USDA Natural Resources Conservation Service

Ecological site R063AY024SD
Shallow

Last updated: 6/26/2024
Accessed: 05/10/2025

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.

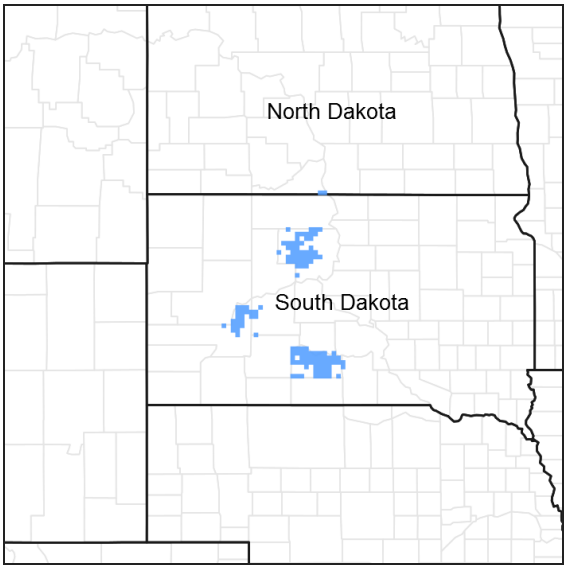

Figure 1. Mapped extent

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 Ecological Site occurs throughout MLRA 63A. It is considered a run-off site located on gentle to steeply sloped uplands. Slopes range from 0 to 40 percent. The soils are formed in residuum or colluvium derived from interbedded shale and sandstone or alluvium from mudstone. Soil surface textures range between clay loam and silty clay loam. Root restricting bedrock occurs between 10 and 20 inches in depth. Vegetation in reference consists of mid-statured warm-and cool-season grasses, shortgrasses and grass-likes. Forbs can be diverse but never dominant. Shrub include yucca, fringed sagewort and wild rose.

Associated sites

R063AY011SD	**Clayey**
R063AY012SD	**Thin Upland**
R063AY017SD	**Shallow Clay**
R063AY018SD	**Dense Clay**

Similar sites

R063AY011SD	**Clayey** Clayey [more green needlegrass, less sideoats grama; higher production]
R063AY017SD	**Shallow Clay** Shallow Clay [more green needlegrass and sideoats grama; less needleandthread]

Table 1. Dominant plant species

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

Physiographic features

This site typically occurs on gently to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,600–2,700 ft
Slope	6–80%
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 (average)	130 days
Freeze-free period (average)	151 days
Precipitation total (average)	19 in

Climate stations used

- (1) COTTONWOOD 2 E [USC00391972], Kadoka, SD
- (2) KENNEBEC [USC00394516], Kennebec, SD
- (3) POLLOCK [USC00396712], Pollock, SD
- (4) CEDAR BUTTE 1NE [USC00391539], White River, 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 or colluvium derived from interbedded shale and sandstone or alluvium from mudstone. The clay loam to silty clay loam surface layer is 2 to 8 inches thick. The bedrock which occurs at 10 to 20 inches is soft, calcareous shale interbedded with lenses of soft sandstone. This typically forms a restrictive layer which inhibits plant roots. The soils have a moderate infiltration rate. 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. Subsurface soil layers are restrictive to water movement and penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 15 percent. Low available water capacity and very slow permeability strongly influences the soil-water-plant relationship.

Soil correlated to the Shallow Ecological Site: Shingle

Access Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) for specific local soils information.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Colluvium–sandstone and shale
Surface texture	(1) Silty clay (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	10–20 in
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	2–3 in
Calcium carbonate equivalent (0-40in)	1–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–25%
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.

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

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

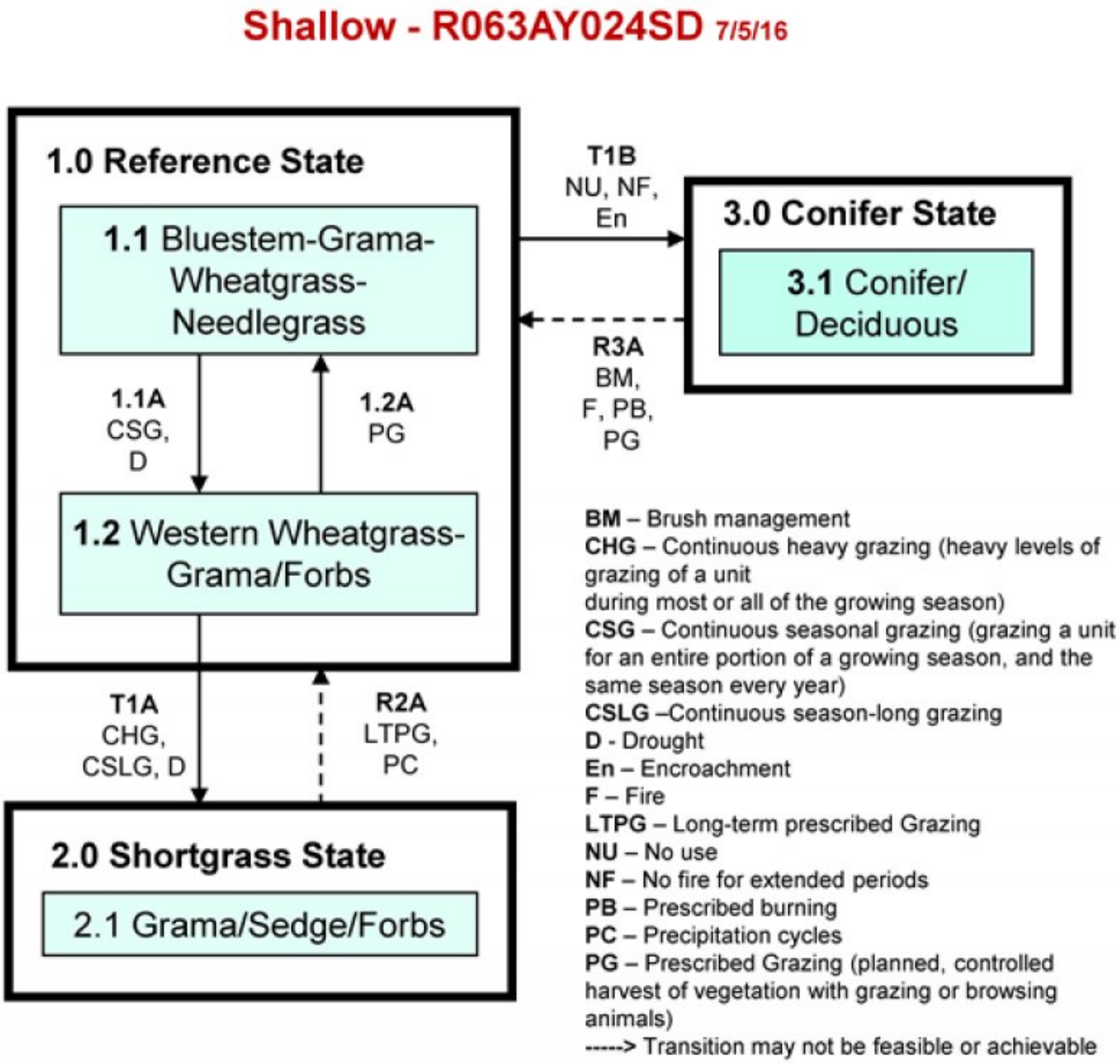

Figure 6. Shallow - R063AY024SD

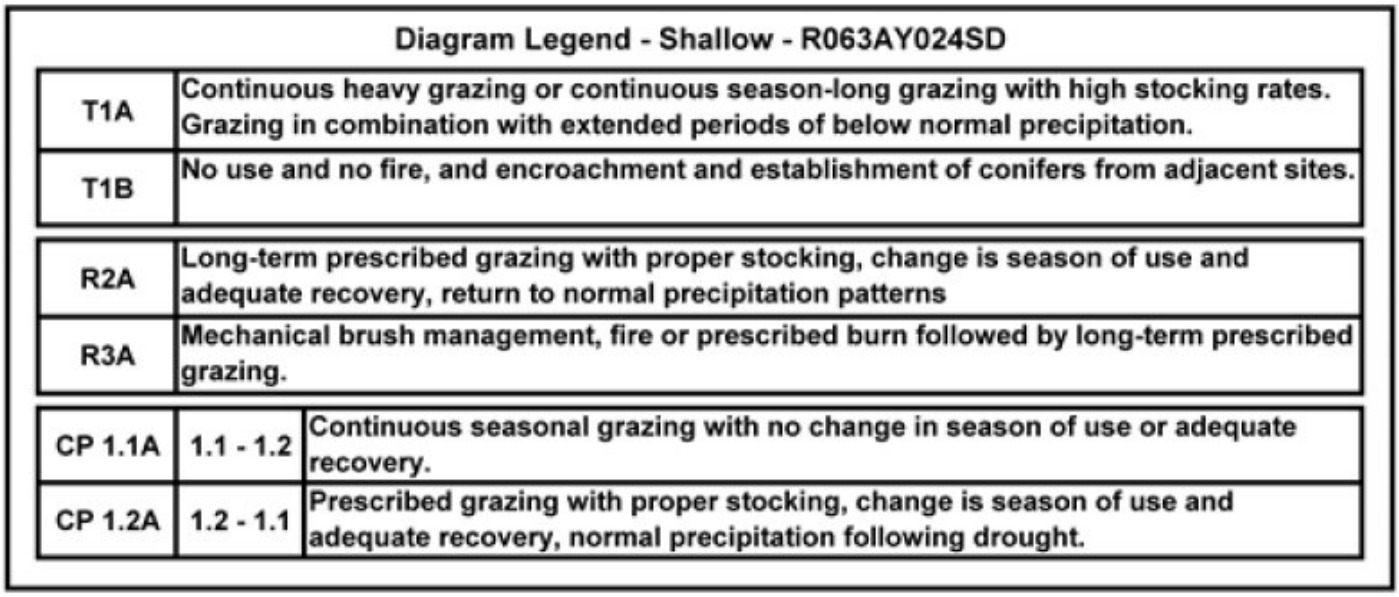

Figure 7. Shallow - R063AY024SD

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 mid-grasses, shortgrasses, grass-likes, forbs and shrubs. The primary disturbances included fire and grazing by large ungulates and small mammals.

Community 1.1
Bluestem-Grama-Wheatgrass-Needlegrass Plant Community

Interpretations are primarily based on the Bluestem-Grama-Wheatgrass-Needlegrass Plant Community, which is considered to be reference plant community. Potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The major grasses include little bluestem, sideoats grama, western wheatgrass, and needleandthread. Other grasses and grass-likes occurring on this plant community include blue grama, hairy grama, buffalograss, and sedge. Forbs commonly occurring include purple coneflower, purple prairie clover, green sagewort, dotted gayfeather, cudweed sagewort, and scurfpea. Shrubs commonly occurring include fringed sagewort, plum, yucca and rose. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Runoff 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	895	1368	1835
Forb	75	120	165
Shrub/Vine	30	96	165
Tree	0	16	35
Total	**1000**	**1600**	**2200**

Figure 9. 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
Western Wheatgrass-Grama/Forbs Plant Community

This plant community develops under continuous seasonal grazing by large herbivores. The potential vegetation is about 70 percent grasses and grass-likes, 15 percent forbs, and 10 percent shrubs. The major grasses and grass-likes include western wheatgrass, blue grama, and sideoats grama. Other grasses occurring on this plant community include buffalograss, needleandthread, and sedges. Forbs commonly occurring on this site include dotted gayfeather, cudweed sagewort, purple coneflower, and scurfpea. Shrubs commonly found include fringed sagewort, rose, and yucca. When compared to the Bluestem-Grama-Wheatgrass-Needlegrass Plant Community, blue grama, and western wheatgrass have increased. The needlegrasses, little bluestem, and sideoats grama have decreased. This plant community is stable and protected from excessive erosion. The dominant herbaceous species are very adapted to grazing; however, the mid-grass species and the more palatable forbs will decrease in the community through continuous seasonal grazing. This plant community tends to be resilient if disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	640	1134	1625
Forb	135	175	215
Shrub/Vine	25	84	145
Tree	0	7	15
Total	**800**	**1400**	**2000**

Figure 11. Plant community growth curve (percent production by month). SD6302, Pierre Shale Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, uplands..

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

Pathway 1.1A
Community 1.1 to 1.2

Continuous seasonal grazing (grazing the same area for the entire growing season at the same time of year every year) will convert the plant community to the Western Wheatgrass-Grama/Forbs Plant Community. Mid and tall warm-season grasses decrease, while western wheatgrass and short warm-season grasses blue grama and buffalograss increase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing including proper stocking, change in season of use and adequate time for recovery will move this plant community to the Bluestem-Grama-Wheatgrass-Needlegrass Plant Community.

State 2
Shortgrass State

This state is dominated by shortgrass species and upland sedges. It is the result of continuous season-long grazing or heavy continuous grazing. Desirable species have been over utilized and removed or greatly reduced in the plant community. The site is has increased runoff and depending on percent bare ground and slope the site can be susceptible to erosion. This state can be very resistant to change.

Community 2.1
Grama/Sedge/Forbs Plant Community

This plant community develops from long-term heavy grazing, or continuous season-long grazing with stocking rates at higher than stainable levels. Extended periods of below normal precipitation can accelerate this shift. This plant community can sometimes be found in small patches dispersed throughout the pasture, encircling spot grazed areas, and areas distant from water sources. This is a typical pattern found in properly stocked pastures grazed season-long. Diversity is lost, as shortgrasses become dominant in the plant community. Grazing tolerant blue grama and sedges have replaced the bluestems, western wheatgrass, and green needlegrass. Sideoats grama and needleandthread remain, but are less productive because of grazing pressure. Because of grazing pressure, threeawn, fringed sagewort, green sagewort, yucca, woolly Indianwheat, pussytoes, and cactus become more prevalent in the plant community. This plant community is typically resistant to change. Generally, this plant community will require significant management inputs and time to move it away from this plant community. Onsite soil erosion is low. Infiltration is low, and runoff is high. Typically the runoff is very clean, but offsite areas can be significantly impacted due to the increased runoff. Continued overuse results in an increase of bare ground and higher erosion potential.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	510	775	1140
Forb	45	125	205
Shrub/Vine	45	100	155
Total	**600**	**1000**	**1500**

Figure 13. Plant community growth curve (percent production by month). SD6305, Pierre Shale Plains, warm-season dominant.. Warm-season dominant, uplands..

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

State 3
Conifer State

This state is dominated by juniper species and is a result of no use and no fire resulting in encroachment of conifers. In the absence of fire, this plant community phase will be resistant to change. This state will have lower water infiltration rates, increased runoff, and an increased potential for soil erosion. The resulting plant community is less productive for grazing animals and wildlife than the other states.

Community 3.1
Conifer/Deciduous Plant Community

This plant community develops under no use, no fire, and encroachment by juniper. Juniper is currently expanding on this site due to suppression of fire. The juniper canopy is 15 percent. The understory is made up of 70 to 85 percent grasses and grass-like species and 5 to 10 percent forbs. Dominant grasses and grass-likes include western wheatgrass, blue grama, needleandthread, little bluestem, and sedges. As the canopy increases, warm-season grasses tend to decrease as the cool-season grasses initially increase. Forbs commonly found in this community include green sagewort, western yarrow, dotted gayfeather, and Indian breadroot. Nonnative species such as cheatgrass and bluegrass will tend to invade this plant community. Compared to the Bluestem-Grama-Wheatgrass-Needlegrass Plant Community, juniper increases significantly. The grass component decreases dramatically as the buildup of juniper needles increases. Annual herbaceous production also decreases significantly. While the juniper canopy provides excellent protection from the weather for both livestock and wildlife, it is not capable of supporting large numbers of wildlife and livestock due to decreased production. A significant reduction of juniper/pine can be accomplished through mechanical brush management or prescribed burning. The

vegetation in the understory is capable of enduring fire; however, very hot fires will have a detrimental effect to the plant community.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	535	900	1265
Tree	55	120	185
Shrub/Vine	55	90	125
Forb	55	90	125
Total	**700**	**1200**	**1700**

Figure 15. Plant community growth curve (percent production by month). SD6311, Pierre Shale Plains, heavy conifer canopy.. Mature eastern redcedar overstory..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	7	11	24	27	12	5	4	3	2	1

Transition 1A
State 1 to 2

Continuous heavy grazing, or continuous season-long grazing where stocking rates are slightly above carrying capacity will shift this plant community (1.2) to the Shortgrass State. Extended periods of below normal precipitations can accelerate this transition.

Transition 1B
State 1 to 3

No use, no fire, and encroachment of conifers, primarily juniper species, will shift the Reference State toward a Conifer/Deciduous State (3.0).

Restoration pathway 2A
State 2 to 1

With long-term prescribed grazing, that includes proper stocking, change in season of use and adequate recovery periods and/or a return to normal precipitation patterns may shift this plant community back to the Reference State. The restoration may take an extended period of time and in the end not meet management goals or objectives.

Restoration pathway 3A
State 3 to 1

Mechanical brush management and/or prescribed burning or fire will move this plant community towards the Reference State. The restoration of this site may not be feasible or achievable depending on how well established juniper is on the site and the density of juniper.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid Warm-Season Grasses**			240–480	
	sideoats grama	BOCU	*Bouteloua curtipendula*	160–400	–
	little bluestem	SCSC	*Schizachyrium scoparium*	80–240	–

	plains muhly	MUCU3	*Muhlenbergia cuspidata*	16–80	–
2	**Rhizomatous Wheatgrass**			160–320	
	western wheatgrass	PASM	*Pascopyrum smithii*	180–320	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–80	–
3	**Short Warm-Season Grasses**			80–240	
	blue grama	BOGR2	*Bouteloua gracilis*	80–240	–
	buffalograss	BODA2	*Bouteloua dactyloides*	32–160	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–80	–
4	**Needlegrass**			80–240	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	80–240	–
	green needlegrass	NAVI4	*Nassella viridula*	16–80	–
5	**Tall Warm-Season Grasses**			32–160	
	big bluestem	ANGE	*Andropogon gerardii*	16–128	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	16–80	–
6	**Other Native Grasses**			32–128	
	dropseed	SPORO	*Sporobolus*	16–80	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	16–48	–
	threeawn	ARIST	*Aristida*	0–32	–
7	**Grass-likes**			32–160	
	threadleaf sedge	CAFI	*Carex filifolia*	16–128	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–80	–
	needleleaf sedge	CADU6	*Carex duriuscula*	16–80	–
Forb					
9	**Forbs**			80–160	
	Forb, native	2FN	*Forb, native*	16–80	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	32–80	–
	dotted blazing star	LIPU	*Liatris punctata*	16–64	–
	scurfpea	PSORA2	*Psoralidium*	16–48	–
	purple prairie clover	DAPU5	*Dalea purpurea*	16–48	–
	tarragon	ARDR4	*Artemisia dracunculus*	16–48	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	16–48	–
	milkvetch	ASTRA	*Astragalus*	16–32	–
	false boneset	BREU	*Brickellia eupatorioides*	0–32	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	16–32	–
	pussytoes	ANTEN	*Antennaria*	16–32	–
	prairie clover	DALEA	*Dalea*	0–32	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	16–32	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	16–32	–
	goldenrod	SOLID	*Solidago*	16–32	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	16–32	–
	white heath aster	SYER	*Symphyotrichum ericoides*	16–32	–
	beardtongue	PENST	*Penstemon*	16–32	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–32	–

	American vetch	VIAM	*Vicia americana*	0–32	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–16	–
	largebract Indian breadroot	PECU3	*Pediomelum cuspidatum*	0–16	–
	Indian breadroot	PEDIO2	*Pediomelum*	0–16	–
	spiny phlox	PHHO	*Phlox hoodii*	0–16	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–16	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–16	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–16	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0–16	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–16	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–16	–
	hoary puccoon	LICA12	*Lithospermum canescens*	0–16	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0–16	–
	buckwheat	ERIOG	*Eriogonum*	0–16	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–16	–
	old man's whiskers	GETR	*Geum triflorum*	0–16	–
	textile onion	ALTE	*Allium textile*	0–16	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–16	–
Shrub/Vine					
10	**Shrubs**			32–160	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–80	–
	prairie sagewort	ARFR4	*Artemisia frigida*	16–80	–
	rose	ROSA5	*Rosa*	16–48	–
	American plum	PRAM	*Prunus americana*	0–48	–
	chokecherry	PRVI	*Prunus virginiana*	0–32	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–32	–
	pricklypear	OPUNT	*Opuntia*	0–32	–
	snowberry	SYMPH	*Symphoricarpos*	0–32	–
	soapweed yucca	YUGL	*Yucca glauca*	0–32	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–16	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–16	–
Tree					
11	**Trees**			0–32	
	Tree	2TREE	*Tree*	0–32	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–32	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–32	–
	bur oak	QUMA2	*Quercus macrocarpa*	0–32	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					

1	**Mid Warm-Season Grasses**			140–280	
	sideoats grama	BOCU	*Bouteloua curtipendula*	70–210	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–140	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–70	–
2	**Rhizomatous Wheatgrass**			210–420	
	western wheatgrass	PASM	*Pascopyrum smithii*	140–350	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–70	–
3	**Short Warm-Season Grasses**			140–350	
	blue grama	BOGR2	*Bouteloua gracilis*	140–280	–
	buffalograss	BODA2	*Bouteloua dactyloides*	70–210	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–70	–
4	**Needlegrass**			70–140	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–112	–
	green needlegrass	NAVI4	*Nassella viridula*	0–70	–
5	**Tall Warm-Season Grasses**			28–70	
	big bluestem	ANGE	*Andropogon gerardii*	14–70	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	14–42	–
6	**Other Native Grasses**			14–70	
	dropseed	SPORO	*Sporobolus*	14–42	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	14–28	–
	threeawn	ARIST	*Aristida*	0–14	–
7	**Grass-likes**			70–140	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–70	–
	needleleaf sedge	CADU6	*Carex duriuscula*	28–70	–
	threadleaf sedge	CAFI	*Carex filifolia*	28–70	–
Forb					
9	**Forbs**			140–210	
	Forb, native	2FN	*Forb, native*	14–70	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	28–70	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	14–70	–
	dotted blazing star	LIPU	*Liatris punctata*	14–56	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–42	–
	tarragon	ARDR4	*Artemisia dracunculus*	14–42	–
	scurfpea	PSORA2	*Psoralidium*	14–42	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	14–42	–
	goldenrod	SOLID	*Solidago*	14–42	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	14–42	–
	white heath aster	SYER	*Symphyotrichum ericoides*	14–42	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–42	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	14–42	–
	American vetch	VIAM	*Vicia americana*	0–42	–
	textile onion	ALTE	*Allium textile*	0–28	–
	pussytoes	ANTEN	*Antennaria*	14–28	–

	milkvetch	ASTRA	*Astragalus*	14–28	–
	false boneset	BREU	*Brickellia eupatorioides*	0–28	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–28	–
	prairie clover	DALEA	*Dalea*	0–28	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	14–28	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–28	–
	beardtongue	PENST	*Penstemon*	0–28	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–28	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–14	–
	largebract Indian breadroot	PECU3	*Pediomelum cuspidatum*	0–14	–
	Indian breadroot	PEDIO2	*Pediomelum*	0–14	–
	spiny phlox	PHHO	*Phlox hoodii*	0–14	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–14	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0–14	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–14	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–14	–
	hoary puccoon	LICA12	*Lithospermum canescens*	0–14	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0–14	–
	buckwheat	ERIOG	*Eriogonum*	0–14	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–14	–
	old man's whiskers	GETR	*Geum triflorum*	0–14	–
Shrub/Vine					
10	**Shrubs**			28–140	
	prairie sagewort	ARFR4	*Artemisia frigida*	28–112	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–70	–
	pricklypear	OPUNT	*Opuntia*	0–70	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–70	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–70	–
	rose	ROSA5	*Rosa*	0–70	–
	soapweed yucca	YUGL	*Yucca glauca*	14–70	–
	American plum	PRAM	*Prunus americana*	0–28	–
	chokecherry	PRVI	*Prunus virginiana*	0–14	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–14	–
	snowberry	SYMPH	*Symphoricarpos*	0–14	–
Tree					
11	**Trees**			0–14	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–14	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–14	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					

1	**Mid Warm-Season Grasses**			50–100	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–100	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–100	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–20	–
2	**Rhizomatous Wheatgrass**			10–50	
	western wheatgrass	PASM	*Pascopyrum smithii*	10–50	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–20	–
3	**Short Warm-Season Grasses**			100–350	
	blue grama	BOGR2	*Bouteloua gracilis*	100–350	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	100–350	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–50	–
4	**Needlegrass**			0–100	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	20–100	–
5	**Tall Warm-Season Grasses**			20–80	
	prairie sandreed	CALO	*Calamovilfa longifolia*	20–100	–
6	**Other Native Grasses**			50–150	
	threeawn	ARIST	*Aristida*	20–100	–
	dropseed	SPORO	*Sporobolus*	20–100	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–30	–
7	**Grass-likes**			100–200	
	needleleaf sedge	CADU6	*Carex duriuscula*	100–150	–
	threadleaf sedge	CAFI	*Carex filifolia*	100–150	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–50	–
Forb					
9	**Forbs**			50–200	
	white sagebrush	ARLU	*Artemisia ludoviciana*	50–100	–
	goldenrod	SOLID	*Solidago*	30–70	–
	white heath aster	SYER	*Symphyotrichum ericoides*	20–50	–
	dotted blazing star	LIPU	*Liatris punctata*	10–50	–
	scurfpea	PSORA2	*Psoralidium*	10–50	–
	milkvetch	ASTRA	*Astragalus*	20–50	–
	Forb, native	2FN	*Forb, native*	10–50	–
	boxelder	ACNE2	*Acer negundo*	10–50	–
	American vetch	VIAM	*Vicia americana*	10–50	–
	pussytoes	ANTEN	*Antennaria*	10–30	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	10–30	–
	buckwheat	ERIOG	*Eriogonum*	10–30	–
	purple prairie clover	DAPU5	*Dalea purpurea*	10–30	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–30	–
	spiny phlox	PHHO	*Phlox hoodii*	0–30	–
	woolly plantain	PLPA2	*Plantago patagonica*	10–30	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–30	–

	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–30	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	10–30	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	10–30	–
	beardtongue	PENST	*Penstemon*	10–20	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–20	–
	tarragon	ARDR4	*Artemisia dracunculus*	10–20	–
	textile onion	ALTE	*Allium textile*	0–20	–
	false boneset	BREU	*Brickellia eupatorioides*	0–20	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–20	–
	prairie clover	DALEA	*Dalea*	10–20	–
	hoary puccoon	LICA12	*Lithospermum canescens*	0–10	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0–10	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–10	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–10	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–10	–
	largebract Indian breadroot	PECU3	*Pediomelum cuspidatum*	0–10	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–10	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0–10	–
Shrub/Vine					
10	**Shrubs**			50–150	
	pricklypear	OPUNT	*Opuntia*	10–100	–
	prairie sagewort	ARFR4	*Artemisia frigida*	50–100	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–50	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–50	–
	rose	ROSA5	*Rosa*	0–50	–
	soapweed yucca	YUGL	*Yucca glauca*	20–50	–
	chokecherry	PRVI	*Prunus virginiana*	0–10	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–10	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–10	–

Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid Warm-Season Grasses**			60–180	
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–180	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–120	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	12–60	–
2	**Rhizomatous Wheatgrass**			0–120	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–180	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–12	–
3	**Short Warm-Season Grasses**			60–180	
	blue grama	BOGR2	*Bouteloua gracilis*	60–180	–

	hairy grama	BOHI2	*Bouteloua hirsuta*	0–120	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–60	–
4	**Needlegrass**			60–180	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	60–180	–
	green needlegrass	NAVI4	*Nassella viridula*	0–60	–
5	**Tall Warm-Season Grasses**			0–60	
	big bluestem	ANGE	*Andropogon gerardii*	0–60	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–60	–
6	**Other Native Grasses**			0–96	
	prairie Junegrass	KOMA	*Koeleria macrantha*	12–60	–
	dropseed	SPORO	*Sporobolus*	0–36	–
	threeawn	ARIST	*Aristida*	0–36	–
7	**Grass-likes**			60–180	
	needleleaf sedge	CADU6	*Carex duriuscula*	60–120	–
	threadleaf sedge	CAFI	*Carex filifolia*	60–120	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–60	–
Forb					
9	**Forbs**			60–120	
	goldenrod	SOLID	*Solidago*	12–60	–
	Indian breadroot	PEDIO2	*Pediomelum*	12–60	–
	scurfpea	PSORA2	*Psoralidium*	12–60	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	24–60	–
	dotted blazing star	LIPU	*Liatris punctata*	12–60	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–36	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	12–36	–
	buckwheat	ERIOG	*Eriogonum*	0–36	–
	milkvetch	ASTRA	*Astragalus*	12–36	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	12–36	–
	pussytoes	ANTEN	*Antennaria*	12–36	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–36	–
	prairie clover	DALEA	*Dalea*	12–36	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–36	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	12–36	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–36	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–36	–
	American vetch	VIAM	*Vicia americana*	0–24	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–24	–
	beardtongue	PENST	*Penstemon*	0–24	–
	spiny phlox	PHHO	*Phlox hoodii*	0–24	–
	Forb, native	2FN	*Forb, native*	0–24	–
	tarragon	ARDR4	*Artemisia dracunculus*	12–24	–
	false boneset	BREU	*Brickellia eupatorioides*	0–24	–

	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–24	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	12–24	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–24	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–24	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–24	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–12	–
	largebract Indian breadroot	PECU3	*Pediomelum cuspidatum*	0–12	–
	hoary puccoon	LICA12	*Lithospermum canescens*	0–12	–
	textile onion	ALTE	*Allium textile*	0–12	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–12	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0–12	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0–12	–
Shrub/Vine					
10	**Shrubs**			60–120	
	skunkbush sumac	RHTR	*Rhus trilobata*	0–60	–
	rose	ROSA5	*Rosa*	0–60	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–60	–
	prairie sagewort	ARFR4	*Artemisia frigida*	12–60	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–60	–
	pricklypear	OPUNT	*Opuntia*	0–60	–
	soapweed yucca	YUGL	*Yucca glauca*	0–36	–
	American plum	PRAM	*Prunus americana*	0–24	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–12	–
Tree					
11	**Trees**			60–180	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	60–120	–
	eastern redcedar	JUVI	*Juniperus virginiana*	60–120	–

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-Grama-Wheatgrass-Needlegrass PCP (1.1):
Average Annual Production (lbs./acre, air-dry) 1600
Stocking rate (AUM/acre) 0.44

Western Wheatgrass-Grama/Forbs PCP (1.2):
Average Annual Production (lbs./acre, air-dry) 1400
Stocking Rate 0.38

Grama/Sedge/Forbs PCP (2.1):
Average Annual Production (lbs./acre, air-dry) 1000
Stocking Rate 0.27

Confer/Deciduous PCP (3.1):
Average Annual Production (lbs./acre, air-dry) 1200
Stocking Rate: Variable depending on juniper cover 0.25

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

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 very slow to moderate 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. Dominance by blue grama and sedge will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves

Recreational uses

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

Wood products

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

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.

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Contributors

Betty Bisch
Stan Boltz

Approval

Suzanne Mayne-Kinney, 6/26/2024

Acknowledgments

Rick L. Peterson, ESD update 7/6/16

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/09/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slight to none, typically on steeper slopes and discontinuous.

2. **Presence of water flow patterns:** None, or barely visible and discontinuous with numerous debris dams when present.

3. **Number and height of erosional pedestals or terracettes:** Few pedastalled 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):** Small size litter classes will generally move short distances, some medium size class litter will move very short distances. Litter debris dams are occasionally present.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability ratings should typically be 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 2 to 6 inches thick with light to dark brownish gray 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 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 – when dry, B horizons can be hard and appear to be compacted, but no platy structure will be present.

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 warm-season grasses > Mid cool-season rhizomatous grasses >

Sub-dominant: Mid/tall cool-season bunchgrasses = Short warm-season grasses >

Other: Tall warm-season grasses = Grass-likes = Forbs = Shrubs > Trees > Short cool-season bunchgrasses

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 1,000-2,200 lbs./acre (air-dry weight). Reference value production is 1,600 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, Kentucky bluegrass

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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.
