

Ecological site R060AY009SD Sandy

Accessed: 05/03/2024

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.

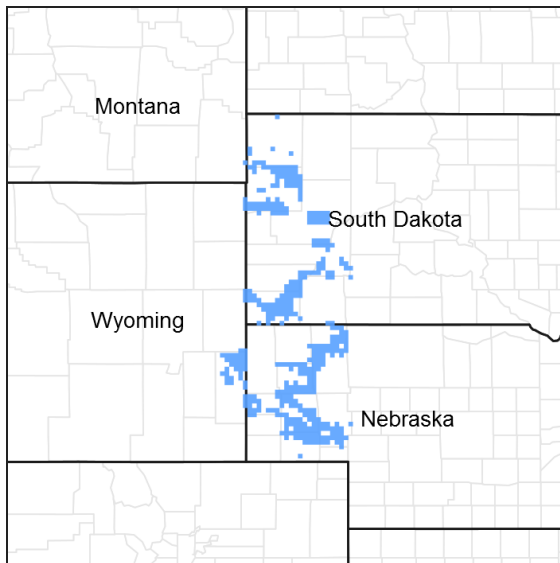


Figure 1. Mapped extent

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): 060A–Pierre Shale Plains

MLRA Notes:

The Pierre Shale Plains (MLRA 60A) consists of approximately 10,150 square miles, the majority of which is located in South Dakota (70 percent) and small portions are in Montana (2 percent), Nebraska (8 percent), and Wyoming (20 percent). It encircles the Black Hills (MLRA 62) and the Dakota Hogback (MLRA 61). MLRA 60A includes portions of the Oglala, Buffalo Gap, and Thunder Basin National Grasslands. It also includes small sections of the Pine Ridge Indian Reservation, Badlands National Park, and Black Hills National Forest. The Cheyenne and Belle Fourche Rivers flow through the MLRA.

MLRA 60A is in the unglaciated section of the Missouri Plateau, of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been deeply eroded. Cretaceous Pierre Shale underlies almost all of this MLRA. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clay. These clays shrink as they dry and swell as they receive moisture. Soils are shallow to very deep and generally are well drained and clayey.

Elevations generally range from 2,620 to 3,610 feet throughout the MLRA, but can range up to 4,260 feet. The average annual precipitation for the western side of the MLRA is 13 to 16 inches, whereas the eastern side receives 16 to 18 inches. A suite of ecological sites have been written specifically for these two precipitation zones. The Locator Map shows the break between the two precipitation zones.

This area supports a mixed natural prairie vegetation consisting of both cool- and warm-season grasses and forbs. Wyoming big sagebrush occurs primarily in the drier western portion of the MLRA; however, small remnant stands can be found in the eastern portion. Dominant land uses of the area are primarily ranching and, to a lesser extent, farming. Major resource concerns to this MLRA are wind erosion and surface water quality.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 60A – Pierre Shale Plains.

EPA - Level IV Ecoregions of the Continental United States: 43e – Sagebrush Steppe, 43g Semiarid Pierre Shale Plains, and 43k – Dense Clay Prairie.

Ecological site concept

The Sandy ecological site occurs throughout the MLRA. It is located on upland landscapes and does not receive additional moisture from runoff or overflow. Typical slope ranges from 0 to 15 percent. Soils are deep, (greater than 20 inches) with surface textures ranging from fine sandy loam to sandy loam. Subsurface textures range from sand to very fine sandy loamy. Vegetation in the Reference Plant Community consists of a mix of cool- and warm-season grasses. Dominant grasses include prairie sandreed, needle and thread, big bluestem, little bluestem, western wheatgrass, and Indian ricegrass. Forbs are common and diverse. Shrubs include leadplant, rose, and sand sage brush. In the western portion of the MLRA, silver sagebrush and green rabbitbrush will be the most common shrubs. This site is susceptible to invasion of non-native, cool-season grasses.

Associated sites

R060AY008SD	<p>Sands The Sands site can be located adjacent to the Sandy site, but on steeper slopes and undulating landscapes.</p>
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Similar sites

R060AY008SD	<p>Sands The Sands site will have more sand and/or big bluestem, less western wheatgrass, and steeper slopes.</p>
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Calamovilfa longifolia</i> (2) <i>Hesperostipa comata</i>

Physiographic features

This site occurs mainly on nearly level to undulating slopes on uplands and river valleys.

Table 2. Representative physiographic features

Landforms	(1) Valley (2) Interdune (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	762–1,311 m
Slope	0–15%

Aspect	Aspect is not a significant factor
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Climatic features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains, where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation for the entire MLRA ranges from 13 to 18 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air masses from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but the more severe occur during late fall, late winter, and spring. The normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 19°F (Moorcroft CAA, WY) to about 22°F (Belle Fourche, SD). July is the warmest month with temperatures averaging from about 70°F (Moorcroft CAA, WY) to about 72°F (Belle Fourche, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 51°F. 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 generally are 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 can 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)	115 days
Freeze-free period (average)	133 days
Precipitation total (average)	432 mm

Climate stations used

- (1) BELLE FOURCHE [USC00390559], Belle Fourche, SD
- (2) WASTA [USC00398911], Owanka, SD
- (3) MOORCROFT 3S [USW00024088], Moorcroft, WY
- (4) ARDMORE 1 NW [USC00390236], Edgemont, SD
- (5) UPTON [USC00489205], Upton, WY
- (6) REDBIRD [USC00487555], Lance Creek, WY

Influencing water features

No significant water features influence this site.

Soil features

The soils in this site are well to somewhat excessively drained and formed in eolian sand or alluvium. The surface layer is 4 to 14 inches thick. The texture of the subsurface ranges from sand to very fine sandy loam. Slopes range from 0 to 15 percent. 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 with numerous debris dams, or vegetative barriers. The soil surface is stable and intact.

Soils correlated to the Sandy site include: Alice, Ascalon, Assinniboine, Dwyer, Jayem, Manter, Mawer, Satanta, and Vetal.

More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Fine sandy loam (3) Loamy fine sand
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	51–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
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, 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 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.

Sand dropseed, blue grama, and needle and thread increase as this site deteriorates from improper management. Species such as sand bluestem, prairie sandreed and little bluestem will decrease in frequency and production. The plant community upon which interpretations are primarily based is the Reference Plant Community (1.1). The Reference Plant Community has been determined by studying 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 communities that can occur on the site and the transitions between communities. The ecological processes are discussed in more detail in the plant community narratives following the diagram.

State and transition model

Sandy – R060AY009SD 9/07/17

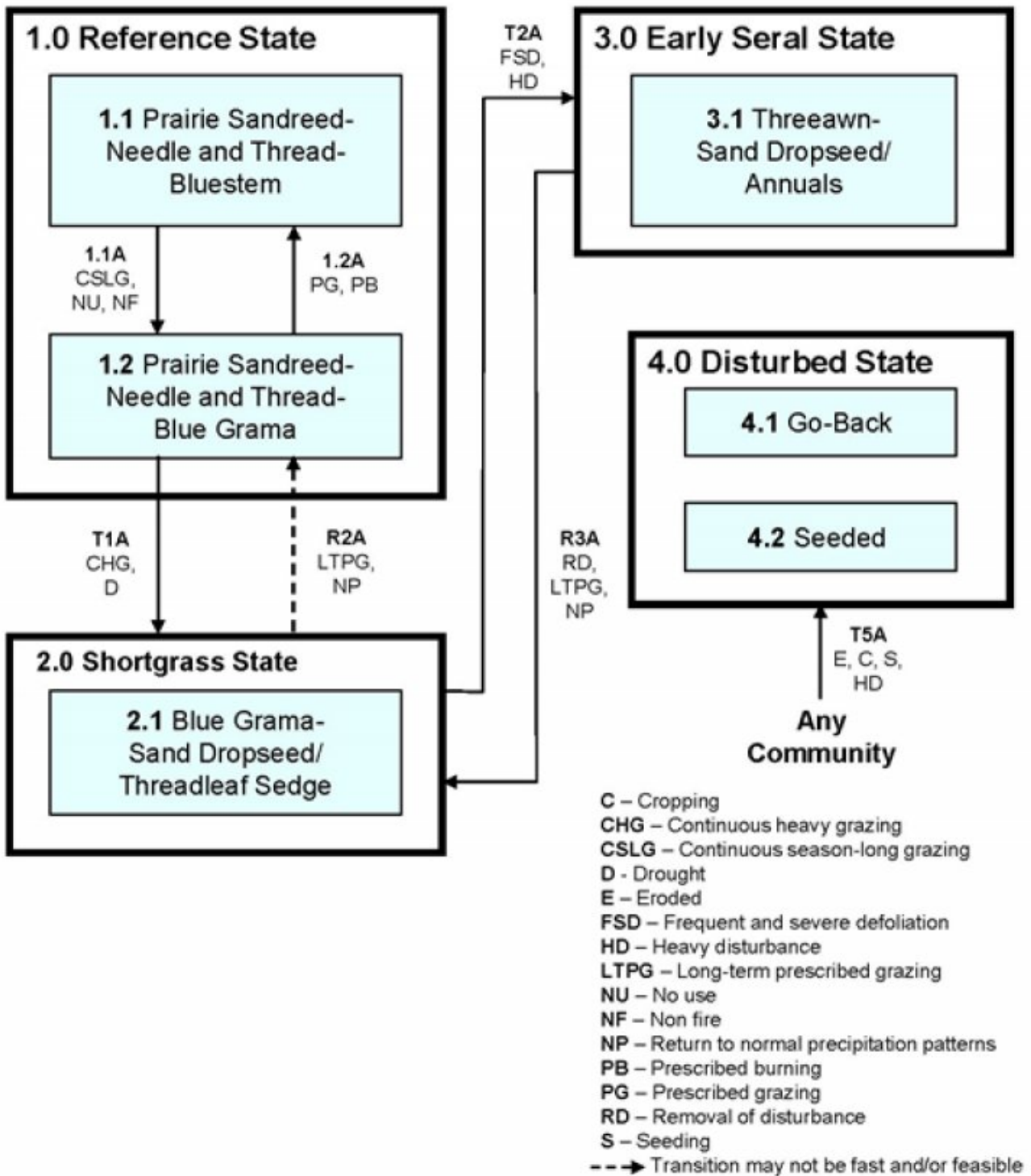


Figure 6. Sandy - R060AY009SD

Diagram Legend - Sandy - R060AY009SD		
T1A	Continuous heavy grazing or heavy grazing in combination with drought.	
T2A	Frequent and severe defoliation and/or heavy disturbance.	
T5A	Heavy disturbance such as soil erosion, tillage, abandoned cropland, or tillage and seeding to introduced perennial forage crops.	
R2A	Long-term prescribed grazing with change in season of use and adequate time for recovery, return to normal precipitation patterns.	
R3A	Removal of disturbance coupled with long-term prescribed grazing with change in season of use, and adequate recovery time, return to normal precipitation patterns.	
CP 1.1A	1.1 - 1.2	Continuous season-long grazing or no use and no fire.
CP 1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change in season of use, and adequate time for recovery. Prescribed burning could also be a management option.

Figure 7. Sandy - R060AY009SD

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 warm- and cool-season grasses. Grazing or the lack of grazing and fire are the major drivers between plant communities. Non-use and no fire or long-term, light grazing will result in litter accumulations and the loss of species diversity and production. This site can be susceptible to the invasion of non-native, cool-season grasses if they are found in adjoining plant communities.

Community 1.1 Prairie Sandreed-Needle and Thread-Bluestem



Figure 8. Sandy - R060AY009SD - PCP 1.1

The plant community upon which interpretations are primarily based is the Prairie Sandreed-Needle and Thread-Bluestem Plant Community (1.1). This is also considered the Reference Plant Community. This plant community can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of deferment. The potential vegetation is about 85 to 95 percent grasses or grass-like plants, 5 to 10 percent forbs, and 0 to 5 percent shrubs. The site is dominated by mid- and tall- grasses. Major grasses are prairie sandreed, needle and thread, and little bluestem. Other grass and grass-like species occurring on the site include sand bluestem, blue grama, western wheatgrass, and threadleaf sedge. Significant forbs include dotted gayfeather, penstemon, and prairie coneflower. Shrubs in this community are rose, leadplant,

sand sagebrush, and fringed sagewort. In the western portion of the MLRA, silver sagebrush and rubber rabbitbrush will replace sand sagebrush. Community dynamics, nutrient cycle, water-cycle, and energy flow are functioning properly. Plant litter is properly distributed with little movement off-site, and natural plant mortality is very low. The diversity in species allows for high drought tolerance. Run-off from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1250	1816	2376
Forb	95	151	207
Shrub/Vine	–	50	106
Total	1345	2017	2689

Figure 10. Plant community growth curve (percent production by month). SD6004, Pierre Shale Plains, warm-season dominant, cool-season sub-dominant. Warm season dominant, cool-season sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	18	25	25	15	7	0	0	0

Community 1.2 Prairie Sandreed-Needle and Thread-Blue Grama



Figure 11. Sandy - R060AY009SD - PCP 1.2

This plant community developed under continuous season-long grazing. The mid-grass component is reduced and an understory of short sod-forming grasses is increasing. This plant community also develops under continuous seasonal grazing. This occurs when grazed at the same time of the growing season, every year. If grazed early, needle and thread will be reduced, whereas if grazed later, little bluestem and sand bluestem will be reduced. Dominant grasses include needle and thread, blue grama, and prairie sandreed. Other grasses and grass-likes include western wheatgrass, sand dropseed, and threadleaf sedge. Forbs commonly found in this plant community include gayfeather, penstemon, prairie coneflower, cudweed sagewort, western ragweed, and spiderwort. Shrubs in this community include rose, sand sagebrush, fringed sagewort, and broom snakeweed. When compared to the Reference Plant Community, little bluestem has decreased and prairie sandreed is beginning to decline. Needle and thread, blue grama, and sand dropseed are increasing. Plant diversity is high but on a downward trend. This plant community is not resistant to change. Management changes can easily shift this plant community. Soil erosion is low. The water cycle is functioning, infiltration is high and runoff is low.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	712	1170	1737
Shrub/Vine	11	74	140
Forb	62	101	140
Total	785	1345	2017

Figure 13. Plant community growth curve (percent production by month). SD6004, Pierre Shale Plains, warm-season dominant, cool-season sub-dominant. Warm season dominant, cool-season sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	18	25	25	15	7	0	0	0

Pathway 1.1A Community 1.1 to 1.2



Prairie Sandreed-Needle and Thread-Bluestem



Prairie Sandreed-Needle and Thread-Blue Grama

Continuous season-long grazing or nonuse and no fire will convert the plant community to the Prairie Sandreed-Needle and Thread Plant Community (1.2).

Pathway 1.2A Community 1.2 to 1.1



Prairie Sandreed-Needle and Thread-Blue Grama



Prairie Sandreed-Needle and Thread-Bluestem

Prescribed grazing with adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Bluestem-Prairie Sandreed-Needle and Thread Plant Community (1.1). Prescribed burning can also be incorporated as a management tool.

State 2 Shortgrass State

The Shortgrass State is dominated by grazing tolerant, shortgrass species and upland sedges. This State is the result of grazing patterns that do not provide adequate recovery time for the tall, warm-season and mid-stature cool-season grasses. The hydrologic function of this site is dramatically altered. Runoff is high and infiltration is low. This State is very resistant to change through grazing management alone.

Community 2.1 Blue Grama/Threadleaf Sedge/Sand Dropseed

This plant community typically develops under continuous season long grazing over a period of several years. It is made up of short, grazing tolerant species. The dominant species are blue grama, sand dropseed, threadleaf sedge, and needle and thread. Dominant forbs include western ragweed, scurfpea, cutleaf ironplant, annual eriogonum, and cudweed sagewort. Dominant shrubs are broom snakeweed, cactus, and fringed sagewort.

Compared to the Reference Plant Community, blue grama and sand dropseed have increased, creating sod-bound conditions. Little bluestem is absent, and prairie sandreed is limited to a few sparse colonies. Fringed sagewort and broom snakeweed may also be increasing. This plant community is fairly resistant to change. Soil erosion is low. The water cycle is reduced because of the lack of surface litter. Infiltration is moderate due to soil texture, which can help to reduce runoff, but off-site gully erosion can be a concern. Forage production, species diversity, and ground cover are declining.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	527	807	1031
Shrub/Vine	45	101	157
Forb	45	101	157
Total	617	1009	1345

Figure 15. Plant community growth curve (percent production by month).
SD6003, Pierre Shale Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

State 3 Early Seral State

This State is the result of very heavy, concentrated disturbance such as concentrated rodent activity, or livestock concentration areas. Extended periods of drought accompanied by heavy grazing can also push an 'At Risk' plant community phase to this State. In most cases, this State is dominated by pioneer perennial and annual grass and forb species. The percentage of bare ground is also much higher than on any other plant community phase.

Community 3.1 Threawn-Dropseed/Annual

This plant community develops where the rangeland is grazed year-round, at high stock densities and/or occupation by prairie dogs. The plant composition is made up of annuals with a few species of perennial forbs and grasses that are tolerant to frequent and severe defoliation. Dominant species are threawn, sand dropseed, blue grama, and threadleaf sedge. Most of the mid-grasses have been eliminated. Cheatgrass is invading the site. Dominant forbs include curlycup gumweed, fetid marigold, verbena, annual eriogonum, green sagewort, and western ragweed. Broom snakeweed, fringed sagewort, and cactus can be abundant. This plant community is resistant to positive change due to the lack of perennial species present and the amount of annuals and invaders occupying the site. Soil erosion is high compared to the potential plant community for the site due to the increased bare ground. Infiltration is low and runoff is high from the lack of litter and viable plant population.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	224	401	633
Forb	50	112	174
Shrub/Vine	6	47	90
Total	280	560	897

Figure 17. Plant community growth curve (percent production by month).
SD6003, Pierre Shale Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

State 4

Disturbed State

This State can transition from any Plant Community. The two separate vegetative Plant Communities are highly variable in nature. They are derived through different management scenarios, and are not related successional. Infiltration, runoff, and soil erosion varies depending on the vegetation present on the site.

Community 4.1

Go-Back

The Go-back Plant Community can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned land, either past or present). During the early successional stages, the species that mainly dominate are annual grasses and forbs, later replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes dominated by threeawn, bluegrass, smooth brome, annual brome, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, western ragweed, Rocky Mountain beeplant, deathcamas, prickly lettuce, mare's-tail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health.

Community 4.2

Seeded

The Seeded Plant Community is normally those areas planted to pubescent or intermediate wheatgrass, alfalfa, crested wheatgrass, or other introduced species. Refer to the associated Forage Suitability Group description in the eFOTG for adapted species.

Transition T1A

State 1 to 2

Continuous heavy grazing or drought will transition this plant community to the Shortgrass State (2.0).

Transition T5A

State 1 to 4

Heavy disturbance, soil erosion, tillage, abandoned cropland, or seeding to improved pasture species result in a transition to the Disturbed State (4.0).

Transition T5A

State 1 to 4

Heavy disturbance, soil erosion, tillage, abandoned cropland, or seeding to improved pasture species result in a transition to the Disturbed State (4.0).

Restoration pathway R2A

State 2 to 1

Long-term, prescribed grazing and a return of normal precipitation patterns may move this plant community back towards the Reference State (1.0). The rate of this transition can be extremely variable depending on the species present on the site and the availability of a seed source. Typically, this transition will take a long period of time, and in the end, may not meet management goals or objectives.

Transition T2A

State 2 to 3

Frequent and severe defoliation and/or heavy disturbance will transition this plant community to the Early Seral State (3.0).

Transition T5A

State 2 to 4

Heavy disturbance, soil erosion, tillage, abandoned cropland, or seeding to improved pasture species result in a transition to the Disturbed State (4.0).

Restoration pathway R3A

State 3 to 2

Removal of heavy disturbance, coupled with long-term prescribed grazing and a return to normal precipitation patterns will transition this plant community to the Shortgrass State (2.0).

Transition T5A

State 3 to 4

Heavy disturbance, soil erosion, tillage, abandoned cropland, or seeding to improved pasture species result in a transition to the Disturbed State (4.0).

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Prairie Sandreed			303–706	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	303–706	–
2	Sand Bluestem			90–168	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	90–168	–
3	Little Bluestem			202–303	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	202–303	–
4	Needle and Thread			202–404	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	202–404	–
5	Native Grasses and Grass-likes			202–504	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	101–303	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	20–202	–
	sedge	CAREX	<i>Carex</i>	0–101	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–101	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–101	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–101	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–101	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–61	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–40	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–40	–
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	0–20	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–20	–
	Scribner's rosette	DIOLS	<i>Dichanthelium oliaosanthos var.</i>	0–20	–

	grass		<i>scribnerianum</i>		
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–20	–
Forb					
7	Forbs			101–202	
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0–61	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–40	–
	bush morning-glory	IPLE	<i>Ipomoea leptophylla</i>	0–40	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–40	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–40	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–40	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–40	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–40	–
	yellow sundrops	CASE12	<i>Calylophus serrulatus</i>	0–40	–
	larkspur	DELPH	<i>Delphinium</i>	0–40	–
	scarlet beeblossom	OESU3	<i>Oenothera suffrutescens</i>	0–40	–
	beardtongue	PENST	<i>Penstemon</i>	0–40	–
	scurfpea	PSORA2	<i>Psoralidium</i>	0–40	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–40	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0–40	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–40	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–40	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–40	–
	vervain	VERBE	<i>Verbena</i>	0–20	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–20	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–20	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–20	–
Shrub/Vine					
8	Shrubs			0–101	
	rose	ROSA5	<i>Rosa</i>	0–101	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–61	–
	western sandcherry	PRPUB	<i>Prunus pumila var. besseyi</i>	0–40	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–20	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–20	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–20	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–20	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–20	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–20	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Prairie Sandreed			202–404	

	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	202–404	–
2	Sand Bluestem			13–135	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	13–135	–
3	Little Bluestem			67–135	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	67–135	–
4	Needleandthread			202–336	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	202–336	–
5	Native Grasses and Grass-likes			135–471	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	135–269	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	67–202	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	13–108	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–67	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	13–67	–
	sedge	CAREX	<i>Carex</i>	0–67	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–40	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–40	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–40	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–27	–
	threeawn	ARIST	<i>Aristida</i>	0–27	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	13–27	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–13	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–13	–
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	0–13	–
6	Non-native Grasses			0–67	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–67	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	13–40	–
Forb					
7	Forbs			67–135	
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–67	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0–67	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–40	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	13–40	–
	larkspur	DELPH	<i>Delphinium</i>	0–40	–
	vervain	VERBE	<i>Verbena</i>	0–40	–
	beardtongue	PENST	<i>Penstemon</i>	0–40	–
	scurfpea	PSORA2	<i>Psoralidium</i>	0–40	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0–40	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	13–27	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	13–27	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–27	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	13–27	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–27	–
	false henocet	DELU	<i>Brickellia cuneata</i>	0–27	–

	false dionesei	DREU	<i>Dickelia eupatorioides</i>	0-21	-
	yellow sundrops	CASE12	<i>Calylophus serrulatus</i>	0-27	-
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0-27	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-27	-
	bush morning-glory	IPLE	<i>Ipomoea leptophylla</i>	0-27	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	13-27	-
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0-27	-
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0-27	-
	scarlet beeblossom	OESU3	<i>Oenothera suffrutescens</i>	0-27	-
	fetid marigold	DYPA	<i>Dyssodia papposa</i>	0-13	-
Shrub/Vine					
8				13-135	
	rose	ROSA5	<i>Rosa</i>	0-67	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-40	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-40	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-40	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-27	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-27	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-27	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-27	-
	western sandcherry	PRPUB	<i>Prunus pumila var. besseyi</i>	0-13	-

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Prairie Sandreed			10-50	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	10-50	-
2	Sand Bluestem			0-20	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0-20	-
3	Little Bluestem			0-50	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-50	-
4	Needleandthread			50-101	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	50-101	-
5	Native Grasses and Grass-likes			202-504	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	151-303	-
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	101-202	-
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	50-202	-
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	10-101	-
	threeawn	ARIST	<i>Aristida</i>	0-101	-
	sedge	CAREX	<i>Carex</i>	0-50	-
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	20-50	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-50	-
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	0-30	-

	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–20	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–10	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–10	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–10	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–10	–
6	Non-native Grasses			10–163	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	10–151	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	10–20	–
Forb					
7	Forb			50–151	
	vervain	VERBE	<i>Verbena</i>	0–50	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–50	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	10–50	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–50	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	10–50	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	10–50	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–50	–
	tenpetal blazingstar	MEDE2	<i>Mentzelia decapetala</i>	0–30	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	10–30	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	10–30	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	10–30	–
	scurfpea	PSORA2	<i>Psoralidium</i>	10–30	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	10–20	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0–20	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–20	–
	yellow sundrops	CASE12	<i>Calylophus serrulatus</i>	0–20	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–20	–
	larkspur	DELPH	<i>Delphinium</i>	0–20	–
	fetid marigold	DYPA	<i>Dyssodia papposa</i>	0–10	–
	scarlet beeblossom	OESU3	<i>Oenothera suffrutescens</i>	0–10	–
	beardtongue	PENST	<i>Penstemon</i>	0–10	–
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	0–10	–
	bush morning-glory	IPLE	<i>Ipomoea leptophylla</i>	0–10	–
	spiderwort	TRADE	<i>Tradescantia</i>	0–10	–
Shrub/Vine					
8	Shrub/Vine			50–151	
	pricklypear	OPUNT	<i>Opuntia</i>	0–81	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–50	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–50	–

	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–50	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–40	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–27	–
	rose	ROSA5	<i>Rosa</i>	0–20	–
	California amaranth	AMCA	<i>Amaranthus californicus</i>	0–10	–

Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Prairie Sandreed			0–6	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–6	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	–	–
3	Little Bluestem			0–11	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–11	–
4	Needleandthread			0–28	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–28	–
5	Native Grasses and Grass-likes			168–280	
	threeawn	ARIST	<i>Aristida</i>	112–168	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	28–112	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	28–84	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	28–56	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–28	–
	sedge	CAREX	<i>Carex</i>	0–28	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–28	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–11	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–6	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–6	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–6	–
6	Non-native Grasses			11–56	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	11–28	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	0–28	–
Forb					
7	Forb			56–168	
	Forb, annual	2FA	<i>Forb, annual</i>	11–84	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	11–56	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	6–56	–
	vervain	VERBE	<i>Verbena</i>	6–28	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	6–28	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	6–28	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–17	–
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	0–11	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–6	–

	rush skeletonplant	LYJU	<i>Lygoesmia juncea</i>	0-6	-
	scurfpea	PSORA2	<i>Psoralidium</i>	0-6	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-6	-
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0-6	-
Shrub/Vine					
8	Shrub/Vine			11-84	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	6-45	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	6-28	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-11	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-11	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-11	-
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-11	-
	rose	ROSA5	<i>Rosa</i>	0-6	-

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). Therefore, 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.

Plant Community = Prairie Sandreed-Needle and Thread-Bluestem (1.1)
Average Annual Production (lbs./ac, air-dry) = 1800
Stocking Rate (AUM/ac) = 0.49

Plant Community = Prairie Sandreed-Needle and Thread-Blue Grama (1.2)
Average Annual Production (lbs./ac, air-dry) = 1200
Stocking Rate (AUM/ac) = 0.33

Plant Community = Blue Grama-Sand Dropseed/Threadleaf Sedge (2.1)
Average Annual Production (lbs./ac, air-dry) = 900
Stocking Rate (AUM/ac) = 0.25

Plant Community = Threeawn-Sand Dropseed/Annuals (3.1)
Average Annual Production (lbs./ac, air-dry) = 500
Stocking Rate (AUM/ac) = 0.14

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

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 B, with localized areas in group A. Infiltration ranges from high to very high. Runoff potential for this site varies from very low to low, depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short grasses form a strong sod and dominate the site. Normally 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 opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an aesthetic value that appeals to visitors.

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 towards an "Approved" status.

Site Development and Testing Plan:

Future work, as described in a Project Plan, is needed 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 needed to produce the final document.

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Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel was also used. Those involved in developing this site description include: Stan Boltz, Range Management Specialist, NRCS; Darrel DuVall, Range Management Specialist, NRCS; Jill Epley, Range Management Specialist, NRCS; Mitch Faulkner, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; Rick Peterson, Range Management Specialist, NRCS; Mike Stirling, Range Management Specialist, NRCS.

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Contributors

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Rick L. Peterson

Acknowledgments

ESD updated by Rick L. Peterson on 9/7/17.

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, Ryan Beer, Mitch Iverson, Thad Berrett, Cheryl Nielsen
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	06/04/2008
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, or barely visible and discontinuous.

- 3. Number and height of erosional pedestals or terracettes:** Typically non-existent, but steeper areas may have limited pedestalling of bunchgrasses. No exposed roots should be present.

- 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.

- 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):** Litter should fall in place. Slight amount of movement of smallest size class litter is possible, but not normal.

- 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 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely 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 8 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular at least in the upper A-horizon.

- 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- and warm-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.
-

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: Tall warm-season rhizomatous grasses >>

Sub-dominant: Mid warm-season bunchgrasses = mid cool-season bunchgrasses > short warm-season grasses >

Other: Short cool-season grasses/grass-likes > forbs > shrubs

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 1,200-2,400 lbs./acre (air-dry weight). Reference value production is 1,800 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
-

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.
-