9	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–9	–
Shrub/Vine					
9	**Shrubs**			45–135	
	prairie sagewort	ARFR4	*Artemisia frigida*	9–36	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	9–36	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	9–36	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	9–27	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–27	–
	saltbush	ATRIP	*Atriplex*	0–9	–
	rose	ROSA5	*Rosa*	0–9	–

Table 10. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			6–60	
	western wheatgrass	PASM	*Pascopyrum smithii*	6–60	–
2	**Short Warm-Season Grasses**			150–300	
	blue grama	BOGR2	*Bouteloua gracilis*	30–150	–
	saltgrass	DISP	*Distichlis spicata*	90–120	–
	buffalograss	BODA2	*Bouteloua dactyloides*	6–60	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–30	–
3	**Needlegrass**			0–12	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–12	–
5	**Other Native Grasses**			12–30	
	Sandberg bluegrass	POSE	*Poa secunda*	6–30	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–18	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–18	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	6–12	–
6	**Grass-Likes**			30–120	
	needleleaf sedge	CADU6	*Carex duriuscula*	18–90	–
	threadleaf sedge	CAFI	*Carex filifolia*	6–48	–

	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–12	–
7	**Non-Native Grasses**			0–48	
	cheatgrass	BRTE	*Bromus tectorum*	0–48	–
	bluegrass	POA	*Poa*	0–12	–
Forb					
8	**Forbs**			12–60	
	sweetclover	MELIL	*Melilotus*	0–48	–
	Forb, introduced	2FI	*Forb, introduced*	0–30	–
	woolly plantain	PLPA2	*Plantago patagonica*	6–18	–
	curly dock	RUCR	*Rumex crispus*	0–18	–
	common dandelion	TAOF	*Taraxacum officinale*	0–18	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–12	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–12	–
	Forb, native	2FN	*Forb, native*	0–12	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–12	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–12	–
	povertyweed	IVAX	*Iva axillaris*	0–6	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–6	–
	spiny phlox	PHHO	*Phlox hoodii*	0–6	–
	deathcamas	ZIGAD	*Zigadenus*	0–6	–
Shrub/Vine					
9	**Shrubs**			60–120	
	prairie sagewort	ARFR4	*Artemisia frigida*	6–60	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	6–48	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	6–36	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–30	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–18	–
	rose	ROSA5	*Rosa*	0–6	–

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 ESD). 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.

The following stocking rates are based on 912 lbs./acre (air-dry weight) per Animal-Unit-Month (AUM), with a 25 percent harvest efficiency of preferred and desirable forage species. An AUM is defined as the equivalent amount of forage required by a 1,000-pound cow with calf up to 6 months of age for one month (refer to USDA NRCS, National Range and Pasture Handbook).

Plant Community: Western Wheatgrass-Blue Grama (1.1)
Average Annual Production (lbs./acre, air-dry): 1500
Stocking Rate (AUM/acre): 0.41

Plant Community: Blue Grama-Inland Saltgrass-Western Wheatgrass (1.2)
Average Annual Production (lbs./acre, air-dry): 900
Stocking Rate (AUM/acre): 0.25

Plant Community: Cactus/Inland Saltgrass-Blue Grama (1.3)
Average Annual Production (lbs./acre, air-dry): 600
Stocking Rate (AUM/acre): 0.16

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

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. 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 slow and runoff potential for this site is high. In many cases, areas with greater than 75 percent ground cover have the greatest potential for higher infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama and/or inland saltgrass will result in reduced infiltration and increased runoff. 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 requirements as an “Approved” ESD as laid out in the 1997, rev.1, 2003 National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and-Transition model. All other alternative states are at least described in narrative form. The “Previously Approved” ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The “Previously Approved” ESD 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 toward an “Approved” status.

Site Development and Testing Plan:
Future work, as described in a Project Plan, is necessary to validate the information in this Provisional Ecological Site Description. 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. The final field review, peer review, quality control, and quality assurance reviews of the ESD will be required to produce the final document.

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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; Rick Peterson, RMS, NRCS; and Dana Larsen, RMS, NRCS.

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Approval

David Kraft, 9/11/2018

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ESD Updated by Rick L. Peterson on 11/13/17.
Editorial Review by Carla Green Adams.

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.

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Date	02/20/2009
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Broken or irregular in appearance or discontinuous with numerous debris dams.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is roughly 10 to 20 percent. Slickspots occur in association with this site, and may comprise areas with much more bare ground.

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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: Wheatgrass (mid, cool-season rhizomatous grass) >

    Sub-dominant: Short, warm-season grasses >>

    Other: Cool-season bunchgrasses = grass-like species = forbs = shrubs > mid, warm-season grasses

    Additional: Other grasses in other functional groups occur in minor amounts.

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):** Litter cover roughly 30 to 50 percent, and litter is in contact with the soil surface. Litter depth is roughly 0.25 to 0.5 inches.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 1,000 to 2,000 pounds/acre, with the reference value being 1,500 pounds/acre (air-dry basis).

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:** Perennial grasses should have vigorous rhizomes or tillers.