Ecological site R058DY022SD
Loamy Terrace

Last updated: 7/18/2024
Accessed: 09/20/2024

General information

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

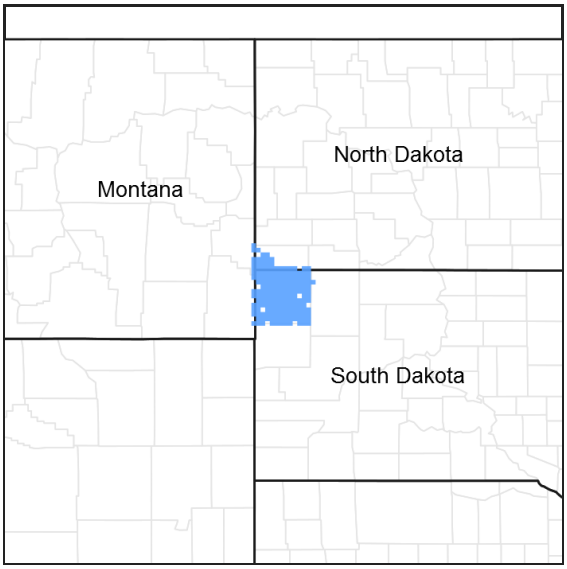


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 058D–Northern Rolling High Plains, Eastern Part

The Northern Rolling High Plains, Eastern Part (MLRA 58D) is shared between South Dakota (65 percent), Montana (21 percent), and North Dakota (14 percent). The MLRA is approximately 2,755 square miles. The small towns of Buffalo and Camp Crook, South Dakota, and Marmarth, North Dakota, are all within the boundary of this MLRA, and Baker, Montana, is on the northern most edge. Portions of the Little Missouri National Grassland and Custer National Forest are also in the MLRA. Portions of the Little Missouri River and the headwaters of major tributaries that eventually form the Grand and Moreau Rivers in South Dakota are also in this area.

The Northern Rolling High Plains, Eastern Part consists of Cretaceous marine and continental sediments of shale, siltstone, and sandstone. The continental and marine Hell Creek Formation is under approximately 85 percent of the MLRA, and the Fox Hills Sandstone forms the southern boundary of the MLRA. Tertiary deposits are in scattered areas throughout the MLRA. These deposits consist of the Paleocene Ludlow and Tongue River Formations, the Oligocene White River Group, and the Miocene Arikaree Group. These Tertiary deposits are resistant and positioned above the Cretaceous beds. Ponderosa pine growing in areas of these Tertiary formations further distinguishes these formations from the other formations in the MLRA. Pleistocene and Holocene river sand and gravel deposits are also on the valley floors and on the terraces along the larger rivers in the area. A large Quaternary eolian deposit is directly south of the town of Buffalo.

The average elevation of MLRA 58D ranges from 2,300 feet to 4,000 feet, increasing gradually from east to west. Harding Peak is the highest point at 4,019 feet. In places, flat-topped, steep-sided buttes rise sharply above the gently rolling plains below.

The dominant soil orders in this MLRA are Alfisols, Entisols, Inceptisols, and Mollisols. The soils in the area dominantly have a frigid soil temperature regime, an ustic soil moisture regime that borders on aridic, and mixed mineralogy. They are shallow to very deep, generally well drained, and loamy or clayey.

Annual precipitation is 14 to 17 inches and can fluctuate widely from year to year. Most rainfall occurs early in the growing season. Some high-intensity thunderstorms occur mid to late summer. The native vegetation in this MLRA consists primarily of grasses and forbs with a small component of trees and shrubs along streams. Ponderosa pine grow on the upper slopes and on the top of some of the higher buttes. Open grasslands are characterized by western wheatgrass, green needlegrass, blue grama, and buffalograss. Wyoming big sagebrush grows on clayey soils in the western part of the MLRA.

More than four-fifths of the MLRA is privately owned ranches running cattle, sheep, or both. Less than 5 percent of the area is federally owned. The major resource concerns are water quality, wind erosion, and water erosion (USDA, NRCS. 2006. Ag Handbook 296).

Classification relationships

USDA
Land Resource Region G—Western Great Plains Range and Irrigated Region:
Major Land Resource Area (MLRA) 58D—Northern Rolling High Plains, Eastern Part.

US Environmental Protection Agency (EPA)
Level IV Ecoregions of the Conterminous United States:
Northwestern Great Plains—43:
Forested Buttes—43d.
Sagebrush Steppe—43e.

USDA Forest Service
Ecological Subregions: Sections and Subsections of Conterminous United States:
Great Plains - Palouse Dry Steppe Province—331:
Missouri Plateau Section—331M.
Sagebrush Steppe Subsection—334Mi.

Ecological site concept

The Loamy Terrace ecological site is found throughout MLRA 58D. It is located on nearly level stream terraces. It may receive additional moisture from extreme flooding events. Typical slopes range from 1 to 4 percent. Soils are deep (greater than 20 inches) with fine sandy loam to silty clay surface textures that is 5 to 15 inches thick.

The vegetation in the Reference State (1.0) consists of a mix of cool- and warm-season grasses. Cool-season grasses are dominate and warm-season grasses are subdominant. Major grasses include western wheatgrass, green needlegrass, and needle and thread. Forbs are common and diverse. Silver sagebrush and western snowberry are almost always present. Scattered green ash, plains cottonwood, boxelder, and American elm may also occur.

Associated sites

R058DY009SD	**Sandy** The Sandy ecological site is be found on landscaped above or upslope of the Loamy Terrace ecological site.
R058DY010SD	**Loamy** The Loamy ecological site is found on landscaped above or upslope of the Loamy Terrace ecological site.

R058DY020SD	**Loamy Overflow** The Loamy Overflow ecological site is be found adjacent to or down-slope of the Loamy Terrace ecological site.

Similar sites

R058DY010SD	**Loamy** The Loamy ecological site will have more western wheatgrass; less green needlegrass; and less vegetative production than the Loamy Terrace ecological site.
R058DY020SD	**Loamy Overflow** The Loamy Overflow ecological site will have more big bluestem; and more vegetative production than the Loamy Terrace ecological site.
R058DY031SD	**Sandy Terrace** The Sandy Terrace ecological site will be found on similar landscape positions and will have similar vegetative production levels as the Loamy Terrace. It will have more warm-season grasses and less cool-season wheatgrass than the Loamy Terrace ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia cana ssp. cana* (2) *Symphoricarpos occidentalis*
Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Physiographic features

The Loamy Terrace ecological site occurs on nearly level stream terraces.

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Flood plain
Runoff class	Low to medium
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	2,300–4,000 ft
Slope	1–4%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

The climate in MLRA 58D is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland to the east. Average annual precipitation ranges from 14 to 17 inches with most falling in the early growing season. Some high intensity, convective thunderstorms occur in the summer. Precipitation in winter occurs as snow. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This wide range is due to the high elevation and dry air, which permit rapid incoming and outgoing radiation. Outbreaks of cold air from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter but have the most severe effect on ranching operations during late winter and in spring.

The normal average annual temperature is about 44 °F. January is the coldest month with average temperatures

ranging from about 12 °F (Marmarth, North Dakota) to about 20 °F (Baker, Montana). July is the warmest month with temperatures averaging from about 70 °F (Marmarth, North Dakota) to about 76 °F (Baker, Montana). The range of normal average monthly temperatures between the coldest and warmest months is about 55 °F. Wind speeds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime winds. Strong storms may bring brief periods of high winds with gusts of more than 50 mph.

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. Cool-season plants may green-up in September and October if adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	97-111 days
Freeze-free period (characteristic range)	121-129 days
Precipitation total (characteristic range)	15-17 in
Frost-free period (actual range)	93-115 days
Freeze-free period (actual range)	120-132 days
Precipitation total (actual range)	14-17 in
Frost-free period (average)	104 days
Freeze-free period (average)	125 days
Precipitation total (average)	16 in

Climate stations used

- (1) BAKER 1 E [USC00240412], Baker, MT
- (2) LADNER 9SW [USC00394671], Camp Crook, SD
- (3) CAMP CROOK [USC00391294], Camp Crook, SD
- (4) BUFFALO ASOS [USW00094037], Buffalo, SD
- (5) BUFFALO 13 ESE [USW00094081], Reva, SD
- (6) REDIG 11 NE [USC00397062], Buffalo, SD
- (7) HOOVER [USC00393945], Newell, SD

Influencing water features

The Loamy Terrace ecological site occurs adjacent to lowland and overflow sites along stream corridors.

Stream Type: B6, C6 (Rosgen System)

Soil features

Soils common to the Loamy Terrace ecological site have fine sandy loam to silty clay surface textures that are 5 to 15 inches thick. Slopes range from 0 to 4 percent. Soils are deep and formed in alluvium derived from shale and sandstone. The texture of the subsurface layer’s ranges from loamy fine sand to clay. The soils in this site are well drained and have a moderate to moderately slow infiltration rate. Soils are stratified and are nonrestrictive to water movement and root penetration.

This site should show no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact.

Major Soil correlated to the Loamy Terrace ecological site include, Harlake, Havre, Korchea, and Wolf Point.

These soils are susceptible mainly to water erosion typically as a result of flooding events. Erosion may occur with a loss of vegetative cover. 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 production.

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 area of interest, or use the internet to access USDA's Web Soil Survey.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Fine sandy loam (2) Loam (3) Silty clay
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–6 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–8 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%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Loamy Terrace ecological site developed under the Northern Great Plains climatic conditions; light to severe grazing by bison and other large herbivores; sporadic, natural or human-caused wildfire (often of light intensities); and other biotic and abiotic factors that typically influence soil and site development. Changes occur in the plant communities due to short-term weather variations, effects of native and exotic plant and animal species, and management actions. Although the following plant community descriptions are typical of the transitions between communities, severe disturbances, such as periods of well below average precipitation and the introduction of non-native cool-season grasses, can cause significant shifts in plant communities and species composition.

A high percentage of these areas have been tilled in the past and have been planted to alfalfa for haying or are in a winter wheat-fallow rotation. Also, many of these areas are located in good winter livestock areas and are used as calving and feeding areas. Very few areas exist that have not had severe soil disturbance. Many areas that have not been tilled have been continuously hayed resulting in a monoculture of western wheatgrass.

The plant community upon which interpretations are primarily based is the Western Wheatgrass-Green Needlegrass/Shrub Plant Community (1.1). This 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

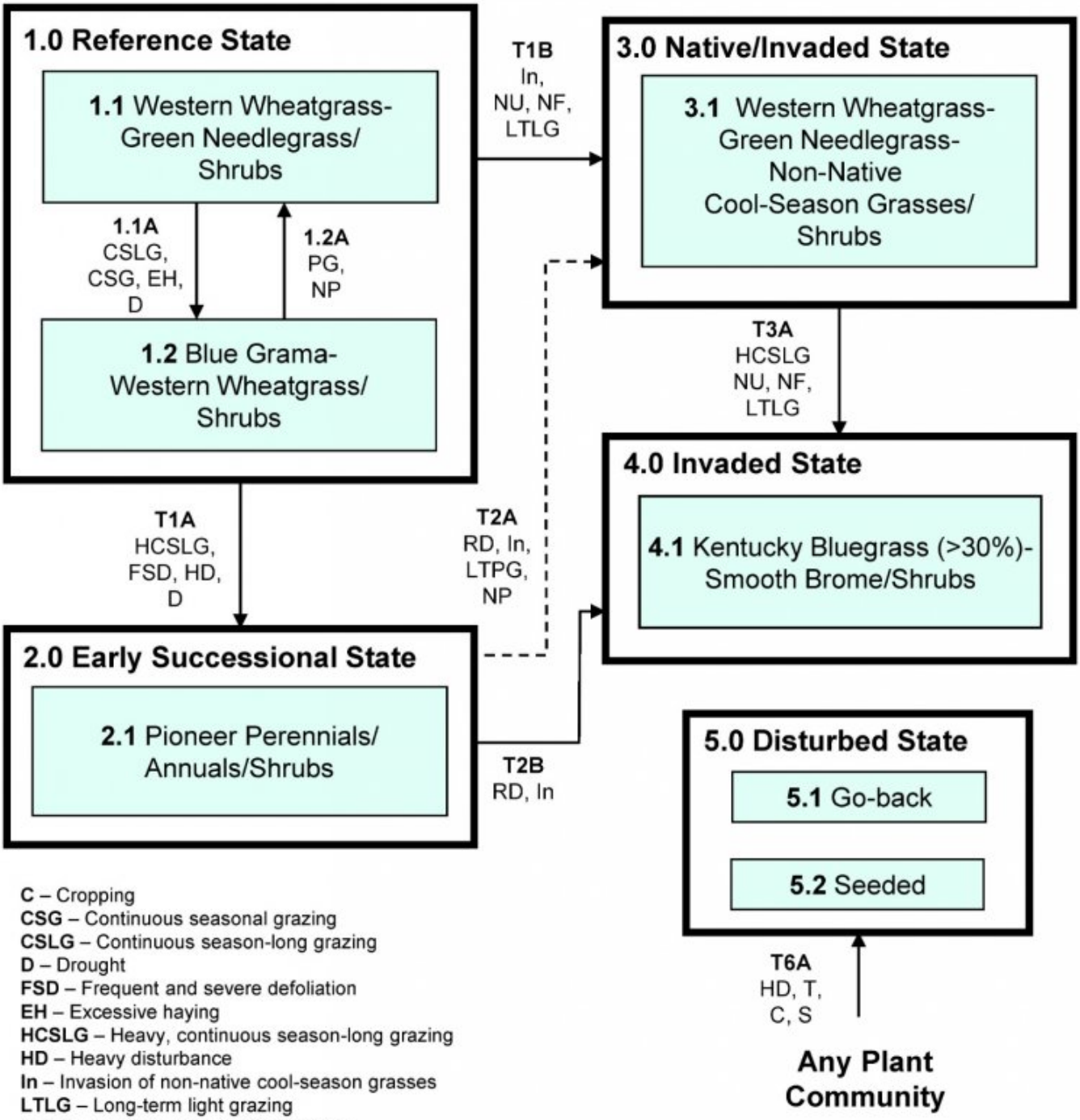
been determined through similar studies and experience.

Continuous season long grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the Western Wheatgrass-Green Needlegrass/Shrub Plant Community (1.1). Species such as blue grama will initially increase. Western wheatgrass, green needlegrass, and needle and thread will decrease in frequency and production. Extended periods of non-use and lack of fire will result in a plant community having high litter levels, which favors an increase in non-native cool-season grasses.

The following state-and-transition diagram illustrates the common plant communities 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

Loamy Terrace – R058DY022SD 1/27/20



C – Cropping
CSG – Continuous seasonal grazing
CSLG – Continuous season-long grazing
D – Drought
FSD – Frequent and severe defoliation
EH – Excessive haying
HCSLG – Heavy, continuous season-long grazing
HD – Heavy disturbance
In – Invasion of non-native cool-season grasses
LTLG – Long-term light grazing
LTPG – Long-term prescribed grazing
NF – No fire
NP – Normal precipitation
NU – No use
PG – Prescribed grazing
RD – Removal of disturbances
S – Seeding
T – Tillage
- - → Transition may not be fast or feasible

Diagram Legend: Loamy Terrace - R058DY022SD

T1A	1.0 to 2.0	Heavy, continuous seasonal grazing; frequent and severe defoliation; heavy disturbance; or heavy grazing in combination with drought.
T1B	1.0 to 3.0	Invasion of non-native cool-season grasses; no use; no fire; or long-term light grazing.
T2A	2.0 to 3.0	Removal of grazing disturbance followed by long-term prescribed grazing; invasion and establishment of non-native cool-season grasses; a return to normal precipitation patterns following drought. Transition may not be rapid or feasible.
T2B	2.0 to 4.0	Removal of grazing disturbance; invasion and establishment of non-native cool-season grasses.
T3A	3.0 to 4.0	Heavy continuous season-long grazing; no use; no fire; long-term light grazing.
T6A	Any plant community to 5.0	Heavy disturbance including tillage; abandoned cropland; or tillage and seeding to introduced perennial forage crops.

1.1A	1.1 to 1.2	Continuous season-long grazing; continuous seasonal grazing (spring or late winter); heavy grazing in combination with drought; excessive haying.
1.2A	1.2 to 1.1	Prescribed grazing with proper stocking rates, change in season of use, and adequate recovery periods. A return to normal precipitation patterns following drought.

State 1
Reference State

The Reference State (1.0) represents what is believed to show the natural range of variability that dominated the dynamics of the ecological site prior to European settlement. The vegetation in the Reference State (1.0) is dominated by cool-season grasses and subdominant warm-season grasses. In pre-European times, the primary disturbance mechanisms included periodic 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-season wheatgrasses and needlegrasses would have declined and a corresponding increase in short statured grass and grass-like species would have occurred. Sliver sagebrush and western snowberry will almost always be present. Deciduous trees will likely be found scattered across this site, but regeneration is unlikely. Today, a similar state can be found on areas that are properly managed with grazing and sometimes on areas receiving occasional short periods of rest.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- boxelder (*Acer negundo*), tree
- American elm (*Ulmus americana*), tree
- silver sagebrush (*Artemisia cana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- green needlegrass (*Nassella viridula*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), grass
- blue grama (*Bouteloua gracilis*), grass
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- Maximilian sunflower (*Helianthus maximiliani*), other herbaceous
- mint (*Mentha*), other herbaceous
- white prairie aster (*Symphyotrichum falcatum*), other herbaceous
- goldenrod (*Solidago*), other herbaceous
- tarragon (*Artemisia dracunculus*), other herbaceous
- scurfpea (*Psoralidium*), other herbaceous

Community 1.1
Western Wheatgrass-Green Needlegrass/Shrubs

The interpretive plant community for this site is the Western Wheatgrass-Green Needlegrass/Shrubs Plant Community. This is also considered to be Reference Plant Community (1.1). This plant community can be found on areas that are properly managed with grazing and occasional short periods of deferment. The potential vegetation is about 80 percent grasses or grass-like plants, 5 percent forbs, 15 percent shrubs, and 0 to 2 percent trees. Cool-season grasses dominate this plant community and warm-season grasses are subdominant. The major grasses include western wheatgrass, green needlegrass, and needle and thread. Major forbs and shrubs include cudweed sagewort, Maximilian sunflower, mint, white prairie aster, silver sagebrush, and western snowberry. Scattered green ash, plains cottonwood, boxelder, and American elm may occur. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Runoff from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1360	1975	2570
Shrub/Vine	220	313	400
Forb	120	187	275
Tree	0	25	55
Total	**1700**	**2500**	**3300**

Figure 9. Plant community growth curve (percent production by month). SD5802, Northern Rolling High Plains, cool-season dominant, warm-season subdominant. Cool-season dominant, warm-season subdominant..

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

Community 1.2
Blue Grama-Western Wheatgrass/Shrubs

This plant community can slowly develop from the adverse effects of continuous seasonal grazing or continuous season-long grazing without adequate recovery periods between each grazing event during the growing season; or from over utilization during extended periods of drought. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. The potential vegetation is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, 10 percent shrubs, and 0 to 2 percent trees. Blue grama and western wheatgrass are the dominant species. Green needlegrass has been greatly reduced. Forb species include cudweed sagewort, white prairie aster, goldenrod, green sagewort, scurfpea, and western yarrow. The dominant shrubs include fringed sagewort, silver sagebrush, and western snowberry. Compared to the Western Wheatgrass-Green Needlegrass/Shrubs Plant Community (1.1), the shortgrass species including blue grama, and sedge have increased in composition. The cool-season species including western wheatgrass and green needlegrass have decreased in composition. Vegetative production has also declined. This plant community is relatively stable and resistant to change. The dominant herbaceous species are very adapted to grazing; however, the mid-grass species and the more palatable forbs will decrease. The reduction of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, increased runoff, and high evapotranspiration rates. This plant community can occur throughout the site, on spot grazed areas, and around water sources where season-long grazing patterns occur. Soil erosion will be minimal due to the sod forming habit of blue grama.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1040	1428	1715
Shrub/Vine	80	128	175
Forb	80	128	175
Tree	0	16	35
Total	**1200**	**1700**	**2100**

Figure 11. Plant community growth curve (percent production by month). SD5803, Northern Rolling High Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing; continuous seasonal grazing (early spring or late winter); heavy grazing in combination with drought; or excessive haying will lead to the Reference Plant Community (1.1) to the Blue Grama-Western Wheatgrass/Shrubs Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing with proper stocking rate, change in season of use, and adequate time for plant recovery; and a return to normal precipitation patterns following drought will convert the Blue Grama-Western Wheatgrass/Shrubs Plant Community (1.2) to the Western Wheatgrass-Green Needlegrass/Shrubs Plant Community (1.1).

Conservation practices

Prescribed Grazing

State 2
Early Successional State

The Early Successional State (3.0) is dominated by weedy annuals, threeawn, wheatgrass, and shrubs. This State is the result of heavy disturbance such as frequent and severe defoliation, heavy livestock concentrations coupled with grazing management that does not provide adequate recovery time for cool-season wheatgrasses and needlegrass. The hydrologic function is also likely to be dramatically altered. Runoff is high and infiltration is low. This State is very resistant to change through grazing management alone.

Dominant plant species

- threeawn (*Aristida*), grass
- blue grama (*Bouteloua gracilis*), grass
- field brome (*Bromus arvensis*), grass
- buffalograss (*Bouteloua dactyloides*), grass
- sedge (*Carex*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- sixweeks fescue (*Vulpia octoflora*), grass
- prairie sagewort (*Artemisia frigida*), other herbaceous
- fetid marigold (*Dyssodia papposa*), other herbaceous
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous
- pussytoes (*Antennaria*), other herbaceous

Community 2.1
Pioneer Perennials/Annuals/Shrubs

This plant community develops under heavy, continuous season-long grazing; or frequent and severe defoliation; or from heavy disturbance such as livestock or wildlife concentration areas. The potential plant community is made up of approximately 65 percent grasses and grass-like species, 25 percent forbs, 10 percent shrubs, and 0 to 2 percent trees. The dominant grasses include threeawn, blue grama, and annual brome grasses. Other grasses may include buffalograss, sedges, western wheatgrass, and sixweeks fescue. The dominant forbs include fringed sagewort, fetid marigold, western ragweed, pussytoes, and other annual invader-like species. Other plant species from adjacent ecological sites can become minor components of this plant community. This plant community is susceptible to invasion of Canada thistle and other non-native species because of the relatively high percentage of bare ground. Compared to the Wheatgrass-Green Needlegrass/Shrubs Plant Community (1.1), threeawn, annual brome grasses, and the percentage of bare ground has increased. Wheatgrasses, needlegrasses, and other cool-season grasses and grass-like species have decreased, as have the warm-season species including blue grama, sideoats grama, and buffalograss. Many annual and perennial forbs, including native and non-native species, have invaded the site. This plant community is resistant to change back to a higher successional plant community because of the loss of plant diversity and overall soil disturbance. It is very susceptible to invasion of non-native plant species. The potential for soil erosion is 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 toward another plant community. This movement is highly variable in its succession.

Figure 12. Plant community growth curve (percent production by month). SD5804, Northern Rolling High Plains, warm-season dominant, cool-season sub-dominant.. Warm-season dominant, cool-season sub-dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	18	24	25	15	7	1	0	0

State 3
Native/Invaded State

The Native/Invaded State has been invaded by Kentucky bluegrass, smooth brome, and annual bromes, but not at the level to which the plant community is dominated by these species. The plant community in this State looks very similar to the Reference Plant Community (1.1) and it functions very much like the Reference State. It is ‘At Risk’ of transitioning to the Invaded State (4.0), which is dominated by Kentucky bluegrass and smooth brome.

Dominant plant species

- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- boxelder (*Acer negundo*), tree
- American elm (*Ulmus americana*), tree
- silver sagebrush (*Artemisia cana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- smooth brome (*Bromus inermis*), grass
- field brome (*Bromus arvensis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- green needlegrass (*Nassella viridula*), grass
- (*Stipa*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- blue grama (*Bouteloua gracilis*), grass
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- Maximilian sunflower (*Helianthus maximiliani*), other herbaceous
- mint (*Mentha*), other herbaceous
- white prairie aster (*Symphyotrichum falcatum*), other herbaceous
- goldenrod (*Solidago*), other herbaceous
- tarragon (*Artemisia dracunculus*), other herbaceous

- scurfpea (*Psoralidium*), other herbaceous

Community 3.1
Western Wheatgrass-Green Needlegrass-Non-Native Cool-Season Grasses/Shrubs

This plant community develops when Kentucky bluegrass and smooth brome invade and become established on the site. This is due to the close proximity to seed sources or expansion from road ditches, improved pastures, or other invaded sites. Non-use and no fire, or very light stocking rates for long periods of time will allow these non-native, cool-season grasses to increase in the plant community. With non-use, plant litter accumulates in large amounts when this community first develops. Litter buildup reduces mature native plant vigor and density, and seedling recruitment declines. Eventually litter levels become high enough that plant density decreases. The potential vegetation is 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs and trees. The dominant grasses will be western wheatgrass, needlegrass, and non-native cool-season grasses, primarily, Kentucky bluegrass and smooth brome. Forbs will be diverse but not dominant. Shrubs and trees will occur in similar amounts as in the Reference Plant Community (1.1).

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1270	1560	1825
Shrub/Vine	195	300	425
Forb	35	120	205
Tree	0	20	45
Total	**1500**	**2000**	**2500**

Figure 14. Plant community growth curve (percent production by month). SD5801, Northern Rolling High Plains, cool-season dominant.. Cool-season dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

State 4
Invaded State

The Invaded State is the result of invasion of introduced cool-season grass species. This state is characterized by the dominance of Kentucky bluegrass and smooth brome, and an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade-tolerant introduced grass species. The nutrient cycle is also impaired, the result is typically a higher level of nitrogen, which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns, thereby shifting competitive advantage to shade-tolerant, introduced grass species. Studies indicate that soil biological activity is altered, and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the invasive grass dominance. Preliminary studies indicate this threshold may exist when Kentucky bluegrass exceeds 30 to 35 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. Plant communities dominated by Kentucky bluegrass have significantly less cover and diversity of native grasses and forb species (Toledo, D. et al., 2014).

Dominant plant species

- western snowberry (*Symphoricarpos occidentalis*), shrub
- silver sagebrush (*Artemisia cana*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- smooth brome (*Bromus inermis*), grass
- sweetclover (*Melilotus*), other herbaceous
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- goldenrod (*Solidago*), other herbaceous

Community 4.1
Kentucky Bluegrass (>30%)-Smooth Brome/Shrubs

This plant community develops after an extended period of non-use and exclusion of fire. Eventually litter levels become high enough to reduce native grass vigor, diversity, and density. Kentucky bluegrass dominates this plant community. Common forbs include sweetclover, cudweed sagewort, and goldenrod species. Shrubs such as western snowberry and silver sagebrush will persist. As will scattered trees. The Kentucky Bluegrass (> 30%)-Smooth Brome plant community is resistant to change without long-term prescribed grazing and possible prescribed fire. The combination of both grazing and fire is most effective in moving this plant community toward the Western Wheatgrass/Green Needlegrass-Non-Native Cool-Season Grasses/Shrub Plant Community (3.1). Soil erosion is low, but runoff may increase. Once the advanced stage of this plant community is reached, time and external resources will be needed to see a recovery in the diversity of the site.

Figure 15. Plant community growth curve (percent production by month). SD5801, Northern Rolling High Plains, cool-season dominant.. Cool-season dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

State 5
Disturbed State

Any plant community can transition to the Disturbed State (5.0). The three separate vegetative plant communities found in this State are highly variable in nature. They are derived through different management scenarios and are not related successionally. Infiltration, runoff, and soil erosion vary depending upon the vegetation present on the site.

Dominant plant species

- threeawn (*Aristida*), grass
- dropseed (*Sporobolus*), grass
- field brome (*Bromus arvensis*), grass
- crested wheatgrass (*Agropyron cristatum*), grass
- smooth brome (*Bromus inermis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- foxtail barley (*Hordeum jubatum*), grass
- sweetclover (*Melilotus*), other herbaceous
- Canada thistle (*Cirsium arvense*), other herbaceous
- prickly lettuce (*Lactuca serriola*), other herbaceous
- Canadian horseweed (*Conyza canadensis*), other herbaceous
- forage kochia (*Bassia prostrata*), other herbaceous
- common sunflower (*Helianthus annuus*), other herbaceous

Community 5.1
Go-back

The Go-back plant community can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned cropland). During the early successional stages, the species that mainly dominate are annual grasses and forbs, later replaced by both native and introduced perennials. The vegetation in this plant community can vary greatly, sometimes it is dominated by threeawn, dropseed, annual brome, crested wheatgrass, smooth brome, broom snakeweed, sweetclover, and non-native thistles. Other plants that commonly occur on the site can include western wheatgrass, prickly lettuce, mare’s tail, kochia, squirreltail, foxtail, and annual sunflower. Bare ground is prevalent due to the loss of organic matter and lower overall soil health.

Community 5.2
Seeded

The Seeded Plant Community normally includes those areas seeded to pubescent or intermediate wheatgrass, crested wheatgrass, alfalfa, or other forage species. For adapted species, refer to the USDA-NRCS e-FOTG for the appropriate Forage Suitability Group description.

Transition T1A
State 1 to 2

Heavy, continuous season-long grazing, frequent and severe defoliation, heavy disturbance, combined with drought will transition the Reference State (1.0) to the Early Successional State (2.0).

Transition T1B
State 1 to 3

Non-use and lack of fire for extended periods of time; long-term light grazing; invasion of non-native cool-season grasses, will transition the Reference State (1.0) to the Native/Invaded State (3.0).

Transition T6A
State 1 to 5

Heavy disturbance including tillage; abandonment of cropland; cropping; and seeding to improved pasture species will result in a transition to the Disturbed State (5.0). This transition can occur from any plant community on this site.

Transition T2A
State 2 to 3

Removal of the grazing disturbance; invasion of non-native cool-season grasses; the implementation of long-term prescribed grazing; and favorable climatic conditions, may shift the Early Successional State (2.0) to the Native/Invaded State (3.0). This transition may not be rapid or meet management objectives.

Conservation practices

Prescribed Grazing

Transition T2B
State 2 to 4

Removal of the grazing disturbance and the invasion of non-native cool-season grasses will transition the Early Successional State (2.0) to the Invaded State (4.0).

Transition T6A
State 2 to 5

Heavy disturbance including tillage; abandonment of cropland; cropping; and seeding to improved pasture species will result in a transition to the Disturbed State (5.0). This transition can occur from any plant community on this site.

Transition T3A
State 3 to 4

Heavy, continuous season-long grazing; no use and no fire; or long-term light grazing will transition the Native/Invaded State (3.0) to the Invaded State (4.0).

Transition T6A
State 3 to 5

Heavy disturbance including tillage; abandonment of cropland; cropping; and seeding to improved pasture species will result in a transition to the Disturbed State (5.0). This transition can occur from any plant community on this site.

Transition T6A
State 4 to 5

Heavy disturbance including tillage; abandonment of cropland; cropping; and seeding to improved pasture species will result in a transition to the Disturbed State (5.0). This transition can occur from any plant community on this site.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			500–875	
	western wheatgrass	PASM	*Pascopyrum smithii*	500–875	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–250	–
2	**Cool-Season Bunchgrass**			500–750	
	green needlegrass	NAVI4	*Nassella viridula*	125–500	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	125–250	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	125–250	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	125–250	–
3	**Short Warm-Season Grasses**			125–250	
	blue grama	BOGR2	*Bouteloua gracilis*	125–250	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–125	–
	saltgrass	DISP	*Distichlis spicata*	0–25	–
4	**Tall and Mid- Warm-Season Grasses**			125–375	
	prairie sandreed	CALO	*Calamovilfa longifolia*	50–250	–
	little bluestem	SCSC	*Schizachyrium scoparium*	25–200	–
	big bluestem	ANGE	*Andropogon gerardii*	25–200	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	25–125	–
	switchgrass	PAVI2	*Panicum virgatum*	25–125	–
5	**Other Native Grasses**			125–250	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–125	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	25–100	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–75	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–75	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–50	–
	Grass, perennial	2GP	*Grass, perennial*	0–50	–
6	**Grass-Likes**			25–125	
	threadleaf sedge	CAFI	*Carex filifolia*	25–125	–
	needleleaf sedge	CADU6	*Carex duriuscula*	25–125	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–125	–
7	**Non-Native Cool-Season Grasses**			0	
Forb					
8	**Forbs**			125–250	
	white sagebrush	ARLU	*Artemisia ludoviciana*	25–125	–

	white prairie aster	SYFA	*Symphyotrichum falcatum*	25–125	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	25–125	–
	mint	MENTH	*Mentha*	25–125	–
	Forb, native	2FN	*Forb, native*	25–100	–
	pussytoes	ANTEN	*Antennaria*	0–75	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–50	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	25–50	–
	scurfpea	PSORA2	*Psoralidium*	0–50	–
	goldenrod	SOLID	*Solidago*	25–50	–
	purple prairie clover	DAPU5	*Dalea purpurea*	25–50	–
	American vetch	VIAM	*Vicia americana*	25–50	–
	dotted blazing star	LIPU	*Liatris punctata*	0–25	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–25	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–25	–
	field sagewort	ARCA12	*Artemisia campestris*	0–25	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–25	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–25	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–25	–
	western wallflower	ERAS2	*Erysimum asperum*	0–25	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–25	–
Shrub/Vine					
9	**Shrubs**			250–375	
	silver sagebrush	ARCA13	*Artemisia cana*	25–250	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	25–250	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–100	–
	prairie sagewort	ARFR4	*Artemisia frigida*	25–75	–
	prairie rose	ROAR3	*Rosa arkansana*	25–75	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–75	–
	chokecherry	PRVI	*Prunus virginiana*	25–50	–
	leadplant	AMCA6	*Amorpha canescens*	0–50	–
	American plum	PRAM	*Prunus americana*	25–50	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–25	–
Tree					
10	**Trees**			0–50	
	American elm	ULAM	*Ulmus americana*	0–25	–
	boxelder	ACNE2	*Acer negundo*	0–25	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–25	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–25	–
	Tree	2TREE	*Tree*	0–25	–

Table 9. Community 1.2 plant community composition

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

Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			170–340	
	western wheatgrass	PASM	*Pascopyrum smithii*	170–340	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–170	–
2	**Cool-Season Bunchgrass**			34–170	
	green needlegrass	NAVI4	*Nassella viridula*	17–136	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	17–136	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–85	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–68	–
3	**Short Warm-Season Grasses**			340–595	
	blue grama	BOGR2	*Bouteloua gracilis*	255–595	–
	buffalograss	BODA2	*Bouteloua dactyloides*	34–170	–
	saltgrass	DISP	*Distichlis spicata*	0–68	–
4	**Tall and Mid- Warm-Season Grasses**			0–51	
	prairie sandreed	CALO	*Calamovilfa longifolia*	17–136	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–85	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–85	–
	big bluestem	ANGE	*Andropogon gerardii*	0–51	–
	switchgrass	PAVI2	*Panicum virgatum*	0–17	–
5	**Other Native Grasses**			17–119	
	prairie Junegrass	KOMA	*Koeleria macrantha*	17–85	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–34	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–34	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	17–34	–
	Grass, perennial	2GP	*Grass, perennial*	0–34	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–34	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–17	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–17	–
6	**Grass-Likes**			34–170	
	threadleaf sedge	CAFI	*Carex filifolia*	17–136	–
	needleleaf sedge	CADU6	*Carex duriuscula*	17–136	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–85	–
7	**Non-Native Cool-Season Grasses**			0	
Forb					
8	**Forbs**			85–170	
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–119	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	17–85	–
	Forb, native	2FN	*Forb, native*	17–68	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	17–51	–
	pussytoes	ANTEN	*Antennaria*	0–51	–
	goldenrod	SOLID	*Solidago*	17–51	–
	field sagewort	ARCA12	*Artemisia campestris*	17–51	–
	scurfpea	PSORA2	*Psoralidium*	17–51	–

	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–34	–
	western wallflower	ERAS2	*Erysimum asperum*	0–34	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–34	–
	mint	MENTH	*Mentha*	0–34	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	17–34	–
	purple prairie clover	DAPU5	*Dalea purpurea*	17–34	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–34	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–17	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–17	–
	American vetch	VIAM	*Vicia americana*	0–17	–
Shrub/Vine					
9	**Shrubs**			85–170	
	silver sagebrush	ARCA13	*Artemisia cana*	17–136	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	17–119	–
	prairie sagewort	ARFR4	*Artemisia frigida*	17–119	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–85	–
	prairie rose	ROAR3	*Rosa arkansana*	17–51	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–51	–
	American plum	PRAM	*Prunus americana*	17–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–17	–
	chokecherry	PRVI	*Prunus virginiana*	0–17	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–17	–
Tree					
10	**Trees**			0–34	
	American elm	ULAM	*Ulmus americana*	0–17	–
	boxelder	ACNE2	*Acer negundo*	0–17	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–17	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–17	–
	Tree	2TREE	*Tree*	0–17	–

Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrass**			200–400	
	western wheatgrass	PASM	*Pascopyrum smithii*	200–400	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–100	–
2	**Cool-Season Bunchgrass**			100–300	
	green needlegrass	NAVI4	*Nassella viridula*	100–300	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	20–100	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	20–80	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–80	–
3	**Short Warm-Season Grasses**			40–160	
	blue grama	BOGR2	*Bouteloua gracilis*	20–140	–

	buffalograss	BODA2	*Bouteloua dactyloides*	0–60	–
	saltgrass	DISP	*Distichlis spicata*	0–20	–
4	**Tall and Mid- Warm-Season Grasses**			0–140	
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–100	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–60	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–40	–
	switchgrass	PAVI2	*Panicum virgatum*	0–20	–
	big bluestem	ANGE	*Andropogon gerardii*	0–20	–
5	**Other Native Grasses**			20–100	
	Canada wildrye	ELCA4	*Elymus canadensis*	0–80	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–60	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–60	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–40	–
	Grass, perennial	2GP	*Grass, perennial*	0–40	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–20	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–20	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–20	–
6	**Grass-Likes**			40–160	
	threadleaf sedge	CAFI	*Carex filifolia*	20–140	–
	needleleaf sedge	CADU6	*Carex duriuscula*	20–140	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–100	–
7	**Non-Native Cool-Season Grasses**			100–300	
	Kentucky bluegrass	POPR	*Poa pratensis*	100–300	–
	smooth brome	BRIN2	*Bromus inermis*	0–300	–
	cheatgrass	BRTE	*Bromus tectorum*	40–200	–
	field brome	BRAR5	*Bromus arvensis*	0–200	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–200	–
Forb					
8	**Forbs**			40–200	
	white sagebrush	ARLU	*Artemisia ludoviciana*	20–120	–
	field cottonrose	LOAR5	*Logfia arvensis*	0–100	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	20–80	–
	goldenrod	SOLID	*Solidago*	20–80	–
	Forb, introduced	2FI	*Forb, introduced*	20–80	–
	pussytoes	ANTEN	*Antennaria*	0–60	–
	Forb, native	2FN	*Forb, native*	20–60	–
	scurfpea	PSORA2	*Psoralidium*	0–60	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	20–60	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–40	–
	goatsbeard	TRAGO	*Tragopogon*	0–40	–
	vervain	VERBE	*Verbena*	0–40	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–40	–

	field sagewort	ARCA12	*Artemisia campestris*	0–40	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–20	–
	mint	MENTH	*Mentha*	0–20	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–20	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–20	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–20	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–20	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–20	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–20	–
	western wallflower	ERAS2	*Erysimum asperum*	0–20	–
Shrub/Vine					
9	**Shrubs**			200–400	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	40–200	–
	silver sagebrush	ARCA13	*Artemisia cana*	20–160	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–140	–
	American plum	PRAM	*Prunus americana*	20–140	–
	chokecherry	PRVI	*Prunus virginiana*	20–100	–
	prairie rose	ROAR3	*Rosa arkansana*	20–100	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–80	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–60	–
	prairie sagewort	ARFR4	*Artemisia frigida*	20–60	–
	leadplant	AMCA6	*Amorpha canescens*	0–40	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–40	–
Tree					
10	**Trees**			0–40	
	American elm	ULAM	*Ulmus americana*	0–20	–
	boxelder	ACNE2	*Acer negundo*	0–20	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–20	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–20	–
	Tree	2TREE	*Tree*	0–20	–

Animal community

Wildlife Interpretations
MLRA 58D lies within the drier portion of the northern mixed-grass prairie ecosystem where sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, this area consisted of diverse grass- and shrubland habitats interspersed with varying densities of depressional instream wetlands and woody riparian corridors. These habitats provided critical life cycle components for many users. Many species of grassland birds, small mammals, reptiles, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as the gray wolf, mountain lion, and grizzly bear, and smaller carnivores such as the coyote, bobcat, fox, and raptors. The prairie dog was once abundant; however, the species remains a keystone species within its range. The black-footed ferret, burrowing owl, ferruginous hawk, mountain plover, and swift fox were associated with prairie dog complexes.

Historically, the northern mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement,

livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. The bison was a historical keystone species but had been extirpated in this area as a free-ranging herbivore. The loss of the bison and reduction of prairie dog populations and fire as ecological drivers greatly influenced the character of the remaining native plant communities and altered wildlife habitats. Human development has reduced habitat quality for area-sensitive species.

Within MLRA 58D, the Loamy Terrace ecological site provides upland grassland cover with an associated forb, shrub, and tree component. It was typically part of an expansive grassland landscape that included combinations of Shallow Loamy, Shallow Clayey, Thin Loamy, Thin Claypan, Sandy, Sandy Claypan, Loamy, Sandy Terrace, and Clayey ecological sites.

This ecological site can support an abandoned floodplain plant community and may be associated with an adjacent riparian plant community. The abandoned floodplain plant community may be composed of mature cottonwood and various age classes of elm, green ash, and boxelder; with a shrub component of chokecherry, wild plum, western snowberry, silver sagebrush, wild rose, etc. The presence or absence of this tree and shrub component is an important factor influencing wildlife species composition.

Rare flooding events deposit silt on the site which may allow the potential regeneration of plains cottonwood. However, due to the doughtiness of this site, cottonwood establishment does not occur. This site is subject to invasion of grass species such as annual brome grasses and Kentucky bluegrass. Woody species such as Eastern red cedar, Rocky Mountain juniper, and Russian olive may invade this site.

The Loamy Terrace ecological site has been subject to conversion to cropland or hayland, some sites being irrigated. Where intact, the site provides important habitat for grassland, woodland and shrub nesting birds, small rodents, bats, mammalian predators, and a variety of reptiles, amphibians, and insects. Within MLRA 58D this site provides the suitable habitat for herptiles and raccoons. These sites also provide forage sites for greater sage-grouse broods. Invasive grass or woody species have impacted the biological integrity of the site, particularly for ground nesting birds.

Western Wheatgrass-Green Needlegrass/Shrub (1.1), Western Wheatgrass-Green Needlegrass-Non-Native Cool-Season Grasses/Shrub (3.1): The predominance of grasses plus high diversity of forbs and shrubs in this community favors grazers and mixed-feeders, such as white-tailed deer. Plant communities associated with woody habitat provide habitat for songbirds such as brown thrasher, redheaded woodpecker, warbling vireo, yellow warbler, gray catbird, Say’s phoebe, loggerhead shrike, Lazuli bunting, yellow breasted chat, and black-headed grosbeak; and raptors such as red-tailed hawk, Swainson’s hawk, American kestrel, and great-horned owl. Insects, such as pollinators, play a large role in maintaining the forb community and provide a forage base for birds and other species. Diverse prey populations are available for grassland raptors and mammalian predators, especially bobcat.

The diversity of grasses, forbs, and shrubs provide high nutrition levels for small and large herbivores including voles, mice, thirteen-lined ground squirrel, Eastern cottontail rabbit, white-tailed jackrabbit, and deer. This ecological site provides excellent fawning habitat for white-tailed deer. The relatively high stature of this plant community provides suitable thermal, protective, and escape cover for small and large mammals. This plant community provides habitat for tiger salamander, various frog, and toad species, and bull and garter snakes. Introduced bird species such as European starling, ring-necked pheasant, and gray partridge will use this site.

Blue Grama-Western Wheatgrass/Shrubs (1.2): Resulting from continuous season-long grazing without adequate recovery periods between grazing events or increased fire frequency, western wheatgrass and blue grama will dominate. Shrub diversity and density has decreased. The tree component is aging, and the tree diversity and density remains largely unchanged. Livestock damage to trees is often noticeable. The loss of shrub component results in reduced habitat for brown thrasher, yellow warbler, gray catbird, loggerhead shrikes, Lazuli bunting, and yellow breasted chat. The tall tree component continues to provide habitat for red-tailed hawk, American kestrel, redheaded woodpecker, warbling vireo, black-headed grosbeak, and Say’s phoebe. This plant community provides habitat for tiger salamander, leopard frog, and bull and garter snakes.

Pioneer Perennial/Annuals/Shrubs (2.1): This plant community develops under severe disturbance or excessive defoliation. The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional

biennial and perennial species. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of annual bromegrasses, crested wheatgrass, and other non-native species due to severe soil disturbances and relatively high percent of bare ground.

Soil erosion is potentially high, impacting offsite aquatic habitats through increased runoff, nutrient, and sediment loads. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased wildlife abundance and diversity.

Since secondary succession is highly variable plant and wildlife species will vary. This plant community provides habitat for generalist or early successional species.

The Invaded State (4.0): Includes areas that have been invaded and are dominated by species such as smooth brome, Kentucky bluegrass, crested wheatgrass, non-native thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species. These sites greatly reduce foraging, reproductive, and escape cover for grassland nesting bird species.

Grazing Interpretations
The following list suggests annual, initial stocking rates for average growing conditions. These estimates are conservative and should be used only as guidelines in the initial stages of conservation planning. Commonly, 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 estimates of carrying capacity 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. In consultation with the land manager, a more intensive grazing management program that results in improved harvest efficiencies and increased carrying capacity may be developed.

The following suggested initial stocking rates are based on 912 lb/acre (air-dry weight) per animal-unit-month (AUM) with a 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA-NRCS, National Range and Pasture Handbook). An AUM is defined as the equivalent amount of forage required by a 1,000-pound cow, with or without calf, for one month.

Plant Community: Western Wheatgrass-Green Needlegrass/Shrubs (1.1)
Average Production (lb/acre, air-dry): 2,500
Stocking Rate (AUM/acre): 0.59**

Plant Community: Blue Grama-Western Wheatgrass/Shrubs (1.2)
Average Production (lb/acre, air-dry): 1,700
Stocking Rate (AUM/acre): 0.43**

Plant Community: Western Wheatgrass-Green Needlegrass-Non-Native Cool-Season Grasses/Shrubs (3.1)
Average Production (lb/acre, air-dry): 2,000
Stocking Rate (AUM/acre): 0.46**

Plant Community: All other plant communities identified in this document have variable annual production values and require onsite sampling to determine initial stocking rates.

* Total annual production and stocking rates are highly variable and require onsite sampling.

** Total onsite annual production may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values were 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 for livestock. During the dormant period, the forage for livestock likely has insufficient protein to meet livestock requirements. Added protein allows ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups B, with localized areas in group 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 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Normally areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

Harvesting the seeds of native plants can provide additional income on this site.

Other information

Revision Notes: “Previously Approved” Provisional
This provisional ecological site description (ESD) has passed quality control (QC) and quality assurance (QA) to ensure it meets the 2014 NESH standards for a “Provisional” ecological site description.

This ecological site description (ESD) is an updated “Previously Approved” ESD that represented a first-generation tier of documentation that met all requirements as an “Approved” ESD as laid out in the 1997 National Range and Pasture Handbook (NRPH). The requirements for approved status changed with the release of the 2014 National Ecological Site Handbook (NESH). The previously approved document fully described the reference state and community phases in the state-and-transition model. All other alternative states were 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 may not contain all tabular and narrative entries as required in the current “Approved” level of documentation, but it is expected this ESD will continue refinement toward the current “Approved” status.

Site Development and Testing Plan
Future work, as described in an official project plan, is necessary to validate the information in this provisional ecological site description. The plan will include field activities for low-, medium-, and high-intensity sampling, soil correlations, and analysis of the data. Annual field reviews should be done by soil scientists and vegetation specialists. Final field review, peer review, quality control, and quality assurance reviews are required to produce the final document.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site description include: Ryan Beer, Range Management Specialist (RMS), NRCS; Chuck Berdan, Biologist, Bureau of Land Management (BLM); Stan Boltz, RMS, NRCS; Dave Dewald, Wildlife BIO, NRCS; Mitch Faulkner, RMS, NRCS; Jody Forman, RMS, NRCS; Dennis Froemke, RMS, NRCS; Tom Juntti, BIO, United States Forest Service (USFS); Cheryl Nielsen, RMS, NRCS; Jeff Printz, RMS, NRCS; Mike Stirling, RMS, NRCS; Dan Svingen, BIO, USFS; Darrell Vanderbusch, Soil Scientist, NRCS; Cindy Zachmeier, BIO, NRCS; and Tim Zachmeier, BIO, BLM.

Other references

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C.A. Carpenter, and W.H McNab. 2007. Ecological subregions: Sections and subsections of the conterminous United States. USDA Forest Service, General Technical Report WO-76D. https://www.fs.fed.us/research/publications/misc/73326-wo-gtr-76d-cleland2007.pdf (accessed 31 January 2019).

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
High Plains Regional Climate Center, University of Nebraska. 2018. http://www.hprcc.unl.edu/ (accessed 6 April 2018).

Larson, G.E. and J.R. Johnson. 1999. Plants of the Black Hills and Bear Lodge Mountains. South Dakota State University, College of Agriculture and Biological Sciences and Agriculture Experiment Station, Bulletin 732, Brookings, SD.

Toledo, D., M. Sanderson, K. Spaeth, J. Hendrickson, and J. Printz. 2014. Extent of Kentucky bluegrass and its effect on native plant species diversity and ecosystem services in the Northern Great Plains of the United States. Invasive Plant Science and Management. 7(4):543–522. Weed Science Society of America.

Soil Survey Staff. 2020. Official soil series descriptions. USDA Natural Resources Conservation Service. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053587 (accessed 24 January 2020).

Soil Survey Staff. 2020. Web Soil Survey. USDA Natural Resources Conservation Service. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx (accessed 24 January 2020).

U.S. Department of Agriculture, Natural Resources Conservation Service. 1997. National range and pasture handbook, rev. 1, 2003. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043055.pdf (accessed 7 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. Agriculture Handbook 296. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050898.pdf (accessed 17 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2012. National engineering handbook, part 630. Hydrology chapters from e-Directives. https://directives.sc.egov.usda.gov/viewerFS.aspx?hid=21422 (accessed 17 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2014. National ecological site handbook, 1st ed. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcseprd1291232 (accessed 27 January 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. Climate data. National Water and Climate Center. http://www.wcc.nrcs.usda.gov/ (accessed 2 December 2018).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2020. Electronic field office technical guide. https://efotg.sc.egov.usda.gov (accessed 24 January 2020).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. National Soil Information System, Information Technology Center. http://nasis.nrcs.usda.gov (accessed 25 May 2018.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2020. PLANTS database. National Plant Data Team, Greensboro, NC. http://plants.usda.gov (accessed 24 January 2020).

U.S. Environmental Protection Agency. 2018. EPA level III and level IV ecoregions of the conterminous United States. https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions- conterminous-united-states (accessed 26 April 2018).

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Approval

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Acknowledgments

This ecological site description was updated by Rick L. Peterson on January 27, 2020.

The ESDs were available for QC review by Mark Hayek, Emily Helms, Ryan Beer, and Mitch Faulkner.

All ecological sites were then reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS in September 2020.

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	05/06/2010
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:** None, or barely visible and discontinuous.

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 should be present.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement of smallest size class litter is possible, but not normal.

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 5 to 15 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular 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 > Mid/tall cool-season bunchgrasses >

    Sub-dominant: Mid/tall warm-season grasses = shrubs >

    Other: Short warm-season grasses = Forbs > Grass-likes > Trees

    Additional:

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,700-3,300 lbs./acre (air-dry weight). Reference value production is 2,500 lbs./acre (air-dry weight).

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

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