

Ecological site R061XS010SD Loamy-South (16-18" PZ)

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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

R061XS012SD	Thin Upland-South (16-18" PZ)
R061XS024SD	Shallow Loamy-South (16-18" PZ)
R061XY020SD	Overflow

Similar sites

R061XS011SD	Clayey-South (16-18" PZ) (R061XS011SD) – Clayey [more green needlegrass; less needleandthread and big bluestem]
R061XY020SD	Overflow (R061XY020SD) – Loamy Overflow [more big bluestem; higher production]

Table 1. Dominant plant species

Tree	Not specified
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Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Hesperostipa comata</i> ssp. <i>comata</i>

Physiographic features

This site occurs on nearly level to moderately sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Terrace (3) Plain
Flooding frequency	None
Ponding frequency	None
Elevation	2,900–4,000 ft
Slope	1–15%
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)	128 days
Freeze-free period (average)	155 days
Precipitation total (average)	20 in

Influencing water features

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

Soil features

The typical features of soils in this site are very fine sandy loam to silty clay textured sub-surface soils, with slopes ranging from about 1 to 15 percent. The soils in this site are well drained and formed in residuum, alluvium, and eolian deposits. The loam to silt loam surface layer is 4 to 9 inches thick. The soils have a moderate to moderately 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) Loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	40–80 in
Surface fragment cover ≤3"	0–4%
Surface fragment cover >3"	0–3%
Available water capacity (0-40in)	6–8 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	6.1–9
Subsurface fragment volume ≤3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–4%

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.

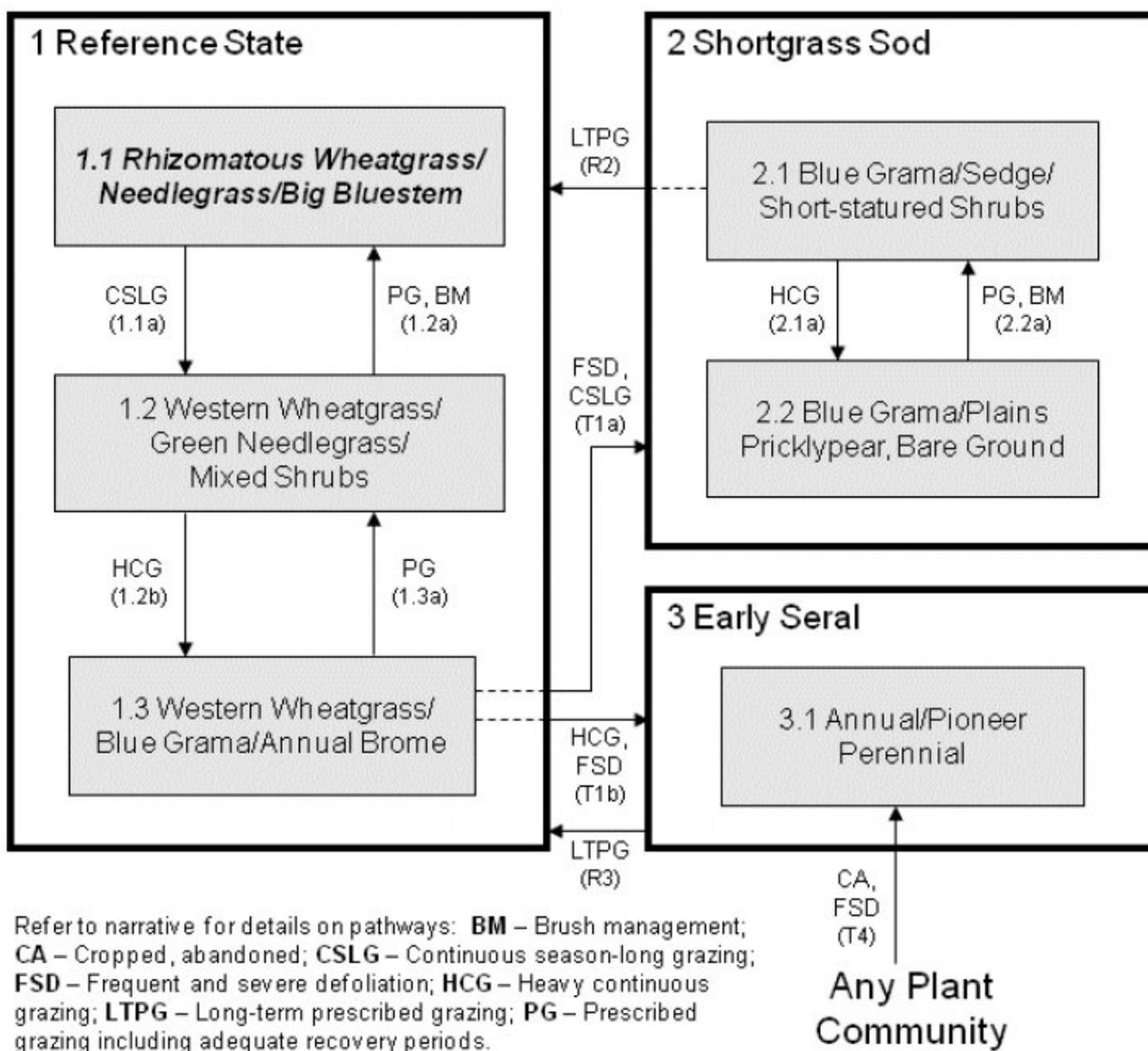
Continuous season-long grazing (during the typical growing season of May through October) and/or heavy continuous grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Rhizomatous Wheatgrass/Needlegrass/Big Bluestem Plant Community Phase. Blue grama will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Needleandthread, green needlegrass, big bluestem, sideoats grama, Indiagrass and little bluestem will decrease in frequency and production. Excessive defoliation can

cause threawn 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, and an increase in shrubs.

Interpretations are primarily based on the Rhizomatous Wheatgrass/Needlegrass/Big Bluestem 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 was 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 frequent 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 state 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 Rhizomatous Wheatgrass/Needlegrass/Big Bluestem



Interpretations are based primarily on the Rhizomatous Wheatgrass/Needlegrass/Big Bluestem Plant Community Phase (this is also considered to be climax). The potential vegetation is about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. The community is dominated by cool-season grasses with warm-season grasses being subdominant. The major grasses include western wheatgrass, needleandthread, green needlegrass, big bluestem, and sideoats grama. Other grass or grass-like species include blue grama, thickspike wheatgrass, Indiangrass, plains muhly, prairie dropseed, and threadleaf sedge. 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1300	1815	2265
Forb	100	220	385
Shrub/Vine	100	165	250
Total	1500	2200	2900

Figure 7. 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/Green Needlegrass/Mixed Shrubs

This plant community phase is a result of continuous season-long grazing or prolonged periods of light use or non-use and a lack of fire. The potential vegetation is about 65 percent grasses or grass-like plants, 15 percent forbs,

and 20 percent shrubs. The community is dominated by cool-season grasses with warm-season being subdominant. The major grasses include western wheatgrass, green needlegrass, needleandthread, and blue grama. Other grass or grass-like species include sideoats grama, thickspike wheatgrass, hairy grama, big bluestem, threadleaf sedge, and sun sedge. Kentucky bluegrass and cheatgrass also begin to invade, and shrubs increase significantly. Forbs commonly include cudweed sagewort, goldenrod, scurfpea, white prairie aster, and western ragweed. Shrubs include western snowberry, fringed sagewort, rose, and in some areas, big sagebrush. 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. However, blue grama and sedge have increased, and runoff and infiltration will begin to be negatively affected.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1120	1473	1720
Shrub/Vine	90	237	450
Forb	90	190	330
Total	1300	1900	2500

Figure 9. 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 1.3 Western Wheatgrass/Blue Grama/Annual Brome

This plant community evolves under heavy continuous 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 grasses include western wheatgrass, blue grama, and threadleaf sedge. Annual brome (cheatgrass and/or Japanese brome grass) may also invade and become significant. Grasses of secondary importance include needleandthread, green needlegrass, hairy grama, sideoats grama, and Kentucky bluegrass. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, scurfpea, and western ragweed. When compared to the Rhizomatous Wheatgrass/Needlegrass/Big Bluestem Plant Community Phase (1.1), blue grama and threadleaf sedge have increased. Needleandthread, green needlegrass and other tall and mid-statured grasses have decreased, and production is also reduced. 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.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1030	1440	1780
Shrub/Vine	85	180	310
Forb	85	180	310
Total	1200	1800	2400

Figure 11. 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		

Pathway 1.1a **Community 1.1 to 1.2**

Continuous season-long grazing or prolonged periods with very light use or no use and a lack of fire will cause this plant community to shift to the Western Wheatgrass/Green Needlegrass/Mixed Shrubs Plant Community Phase (1.2). With continuous season-long grazing, some areas will receive little or no grazing while other areas will be repeatedly grazed.

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 Rhizomatous Wheatgrass/Needlegrass/Big Bluestem Plant Community Phase. Brush management may expedite this shift.

Conservation practices

Prescribed Grazing

Pathway 1.2b **Community 1.2 to 1.3**

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) or a combination of disturbances for extended periods of time will lead to the 1.3 Western Wheatgrass/Blue Grama/Annual Brome Plant Community Phase.

Pathway 1.3a **Community 1.3 to 1.2**

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 1.2 Western Wheatgrass/Green Needlegrass/Mixed Shrubs Plant Community Phase or possibly to the 1.1 Rhizomatous Wheatgrass/Needlegrass/Big Bluestem Plant Community Phase.

Conservation practices

Prescribed Grazing

State 2 **Shortgrass Sod**

This state typically occurs as a result on continuous season-long grazing at moderate to heavy stocking levels over extended periods of time. Gradually short-statured species such as blue grama and threadleaf sedge become dominant. This change in plant composition alters the hydrologic cycle increasing runoff and reducing infiltration. This is due to the compact, short depth of the rooting structure of the dominant species, and in the advanced stages, to the increased bare ground.

Community 2.1 **Blue Grama/Sedge/Short-statured Shrubs**

This plant community evolved under moderate to heavy continuous season-long grazing or from over utilization during extended drought periods. This plant community may also exist adjacent to prairie dog colonies. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 10 percent forbs,

and 15 percent shrubs. Dominant grasses typically include blue grama and threadleaf sedge. Grasses of secondary importance include western wheatgrass, hairy grama, sun sedge, needleandthread, and sand dropseed. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, scurfpea, western ragweed, and western yarrow. When compared to the Rhizomatous Wheatgrass/Needlegrass/Big Bluestem Plant Community Phase (1.1), blue grama and threadleaf sedge 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 has significantly less production. The thick sod prevents other species from getting established. 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 most other grasses. Soil erosion will be minimal due to the sod forming habit of blue grama and buffalograss.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	770	1155	1505
Shrub/Vine	65	140	240
Forb	65	105	155
Total	900	1400	1900

Figure 13. 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		

Community 2.2 Blue Grama/Plains Pricklypear, Bare Ground

This plant community is a result of heavy continuous grazing over extended periods of time, or from a combination of prolonged periods of below-average precipitation and other disturbances. This plant community is similar to the 2.1 Blue Grama/Sedge/Short-statured Shrubs Plant Community Phase, but the grass cover has been reduced even further, and bare ground has increased. Short-statured shrubs such as plains pricklypear and broom snakeweed also have increased. The total annual production is typically about 900 pounds per acre on an air-dry weight basis. Runoff is increased even further due to the increase in bare ground, and erosion will begin to increase.

Figure 14. Plant community growth curve (percent production by month). SD6105, Black Hills Foot Slopes, warm-season dominant. Warm-season dominant.

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

Pathway 2.1a Community 2.1 to 2.2

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) or a combination of disturbances for extended periods of time will lead to the 2.2 Blue Grama/Plains Pricklypear, Bare Ground Plant Community Phase.

Pathway 2.2a Community 2.2 to 2.1

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 2.1 Blue Grama/Sedge/Short-statured Shrubs Plant Community Phase. Brush management may also be needed to expedite

this pathway.

Conservation practices

Brush Management
Prescribed Grazing

State 3 Early Seral

This state is the result of very heavy, concentrated disturbance such as cropping, concentrated rodent activity, or concentrated livestock areas. This State can also result from invasion by highly competitive weed species such as Canada thistle, hound's tongue, leafy spurge, or knapweeds. In most cases, this phase is dominated by annual and/or pioneer perennial species. Bare ground is also typically much higher than on any other plant community phase.

Community 3.1 Annual/Pioneer Perennial

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 brome grass (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 Rhizomatous Wheatgrass/Needlegrass/Big Bluestem Plant Community Phase (1.1), red 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 T1a State 1 to 2

Continuous season-long grazing over extended periods of time or the beginnings of frequent and severe defoliation (as occurs adjacent to prairie dog colonies) will tend to shift this plant community over a threshold leading to the Shortgrass Sod State (State 2).

Transition T1b State 1 to 3

Heavy continuous grazing (typically very heavy grazing for extended periods of time) or frequent and severe defoliation (as occurs with occupation by prairie dogs) will shift this plant community over a threshold leading to the 3.1 Annual/Pioneer Perennial Plant Community Phase within the Early Seral State (State 3).

Restoration pathway R2 State 2 to 1

Long-term prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light

to moderate grazing possibly including periodic rest may eventually shift this plant community over a threshold to the Reference State (State 1).

Conservation practices

Prescribed Grazing

Restoration pathway R2 State 3 to 1

Long-term prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest may eventually shift this plant community over a threshold to the Reference State (State 1).

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	Rhizomatous Wheatgrass			330–770	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	330–660	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–220	–
2	Needlegrass			330–770	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	110–550	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	110–550	–
3	Tall Warm-Season Grasses			44–220	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	44–220	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–66	–
4	Mid Warm-Season Grasses			110–220	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	44–220	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–66	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	22–66	–
5	Short Sod Grasses/Grass-likes			44–110	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–110	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	22–66	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0–44	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–44	–
6	Other Native Grasses			44–110	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	22–88	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–66	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–22	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–22	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–22	–
7	Forbs			110–330	
	Forb, native	2FN	<i>Forb, native</i>	22–66	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–44	–
	false honoet	RRFI1	<i>Brickellia eupatorioides</i>	22–44	–

	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
	prairie clover	DALEA	<i>Dalea</i>	22–44	–
	fleabane	ERIGE2	<i>Erigeron</i>	22–44	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	22–44	–
	scurfpea	PSORA2	<i>Psoralea</i>	22–44	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	22–44	–
	goldenrod	SOLID	<i>Solidago</i>	22–44	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	22–44	–
	American vetch	VIAM	<i>Vicia americana</i>	22–44	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	22–44	–
	beardtongue	PENST	<i>Penstemon</i>	22–44	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–22	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–22	–
	desertparsley	LOMAT	<i>Lomatium</i>	0–22	–
	four o'clock	MIRAB	<i>Mirabilis</i>	0–22	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–22	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense</i> var. <i>occidentale</i>	0–22	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–22	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–22	–
	common starlily	LEMO4	<i>Leucocrinum montanum</i>	0–22	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–22	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–22	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	0–22	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	0–22	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–22	–
Shrub/Vine					
8	Shrubs			110–220	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–66	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	22–66	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–66	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	22–66	–
	rose	ROSA5	<i>Rosa</i>	22–44	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–44	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	22–44	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–22	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			190–570	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	190–475	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–152	–
2	Needlegrass			190–475	

	green needlegrass	NAVI4	<i>Nassella viridula</i>	95–380	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	38–285	–
3	Tall Warm-Season Grasses			0–95	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–95	–
4	Mid Warm-Season Grasses			19–152	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	19–152	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–38	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–38	–
5	Short Sod Grass/Grass-likes			95–285	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	38–190	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–95	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	19–95	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0–76	–
6	Other Native Grasses			19–95	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–57	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	19–57	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–38	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–19	–
7	Non-Native Grasses			19–133	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	19–95	–
	bluegrass	POA	<i>Poa</i>	0–95	–
Forb					
8	Forbs			95–285	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	19–76	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–57	–
	Forb, native	2FN	<i>Forb, native</i>	0–57	–
	goldenrod	SOLID	<i>Solidago</i>	19–57	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	19–38	–
	cinquefoil	POTEN	<i>Potentilla</i>	19–38	–
	scurfpea	PSORA2	<i>Psoralegium</i>	19–38	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	19–38	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	19–38	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	19–38	–
	fleabane	ERIGE2	<i>Erigeron</i>	19–38	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–19	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–19	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–19	–
	desertparsley	LOMAT	<i>Lomatium</i>	0–19	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–19	–
	beardtongue	PENST	<i>Penstemon</i>	0–19	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–19	–
	flea bane	BRFL	<i>Briellia cuneata</i>	0–19	–

	raise dorieset	BKEU	<i>Brickellia eupatorioides</i>	0-19	-
	prairie clover	DALEA	<i>Dalea</i>	0-19	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0-19	-
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	0-19	-
	American vetch	VIAM	<i>Vicia americana</i>	0-19	-
	deathcamas	ZIGAD	<i>Zigadenus</i>	0-19	-
Shrub/Vine					
9	Shrubs			95-380	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	38-190	-
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0-152	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-95	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	19-95	-
	pricklypear	OPUNT	<i>Opuntia</i>	19-57	-
	rose	ROSA5	<i>Rosa</i>	19-57	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-57	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-38	-

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			180-450	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	180-450	-
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0-90	-
2	Needlegrass			18-270	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	18-180	-
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-180	-
3	Tall Warm-Season Grasses			0-54	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-54	-
4	Mid Warm-Season Grasses			18-126	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	18-108	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-36	-
5	Short Sod Grass/Grass-likes			180-540	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	90-270	-
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	36-180	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-144	-
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0-90	-
6	Other Native Grasses			18-90	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-54	-
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0-54	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	18-36	-
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-36	-

7	Non-Native Grasses			90-270	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	36-270	-
	bluegrass	POA	<i>Poa</i>	0-126	-
Forb					
8	Forbs			90-270	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	18-90	-
	Forb, introduced	2FI	<i>Forb, introduced</i>	18-90	-
	Forb, native	2FN	<i>Forb, native</i>	0-54	-
	scurfpea	PSORA2	<i>Psoraleidium</i>	18-54	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	18-54	-
	goldenrod	SOLID	<i>Solidago</i>	18-54	-
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	18-36	-
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	18-36	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-18	-
	fleabane	ERIGE2	<i>Erigeron</i>	0-18	-
	buckwheat	ERIOG	<i>Eriogonum</i>	0-18	-
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0-18	-
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-18	-
	cinquefoil	POTEN	<i>Potentilla</i>	0-18	-
	deathcamas	ZIGAD	<i>Zigadenus</i>	0-18	-
Shrub/Vine					
9	Shrubs			90-270	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	18-126	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	18-126	-
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	18-90	-
	pricklypear	OPUNT	<i>Opuntia</i>	18-72	-
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0-54	-
	rose	ROSA5	<i>Rosa</i>	18-36	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-36	-

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Rhizomatous Wheatgrass			0-140	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-140	-
2	Needlegrass			14-140	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	14-98	-
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-70	-
3	Mid Warm-Season Grasses			0-70	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-70	-
4	Short Sod Grass/Grass-likes			280-770	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	210-490	-

	threadleaf sedge	CAFI	<i>Carex thilifolia</i>	70–280	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–140	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0–112	–
5	Other Native Grasses			14–112	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–70	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–42	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–42	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	14–28	–
6	Non-Native Grasses			14–140	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	14–140	–
	bluegrass	POA	<i>Poa</i>	0–56	–
Forb					
7	Forbs			70–140	
	Forb, introduced	2FI	<i>Forb, introduced</i>	14–70	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	14–56	–
	goldenrod	SOLID	<i>Solidago</i>	14–42	–
	Forb, native	2FN	<i>Forb, native</i>	0–42	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	14–28	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	14–28	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	14–28	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	14–28	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–14	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–14	–
Shrub/Vine					
8	Shrubs			70–210	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	14–112	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	14–70	–
	pricklypear	OPUNT	<i>Opuntia</i>	14–70	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	14–42	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–28	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–14	–
	rose	ROSA5	<i>Rosa</i>	0–14	–

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.

Rhizomatous Wheatgrass/Needlegrass/Big Bluestem (1.1)

Average Annual Production (lbs./acre, air-dry): 2,200
Stocking Rate* (AUM/acre): 0.60

Western Wheatgrass/Green Needlegrass/Mixed Shrubs (1.2)
Average Annual Production (lbs./acre, air-dry): 1,900
Stocking Rate* (AUM/acre): 0.52

Western Wheatgrass/Blue Grama/Annual Brome (1.3)
Average Annual Production (lbs./acre, air-dry): 1,800
Stocking Rate* (AUM/acre): 0.49

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

Blue Grama/Plains Pricklypear, Bare Ground (2.2)
Average Annual Production (lbs./acre, air-dry): 900
Stocking Rate* (AUM/acre): 0.25

Annual/Pioneer Perennial (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 group B and C. 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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USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (<http://wcc.nrcs.usda.gov>)

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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.

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.

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 usually 6. Typically high root content, organic matter, and granular structure. Soil surface is very resistant to erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically granular, and mollic (higher organic matter) colors of A-horizon about 4 to 8 inches deep. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.

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.

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.

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: Rhizomatous wheatgrass (mid, cool-season) = needlegrasses (tall and mid, cool-season) >

Sub-dominant: Forbs >

Other: Tall, warm-season grasses = mid, warm-season grasses = shrubs > short sod grasses & grass-likes

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

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.

14. **Average percent litter cover (%) and depth (in):** 80 to 90 percent plant litter cover, roughly 0.5 to 1 inch depth. Litter

cover is in contact with soil surface.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Ranges from 1,500 to 2,900 pounds/acre. Reference value is 2,200 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 brome grass.
-
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.
-