USDA Natural Resources
Conservation Service

Ecological site R063AY025SD
Shallow Porous Clay

Last updated: 6/26/2024
Accessed: 05/12/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

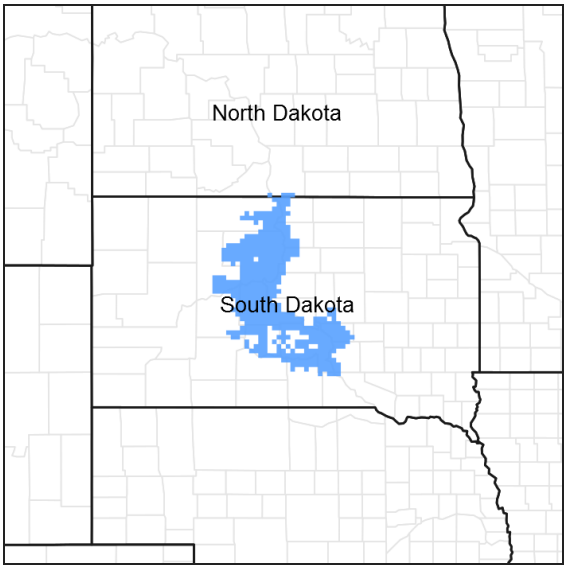


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 063A–Northern Rolling Pierre Shale Plains

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

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

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, Major Land Resource Area

(MLRA): 63A Northern Rolling Pierre Shale Plains, (USDA-NRCS, Ag Handbook 296).
Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Shallow Porous Clay Ecological Site occurs throughout the MLRA. It is located on upland landscapes and does not receive additional moisture from runoff or overflow. Typical slope range from 2 to 45 percent. The soil is shallow, less than 20 inches deep, with a clay surface texture which is 2 to 8 inches thick. The soil is derived from weathered shale and is non-calcareous. Shale chips are found throughout the soil profile (up to 50 percent by volume) and do not restrict root growth. Because the soil is slightly to strongly acid, bare ground or soft, unconsolidated shale fragments are common. The vegetation in reference consist of a mix of cool- and warm-season grasses, however the mid to tall warm-season grasses tend to be the dominant group. Little bluestem, prairie sandreed, and big bluestem are the dominant warm-season grasses. Western wheatgrass and green needlegrass are the dominate cool-season grasses. Yucca is almost always present as this site functions much like a sands site.

Associated sites

R063AY010SD	**Loamy**
R063AY011SD	**Clayey**
R063AY012SD	**Thin Upland**
R063AY018SD	**Dense Clay**

Similar sites

R063AY017SD	**Shallow Clay** Shallow Clay [cool-season dominant; slightly more productive]
R063AY011SD	**Clayey** Clayey [Less sideoats grama; higher production]
R063AY024SD	**Shallow** Shallow [More needleandthread; less green needlegrass]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Calamovilfa longifolia* (2) *Schizachyrium scoparium*

Physiographic features

This site typically occurs on gently to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Plain
Flooding frequency	None
Elevation	1,600–2,700 ft
Slope	2–45%
Water table depth	80 in

Aspect	Aspect is not a significant factor

Climatic features

MLRA 63A is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and abundant sunshine. Extreme temperature fluctuations are also common. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 16 to 20 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 11°F (Pollock, South Dakota (SD)), to about 22°F (Cedar Butte, SD). July is the warmest month with temperatures averaging from about 72°F (Pollock, SD), to about 76° F (Cedar Butte, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Green up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	108-117 days
Freeze-free period (characteristic range)	129-131 days
Precipitation total (characteristic range)	17-20 in
Frost-free period (actual range)	104-120 days
Freeze-free period (actual range)	127-132 days
Precipitation total (actual range)	17-20 in
Frost-free period (average)	113 days
Freeze-free period (average)	130 days
Precipitation total (average)	19 in

Climate stations used

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

Influencing water features

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

Soil features

The soils in this site are well drained and formed in residuum derived from shale. The surface layer is 2 to 8 inches thick. The parent material occurs at 10 to 20 inches, is loose shale chips (parachannery up to 50 percent by volume) which does not restrict plant roots. This site typically develops on acid shale. The soils have a moderate infiltration rate. This site may show slight to moderate evidence of rills and wind scoured areas. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers.

These soils are susceptible to wind and water erosion. The hazard of water erosion increases on slopes greater than about 10 percent. Low available water capacity strongly influences the soil-water-plant relationship.

Soil correlated to the Shallow Porous Clay Ecological Site: Dupree
Access Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) for specific local soils information.

Table 4. Representative soil features

Parent material	(1) Residuum–acid shale
Surface texture	(1) Clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderate
Soil depth	10–20 in
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2–3 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	4–6
Subsurface fragment volume <=3" (Depth not specified)	15–60%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

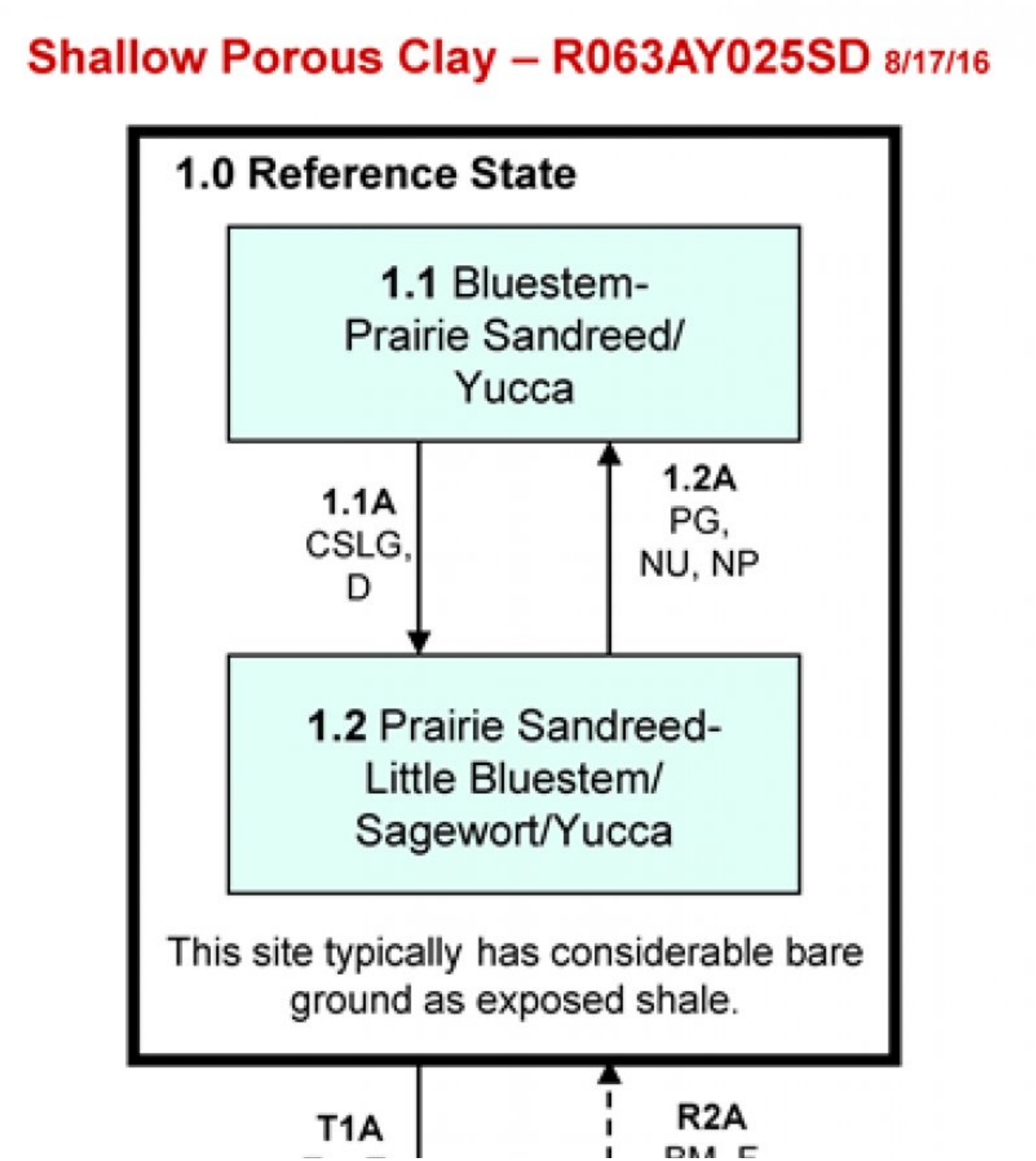
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions 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.

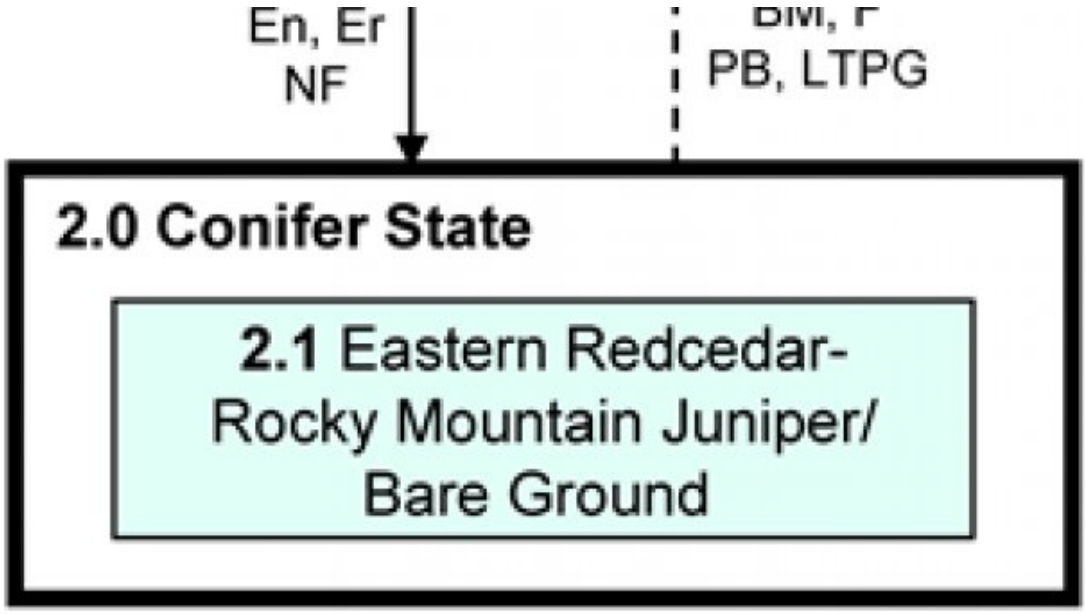
As this site deteriorates, species such as sedges, forbs, and blue grama will increase. Perennial grasses such as little bluestem, big bluestem, and rhizomatous wheatgrass will decrease in frequency and production. Dunes may form due to lack of ground cover. The various plant communities on this site are often all contained within a dune-like area under the same grazing management. Soil erosion and dune formation greatly influence the existing plant communities. Depositional areas tend to be dominated by prairie sandreed and bluestem, while the areas from which soil is transported tend to be characterized by sedge, rush, and bare ground. However, the amount of deposition and transport can alter the plant communities. The historic and recent grazing impacts will also influence the plant composition. Prairie sandreed is an important plant on this site. Prairie sandreed has large rhizomes that help hold and bind the soil. As the prairie sandreed decreases along with bluestem and wheatgrass, the hazard for wind erosion increases. Areas can become bare dune like areas. Juniper species can encroach and become the dominant species on this site if they are present on adjacent sites.

Interpretations are primarily based on the Bluestem-Prairie Sandreed/Yucca Plant Community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following 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





BM – Brush management
CSLG – Continuous season-long grazing
D - Drought
F – Fire
En – Encroachment of trees
Er – Erosion
LTPG – Long-term prescribed grazing
NF – No fire
NP – Normal precipitation patterns
NU – No use or extended deferment
PG – Prescribed grazing
- - → Recovery may not be quick or feasible

Figure 8. Shallow Porous Clay - R063AY025SD

Diagram Legend - Shallow Porous Clay - R063AY025SD

T1A	Encroachment and establishment of juniper species from adjacent sites, erosion, no fire.	
R2A	Mechanical brush management, fire or prescribed burn followed by long-term prescribed grazing. Recovery may take an extended period of time.	
CP 1.1A	1.1 - 1.2	Continuous season-long grazing without change in season of use or adequate time for recovery, drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change is season of use and adequate time for recovery, extended deferment or non-use, normal precipitation patterns following drought.

Figure 9. Shallow Porous Clay - R063AY025SD

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-season grasses and sub-dominant cool-season grass. Yucca is almost always present. Grazing, fire or lack of fire, erosion and drought are the major drivers between plant communities.

Community 1.1
Bluestem-Prairie Sandreed/Yucca Plant Community

The plant community upon which interpretations are primarily based is the Bluestem-Prairie Sandreed/Yucca Plant Community (this is also considered the reference plant community). Potential vegetation is about 70 to 80 percent grasses or grass-like plants, and 10 to 20 percent forbs, and 0 to 10 percent woody plants. A mix of warm- and cool-season midgrasses dominates. Major grasses or grass-like species include prairie sandreed, little bluestem, big bluestem, western wheatgrass and sun sedge. Other grasses occurring in this plant community include threadleaf sedge, blue grama, and sideoats grama. Forbs occurring in this plant community are dotted gayfeather, purple coneflower, cudweed sagewort, and stiff sunflower. Yucca almost always occurs on this site, and leadplant and sumac are common. Eastern redcedar can also occurs in minor amounts. This 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). Occasionally this plant community will have areas influenced by natural geologic erosion and will exhibit considerable bare ground or exposed shale fragments.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	865	1113	1325
Forb	125	210	320
Shrub/Vine	10	63	125
Tree	0	14	30
Total	**1000**	**1400**	**1800**

Figure 11. 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 1.2
Prairie Sandreed-Little Bluestem/Sagewort/Yucca Plant Community

This plant community develops under moderate, season-long grazing by livestock. Vegetation is about 70 to 85 percent grasses and grass-like plants, 5 to 15 percent forbs, and 2 to 12 percent woody plants. Dominant grasses include prairie sandreed, little bluestem, sun sedge, and needlegrasses. Grasses and grass-likes of secondary importance include sideoats grama and sedge. Forbs commonly found in this plant community include sagewort, goldenrod, white prairie aster, dotted gayfeather, and prairie coneflower. Yucca, plains pricklypear, and broom snakeweed are commonly found. Leadplant and eastern redcedar may also occur in this plant community. When compared to the Bluestem-Prairie Sandreed-Yucca Plant Community (1.1), prairie sandreed, little bluestem, and sedges have increased. Big bluestem, sideoats grama, and plains muhly have decreased. Cheatgrass has invaded the plant community. Bare ground has also increased. This plant community is unstable and subject to wind erosion. The biotic integrity of this plant community is usually intact, however, it can be at risk.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	540	830	1100
Forb	45	100	165
Shrub/Vine	15	60	110
Tree	0	10	25
Total	**600**	**1000**	**1400**

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

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

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing and/or drought will convert the plant community to the Prairie Sandreed-Little Bluestem/Sagewort/Yucca Plant Community

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that provides proper stocking, change in season of use and adequate time for recovery can shift this plant back to the Bluestem-Prairie Sandreed/Yucca Plant Community (1.1). Return to normal precipitation patterns and/or periods of no use or extended deferments may help accelerate this shift.

State 2
Conifer State

This State occurs when eastern redcedar and/or Rocky Mountain juniper encroach onto the site. As the juniper become established, the herbaceous component declines and more bare ground is exposed. It appears that juniper is creating the condition for continuing encroachment. As bare ground increases juniper establishes more readily. Grazing can contribute to this transition but it can also occur independently without human influence other than through fire suppression.

Community 2.1
Conifer Plant Community

This plant community is the result of encroachment and/or lack of fire to control the juniper species. Eastern

redcedar and/or Rocky Mountain juniper dominate the plant community. Understory vegetation is about 50 to 75 percent grasses and grass-like plants, 5 to 20 percent forbs, and 5 to 30 percent woody plants. The dominant grasses and grass-likes include little bluestem and sedges. Significant forbs include prairie coneflower, purple prairie clover, and goldenrod. Leadplant and yucca have decreased, but are still present. Considerable bare ground or exposed shale fragments may be present under the tree canopy. Where severe erosion has created clay dunes, they may be dominated by prairie sandreed. This community has lost some of its value for grazing wildlife and livestock. This plant community is susceptible to excessive erosion and excessive runoff due to the bare ground.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	310	384	645
Forb	55	90	130
Tree	25	75	130
Shrub/Vine	10	51	95
Total	**400**	**600**	**1000**

Transition 1A
State 1 to 2

Encroachment of eastern redcedar or Rocky Mountain juniper and no fire will shift this State to the Conifer State. Erosion increases with juniper encroachment, which provided more opportunity for juniper establishment.

Restoration pathway 2A
State 2 to 1

Brush management and/or prescribed burning followed by long-term prescribed grazing may shift this plant community back to the Reference State.

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	**TALL WARM-SEASON GRASSES**			210–490	
	big bluestem	ANGE	*Andropogon gerardii*	210–420	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	70–280	–
2	**MID WARM-SEASON GRASSES**			140–350	
	sideoats grama	BOCU	*Bouteloua curtipendula*	70–210	–
	little bluestem	SCSC	*Schizachyrium scoparium*	70–210	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–140	–
3	**COOL-SEASON BUNCHGRASSES**			28–140	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	14–140	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	14–140	–
4	**OTHER NATIVE GRASSES**			14–70	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–70	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–42	–
	threeawn	ARIST	*Aristida*	0–42	–

	blue grama	BOGR2	*Bouteloua gracilis*	0–42	–
5	**GRASS-LIKES**			14–112	
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	14–112	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–42	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–42	–
	Dudley's rush	JUDU2	*Juncus dudleyi*	0–28	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–28	–
Forb					
7	**FORBS**			140–280	
	Forb, native	2FN	*Forb, native*	14–70	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	14–42	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	14–42	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	14–42	–
	dotted blazing star	LIPU	*Liatris punctata*	14–28	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	14–28	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	14–28	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	14–28	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	14–28	–
	milkvetch	ASTRA	*Astragalus*	0–28	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–28	–
	white prairie clover	DACA7	*Dalea candida*	14–28	–
	prairie clover	DALEA	*Dalea*	14–28	–
	buckwheat	ERIOG	*Eriogonum*	0–28	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–28	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–14	–
	fleabane	ERIGE2	*Erigeron*	0–14	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–14	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–14	–
	American vetch	VIAM	*Vicia americana*	0–14	–
Shrub/Vine					
8	**SHRUBS**			14–112	
	leadplant	AMCA6	*Amorpha canescens*	14–42	–
	soapweed yucca	YUGL	*Yucca glauca*	14–42	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–28	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–28	–
	rose	ROSA5	*Rosa*	0–28	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–28	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–28	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–14	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–14	–
Tree					
9	**TREES**			0–28	
	Tree	2TREE	*Tree*	0–28	–

	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–28	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–28	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**TALL WARM-SEASON GRASSES**			150–300	
	prairie sandreed	CALO	*Calamovilfa longifolia*	100–300	–
	big bluestem	ANGE	*Andropogon gerardii*	10–80	–
2	**MID WARM-SEASON GRASSES**			150–300	
	little bluestem	SCSC	*Schizachyrium scoparium*	100–250	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	20–100	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–50	–
3	**COOL-SEASON BUNCHGRASSES**			20–100	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	10–100	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	10–100	–
4	**OTHER NATIVE GRASSES**			50–120	
	western wheatgrass	PASM	*Pascopyrum smithii*	10–100	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–50	–
	threeawn	ARIST	*Aristida*	0–50	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–50	–
5	**GRASS-LIKES**			50–120	
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	20–100	–
	Dudley's rush	JUDU2	*Juncus dudleyi*	0–60	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–40	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–40	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–30	–
6	**NON-NATIVE GRASSES**			0–50	
	cheatgrass	BRTE	*Bromus tectorum*	0–50	–
	bluegrass	POA	*Poa*	0–50	–
Forb					
7	**FORBS**			50–150	
	white sagebrush	ARLU	*Artemisia ludoviciana*	10–50	–
	Forb, native	2FN	*Forb, native*	0–50	–
	buckwheat	ERIOG	*Eriogonum*	0–30	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	10–30	–
	Forb, introduced	2FI	*Forb, introduced*	0–30	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	10–20	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	10–20	–
	dotted blazing star	LIPU	*Liatris punctata*	10–20	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–20	–
	purple prairie clover	DAPU5	*Dalea purpurea*	10–20	–

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	milkvetch	ASTRA	*Astragalus*	0–20	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–10	–
	white prairie clover	DACA7	*Dalea candida*	0–10	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–10	–
	fleabane	ERIGE2	*Erigeron*	0–10	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–10	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–10	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–10	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–10	–
	American vetch	VIAM	*Vicia americana*	0–10	–
Shrub/Vine					
8	**SHRUBS**			20–100	
	soapweed yucca	YUGL	*Yucca glauca*	10–80	–
	prairie sagewort	ARFR4	*Artemisia frigida*	10–50	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–30	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–20	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–20	–
	rose	ROSA5	*Rosa*	0–20	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–20	–
	leadplant	AMCA6	*Amorpha canescens*	0–10	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–10	–
Tree					
9	**TREES**			0–20	
	Tree	2TREE	*Tree*	0–20	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–20	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**GRASSES&GRASS-LIKES**			0–30	
	big bluestem	ANGE	*Andropogon gerardii*	0–30	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–30	–
2	**MID WARM-SEASON GRASSES**			30–60	
	little bluestem	SCSC	*Schizachyrium scoparium*	12–60	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	6–30	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–18	–
3	**COOL-SEASON BUNCHGRASSES**			6–48	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	6–48	–
4	**OTHER NATIVE GRASSES**			6–42	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–30	–
	threeawn	ARIST	*Aristida*	0–30	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–30	–

	~~western wheatgrass~~	~~PASM~~	~~*Pascopyrum smithii*~~	~~0–30~~	
	blue grama	BOGR2	*Bouteloua gracilis*	0–18	–
5	**GRASS-LIKES**			60–150	
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	30–90	–
	Dudley's rush	JUDU2	*Juncus dudleyi*	12–60	–
	needleleaf sedge	CADU6	*Carex duriuscula*	12–48	–
	threadleaf sedge	CAFI	*Carex filifolia*	12–48	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–30	–
6	**NON-NATIVE GRASSES**			6–60	
	cheatgrass	BRTE	*Bromus tectorum*	6–60	–
	bluegrass	POA	*Poa*	6–60	–
Forb					
7	**FORBS**			60–120	
	Forb, introduced	2FI	*Forb, introduced*	0–48	–
	Forb, native	2FN	*Forb, native*	6–48	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	6–30	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	6–30	–
	fleabane	ERIGE2	*Erigeron*	6–24	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	6–24	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	6–18	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	6–18	–
	purple prairie clover	DAPU5	*Dalea purpurea*	6–18	–
	buckwheat	ERIOG	*Eriogonum*	0–18	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	6–18	–
	dotted blazing star	LIPU	*Liatris punctata*	6–18	–
	American vetch	VIAM	*Vicia americana*	0–12	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–12	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–12	–
	white prairie clover	DACA7	*Dalea candida*	6–12	–
	milkvetch	ASTRA	*Astragalus*	0–12	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–6	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–6	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–6	–
Shrub/Vine					
8	**SHRUBS**			12–90	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–30	–
	prairie sagewort	ARFR4	*Artemisia frigida*	6–30	–
	soapweed yucca	YUGL	*Yucca glauca*	6–30	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–18	–
	rose	ROSA5	*Rosa*	6–18	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–18	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–12	–
	leadplant	AMCA6	*Amorpha canescens*	0–12	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–6	–

	[illegible]	[illegible]	[illegible]	[illegible]	
Tree					
9	**TREES**			30–120	
	eastern redcedar	JUVI	*Juniperus virginiana*	30–120	–
	Tree	2TREE	*Tree*	0–30	–

Animal community

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Bluestem-Prairie Sandreed/Yucca Plant Community (1.1)
Average Annual Production (lbs./acre, air-dry): 1400
Stocking Rate (AUM/acre): 0.35

Prairie Sandreed-Little Bluestem/Sagewort/Yucca (1.2)
Average Annual Production (lbs./acre, air-dry): 1000
Stocking Rate (AUM/acre): 0.25

Conifer Plant Community (2.1)
Average Annual Production (lbs./acre, air-dry): 600
Stocking Rate (AUM/acre): 0.10

*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 which is 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 and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

Timber harvest of eastern redcedar may occur on localized areas of this site.

Other products

Seed harvest of native plant species can provide additional income on this site.

Other information

Revision Notes: “Previously Approved Provisional
This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site. This is an updated “Previously Approved” ESD which represents a first generation tier of documentation that prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirement as an Approved ESD as laid out in the 2003 National Range and Pasture Handbook (NRPH). The document fully describe the reference state and community phase in the state and transition model. All other alternative states are at least described in narrative form. The “Previously Approved” ESD has been field tested for a minimum of five years and is a proven functional document for conservation planning. The “Previously Approved” ESD does not contain all tabular and narrative entries as required in the current Approved level of documentation but it is expected that the “Previously Approved” ESD will continue refinement towards an Approved status.

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

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Those involved in developing this site include: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. No SCS-RANGE-417 clipping data collection forms have been recorded for this site.

Other references

High Plains Regional Climate Center, University of Nebraska. (http://www.hprcc.unl.edu/)
USDA, NRCS. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296, 2006
USDA, NRCS. National Ecological Site Handbook, 1st Ed. January, 2014
USDA, NRCS. National Water and Climate Center. (http://www.wcc.nrcs.usda.gov/)
USDA, NRCS. National Range and Pasture Handbook, September 1997
USDA, NRCS. National Soil Information System, Information Technology Center. (http://nasis.nrcs.usda.gov)
USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center.
USDA, NRCS, Various Published Soil Surveys

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Approval

Suzanne Mayne-Kinney, 6/26/2024

Acknowledgments

Rick L. Peterson - ESD Update - 8/23/16

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	05/09/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are common on this site, and are connected, beginning formation of small gullies. This occurs on areas where little to no vegetation is present (these areas are natural on this site to varying degrees).

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2. **Presence of water flow patterns:** Usually not evident.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are sometimes present, but not common. Vegetated areas adjacent to bare shale areas are sometimes elevated above shale.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Extremely variable. Bare soil under tree canopy does not count towards this bare ground value. This site naturally has relatively large areas of bare shale in association with areas covered by vegetation. Vegetated areas would typically range from 20 to about 40 percent bare ground, while the areas of bare shale can be 100 percent bare ground.

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5. **Number of gullies and erosion associated with gullies:** Some relatively shallow V-shaped drainages may appear in areas with rolling topography. Very shallow gullies are more likely to form where smaller particle size topsoil is present above shale beds.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Relatively small blowouts can be present where smaller sized shale chips are dominant on the surface. These areas are typically less than 2 acres in size.

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

movement of smaller size class litter, typically where concentrated flow paths exist.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** On vegetated areas, soil aggregate stability ratings should typically be 5 or greater. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure for 1 minute or longer when dipped in distilled water.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** In vegetated areas where the A-horizon is present, it should be 2 to 8 inches thick with dark grayish brown colors when moist. Structure should typically be moderate fine granular in the A-horizon.

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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.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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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 grasses > Mid warm-season grasses >

    Sub-dominant: Forbs > Mid/tall cool-season bunchgrasses >

    Other: Grass-likes = Shrubs > Mid cool-season rhizomatous grasses > Short warm-season grasses = Trees

    Additional:

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,000-1,800 lbs./acre (air-dry weight). Reference value production is 1,400 lbs./acre (air-dry weight).

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: State and local noxious weeds

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