

Ecological site R060AY021SD Clayey Overflow

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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.

MLRA notes

Major Land Resource Area (MLRA): 060A-Pierre Shale Plains

The Pierre Shale Plains (MLRA 60A) consists of approximately 10,150 square miles, the majority of which is located in South Dakota (70 percent) and small portions are in Montana (2 percent), Nebraska (8 percent), and Wyoming (20 percent). It encircles the Black Hills (MLRA) and the Dakota Hogback (MLRA 61). MLRA 60A includes portions of the Oglala, Buffalo Gap, and Thunder Basin National Grasslands. It also includes small sections of the Pine Ridge Indian Reservation, Badlands National Park, and Black Hills National Forest. The Cheyenne and Belle Fourche Rivers flow through the MLRA.

MLRA 60A is in the unglaciated section of the Missouri Plateau, of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been deeply eroded. Cretaceous Pierre Shale underlies almost all of this MLRA. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clay. These clays shrink as they dry and swell as they receive moisture. Soils are shallow to very deep and generally are well drained and clayey.

Elevations generally range from 2,620 to 3,610 feet throughout the MLRA, but can range up to 4,260 feet. The average annual precipitation for the western side of the MLRA is 13 to 16 inches, whereas the eastern side receives 16 to 18 inches. A suite of ecological sites have been written specifically for these two precipitation zones. The Locator Map shows the break between the two precipitation zones.

This area supports a mixed natural prairie vegetation consisting of both cool- and warm-season grasses and forbs. Wyoming big sagebrush occurs primarily in the drier western portion of the MLRA; however, small remnant stands can be found in the eastern portion. Dominant land uses of the area primarily are ranching and, to a lesser extent, farming. Major resource concerns to this MLRA are wind erosion and surface water quality.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 63B – Southern Rolling Pierre Shale Plains.

EPA - Level IV Ecoregions of the Continental United States: 43e – Sagebrush Steppe, 43g Semiarid Pierre Shale Plains, and 43k – Dense Clay Prairie.

Ecological site concept

The Clayey Overflow Ecological Site occurs throughout the MLRA. It is typically located on Stream Orders 2 and 3 however it can be found on lower stream reaches. This site is a run-in site and receives additional moisture through runoff from adjacent uplands and overflow during occasional flooding. Typical slope range is from 0 to 3 percent. The soil surface layer is 3 to 11 inches in depth with a texture range of silty clay loam to clay. When degraded, this site is susceptible to down cutting. The natural vegetation will gradually shift from almost exclusively herbaceous species in the upper reaches of a drainage to a mix of species including grasses, forbs, shrubs, and trees, in the lower reaches.

Vegetation in Reference consists of a mix of cool- and warm-season tall- and mid-grasses. Western wheatgrass and green needlegrass are dominant, and prairie cordgrass, switchgrass, and big bluestem are sub-dominant. Forbs are common and very diverse. Patches of western snowberry, American plum, chokecherry, and willow are commonly present. In the western portion of the MLRA, Wyoming big sagebrush will likely be present. When trees are present, they will include plains cottonwood, willow, green ash, boxelder, and hackberry. When disturbed, this site is very susceptible to invasion of non-native cool-season grasses, Canada thistle, hound's tongue, and other weedy forbs. It is also susceptible to invasion of Russian olive and saltcedar.

Associated sites

R060AY007SD	Saline Lowland The Saline Lowland can occur adjacent to the overflow site, either upstream or on a low terrace between the overflow and the Loamy Terrace.
R060AY011SD	Clayey 13-16" P.Z. The Clayey 13-16 PZ site will be located an upland landscape position above the overflow site.
R060AY015SD	Thin Claypan The Thin Claypan can occur adjacent to the overflow site, either upstream or on a low terrace above the overflow site.
R060AY018SD	Dense Clay The Dense Clay site will be located an upland landscape position above the overflow site.
R060AY022SD	Loamy Terrace The Loamy Terrace site will be located on the stream or river terrace above the overflow site.
R060AY040SD	Clayey 16-18" P.Z. The Clayey 16-18 PZ site will be located an upland landscape position above the overflow site.

Similar sites

R060AY020SD	Loamy Overflow
	The Loamy Overflow will have more bluestems, less western wheatgrass and more potential for tree and
	shrub establishment.

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) Pascopyrum smithii (2) Nassella viridula

Physiographic features

This site is nearly level to gently sloping and occurs on uplands and river valleys.

Landforms	(1) Alluvial fan(2) Flood plain(3) Stream terrace			
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)			
Flooding frequency	Rare to frequent			
Ponding frequency	None			
Elevation	2,500–4,300 ft			
Slope	0–3%			
Water table depth	80 in			
Aspect	Aspect is not a significant factor			

Table 2. Representative physiographic features

Climatic features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains, where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation for the entire MLRA ranges from 13 to 18 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air masses from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but the more severe occur during late fall, late winter, and spring.

The normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 19°F (Moorcroft CAA, WY) to about 22°F (Belle Fourche, SD). July is the warmest month with temperatures averaging from about 70°F (Moorcroft CAA, WY) to about 72°F (Belle Fourche, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 51°F. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds generally are stronger than nighttime, and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

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

Frost-free period (characteristic range)	98-105 days
Freeze-free period (characteristic range)	123-129 days
Precipitation total (characteristic range)	15-18 in
Frost-free period (actual range)	76-108 days
Freeze-free period (actual range)	113-133 days

Table 3. Representative climatic features

Precipitation total (actual range)	14-18 in
Frost-free period (average)	97 days
Freeze-free period (average)	124 days
Precipitation total (average)	16 in

Climate stations used

- (1) WASTA [USC00398911], Owanka, SD
- (2) MOORCROFT 3S [USW00024088], Moorcroft, WY
- (3) UPTON [USC00489205], Upton, WY
- (4) REDBIRD [USC00487555], Lance Creek, WY
- (5) ARDMORE 1 NW [USC00390236], Edgemont, SD
- (6) BELLE FOURCHE [USC00390559], Belle Fourche, SD

Influencing water features

Stream Type: B6, C6 (Rosgen System)

Wetland description

Not Applicable.

Soil features

The soils in this site are moderately well to well drained and formed in alluvium. The silty clay loam to clay surface layer is 3 to 11 inches thick. The soils have a very slow to moderately slow infiltration rate. This site should show 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.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and/or production.

Major soils correlated to the Clayey Overflow site include: Harlaker, Lodgepole, Lohmiller, and Setter.

More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Table 4. Representative soil features

Surface texture	(1) Sandy clay loam(2) Clay(3) Sandy clay			
Family particle size	(1) Clayey			
Drainage class	Moderately well drained to well drained			
Permeability class	Very slow to moderately slow			
Soil depth	80 in			
Surface fragment cover <=3"	0%			
Surface fragment cover >3"	0%			
Available water capacity (0-40in)	5–8 in			
Calcium carbonate equivalent (0-40in)	0–15%			

Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions specify more typical transitions between communities that will occur, severe disturbances, such as periods of well-below average precipitation, can cause significant shifts in plant communities and/or species composition.

As this site deteriorates, introduced species such as Kentucky bluegrass annual brome and Canada thistle will invade the site. Grasses such as slender wheatgrass, green needlegrass, prairie cordgrass, rhizomatous wheatgrasses, big bluestem, and switchgrass will decrease in frequency and production. Russian olive and/or saltcedar can become established on this site regardless of disturbance.

Clayey Overflow sites that are in association with Dense Clay and Thin Claypan sites with slick spots tend to create inclusions of a transitional plant community. The higher salt levels in the soils create a plant community that combines characteristics of both the Saline Lowland and Clayey Overflow sites. Due to the amount and pattern of the precipitation, the big sagebrush component typically is not resilient once it has been removed if a vigorous stand of grass exists and is maintained. Big sagebrush occurs mainly in the western portions of this MLRA, while silver sagebrush is found throughout the MLRA.

The plant community upon which interpretations are primarily based is the Reference Plant Community (1.1). The Reference Plant Community has been determined by studying rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model



Clayey Overflow - R060AY021SD 7/17/17

BM – Brush management CSG – Continuous seasonal grazing CSLG – Continuous season-long grazing without adequate recovery periods EH – Excessive haying Er – Erosion F - Fire FSG – Frequent and severe grazing H - Haying HCSLG – Heavy, continuous season-long grazing without adequate recovery periods HCSG – Heavy, continuous seasonal grazing HD – Heavy disturbance

In – Invasion of non-native cool-season grasses

LTPG – Long-term prescribed grazing, including adequate recovery opportunity and change in season of use

- NF No fire
- NU No use
- PG Prescribed grazing with adequate recovery opportunity
- RD Removal of disturbance
- --+ Transition may not be rapid or economical

Figure 8. Clayey Overflow - R060AY021SD.

Diagram Legend - Clayey Overflow - R060AY021SD								
T1A	Frequent grasses,	Frequent and severe defoliation, heavy disturbance, invasion of non-native cool-season grasses, soil erosion (down cutting of stream channel).						
R2A	Removal of disturbance, long-term prescribed grazing with change in season of use and adequate recovery period, no fire, potentially long- or short-term rest (non-use). Recovery may not be rapid and/or meet management goals.							
CP 1.1A	1.1 - 1.2	Fire and/or mechanical brush management incorporated with continuous seasonal grazing or haying.						
CP 1.1B	1.1 - 1.3	Heavy, continuous season-long grazing or heavy, continuous seasonal grazing, fire and/or mechanical brush management or excessive haying.						
CP 1.2A	1.2 - 1.1	Long-term prescribed grazing including change in season of use, proper stocking, and adequate time for rest and recovery, and no fire.						
CP 1.2B	1.2 - 1.3	Continuous season-long grazing or continuous seasonal grazing, and/or excessive haying.						
CP 1.3A	1.3 - 1.1	Long-term prescribed grazing including change in season of use, proper stocking, and adequate time for rest and recovery, and no fire.						
CP 1.3B	1.3 - 1.2	Prescribed grazing including change in season of use, proper stocking, and adequate time for rest and recovery.						

Figure 9. Clayey Overflow - R060AY021SD.

State 1 Reference State

This State represents what is believed to exist prior to European settlement In Reference, this site is dominated by cool- and warm-season season grasses, and various shrub species. Grazing or the lack of grazing, fire, excessive haying, erosion, and invasion of non-native cool-season grasses are major drivers in this State.

Community 1.1 Rhizomatous Wheatgrass-Needlegrass-Tall Warm-Season Grasses/Mixed Shrubs

The plant community upon which interpretations are primarily based is the Rhizomatous Wheatgrass- Needlegrass-Tall Warm-Season Grasses/Mixed Shrubs Plant Community (1.1). This is also considered the Reference Plant Community. Potential vegetation is about 65 to 85 percent grasses or grass-like plants, 5 to 10 percent forbs, 5 to 15 percent shrubs, and 0 to 3 percent trees. A mix of cool- and warm-season grasses dominates the plant community. The major grasses and grass-likes include rhizomatous wheatgrasses, prairie cordgrass, green needlegrass, big bluestem, switchgrass, sedges, and rushes. Other grasses in the plant community include mat muhly, Sandberg bluegrass, Canada wildrye, needleleaf sedge, blue grama, and prairie Junegrass. Shrubs include silver sagebrush, leadplant, chokecherry, big sagebrush, rose, and snowberry. Forbs such as aster, American vetch, prairie coneflower, prairie clover, American licorice, cudweed sagewort, and goldenrod are common. Trees occurring on the site include scattered green ash, cottonwood, boxelder, and elm. 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 off-site and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Run-off from adjacent sites and moderate or high available water capacity provides a favorable soilwater-plant relationship.

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	900	1700	2270
Forb	100	210	350
Shrub/Vine	100	158	215
Tree	0	32	65
Total	1100	2100	2900

Figure 11. Plant community growth curve (percent production by month). SD6008, Pierre Shale Plains, lowland cool season/warm season co-dominant. Cool season, warm season co-dominant, lowland..

Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Community 1.2 Rhizomatous Wheatgrass-Needlegrass

This plant community is the result of fire or brush management followed by continuous seasonal grazing or haying. Western wheatgrass and green needlegrass dominate; however, many of the species found in the Reference Plant Community (1.1) continue to persist. These grasses form a sod which is very productive and is often used for dryland hay. This plant community is productive but lacks the diversity of the Reference Plant Community. The soil of this plant community is protected. The watershed is functioning but may produce slightly increased runoff.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1760	2136	2470
Forb	120	188	275
Shrub/Vine	20	138	275
Tree	0	38	80
Total	1900	2500	3100

Figure 13. Plant community growth curve (percent production by month). SD6008, Pierre Shale Plains, lowland cool season/warm season co-dominant. Cool season, warm season co-dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Community 1.3 Rhizomatous Wheatgrass

This plant community results from heavy continuous season-long or seasonal grazing without adequate recovery periods between each grazing event during the growing season. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. Western wheatgrass is the dominant species. Big bluestem, green needlegrass, switchgrass, and prairie cordgrass are greatly reduced. Forb species include western yarrow, asters, prairie coneflower, and western ragweed. Shrubs will be greatly reduced. This plant community is relatively stable and less productive than the Reference Plant Community (1.1). Reduction of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and increased runoff. This plant community can occur throughout the site, on spot-grazed areas, and around water sources where season-long grazing patterns occur. Soil erosion may increase as runoff increases.

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	820	1320	1815
Forb	70	112	155
Shrub/Vine	10	45	80
Tree	0	23	50
Total	900	1500	2100

Figure 15. Plant community growth curve (percent production by month). SD6007, Pierre Shale Plains, cool season dominant, warm season subdominant. Cool season dominant, warm season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	13	20	25	18	11	5	3	0	0

Pathway 1.1A Community 1.1 to 1.2

Continuous seasonal grazing, haying, and/or brush management or fire will convert this plant community to the Rhizomatous Wheatgrass-Needlegrass Plant Community (1.2).

Pathway 1.1B Community 1.1 to 1.3

Heavy, continuous season-long grazing, heavy continuous seasonal grazing, or excessive haying in combination with brush management or fire will convert this plant community to the Rhizomatous Wheatgrass Plant Community (1.3)

Pathway 1.2A Community 1.2 to 1.1

Long-term prescribed grazing that incorporates proper stocking rates, change in season of use, and adequate time for recovery following grazing, and protecting shrubs from fire will aid in returning this plant community phase to the Reference Plant Community (1.1).

Pathway 1.2B Community 1.2 to 1.3

Heavy, continuous season-long grazing, or continuous seasonal grazing, or excessive having will push this plant community to the Rhizomatous Wheatgrass Plan Community (1.3).

Pathway 1.3A Community 1.3 to 1.1

Long-term prescribed grazing including change in season of use, proper stocking, and adequate time for rest and recovery, and no fire over time will shift this plant community back to the Reference Plant Community (1.1).

Pathway 1.3B Community 1.3 to 1.2

Prescribed grazing that incorporates proper stocking rates, change in season of use, and adequate time for recovery following grazing will shift this plant community back to the Rhizomatous Wheatgrass- Needlegrass Plant Community (1.2).

Degraded State

Heavy, long-term animal or machinery impacts have altered soil site stability, hydrologic function, and the biotic integrity of the site. Erosion can down-cut the channel to the point that the site no longer receives additional moisture from overflow. This State is resistant to change and a restoration pathway may not be feasible.

Community 2.1 Western Wheatgrass-Annual Grasses/Forbs/Shrubs

This plant community developed with heavy continuous season-long grazing. Western wheatgrass and Kentucky bluegrass dominate the community. Green needlegrass has been greatly reduced. Big bluestem has been removed. Western yarrow, scurfpea, ragweed, and goldenrod have increased. Non- native grasses and forbs such as annual bromes, curlycup gumweed, thistle, and cocklebur will invade this plant community. This plant community is resistant to change to a higher successional plant community due to low plant diversity and competition of the invaded species. A significant amount of production and diversity has been lost when compared to the Reference Plant Community (1.1). The loss of desirable species has negatively impacted energy flow and nutrient cycling. Water infiltration is reduced significantly. Soil loss may be accelerated where concentrated flows occur. It will take a very long time to restore this plant community back to the Reference State with improved management alone. Renovation would be very costly.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	375	692	1110
Forb	85	135	185
Shrub/Vine	40	68	95
Tree	0	5	10
Total	500	900	1400

Figure 17. Plant community growth curve (percent production by month). SD6006, Pierre Shale Plains, lowland cool season dominant. Cool season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Transition T1A State 1 to 2

Frequent and severe defoliation, heavy disturbance such as livestock feed, excessive haying, invasion of non-native cool-season grasses, and erosion will transition the Reference State (1.0) to the Degraded State (2.0).

Restoration pathway R2A State 2 to 1

Removal of disturbance that caused transition, in combination with long-term prescribed grazing, no fire, and potentially periods of non-use to allow for recovery. This transition may not be rapid or economical and may not meet management goals.

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	Western Wheatgrass			735–1155						

	western wheatgrass	PASM	Pascopyrum smithii	735–1155	_
	slender wheatgrass	ELTRT	Elymus trachycaulus ssp. trachycaulus	42–168	_
	slender wheatgrass	ELTRS	Elymus trachycaulus ssp. subsecundus	21–147	_
	thickspike wheatgrass	ELLAL	Elymus lanceolatus ssp. lanceolatus	21–105	
	Montana wheatgrass	ELAL7	Elymus albicans	0–42	
2	Tall Warm-Season Grass	ses		21–105	
	big bluestem	ANGE	Andropogon gerardii	0–210	-
	prairie cordgrass	SPPE	Spartina pectinata	20–100	-
	switchgrass	PAVI2	Panicum virgatum	21–63	-
3	Needlegrass	-		42–105	
	green needlegrass	NAVI4	Nassella viridula	42–105	-
4	Native Grasses and Gra	ss-likes		105–210	
	buffalograss	BODA2	Bouteloua dactyloides	21–105	-
	blue grama	BOGR2	Bouteloua gracilis	21–105	
	squirreltail	ELEL5	Elymus elymoides	0–105	_
	marsh muhly	MURA	Muhlenbergia racemosa	0–105	_
	composite dropseed	SPCOC2	Sporobolus compositus var. compositus	21–105	_
	spikerush	ELEOC	Eleocharis	0–63	-
	rush	JUNCU	Juncus	0–63	_
	sedge	CAREX	Carex	21–63	_
	saltgrass	DISP	Distichlis spicata	21–63	-
	Canada wildrye	ELCA4	Elymus canadensis	0–63	-
	Grass, perennial	2GP	Grass, perennial	0–63	-
	prairie Junegrass	KOMA	Koeleria macrantha	0–42	-
	foxtail barley	HOJU	Hordeum jubatum	0–42	-
	mat muhly	MURI	Muhlenbergia richardsonis	0–42	-
	Sandberg bluegrass	POSE	Poa secunda	0–42	-
Forb		-	-		
6	Forbs			105–315	
	white sagebrush	ARLU	Artemisia ludoviciana	21–105	-
	starry false lily of the valley	MAST4	Maianthemum stellatum	0–105	_
	white heath aster	SYER	Symphyotrichum ericoides	21–105	_
	American vetch	VIAM	Vicia americana	0–63	
	Maximilian sunflower	HEMA2	Helianthus maximiliani	0–63	
	hairy false goldenaster	HEVI4	Heterotheca villosa	0–63	_
	mint	MENTH	Mentha	21–63	
	scarlet beeblossom	OESU3	Oenothera suffrutescens	0–63	
	scurfpea	PSORA2	Psoralidium	21–63	
	upright prairie coneflower	RACO3	Ratibida columnifera	0–63	_
	goldenrod	SOLID	Solidago	0–63	_
I	falso honosot	DDEII	Brickallia aunatoriaidae	0 63 N	

	ומושב שטוובשבו	DIVEO	υποκειπα ευμαιοποιάες	0-00	-
	purple prairie clover	DAPU5	Dalea purpurea	0–63	_
	American licorice	GLLE3	Glycyrrhiza lepidota	0–63	-
	Forb, annual	2FA	Forb, annual	21–63	-
	Forb, perennial	2FP	Forb, perennial	21–63	-
	common yarrow	ACMI2	Achillea millefolium	0–63	_
	Cuman ragweed	AMPS	Ambrosia psilostachya	0–42	_
	thistle	CIRSI	Cirsium	21–42	-
	curlycup gumweed	GRSQ	Grindelia squarrosa	0–21	_
	cocklebur	XANTH2	Xanthium	0–21	_
Shrub	/Vine	•			
7	Shrubs			105–210	
	silver sagebrush	ARCA13	Artemisia cana	42–315	_
	big sagebrush	ARTR2	Artemisia tridentata	42–315	_
	western snowberry	SYOC	Symphoricarpos occidentalis	42–315	_
	chokecherry	PRVI	Prunus virginiana	21–105	_
	rose	ROSA5	Rosa	21–105	_
	willow	SALIX	Salix	21–105	_
	fourwing saltbush	ATCA2	Atriplex canescens	0–63	_
	prairie sagewort	ARFR4	Artemisia frigida	0–63	-
	Subshrub (<.5m)	2SUBS	Subshrub (<.5m)	0–63	-
	leadplant	AMCA6	Amorpha canescens	0–63	-
	greasewood	SAVE4	Sarcobatus vermiculatus	0–50	-
Tree		-	-		
8	Trees			0–63	
	green ash	FRPE	Fraxinus pennsylvanica	0–63	-
	plains cottonwood	PODEM	Populus deltoides ssp. monilifera	0–63	-
	American elm	ULAM	Ulmus americana	0–63	-
	boxelder	ACNE2	Acer negundo	0–42	-
	common hackberry	CEOC	Celtis occidentalis	0–42	_
	hawthorn	CRATA	Crataegus	0–21	_
	Tree	2TREE	Tree	0–21	_
	-				

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass	/Grasslike				
1	Wheatgrass			750–1000	
	western wheatgrass	PASM	Pascopyrum smithii	750–1000	-
	slender wheatgrass	ELTRT	Elymus trachycaulus ssp. trachycaulus	250–500	_
	thickspike wheatgrass	ELLAL	Elymus lanceolatus ssp. lanceolatus	250–500	_
	Montana wheatgrass	ELAL7	Elymus albicans	125–375	_
	slender wheatgrass	ELTRS	Elymus trachycaulus ssp. subsecundus	0–125	-
2	Tall Warm-Season Gras	250-750			

-				200,00	
	big bluestem	ANGE	Andropogon gerardii	250–500	-
	switchgrass	PAVI2	Panicum virgatum	125–375	-
	prairie cordgrass	SPPE	Spartina pectinata	75–250	_
3	Needlegrass	-		375–750	
	green needlegrass	NAVI4	Nassella viridula	375–750	-
4	Native Grasses and Gra	ss-likes		125–250	
	Canada wildrye	ELCA4	Elymus canadensis	125–250	-
	sedge	CAREX	Carex	125–250	_
	blue grama	BOGR2	Bouteloua gracilis	25–125	-
	composite dropseed	SPCOC2	Sporobolus compositus var. compositus	25–125	-
	squirreltail	ELEL5	Elymus elymoides	0–125	-
	spikerush	ELEOC	Eleocharis	0–125	-
	rush	JUNCU	Juncus	0–125	-
	prairie Junegrass	KOMA	Koeleria macrantha	25–125	-
	buffalograss	BODA2	Bouteloua dactyloides	25–125	-
	marsh muhly	MURA	Muhlenbergia racemosa	0–100	-
	Sandberg bluegrass	POSE	Poa secunda	0–75	-
	Grass, perennial	2GP	Grass, perennial	0–75	-
	mat muhly	MURI	Muhlenbergia richardsonis	0–50	-
	foxtail barley	HOJU	Hordeum jubatum	0–50	_
	saltgrass	DISP	Distichlis spicata	0–25	_
Forb					
6	Forbs			125–250	
	Forb, annual	2FA	Forb, annual	0–75	-
	Forb, perennial	2FP	Forb, perennial	0–75	-
	common yarrow	ACMI2	Achillea millefolium	0–75	-
	white sagebrush	ARLU	Artemisia Iudoviciana	0–75	-
	false boneset	BREU	Brickellia eupatorioides	0–75	-
	purple prairie clover	DAPU5	Dalea purpurea	0–75	-
	American licorice	GLLE3	Glycyrrhiza lepidota	0–75	-
	hairy false goldenaster	HEVI4	Heterotheca villosa	0–75	-
	starry false lily of the valley	MAST4	Maianthemum stellatum	0–75	_
	scarlet beeblossom	OESU3	Oenothera suffrutescens	0–75	-
	scurfpea	PSORA2	Psoralidium	0–75	-
	upright prairie coneflower	RACO3	Ratibida columnifera	0–75	-
	goldenrod	SOLID	Solidago	0–75	_
	white heath aster	SYER	Symphyotrichum ericoides	0–75	_
	American vetch	VIAM	Vicia americana	0–75	_
	mint	MENTH	Mentha	0–50	_
	Maximilian sunflower	HEMA2	Helianthus maximiliani	0–50	-
	thistle	CIRSI	Cirsium	0–25	-
I					

Shrub/Vine

Shrub	/Vine				
7	Shrubs			25–250	
	big sagebrush	ARTR2	Artemisia tridentata	0–125	_
	fourwing saltbush	ATCA2	Atriplex canescens	0–125	-
	rose	ROSA5	Rosa	25–125	_
	silver sagebrush	ARCA13	Artemisia cana	0–125	_
	Subshrub (<.5m)	2SUBS	Subshrub (<.5m)	0–75	_
	leadplant	AMCA6	Amorpha canescens	0–75	_
	chokecherry	PRVI	Prunus virginiana	0–75	_
	greasewood	SAVE4	Sarcobatus vermiculatus	0–75	-
	western snowberry	SYOC	Symphoricarpos occidentalis	0–75	-
	willow	SALIX	Salix	0–50	-
	prairie sagewort	ARFR4	Artemisia frigida	0–50	-
Tree		•	•		
8	Trees			0–75	
	green ash	FRPE	Fraxinus pennsylvanica	0–75	-
	plains cottonwood	PODEM	Populus deltoides ssp. monilifera	0–75	-
	American elm	ULAM	Ulmus americana	0–75	-
	boxelder	ACNE2	Acer negundo	0–50	_
	common hackberry	CEOC	Celtis occidentalis	0–50	_
	hawthorn	CRATA	Crataegus	0–50	_

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass	/Grasslike	•	·		
1	Wheatgrass			525–675	
	western wheatgrass	PASM	Pascopyrum smithii	525–675	_
	thickspike wheatgrass	ELLAL	Elymus lanceolatus ssp. lanceolatus	15–75	_
	slender wheatgrass	ELTRT	Elymus trachycaulus ssp. trachycaulus	30–75	_
	Montana wheatgrass	ELAL7	Elymus albicans	0–30	_
	slender wheatgrass	ELTRS	Elymus trachycaulus ssp. subsecundus	0–30	_
2	Tall Warm-Season Grass	ses		30–150	
	big bluestem	ANGE	Andropogon gerardii	0–75	_
	switchgrass	PAVI2	Panicum virgatum	30–75	_
	prairie cordgrass	SPPE	Spartina pectinata	30–75	-
3	Needlegrass			150–300	
	green needlegrass	NAVI4	Nassella viridula	150–300	_
4	Native Grasses and Gra	ss-likes		75–150	
	buffalograss	BODA2	Bouteloua dactyloides	15–75	-
	blue grama	BOGR2	Bouteloua gracilis	15–75	_
	sedge	CAREX	Carex	30–75	_
	saltgrass	DISP	Distichlis spicata	15–75	_
	Concide wildings			4E 7E	

	Canada wildrye	ELCA4	Elymus canadensis	10-70	-
	squirreltail	ELEL5	Elymus elymoides	0–75	-
	composite dropseed	SPCOC2	Sporobolus compositus var. compositus	15–75	_
	mat muhly	MURI	Muhlenbergia richardsonis	0–45	_
	spikerush	ELEOC	Eleocharis	0–45	_
	foxtail barley	HOJU	Hordeum jubatum	0–45	_
	rush	JUNCU	Juncus	0–45	_
	Grass, perennial	2GP	Grass, perennial	0–45	-
	prairie Junegrass	KOMA	Koeleria macrantha	0–30	-
	marsh muhly	MURA	Muhlenbergia racemosa	0–30	-
	Sandberg bluegrass	POSE	Poa secunda	0–30	-
5	Non-native Grasses	-	ł	30–150	
	Kentucky bluegrass	POPR	Poa pratensis	30–150	-
	cheatgrass	BRTE	Bromus tectorum	15–75	-
Forb)	-!	ł		
6	Forbs			75–150	
	white sagebrush	ARLU	Artemisia ludoviciana	15–75	-
	white heath aster	SYER	Symphyotrichum ericoides	15–75	_
	hairy false goldenaster	HEVI4	Heterotheca villosa	0–45	-
	scarlet beeblossom	OESU3	Oenothera suffrutescens	0-45	_
	scurfpea	PSORA2	Psoralidium	15–45	_
	upright prairie coneflower	RACO3	Ratibida columnifera	0-45	-
	goldenrod	SOLID	Solidago	0–45	_
	thistle	CIRSI	Cirsium	15–45	-
	American licorice	GLLE3	Glycyrrhiza lepidota	0–45	-
	Forb, annual	2FA	Forb, annual	15–45	_
	Forb, perennial	2FP	Forb, perennial	15–45	_
	common yarrow	ACMI2	Achillea millefolium	0-45	-
	Cuman ragweed	AMPS	Ambrosia psilostachya	0–30	_
	curlycup gumweed	GRSQ	Grindelia squarrosa	0–30	-
	purple prairie clover	DAPU5	Dalea purpurea	0–30	-
	starry false lily of the valley	MAST4	Maianthemum stellatum	0–30	-
	cocklebur	XANTH2	Xanthium	0–30	-
	mint	MENTH	Mentha	0–15	-
	Maximilian sunflower	HEMA2	Helianthus maximiliani	0–15	-
Shru	ıb/Vine		l		
7	Shrubs		15–75		
	silver sagebrush	ARCA13	Artemisia cana	0–75	
	big sagebrush	ARTR2	Artemisia tridentata	0–75	
	greasewood	SAVE4	Sarcobatus vermiculatus	0–75	_
	western snowberry	SYOC	Symphoricarpos occidentalis	0-45	
	chokochorny		Durante e instation e	0.45	

	rose	ROSA5	Rosa	15–45	-
	prairie sagewort	ARFR4	Artemisia frigida	0–45	-
	Subshrub (<.5m)	2SUBS	Subshrub (<.5m)	0–45	-
	willow	SALIX	Salix	0–30	-
	fourwing saltbush	ATCA2	Atriplex canescens	0–15	-
	leadplant	AMCA6	Amorpha canescens	0–15	-
Tree	Tree				
8	Trees			0–45	
	green ash	FRPE	Fraxinus pennsylvanica	0–45	-
	plains cottonwood	PODEM	Populus deltoides ssp. monilifera	0–30	-
	American elm	ULAM	Ulmus americana	0–30	-
	boxelder	ACNE2	Acer negundo	0–30	-
	common hackberry	CEOC	Celtis occidentalis	0–30	-
	hawthorn	CRATA	Crataegus	0–15	_
	Tree	2TREE	Tree	0–15	_

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)	
Grass	Grass/Grasslike					
1	Wheatgrass			90–315		
	western wheatgrass	PASM	Pascopyrum smithii	90–315	_	
	slender wheatgrass	ELTRT	Elymus trachycaulus ssp. trachycaulus	0–45	_	
	thickspike wheatgrass	ELLAL	Elymus lanceolatus ssp. lanceolatus	9–45	_	
	slender wheatgrass	ELTRS	Elymus trachycaulus ssp. subsecundus	0–18	_	
2	Tall Warm-Season Gras	sses		25–100		
	prairie cordgrass	SPPE	Spartina pectinata	25–100	_	
3	Needlegrass			0–45		
	green needlegrass	NAVI4	Nassella viridula	0–45	_	
4	Native Grasses and Grass-likes			45–180		
	saltgrass	DISP	Distichlis spicata	9–90	_	
	squirreltail	ELEL5	Elymus elymoides	0–45	_	
	Grass, perennial	2GP	Grass, perennial	0–45	_	
	buffalograss	BODA2	Bouteloua dactyloides	9–45	_	
	blue grama	BOGR2	Bouteloua gracilis	9–45	_	
	sedge	CAREX	Carex	9–45	_	
	foxtail barley	HOJU	Hordeum jubatum	18–45	_	
	composite dropseed	SPCOC2	Sporobolus compositus var. compositus	9–45	_	
	rush	JUNCU	Juncus	0–27	_	
	mat muhly	MURI	Muhlenbergia richardsonis	0–27	_	
	spikerush	ELEOC	Eleocharis	0–27	_	
	Sandberg bluegrass	POSE	Poa secunda	0–18	_	
	orairie Juneorass	KOMA	Koeleria macrantha	0–18	_	

I	P	1			
5	Non-native Grasses	•	•	45–135	
	Kentucky bluegrass	POPR	Poa pratensis	18–135	-
	cheatgrass	BRTE	Bromus tectorum	18–90	-
Forb		1	•	ł	
6	Forbs			90–180	
	cocklebur	XANTH2	Xanthium	18–90	
	thistle	CIRSI	Cirsium	18–90	-
	white sagebrush	ARLU	Artemisia Iudoviciana	18–45	-
	Forb, annual	2FA	Forb, annual	18–45	-
	common yarrow	ACMI2	Achillea millefolium	18–45	-
	goldenrod	SOLID	Solidago	18–45	-
	white heath aster	SYER	Symphyotrichum ericoides	18–45	-
	scurfpea	PSORA2	Psoralidium	18–45	-
	curlycup gumweed	GRSQ	Grindelia squarrosa	9–36	-
	upright prairie coneflower	RACO3	Ratibida columnifera	9–27	
	Cuman ragweed	AMPS	Ambrosia psilostachya	0–27	-
	Forb, perennial	2FP	Forb, perennial	9–27	-
	American licorice	GLLE3	Glycyrrhiza lepidota	0–18	-
	hairy false goldenaster	HEVI4	Heterotheca villosa	0–18	-
	scarlet beeblossom	OESU3	Oenothera suffrutescens	0–18	-
	purple prairie clover	DAPU5	Dalea purpurea	0–9	-
Shrub	/Vine	•	•		
7	Shrubs			45–90	
	silver sagebrush	ARCA13	Artemisia cana	0–45	-
	western snowberry	SYOC	Symphoricarpos occidentalis	9–45	-
	big sagebrush	ARTR2	Artemisia tridentata	0–27	-
	rose	ROSA5	Rosa	9–27	-
	Subshrub (<.5m)	2SUBS	Subshrub (<.5m)	0–27	-
	prairie sagewort	ARFR4	Artemisia frigida	0–18	-
	chokecherry	PRVI	Prunus virginiana	0–9	-
	willow	SALIX	Salix	0–9	-
Tree		•	•	•	
8	Trees			0–9	
	boxelder	ACNE2	Acer negundo	0–9	-
	common hackberry	CEOC	Celtis occidentalis	0–9	-
	hawthorn	CRATA	Crataegus	0–9	-
	green ash	FRPE	Fraxinus pennsylvanica	0–9	
	plains cottonwood	PODEM	Populus deltoides ssp. monilifera	0–9	-
	American elm	ULAM	Ulmus americana	0–9	-

Animal community

The following table lists annual suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often,

the current plant composition does not entirely match any particular plant community (as described in this Ecological Site Description). Therefore, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community = Rhizomatous Wheatgrass-Needlegrass-Tall Warm-Season Grasses/Mixed Shrubs (1.1) Average Annual Production (lbs./ac, air-dry) = 2100 Stocking Rate (AUM/ac) = 0.58

Plant Community = Western Wheatgrass-Needlegrass (1.2) Average Annual Production (lbs./ac, air-dry) = 2200 Stocking Rate (AUM/ac) = 0.60

Plant Community = Rhizomatous Western Wheatgrass (1.3) Average Annual Production (lbs./ac, air-dry) = 1500 Stocking Rate (AUM/ac) = 0.41

Plant Community = Western Wheatgrass-Annual Grasses/Forbs/Shrubs (2.1) Average Annual Production (lbs./ac, air-dry) = 900 Stocking Rate (AUM/ac) = 0.25

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

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been reduced to reflect only preferred or desirable forage species.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups C and D. Infiltration ranges from very slow to moderately slow, and runoff potential for this site varies from low to medium 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 exception would be where short grasses form a dense sod. Normally areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an aesthetic value that appeals to visitors.

Other products

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

Other information

Revision Notes: "Previously Approved" Provisional

This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site. This is an updated "Previously Approved" ESD which represents a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirements as an "Approved" ESD as laid out in the 1997, rev.1, 2003 National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and- Transition model. All other alternative states are at least described in narrative form. The "Previously Approved" ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The "Previously Approved" ESD does not contain all tabular and narrative entries as required in the current "Approved" level of documentation but it is expected that the "Previously Approved" ESD will continue refinement towards an "Approved" status.

Site Development and Testing Plan:

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

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Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site description include: Stan Boltz, Range Management Specialist, NRCS; Darrel DuVall, Range Management Specialist, NRCS; Jill Epley, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; Rick Peterson, Range Management Specialist, NRCS; and Mike Stirling, Range Management Specialist, NRCS.

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Contributors

Stan C. Boltz Rick L. Peterson

Approval

Suzanne Mayne-Kinney, 6/25/2024

Acknowledgments

ESD updated by Rick L. Peterson on 7/20/17

MLRA 60A Provisional Level Quality Control (QC) Process 9/28/17

Ecological Site from MLRA 60A were Previously Approved ESDs and meet the requirements as stated in the 2003 National Range and Pasture Handbook.

The Sites were updated to the Provisional Level by Rick L. Peterson, ESS, Rapid City, SSO in FY17.

The sites were reviewed by George Gamblin, RMS, Wheatland, WY and Mitch Faulkner, RMS, Belle Fourche, SD. Mitch Faulkner acted as the Provisional QC. The Sites were then reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS.

Worked closely with Kent Cooley, Area SS, with MLRA key development and soils narratives

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz, Ryan Beer, Mitch Iverson, Thad Berrett, Cheryl Nielsen
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	06/04/2008

Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills: None.
- 2. **Presence of water flow patterns:** Typically none or barely visible. Evidence of water flow may be present after high overland flow events or flooding from adjacent streams, but vegetation normally remains intact.
- 3. Number and height of erosional pedestals or terracettes: None.
- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground): 0 to 5 percent is typical.
- 5. Number of gullies and erosion associated with gullies: None typical, however limited headcutting may form after high runoff or flooding events. Existing gullies should be stabilized with good vegetative cover.
- 6. Extent of wind scoured, blowouts and/or depositional areas: None typical, but limited deposition may occur after major runoff or flooding events.
- 7. Amount of litter movement (describe size and distance expected to travel): Litter of small and medium size classes will move after average to high rainfall events. Litter does not travel far, typically being trapped in small bunches by the extensive vegetative cover. Litter movement may be fairly extensive after major runoff or flooding events.
- 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 4 to 10 inches thick with mollic (dark) colors when moist. Structure typically is medium subangular blocky 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 cool-season rhizomatous grasses >>

Sub-dominant: Mid/tall cool-season bunchgrasses > tall warm-season rhizomatous grasses > short cool-season grasses/grass-likes >

Other: Shrubs = forbs

Additional:

- 13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.
- 14. Average percent litter cover (%) and depth (in):
- 15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annualproduction): Production ranges from 1,900-3,100 lbs./acre (air-dry weight). Reference value production is 2,500 lbs./acre (air-dry weight).
- 16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: State and local noxious weeds, Kentucky bluegrass
- 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.