USDA Natural Resources
Conservation Service

Ecological site R061XN011SD
Clayey-North (18-22" PZ)

Accessed: 05/06/2024

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.

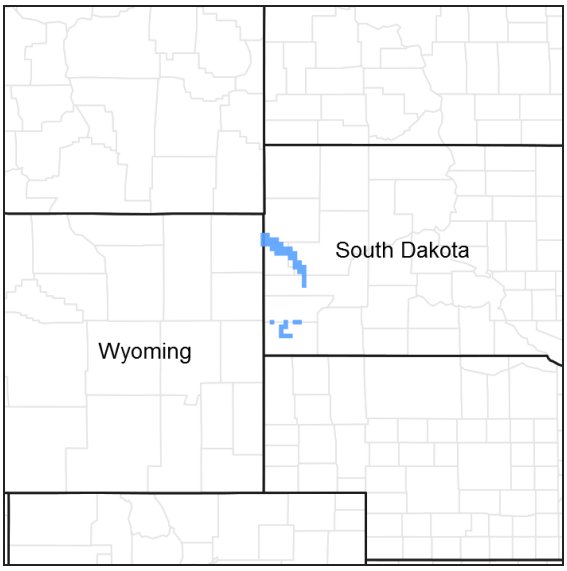


Figure 1. Mapped extent

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.

Classification relationships

Level IV Ecoregions of the Conterminous United States: 17a – Black Hills Foothills.

Associated sites

R061XN012SD	**Thin Upland-North (18-22" PZ)**
R061XY017SD	**Shallow Clayey**

Similar sites

R061XY020SD	**Overflow** (R061XY020SD) – Loamy Overflow [more big bluestem; higher production]
R061XN010SD	**Loamy-North (18-22" PZ)** (R061XN010SD) – Loamy [less green needlegrass; more needleandthread and big bluestem]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Physiographic features

This site occurs on gently to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hogback (3) Plain
Flooding frequency	None
Ponding frequency	None
Elevation	884–1,219 m
Slope	5–30%
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 ranges from 18 to 21 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 outbreaks 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 most severely affect ranch operations during late winter and spring.

The average annual temperature is about 46° F. January is the coldest month with average temperatures ranging from about 20° F (Sundance, Wyoming (WY)) to about 26° F (Fort Meade, South Dakota (SD)). July is the warmest month with temperatures averaging from about 69° F (Sundance, WY) to about 72° F (Fort Meade, SD). The range of average monthly temperatures between the coldest and warmest months is about 48° 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 are generally stronger than nighttime and occasional 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)	140 days
Freeze-free period (average)	167 days
Precipitation total (average)	533 mm

Influencing water features

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

Soil features

The common features of soils in this site are silty clay loam to clay textured sub-surface soils, with slopes ranging

from about 5 to 30 percent. The soils in this site are well drained and formed in residuum. The silty clay loam to clay surface layer is 3 to 6 inches thick. The soils have a slow to very slow infiltration rate. This site typically should show slight to no evidence of rills, wind scoured areas or pedestalled plants. If present, water flow paths are broken, irregular in appearance or discontinuous. The soil surface is stable and intact. Sub-surface soil layers are non-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 10 percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

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

Table 4. Representative soil features

Surface texture	(1) Clay loam (2) Silty clay loam (3) Clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	76–127 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–3%
Available water capacity (0-101.6cm)	10.16–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0–2%

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

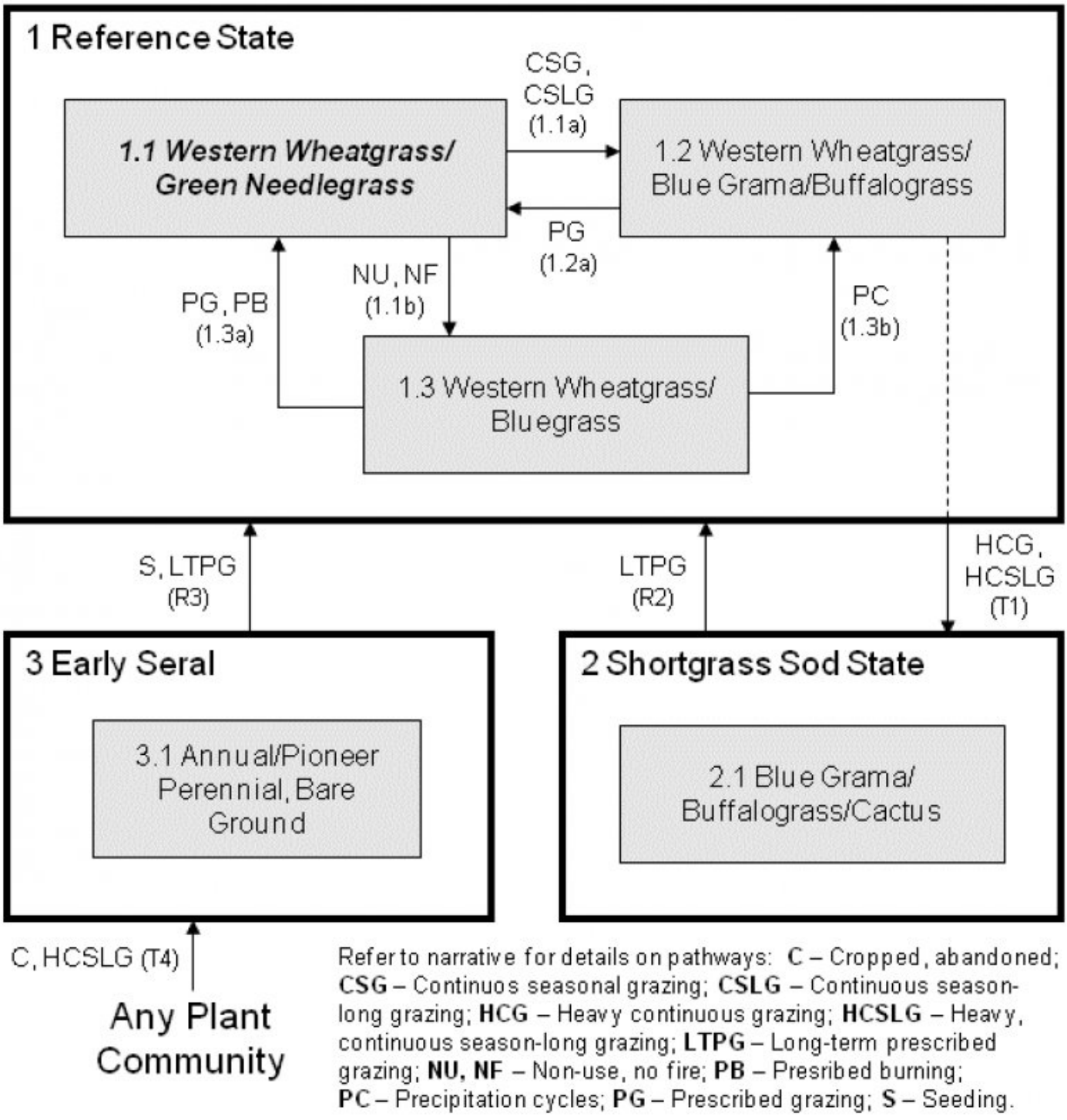
Continuous season-long grazing (during the typical growing season of May through October) and/or heavy continuous grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Western Wheatgrass/Green Needlegrass Plant Community Phase. Bluegrass will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass, big bluestem, sideoats grama, switchgrass, and Indiangrass will decrease in frequency and production. Excessive defoliation can cause threeawn and annuals to increase and dominate the site. Extended periods of non-use and/or lack of fire will result in excessive litter and a

plant community dominated by cool-season grasses such as green needlegrass, western wheatgrass, bluegrass, smooth bromegrass and cheatgrass.

Interpretations are primarily based on the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1). 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 community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience, and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model



State 1
Reference

This state represents the natural range of variability that dominates the dynamics of this ecological site. This state is dominated by cool-season grasses, with warm-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included occasional fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Taller cool- and warm-season grasses would have declined and a corresponding increase in short statured grass and grass-like species would have occurred. Today, a similar condition can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

Community 1.1

Western Wheatgrass/Green Needlegrass

Interpretations are based primarily on the Western Wheatgrass/Green Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses. The major grasses include western wheatgrass, green needlegrass, big bluestem, and sideoats grama. Other grass and grass-like species include blue grama, buffalograss, needleleaf sedge, switchgrass, Indiangrass, Columbia needlegrass, needleandthread and little bluestem. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to 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	2130	2679	3183
Forb	135	228	347
Shrub/Vine	90	121	168
Total	**2355**	**3028**	**3698**

Figure 5. Plant community growth curve (percent production by month). SD6102, Black Hills Foot Slopes, 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
		3	10	23	34	15	6	5	4		

Community 1.2
Western Wheatgrass/Blue Grama/Buffalograss

This plant community evolved under continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year), continuous season-long grazing, or from over utilization during extended drought periods. The potential plant community is made up of approximately 78 percent grasses and grass-like species, 12 percent forbs, and 10 percent shrubs. Dominant grass and grass-like species include western wheatgrass, blue grama, green needlegrass, needleleaf sedge, sideoats grama, and buffalograss. Grasses of secondary importance include needleandthread, tall dropseed, big bluestem, and prairie junegrass. Non-native grasses such as Kentucky bluegrass, cheatgrass, Canada bluegrass, and Japanese bromegrass will likely invade and possibly become somewhat prevalent in this plant community phase. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, goldenrod, and western yarrow. When compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), blue grama and buffalograss have increased. Green needlegrass and the production of mid and tall warm-season grasses have decreased. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. The hydrologic function of the site is beginning to be altered when this

plant community phase is reached due to the shallow, compact nature of the roots of species such as blue grama, buffalograss, needleleaf sedge, and Kentucky bluegrass.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1356	1883	2354
Forb	106	191	308
Shrub/Vine	106	168	252
Total	**1568**	**2242**	**2914**

Figure 7. Plant community growth curve (percent production by month). SD6103, Black Hills Foot Slopes, cool-season/warm-season co-dominant. Cool-season, warm-season co-dominant.

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

Community 1.3
Western Wheatgrass/Bluegrass

This plant community phase is a result of extended periods of non-use and a lack of fire. Excess plant material begins to accumulate which favors the increase and/or encroachment of several non-native cool-season grass species such as Kentucky bluegrass, Canada bluegrass, cheatgrass, smooth bromegrass, and Japanese bromegrass. The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses. The major grasses include western wheatgrass, green needlegrass, Kentucky bluegrass, and smooth bromegrass. Other grass and grass-like species include big bluestem, blue grama, sideoats grama, needleandthread, slender wheatgrass, and needleleaf sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The non-native species typically do not increase to the point of dominance; however, their presence tends to reduce the overall diversity of the plant community. As such, this is a somewhat sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1821	2381	2909
Forb	118	202	308
Shrub/Vine	78	108	146
Total	**2017**	**2691**	**3363**

Figure 9. Plant community growth curve (percent production by month). SD6101, Black Hills Foot Slopes, cool-season dominant. Cool-season dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		4	12	25	36	10	5	4	4		

Pathway 1.1a
Community 1.1 to 1.2

Continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year, continuous season-long grazing, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 1.2 Western Wheatgrass/ Blue Grama/Buffalograss Plant Community Phase.

Pathway 1.1b
Community 1.1 to 1.3

Non-use and no fire for extended periods of time with result in a buildup of plant litter and encourage encroachment of non-native cool-season species which will lead to the 1.3 Western Wheatgrass/Bluegrass Plant Community Phase.

Pathway 1.2a
Community 1.2 to 1.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase.

Conservation practices

Prescribed Grazing

Pathway 1.3a
Community 1.3 to 1.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or a combination of prescribed grazing and prescribed burning (typically an early spring burn to reduce the non-native cool-season species) will shift this community to the 1.1 Western Wheatgrass/Green Needlegrass Plant Community Phase.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3b
Community 1.3 to 1.2

Precipitation cycles (extended periods of well below average precipitation, usually over two or more years) in the absence of grazing and fire will likely cause a shift to the 1.2 Western Wheatgrass/Blue Grama/Buffalograss Plant Community Phase. This transition may also occur if grazing at heavy stocking levels or with inadequate recovery periods commenced.

State 2
Shortgrass Sod

This state occurs as a result of heavy stocking levels, inadequate recovery periods between grazing events, or a combination of these disturbances. This state is dominated by warm--season grasses, with cool-season grasses being subdominant. The shallow, compact nature of the roots of the dominant species causes increased runoff and reduced infiltration. In addition, reduced shading due to a lesser amount of foliar cover causes increased soil temperatures and increased evaporation of the surface soil moisture. These conditions combine to cause the site to become droughtier, and thus reduce the opportunity for recruitment and/or establishment of the taller statured grasses. This state is relatively stable and resistant to change.

Community 2.1
Blue Grama/Buffalograss/Cactus

This plant community developed with heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year), heavy continuous season-long grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 70 percent grasses and grass-like species, 15 percent forbs, and 15 percent shrubs. Dominant grass

and grass-like species include blue grama, buffalograss, and needleleaf sedge. Grasses of secondary importance include western wheatgrass, green needlegrass, needleandthread, sideoats grama, cheatgrass and/or Japanese bromegrass, and Kentucky bluegrass. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, scurfpea, western ragweed, and western yarrow. Dominant shrubs include plains pricklypear, brittle cactus, and fringed sagewort. When compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), blue grama, needleleaf sedge, and buffalograss are dominant on this plant community. Cool-season grasses have decreased significantly. This vegetation state is very resistant to change. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing. This plant community is less productive than most other phases. The thick sod prevents other species from establishing. Lack of litter and reduced plant vigor causes higher soil temperatures, poor water infiltration rates, and high evapotranspiration which gives blue grama a competitive advantage over cool-season mid-grasses.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	863	1255	1592
Shrub/Vine	73	157	269
Forb	73	157	269
Total	**1009**	**1569**	**2130**

Figure 11. Plant community growth curve (percent production by month). SD6104, Black Hills Foot Slopes, warm-season dominant, cool-season sub-dominant. Warm-season dominant, cool-season sub-dominant.

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

State 3
Early Seral

This state occurs as a result of extreme disturbance that typically removes most of the native species normally present on this site. Disturbance in the form of cropping or severe grazing over several years are the most typical. Occupation by black-tailed prairie dogs may also result in this transition. The dominant species present is highly variable, but the common characteristics include high amounts of bare ground, reduced soil aggregate stability, increased runoff and increased erosion (including increased sediment loads in the runoff). Restoration of the ecological processes will be very difficult.

Community 3.1
Annual/Pioneer Perennial, Bare Ground

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, abandoned cropland, defoliation by rodents, etc.). The potential plant community is made up of approximately 60 to 80 percent grasses and grass-like species, 15 to 35 percent forbs, and 2 to 5 percent shrubs. The dominant grass is often threeawn. Other grasses may include cheatgrass, annual bromegrass (Japanese brome and cheatgrass), sedge, blue grama, sand dropseed, bluegrass, and western wheatgrass. The dominant forbs include fetid marigold, sweetclover, western ragweed, cudweed sagewort, and other invader-like species. The dominant shrubs include fringed sagewort, broom snakeweed and cactus. A wide variety of other early seral plant species can occupy this site in varying amounts. This plant community is susceptible to invasion of Canada thistle and other non-native species because of the relatively high percent of bare ground. Compared to the Western Wheatgrass/Green Needlegrass Plant Community Phase (1.1), threeawn, annual brome grasses, and percent of bare ground has increased. Western wheatgrass, needlegrasses and other cool-season grasses have decreased as have the warm-season species including big bluestem, sideoats grama, and little bluestem. Plant diversity is low (plant richness may be high, but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and

vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites.

Transition T1
State 1 to 2

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season) or heavy continuous season-long grazing will convert this plant community to the 2.1 Blue Grama/Buffalograss/Cactus Plant Community Phase in the Shortgrass Sod State (State 2).

Transition T4
State 1 to 3

Cropping followed by abandonment or heavy, continuous season-long grazing (high stocking levels for a majority of the growing season over extended periods of time) will lead this plant community phase over a threshold to the 3.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase within the Early Seral State (State 3).

Transition T4
State 1 to 3

Cropping followed by abandonment or heavy, continuous season-long grazing (high stocking levels for a majority of the growing season over extended periods of time) will lead this plant community phase over a threshold to the 3.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase within the Early Seral State (State 3).

Transition T4
State 1 to 3

Cropping followed by abandonment or heavy, continuous season-long grazing (high stocking levels for a majority of the growing season over extended periods of time) will lead this plant community phase over a threshold to the 3.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase within the Early Seral State (State 3).

Restoration pathway R2
State 2 to 1

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the Reference State (State 1). This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable.

Conservation practices

Prescribed Grazing

Transition T4
State 2 to 3

Cropping followed by abandonment or heavy, continuous season-long grazing (high stocking levels for a majority of the growing season over extended periods of time) will lead this plant community phase over a threshold to the 3.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase within the Early Seral State (State 3).

Restoration pathway R3
State 3 to 1

Seeding of improved/selected varieties of native species may lead this plant community phase over a threshold to a

plant community resembling a phase of the Reference State (State 1). If seed and/or reproductive propagules of native species are still present in sufficient amounts, long-term prescribed grazing may eventually lead this plant community phase over the threshold and result in a phase of the Reference State (State 1). This restoration pathway will likely take a long period of time, if attainable.

Conservation practices

Prescribed Grazing

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			605–1211	
	western wheatgrass	PASM	*Pascopyrum smithii*	605–1211	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–151	–
2	**Needlegrass**			454–908	
	green needlegrass	NAVI4	*Nassella viridula*	454–908	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	0–151	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–151	–
3	**Tall Warm-Season Grasses**			151–454	
	big bluestem	ANGE	*Andropogon gerardii*	61–303	–
	switchgrass	PAVI2	*Panicum virgatum*	0–151	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–151	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–91	–
4	**Mid Warm-Season Grasses**			61–303	
	sideoats grama	BOCU	*Bouteloua curtipendula*	61–303	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–151	–
5	**Short Warm-Season Grasses**			61–303	
	blue grama	BOGR2	*Bouteloua gracilis*	30–242	–
	buffalograss	BODA2	*Bouteloua dactyloides*	30–121	–
6	**Other Native Grasses**			61–151	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–121	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	30–91	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	30–61	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–30	–
7	**Grass-likes**			30–151	
	needleleaf sedge	CADU6	*Carex duriuscula*	30–151	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–91	–
Forb					
8	**Forbs**			151–303	
	Forb, native	2FN	*Forb, native*	30–121	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	30–61	–

	prairie clover	DALEA	*Dalea*	30–61	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	30–61	–
	dotted blazing star	LIPU	*Liatris punctata*	30–61	–
	desert biscuitroot	LOFO	*Lomatium foeniculaceum*	30–61	–
	scurfpea	PSORA2	*Psoralidium*	30–61	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	30–61	–
	goldenrod	SOLID	*Solidago*	30–61	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	30–61	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	30–61	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	30–61	–
	American vetch	VIAM	*Vicia americana*	30–61	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	30–61	–
	beardtongue	PENST	*Penstemon*	30–61	–
	cinquefoil	POTEN	*Potentilla*	0–30	–
	bluebells	MERTE	*Mertensia*	0–30	–
	four o'clock	MIRAB	*Mirabilis*	0–30	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–30	–
	fleabane	ERIGE2	*Erigeron*	0–30	–
	buckwheat	ERIOG	*Eriogonum*	0–30	–
	bellflower	CAMPA	*Campanula*	0–30	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–30	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–30	–
Shrub/Vine					
9	**Shrubs**			91–151	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–61	–
	prairie sagewort	ARFR4	*Artemisia frigida*	30–61	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–61	–
	pricklypear	OPUNT	*Opuntia*	30–61	–
	rose	ROSA5	*Rosa*	30–61	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–30	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–30	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–30	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			336–785	
	western wheatgrass	PASM	*Pascopyrum smithii*	336–785	–
2	**Needlegrass**			112–336	
	green needlegrass	NAVI4	*Nassella viridula*	112–336	–
3	**Tall Warm-Season Grasses**			0–112	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–90	–

	big bluestem	ANGE	*Andropogon gerardii*	0–67	–
4	**Mid Warm-Season Grasses**			22–179	
	sideoats grama	BOCU	*Bouteloua curtipendula*	22–179	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–45	–
5	**Short Warm-Season Grasses**			224–336	
	blue grama	BOGR2	*Bouteloua gracilis*	112–336	–
	buffalograss	BODA2	*Bouteloua dactyloides*	45–179	–
6	**Other Native Grasses**			22–112	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–90	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	22–67	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–22	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–22	–
7	**Grass-likes**			45–224	
	needleleaf sedge	CADU6	*Carex duriuscula*	45–224	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–112	–
8	**Non-Native Grasses**			112–336	
	bluegrass	POA	*Poa*	45–336	–
	brome	BROMU	*Bromus*	22–135	–
	smooth brome	BRIN2	*Bromus inermis*	0–90	–
Forb					
9	**Forbs**			112–269	
	Forb, introduced	2FI	*Forb, introduced*	22–67	–
	Forb, native	2FN	*Forb, native*	22–67	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	22–67	–
	goldenrod	SOLID	*Solidago*	22–67	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	22–45	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	22–45	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–45	–
	desert biscuitroot	LOFO	*Lomatium foeniculaceum*	0–45	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–45	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	22–45	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–45	–
	scurfpea	PSORA2	*Psoralidium*	22–45	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	22–45	–
	prairie clover	DALEA	*Dalea*	0–22	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–22	–
	fleabane	ERIGE2	*Erigeron*	0–22	–
	buckwheat	ERIOG	*Eriogonum*	0–22	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–22	–
	dotted blazing star	LIPU	*Liatris punctata*	0–22	–
	beardtongue	PENST	*Penstemon*	0–22	–
	cinquefoil	POTEN	*Potentilla*	0–22	–

	American vetch	VIAM	*Vicia americana*	0–22	–
Shrub/Vine					
10	**Shrubs**			112–224	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–67	–
	prairie sagewort	ARFR4	*Artemisia frigida*	22–67	–
	pricklypear	OPUNT	*Opuntia*	22–67	–
	rose	ROSA5	*Rosa*	22–45	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–45	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–22	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–22	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			404–942	
	western wheatgrass	PASM	*Pascopyrum smithii*	404–942	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–54	–
2	**Needlegrass**			269–807	
	green needlegrass	NAVI4	*Nassella viridula*	269–807	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–81	–
3	**Tall Warm-Season Grasses**			0–135	
	big bluestem	ANGE	*Andropogon gerardii*	0–135	–
4	**Mid Warm-Season Grasses**			27–135	
	sideoats grama	BOCU	*Bouteloua curtipendula*	26–135	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–81	–
5	**Short Warm-Season Grasses**			27–135	
	blue grama	BOGR2	*Bouteloua gracilis*	27–135	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–81	–
6	**Other Native Grasses**			27–135	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–81	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	27–81	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–27	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–27	–
7	**Grass-likes**			27–135	
	needleleaf sedge	CADU6	*Carex duriuscula*	27–135	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–81	–
8	**Non-Native Grasses**			269–673	
	bluegrass	POA	*Poa*	135–538	–
	smooth brome	BRIN2	*Bromus inermis*	0–269	–
	brome	BROMU	*Bromus*	27–215	–
Forb					
9	**Forbs**			135–269	

	Forb, introduced	2FI	*Forb, introduced*	27–135	–
	Forb, native	2FN	*Forb, native*	0–81	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	27–81	–
	goldenrod	SOLID	*Solidago*	27–81	–
	scurfpea	PSORA2	*Psoralidium*	27–54	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–54	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	27–54	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	27–54	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	27–54	–
	prairie clover	DALEA	*Dalea*	0–27	–
	fleabane	ERIGE2	*Erigeron*	0–27	–
	dotted blazing star	LIPU	*Liatris punctata*	0–27	–
	desert biscuitroot	LOFO	*Lomatium foeniculaceum*	0–27	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–27	–
	cinquefoil	POTEN	*Potentilla*	0–27	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–27	–
	American vetch	VIAM	*Vicia americana*	0–27	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–27	–
Shrub/Vine					
10	**Shrubs**			81–135	
	pricklypear	OPUNT	*Opuntia*	27–54	–
	rose	ROSA5	*Rosa*	27–54	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–54	–
	prairie sagewort	ARFR4	*Artemisia frigida*	27–54	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–27	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–27	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–27	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			16–157	
	western wheatgrass	PASM	*Pascopyrum smithii*	16–157	–
2	**Needlegrass**			0–78	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–78	–
	green needlegrass	NAVI4	*Nassella viridula*	0–78	–
3	**Mid Warm-Season Grasses**			0–78	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–78	–
4	**Short Warm-Season Grasses**			235–628	
	blue grama	BOGR2	*Bouteloua gracilis*	157–549	–
	buffalograss	BODA2	*Bouteloua dactyloides*	78–157	–
5	**Other Native Grasses**			0–47	

	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–31	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–31	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–16	–
6	**Grass-likes**			78–314	
	needleleaf sedge	CADU6	*Carex duriuscula*	78–314	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–78	–
7	**Non-Native Grasses**			16–110	
	brome	BROMU	*Bromus*	16–110	–
	bluegrass	POA	*Poa*	0–78	–
Forb					
8	**Forbs**			78–235	
	Forb, introduced	2FI	*Forb, introduced*	16–126	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	16–78	–
	goldenrod	SOLID	*Solidago*	16–78	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	16–63	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	16–63	–
	scurfpea	PSORA2	*Psoralidium*	16–47	–
	Forb, native	2FN	*Forb, native*	0–31	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–31	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–31	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–16	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–16	–
	buckwheat	ERIOG	*Eriogonum*	0–16	–
Shrub/Vine					
9	**Shrubs**			78–235	
	pricklypear	OPUNT	*Opuntia*	31–126	–
	prairie sagewort	ARFR4	*Artemisia frigida*	16–110	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–63	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–31	–
	rose	ROSA5	*Rosa*	0–31	–

Animal community

Animal Community – Grazing Interpretations
The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this 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.

Western Wheatgrass/Green Needlegrass (1.1)
Average Annual Production (lbs./acre, air-dry): 2,700
Stocking Rate* (AUM/acre): 0.74

Western Wheatgrass/Blue Grama/Buffalograss (1.2)
Average Annual Production (lbs./acre, air-dry): 2,000
Stocking Rate* (AUM/acre): 0.55

Western Wheatgrass/Bluegrass (1.3)
Average Annual Production (lbs./acre, air-dry): 2,400
Stocking Rate* (AUM/acre): 0.66

Blue Grama/Buffalograss/Cactus (2.1)
Average Annual Production (lbs./acre, air-dry): 1,400
Stocking Rate* (AUM/acre): 0.38

Annual/Pioneer Perennial, Bare Ground (3.1)
Average Annual Production (lbs./acre, air-dry): 800
Stocking Rate* (AUM/acre): 0.22

* Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25% 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 groups C and 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% 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, buffalograss, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50% 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 variety of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

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: Stan Boltz, Range Management Specialist, NRCS; Cynthia Englebert, Range Management Specialist, Forest Service; George Gamblin, Range Management Specialist, NRCS; Tate Lantz, Range Management Specialist, NRCS; Ryan Murray, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; L. Michael Stirling, Range Management Specialist, NRCS; Jim Westerman, Soil Scientist, NRCS.

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Contributors

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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	09/30/2009
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.

2. **Presence of water flow patterns:** None, or barely visible and discontinuous.

3. **Number and height of erosional pedestals or terracettes:** Essentially, non-existent.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 5 percent and patches less than 2 inches in diameter.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.

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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):** Soil aggregate stability rating 5 to 6, usually 6. Typically high root content, organic matter, and granular structure. Soil surface is very resistant to erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically subangular blocky parting to granular, and mollic (higher organic matter) colors of A-horizon about 5 to 8 inches deep. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.

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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):** No compaction layer should be evident, but high clay content of B horizons could appear to be a compacted layer.

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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: Wheatgrasses (mid, cool-season grasses) > needlegrasses (mid and tall, cool-season bunchgrasses >

    Sub-dominant: Tall, warm-season grasses >

    Other: Mid, warm-season grasses = short, warm-season grasses = forbs > grass-likes species = shrubs

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

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no 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):** 75 to 85 percent plant litter cover, roughly 0.5 to 1 inch depth. Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Ranges from 2,100 to 3,300 pounds/acre. Reference value is 2,700 pounds/acre (air-dry weight basis).

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Refer to State and Local Noxious Weed List; also Kentucky bluegrass, smooth bromegrass.

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