USDA Natural Resources
Conservation Service

Ecological site R060AY044SD
Shallow Sandy

Accessed: 05/04/2024

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 has 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 Shallow Sandy ecological site occurs primarily in the southern portion of the MLRA. It is located on hills, ridges, or escarpments, and does not receive additional moisture from run off or overflow. Typical slopes range from 3 to 45 percent. Soils are shallow, between 10 and 20 inches deep, with fine sandy loam, sandy loam, loamy fine sand, loamy sand, or sand surface textures. Soils can be calcareous to the surface, but not always. The vegetation in the Reference State (1.0) consists of a mix of cool- and warm-season grasses. Little bluestem, sideoats grama, prairie sandreed, and blue grama are dominant. Cool-season grasses and grass-like species include needle and thread, rhizomatous wheatgrass, bluebunch wheatgrass, and threadleaf sedge. Forbs are common and diverse. Yucca and fringed sagewort are almost always present.

Associated sites

R060AY009SD	**Sandy** The Sandy site can be adjacent to the Shallow Sandy site but typically at lower positions on the landscape and on shallower slopes.
R060AY010SD	**Loamy 13-16" P.Z.** The Loamy 13-16 PZ site can be adjacent to the Shallow Sandy site but typically at lower positions on the landscape and on shallower slopes.
R060AY024SD	**Shallow Loamy** The Shallow Loamy site can be adjacent to the Shallow Sandy site but with different parent material.
R060AY041SD	**Loamy 16-18" P.Z.** The Loamy 16-18 PZ site can be adjacent to the Shallow Sandy site but typically at lower positions on the landscape and on shallower slopes.

Similar sites

R060AY024SD	**Shallow Loamy** The Shallow Loamy site will have less needle and thread and prairie sandreed; slightly higher production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Hesperostipa comata* (2) *Calamovilfa longifolia*

Physiographic features

This site occurs on gently sloping to steep uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	762–1,311 m
Slope	3–45%
Water table depth	0 cm
Aspect	Aspect is not a significant factor

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) ARDMORE 1 NW [USC00390236], Edgemont, SD
- (2) BELLE FOURCHE [USC00390559], Belle Fourche, SD
- (3) WASTA [USC00398911], Owanka, SD
- (4) MOORCROFT 3S [USW00024088], Moorcroft, WY
- (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 of this site are shallow, between 10 and 20 inches in depth, well-drained, and formed in eolian deposits, or alluvium over residuum, or residuum. These soils have moderately rapid to very rapid permeability and may occur on all slopes. The bedrock may be of any kind except igneous or volcanic and is virtually impenetrable to plant

roots. The surface soil will be one or more of the following textures: fine sandy loam, sandy loam, loamy fine sand, loamy sand, or sand. 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.
Sub-surface soil layers are restrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 15 percent. Very low to low available water capacity caused by the shallow rooting depth strongly influences the soil-water-plant relationship.

Soils correlated to Shallow Sandy in MLRA 60A: Butche and Sunup.

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) Loamy fine sand (2) Fine sandy loam (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to very rapid
Soil depth	25–51 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.54–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

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

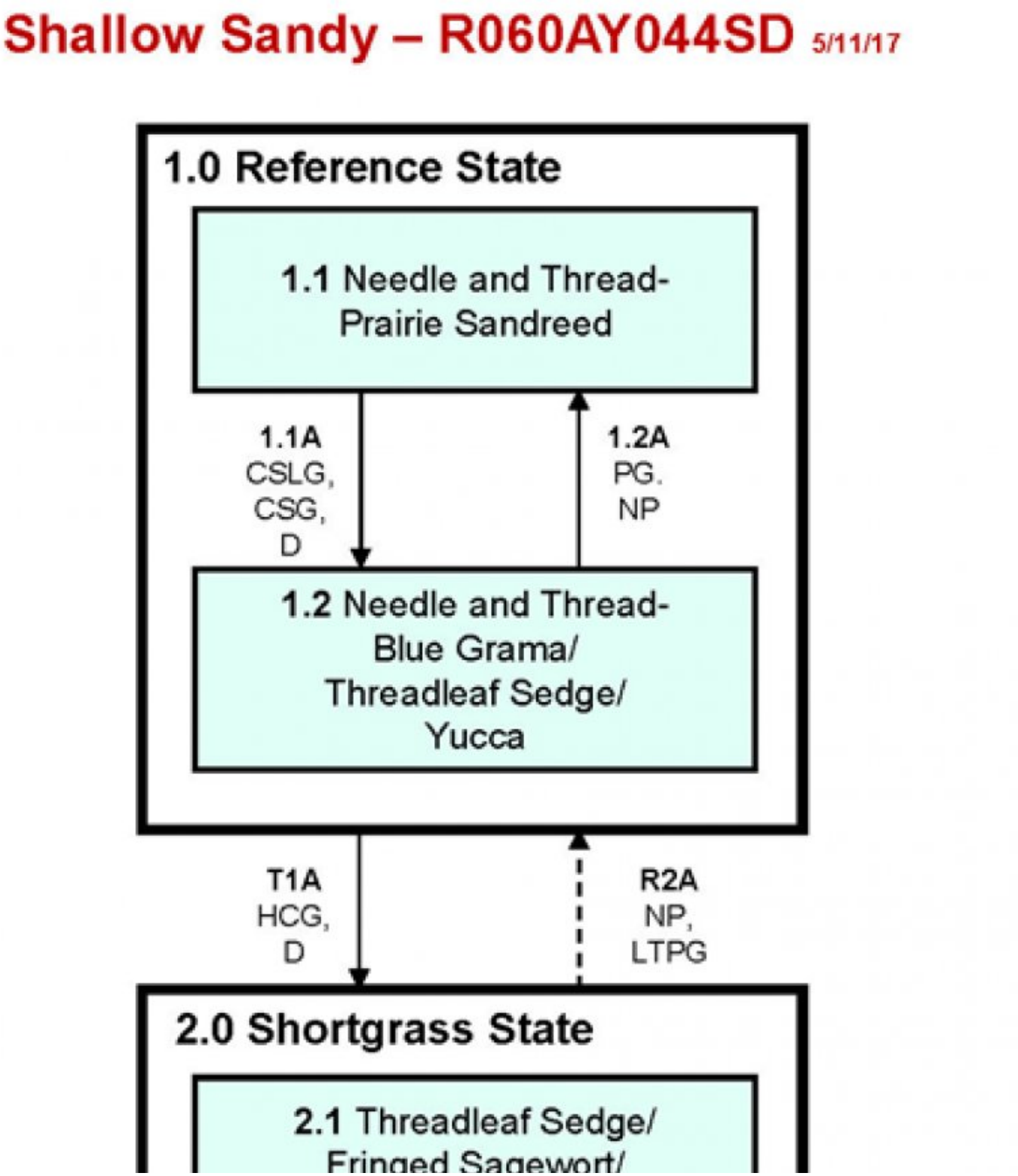
As this site deteriorates, species such as threadleaf sedge and fringed sagewort will increase. Mid grasses such as prairie sandreed and little bluestem will decrease in frequency and production.

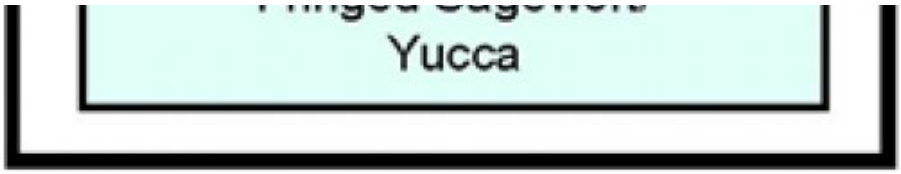
The plant community upon which interpretations are primarily based is the Needle and Thread-Prairie Sandreed

Plant Community (1.1). The Reference Plant Community (1.1) 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 transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model





CSG – Continuous seasonal grazing
CSLG – Continuous season-long grazing without adequate recovery periods
D – Drought
HCG – Heavy continuous grazing
LTPG – Long-term prescribed grazing, including adequate recovery opportunity and change in season of use
NP – Return to normal precipitation patterns
PG – Prescribed grazing with adequate recovery opportunity
– – –▶ Transition may bot be fast or feasible

Figure 6. Shallow Sandy - R060AY044SD

Diagram Legend - Shallow Sandy - R060AY044SD

T1A	Heavy, continuous seasonal grazing, or drought.	
R2A	Return to normal precipitation patterns followed by long-term prescribed grazing with proper stocking, change in season of use, and time for adequate recovery. Transition may not be fast or feasible.	
CP 1.1A	1.1 - 1.2	Continuous season-long grazing, continuous seasonal grazing or drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change in season of use, adequate time for recovery, and return to normal precipitation patterns.

Figure 7. Shallow Sandy - R060AY044SD

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 and cool-season grasses and grass-like species. Heavy grazing or heavy disturbance will cause the plant community to transition to a community dominated by the upland sedges, half-shrubs, and yucca. Severe erosion is a potential 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 the warm months of June through August. Today a similar state can be found in areas where proper livestock use has occurred.

Community 1.1
Needle and Thread-Prairie Sandreed

Figure 8. Plant Community Phase 1.1

The plant community upon which interpretations are primarily based is the Needle and Thread-Prairie Sandreed Plant Community (1.1). This is also considered the Reference Plant Community. Potential vegetation is about 65 to 75 percent grasses or grass-like plants, 5 to 15 percent forbs, and 10 to 20 percent woody plants. The plant community is a mix of warm- and cool-season mid-grasses. Major grasses include needle and thread, prairie sandreed, little bluestem, and sideoats grama. Other grasses occurring include bluebunch wheatgrass, Sandberg bluegrass, blue grama, and threadleaf sedge. The plant community is stable and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	913	1093	1261
Shrub/Vine	140	219	308
Forb	67	146	224
Total	**1120**	**1458**	**1793**

Figure 10. 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

Community 1.2
Needle and Thread/Threadleaf Sedge/Yucca

This plant community is the result of continuous season-long grazing, continuous seasonal grazing, or drought. The understory of grass includes needle and thread, blue grama, threadleaf sedge, and prairie Junegrass. When compared to the Reference Plant Community (1.1), prairie sandreed and little bluestem have decreased. Blue grama, threadleaf sedge, and needle and thread have increased. Yucca and fringed sagewort have also increased. This community is well suited to grazing by both domestic livestock and wildlife during the spring, summer, and fall. The community's soil, biotic integrity, and watershed is intact, although more than normal runoff may occur due to the sod-forming vegetation.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	650	690	734
Shrub/Vine	90	167	241
Forb	45	95	146
Total	**785**	**952**	**1121**

Figure 12. Plant community growth curve (percent production by month). SD6002, Pierre Shale Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant..

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

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing, or continuous seasonal grazing and/or drought will convert the plant community to the Needle and Thread-Blue Grama/Threadleaf/Sedge/Yucca Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing and a return to normal precipitation patterns will return this plant community to the Needle and Thread-Prairie Sandreed Plant Community (1.1).

State 2
Shortgrass State

This state is dominated by upland sedges, shortgrass species, fringed sagewort, and yucca. It is the result of grazing practices that remove the mid-stature warm- and cool-season grasses, and provide a competitive advantage to upland sedges, shortgrasses, and yucca that are grazing-resistant. Water infiltration has decreased and runoff has increased in this state. This state is very resilient and resistant to change.

Community 2.1
Threadleaf Sedge/Fringed Sagewort/Yucca

This plant community is the result of heavy, continuous grazing and/or drought. A sod of threadleaf sedge dominates the site. Fringed sagewort and yucca have increased significantly. When plant communities in the Reference State (1.0) are replaced by sod-forming species and woody shrubs, grass production is reduced. The soil is generally well protected on this plant community. The biotic integrity may be reduced due to low vegetative production. The sod formed by these grasses is resistant to water infiltration. While this sod protects the site, off-site areas are affected by excessive runoff that may cause gully erosion. This sod is resistant to change and may require practices such as long-term prescribed grazing to return to the Reference State (1.0).

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	364	416	465
Shrub/Vine	56	123	191
Forb	28	77	129
Total	**448**	**616**	**785**

Figure 14. Plant community growth curve (percent production by month). SD6002, Pierre Shale Plains, cool-season dominant, warm-season sub-

dominant.. Cool-season dominant, warm-season sub-dominant..

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

Transition T1A
State 1 to 2

Heavy continuous grazing and/or drought will convert this plant community to the Threadleaf Sedge/Fringed Sagewort/Yucca Plant Community.

Restoration pathway R2A
State 2 to 1

Long-term prescribed grazing and a return to normal precipitation patterns will eventually return this plant community to the Reference State (1.0). This transition my not be fast or achievable.

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	**Rhizomatous Wheatgrasses**			73–146	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	73–146	–
	western wheatgrass	PASM	*Pascopyrum smithii*	73–146	–
2	**Bluebunch Wheatgrass**			73–146	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	73–146	–
3	**Little Bluestem**			73–219	
	little bluestem	SCSC	*Schizachyrium scoparium*	73–219	–
4	**Needleandthread**			219–364	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	219–364	–
5	**Prairie Sandreed**			146–291	
	prairie sandreed	CALO	*Calamovilfa longifolia*	146–291	–
6	**Sideoats Grama**			73–146	
	sideoats grama	BOCU	*Bouteloua curtipendula*	73–146	–
7	**Native Grasses& Grass-Likes**			73–219	
	Grass, perennial	2GP	*Grass, perennial*	0–73	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–73	–
	sand bluestem	ANHA	*Andropogon hallii*	0–73	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–73	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–73	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–73	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–73	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–73	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–73	–
Forb					
9	**Forbs**			73–219	

	Forb, perennial	2FP	*Forb, perennial*	0–73	–
	common yarrow	ACMI2	*Achillea millefolium*	0–73	–
	onion	ALLIU	*Allium*	0–73	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–73	–
	aster	ASTER	*Aster*	0–73	–
	milkvetch	ASTRA	*Astragalus*	0–73	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0–73	–
	white prairie clover	DACA7	*Dalea candida*	0–73	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–73	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–73	–
	desertparsley	LOMAT	*Lomatium*	0–73	–
	bluebells	MERTE	*Mertensia*	0–73	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–73	–
	large Indian breadroot	PEES	*Pediomelum esculentum*	0–73	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–73	–
	stemless four-nerve daisy	TEAC	*Tetraneuris acaulis*	0–73	–
	American vetch	VIAM	*Vicia americana*	0–73	–
Shrub/Vine					
10	**Shrubs**			73–308	
	big sagebrush	ARTR2	*Artemisia tridentata*	0–73	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–73	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–73	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–73	–
	soapweed yucca	YUGL	*Yucca glauca*	0–73	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–67	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrasses**			48–95	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	48–95	–
	western wheatgrass	PASM	*Pascopyrum smithii*	48–95	–
2	**Bluebunch Wheatgrass**			0–48	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–48	–
3	**Little Bluestem**			0–48	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–48	–
4	**Needleandthread**			191–286	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	191–286	–
5	**Prairie Sandreed**			0–95	
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–95	–
6	**Sideoats grama**			0–48	

	sideoats grama	BOCU	*Bouteloua curtipendula*	0–48	–
7	**Native Grasses & Grass-Likes**			48–286	
	blue grama	BOGR2	*Bouteloua gracilis*	48–143	–
	threadleaf sedge	CAFI	*Carex filifolia*	48–143	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	19–95	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–48	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–48	–
	Grass, perennial	2GP	*Grass, perennial*	0–48	–
	threeawn	ARIST	*Aristida*	0–48	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–48	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–29	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–19	–
8	**Non-Native Grasses**			0–95	
	cheatgrass	BRTE	*Bromus tectorum*	0–95	–
Forb					
9	**Forbs**			48–143	
	Forb, annual	2FA	*Forb, annual*	0–48	–
	Forb, perennial	2FP	*Forb, perennial*	0–48	–
	common yarrow	ACMI2	*Achillea millefolium*	0–48	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–48	–
	aster	ASTER	*Aster*	0–48	–
	milkvetch	ASTRA	*Astragalus*	0–48	–
	thistle	CIRSI	*Cirsium*	0–48	–
	sweetclover	MELIL	*Melilotus*	0–48	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–48	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–48	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–48	–
	stemless four-nerve daisy	TEAC	*Tetraneuris acaulis*	0–48	–
	desertparsley	LOMAT	*Lomatium*	0–29	–
	onion	ALLIU	*Allium*	0–29	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–29	–
	white prairie clover	DACA7	*Dalea candida*	0–29	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0–19	–
	American vetch	VIAM	*Vicia americana*	0–19	–
	bluebells	MERTE	*Mertensia*	0–19	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–19	–
	large Indian breadroot	PEES	*Pediomelum esculentum*	0–19	–
Shrub/Vine					
10	**Shrubs**			95–241	
	soapweed yucca	YUGL	*Yucca glauca*	19–76	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–50	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–48	–

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–48	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–48	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–48	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–48	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–48	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			0–31	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–31	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–31	–
3	**Little Bluestem**			0–31	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–31	–
4	**Needleandthread**			31–93	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	31–93	–
5	**Prairie Sandreed**			0–31	
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–31	–
6	**Sideoats Grama**			0–31	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–31	–
7	**Native Grasses & Grass-Likes**			93–278	
	threadleaf sedge	CAFI	*Carex filifolia*	62–155	–
	threeawn	ARIST	*Aristida*	0–62	–
	blue grama	BOGR2	*Bouteloua gracilis*	12–62	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	12–62	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–31	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–31	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–31	–
	Grass, perennial	2GP	*Grass, perennial*	0–31	–
8	**Non-Native Grasses**			12–93	
	cheatgrass	BRTE	*Bromus tectorum*	12–93	–
Forb					
9	**Forbs**			31–123	
	tarragon	ARDR4	*Artemisia dracunculus*	0–62	–
	sweetclover	MELIL	*Melilotus*	0–62	–
	thistle	CIRSI	*Cirsium*	0–62	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–31	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	0–31	–
	Forb, annual	2FA	*Forb, annual*	0–31	–
	Forb, perennial	2FP	*Forb, perennial*	0–31	–
	common yarrow	ACMI2	*Achillea millefolium*	0–31	–
	upright prairie	RACO3	*Ratibida columnifera*	0–31	–

	coneflower				
	stemless four-nerve daisy	TEAC	*Tetraneuris acaulis*	0–31	–
	aster	ASTER	*Aster*	0–31	–
	milkvetch	ASTRA	*Astragalus*	0–31	–
	onion	ALLIU	*Allium*	0–19	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–19	–
	desertparsley	LOMAT	*Lomatium*	0–12	–
Shrub/Vine					
10	**Shrubs**			62–185	
	prairie sagewort	ARFR4	*Artemisia frigida*	31–62	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	31–62	–
	soapweed yucca	YUGL	*Yucca glauca*	31–62	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–31	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–31	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–31	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–31	–

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 = Needle and Thread-Prairie Sandreed Plant Community (1.1)
Average Annual Production (lbs./ac, air-dry) = 1300
Stocking Rate (AUM/ac) = 0.36

Plant Community = Needle and Thread-Blue Grama/Threadleaf Sedge/Yucca Plant Community (1.2)
Average Annual Production (lbs./ac, air-dry) = 850
Stocking Rate (AUM/ac) = 0.23

Plant Community = Threadleaf Sedge/Fringed Sagewort/Yucca Plant Community (2.1)
Average Annual Production (lbs./ac, air-dry) = 550
Stocking Rate (AUM/ac) = 0.15

*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 and C. Infiltration ranges from moderately rapid to rapid. Runoff potential for this site varies from medium to very 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 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 were also used. Those involved in developing this site description include: Everet Bainter, Range Management Specialist, NRCS; Stan Boltz, Range Management Specialist, NRCS; Glen Mitchell, Range Management Specialist, NRCS; and Cheryl Nielsen, Range Management Specialist, NRCS.

Other references

EPA – Level III and Level IV Ecoregions of the Continental United States, (https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions- continental-united-states). Available online. Accessed 01/03/17

High Plains Regional Climate Center, University of Nebraska, (http://www.hprcc.unl.edu/). Available online. Accessed 02/27/17.

USDA, NRCS. Soil Survey Staff. Official Soil Series Descriptions. Available online. Accessed 04/25/17.

USDA, NRCS. Soil Survey Staff. Web Soil Survey. Available online. Accessed 04/25/17.

USDA, NRCS. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. Ag Handbook 296.

USDA, NRCS. 2014. National Ecological Site Handbook, 1st Ed.

USDA, NRCS. National Water and Climate Center. (http://www.wcc.nrcs.usda.gov/). Available online. Accessed 02/27/17.

USDA, NRCS. 1997, rev. 1, 2003. National Range and Pasture Handbook.

USDA, NRCS. National Soil Information System, Information Technology Center. (http://nasis.nrcs.usda.gov).

USDA, NRCS. 2017. The PLANTS Database (http://plants.usda.gov, 2017). Available online. Accessed 5/13/17.

USDA, NRCS. Various Published Soil Surveys.

Contributors

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Acknowledgments

ESD Updated by Rick L. Peterson, 5/16/17

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
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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 when present.

3. **Number and height of erosional pedestals or terracettes:** Few pedestalled plants typically on steeper slopes.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 15 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):** Very little litter movement of smallest size class.

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 (peds) 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 3 to 5 inches thick with light grayish brown colors. Structure should typically be 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 & deep rooted species (mid & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine & coarse roots positively influence 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: Mid/tall cool-season bunchgrasses >

    Sub-dominant: tall warm-season rhizomatous grasses = shrubs = mid warm-season bunchgrasses > forbs = short cool-season grasses & grass-likes

    Other: Mid cool-season rhizomatous grasses

    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 1,000-1,600 lbs./acre (air-dry weight). Reference value production is 1,300 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.