USDA Natural Resources
Conservation Service

Ecological site R063AY010SD
Loamy

Last updated: 6/26/2024
Accessed: 05/12/2025

General information

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

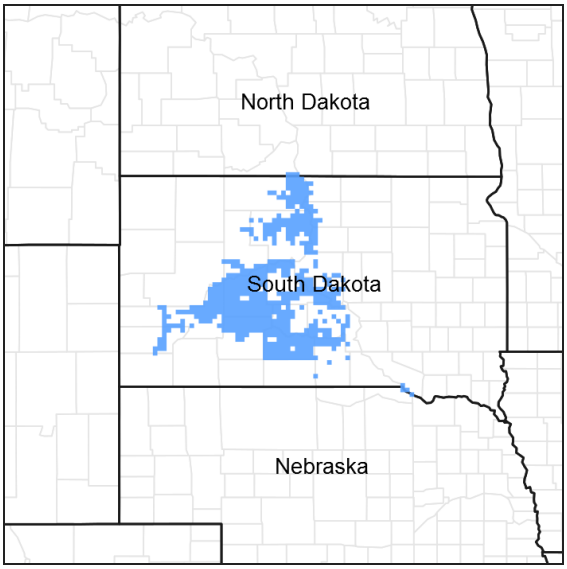


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 063A–Northern Rolling Pierre Shale Plains

MLRA 63A is approximately 10,160 square miles in size, the majority of which is in South Dakota and a very small portion in North Dakota. The MLRA extends west of the northern half of the South Dakota reach of the Missouri River. All five of the major rivers draining western South Dakota cross this area. From north to south, these are the Grand, Moreau, Cheyenne, Bad, and White Rivers.

Elevation range from 1,300 to 1,640 feet on the bottom land along the Missouri River to 1,640 to 2,950 feet on the shale plain uplands. Cretaceous Pierre Shale underlies almost all of this area. This is a marine sediment having layers of volcanic ash that has been altered to smectitic clays. These clays shrink as they dry and swell as they get wet. Tertiary and Quaternary river deposits, remnants of erosion from the Black Hills uplift, cap isolated highlands in this area. Deposits of alluvial sand and gravel occur on the valley floors adjacent to the major streams in the area. The average annual precipitation in this area is 15 to 20 inches.
The vegetation in this area is a transition from eastern tall grass prairie to a western mixed grass prairie, (USDA-NRCS, Ag Handbook 296).

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA): 63A Northern Rolling Pierre Shale Plains, (USDA-NRCS, Ag Handbook 296).
Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Loamy Ecological site occurs throughout the MLRA. It is located on upland landscapes and does not receive additional moisture from run off or overflow. Typical slope range from 0 to 15 percent. The soils surface texture are loam to silty clay loam. Carbonates can be found between 10 to 25 inches below the surface. The vegetation in reference consists of a mix of cool- and warm-season grasses, however mid-statured cool-season grasses tend to be the dominant group. Western wheatgrass, needleandthread and green needlegrass are the dominant cool-season grasses, sideoats grama, little bluestem, blue grama and buffalograss are the dominant warm-season grasses. Forbs are common and diverse, shrubs are present but are in minor amounts.

Associated sites

R063AY011SD	**Clayey**
R063AY012SD	**Thin Upland**
R063AY017SD	**Shallow Clay**
R063AY020SD	**Loamy Overflow**

Similar sites

R063AY011SD	**Clayey** Clayey [more green needlegrass; less needleandthread]
R063AY020SD	**Loamy Overflow** Loamy Overflow [more big bluestem; higher production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Hesperostipa comata*

Physiographic features

This site occurs on nearly level to moderately steep uplands.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Alluvial fan (3) Pediment
Flooding frequency	None
Ponding frequency	None
Elevation	1,600–2,700 ft
Slope	0–15%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 63A is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and abundant sunshine. Extreme temperature fluctuations are also common. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 16 to 20 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 11°F (Pollock, South Dakota (SD)), to about 22°F (Cedar Butte, SD). July is the warmest month with temperatures averaging from about 72°F (Pollock, SD), to about 76° F (Cedar Butte, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	108-117 days
Freeze-free period (characteristic range)	129-131 days
Precipitation total (characteristic range)	17-20 in
Frost-free period (actual range)	104-120 days
Freeze-free period (actual range)	127-132 days
Precipitation total (actual range)	17-20 in
Frost-free period (average)	113 days
Freeze-free period (average)	130 days
Precipitation total (average)	19 in

Climate stations used

- (1) POLLOCK [USC00396712], Pollock, SD
- (2) CEDAR BUTTE 1NE [USC00391539], White River, SD
- (3) COTTONWOOD 2 E [USC00391972], Kadoka, SD
- (4) KENNEBEC [USC00394516], Kennebec, SD

Influencing water features

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

Soil features

The common features of soils in this site are loam to silty clay loam textured surface and subsoils, with typical slopes ranging from 0 to 15 percent but can go up to 25 percent. The soils in this site are well drained and formed in shale, alluvium and loess. The loam to clay surface layer is 3 to 9 inches thick. The soils have a moderate to slow infiltration rate. This site typically should show slight to no evidence of rills, wind scoured areas or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than

about five percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

Soils correlated the Loamy Ecological Site include: Blackpipe, Bryant, Canning, Emigrant, Lowry, Nunn, Ree, Reliance, and Savo.

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

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	80 in
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	5–7 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

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

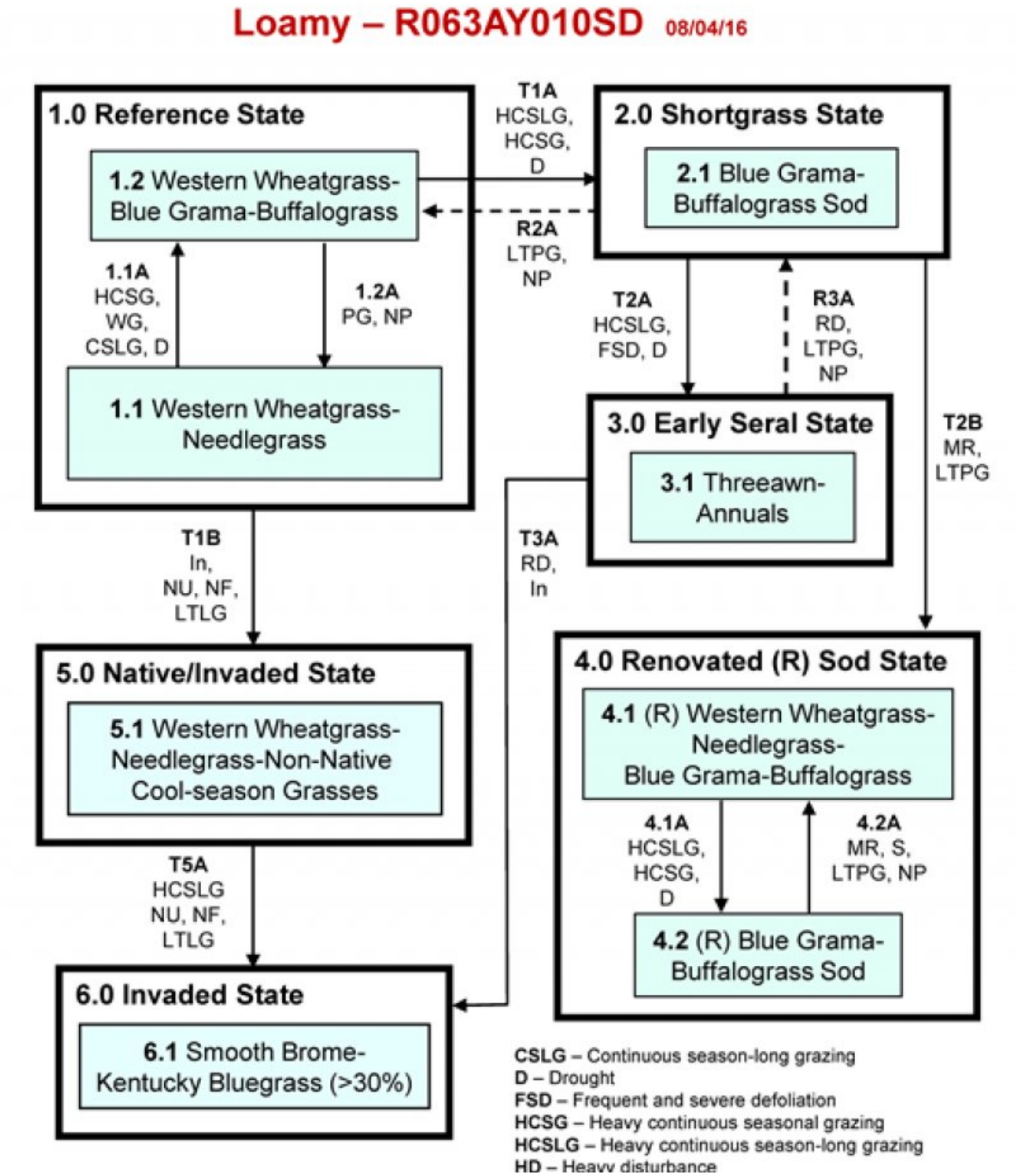
Interpretations are primarily based on the Western Wheatgrass-Needlegrass Plant Community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily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

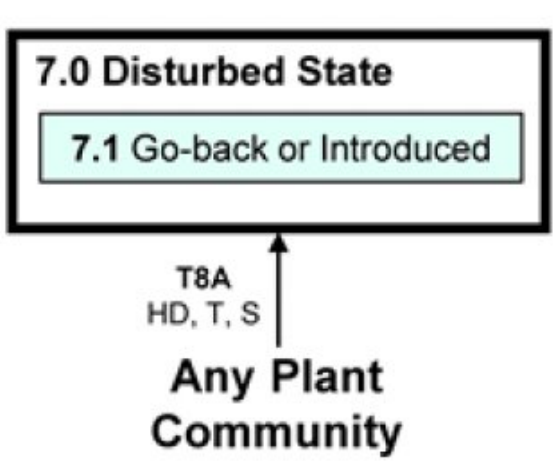
Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence causes this site to depart from the Western Wheatgrass-Needlegrass Plant Community. Blue grama and buffalograss will increase and eventually develop into a sod. Western wheatgrass will increase initially and then

begin to decrease. Green needlegrass, needleandthread, porcupine grass, sideoats grama, and big bluestem will decrease in frequency and production. Excessive defoliation can cause threeawns and annuals to increase and dominate the site. Extended periods of nonuse and/or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as western wheatgrass, bluegrass, and cheatgrass.

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 will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model





In – Invasion of non-native cool-season grasses
LTLG – Long-term light grazing
LTPG – Long-term prescribed grazing
MR – Mechanical renovation
NF – No fire
NP – Normal precipitation
NU – No use
PG – Prescribed grazing
RD – Removal of disturbance
S - Seeding
T - Tillage
WG – Winter grazing
------> Transition may not be fast and/or feasible

Figure 8. Loamy - R063AY010SD

Diagram Legend - Loamy - R063AY010SD

T1A	Heavy continuous season-long grazing or heavy continuous seasonal grazing, without adequate recovery, or grazing in combination with drought.
T1B	Invasion of non-native cool-season grasses, no use, no fire, or long-term light grazing.
T2A	Heavy continuous season-long grazing without adequate recovery, or frequent and severe defoliation or grazing in combination with drought.
T2B	Mechanical renovation to break up sod followed by long-term prescribed grazing that included proper stocking, change in season of use and deferment providing adequate recovery time.
T3A	Removal of grazing disturbance and invasion and establishment of non-native cool-season grasses.
T5A	Heavy continuous season-long grazing, no use and no fire or long-term light grazing.
T8A	Heavy disturbance such as tillage, abandon cropland or tillage and seeding to introduced perennial forage crops.

R2A	Long-term prescribed grazing with change is season of use and adequate recovery, normal precipitation patterns.
R3A	Remove disturbance, long-term prescribed grazing that includes proper stocking, change in season of use and deferment providing adequate recovery in combination with normal precipitation patterns. Transition may not be fast or feasible.

CP 1.1A	1.1 - 1.2	Heavy continuous seasonal grazing (spring), winter grazing, continuous season-long grazing, grazing in combination with drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change is season of use and adequate recovery, normal precipitation following drought.
CP 4.1A	4.1 - 4.2	Heavy continuous season-long grazing, heavy continuous seasonal grazing (spring), grazing in combination with drought.
CP 4.2A	4.2 - 4.1	Mechanical renovation to break up sod, possible seeding of native grasses and forbs followed by long-term prescribed grazing that included proper stocking, change in season of use and deferment providing adequate recovery time, normal precipitation patterns.

Figure 9. Loamy - R063AY010SD

State 1
Reference State

This State represents what is believed to show the natural range of variability that dominated the dynamics of the ecological site prior to European settlement. This site in Reference, is dominated by cool-season grasses and sub-

dominant warm-season grass. Grazing and the lack of grazing, fire and drought are the major drivers between plant communities. Depending on the season of use, continuous seasonal grazing can push this plant community to either a warm-season dominated or a cool-season dominated grassland. Non-use and no fire will result in heavy litter accumulations and the invasion of non-native cool-season grasses.

Community 1.1
Western Wheatgrass-Needlegrass Plant Community

Interpretations are based primarily on the Western Wheatgrass-Needlegrass Plant Community, which is considered to be reference plant community. This plant community can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent woody plants. The community is dominated by cool-season grasses. The major grasses include western wheatgrass, green needlegrass, needleandthread, and sideoats grama. Other grasses include blue grama, buffalograss, sedges, and porcupine grass. This plant community is extremely resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1750	2327	2990
Forb	125	195	275
Shrub/Vine	25	78	135
Total	**1900**	**2600**	**3400**

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

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

Community 1.2
Western Wheatgrass-Blue Grama-Buffalograss Plant Community

This plant community evolved under continuous seasonal grazing (grazing the same area at the same time of year every year) or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grasses include western wheatgrass, blue grama, and buffalograss. Grasses of secondary importance include sideoats grama, sedge, green needlegrass, and needleandthread. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, and western yarrow. A common shrub on this site is fringed sagewort, with the shrub canopy ranging from 0 to 10 percent. When compared to the Western Wheatgrass-Needlegrass Plant Community, blue grama and buffalograss have increased, while green needlegrass and sideoats grama have decreased. The production of mid and tall warm-season grasses has also been reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1110	1700	2190
Forb	95	150	205
Shrub/Vine	95	150	205
Total	**1300**	**2000**	**2600**

Figure 13. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

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 seasonal grazing (grazing the same area at the same time of year every year) will convert the plant community to the Western Wheatgrass-Blue Grama-Buffalograss Plant Community. This would be typical of calving/lambing pastures where the unit is continuously utilized during the late winter through mid-spring. Continuous season-long grazing in association with extended periods of below normal precipitation, can also cause a community shift to more short grass species. This transition will result in decreased forage production and plant species diversity.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing, with proper stocking rates, change in season of use and adequate time for recovery will shift this plant community to the Western Wheatgrass-Needlegrass Plant Community (1.1). Moderate grazing pressure existing during the early spring (prior to May 1) and fall seasons (cool-season regrowth) with favorable growing conditions will move community towards the Western Wheatgrass-Needlegrass Plant Community.

State 2
Shortgrass State

The Shortgrass State is dominated by shortgrass species and upland sedges. The State is the result of grazing patterns that did not provide adequate recover time for cool-season wheat and needle grasses. The hydrologic function of this site is dramatically altered. Runoff is high and infiltration is low. This State is very resistant to change through grazing management alone.

Community 2.1
Blue Grama-Buffalograss Sod Plant Community

This plant community is the result of continuous season-long or continuous seasonal grazing and over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grasses include blue grama and buffalograss. Grasses of secondary importance include sedge and western wheatgrass. Forbs commonly found in this plant community include wild parsley and scarlet globemallow. Fringed sagewort is a common shrub to this site. Shrub canopy ranges from 0 to 10 percent. When compared to the Western Wheatgrass-Needlegrass Plant Community (1.1), blue grama and buffalograss are dominant on this plant community. Cool-season grasses have decreased significantly. This vegetation state is very resistant to change. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	580	1104	1630
Forb	60	98	135
Shrub/Vine	60	98	135
Total	**700**	**1300**	**1900**

Figure 15. Plant community growth curve (percent production by month). SD6305, Pierre Shale Plains, warm-season dominant.. Warm-season dominant, uplands..

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

State 3
Early Seral State

This state is the result of very heavy, concentrated disturbance such as concentrated rodent activity, or livestock concentration areas. This State can also develop as a result of invasion by highly competitive weed species such as Canada thistle, hound’s tongue, leafy spurge, or knapweeds. Extended periods of drought accompanied by heavy grazing can also push an ‘At Risk’ plant community phase to this state. In most cases, this phase is dominated by pioneer perennial and annual grass and forb species. Bare ground is also much higher than on any other plant community phase.

Community 3.1
Threeawn-Annuals Plant Community

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, defoliation by rodents, etc.) The potential plant community is made up of approximately 50 percent grasses and grass-like species, 10-25 percent forbs, and 5-25 percent shrubs. The dominant grasses include threeawn and annual brome grasses. Other grasses may include little bluestem, blue grama, buffalograss, sedges, and western wheatgrass. The dominant forbs include fetid marigold, cudweed sagewort, western ragweed, prostrate verbena, pussytoes, and other annual invader-like species. The dominant shrubs include fringed sagewort and cactus. This plant community is susceptible to invasion of Canada thistle and other nonnative species because of the relatively high percent of bare ground. Compared to the Western Wheatgrass-Needlegrass Plant Community, red threeawn, annual bromegrasses, and percent of bare ground have increased. Western wheatgrass, needlegrasses, and other cool-season grasses and grass-like species have decreased as have the warm-season species including little bluestem, sideoats grama, blue grama, and buffalograss. Plant diversity is low (plant richness may be high, but areas are often dominated by a few species and evenness is lacking). This plant community is difficult to return to the Western Wheatgrass-Needlegrass Plant Community because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites. Mechanical renovation of this Plant Community is also an option to improve forage production, however, if the disturbances causing the transition to this plant community is not changed it will revert back to the original plant community. A separate Transition Pathway was not included in the State and Transition Model because these plant communities are relatively minor in occurrence and the end result are unpredictable.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	350	560	870
Forb	75	120	165
Shrub/Vine	75	120	165
Total	**500**	**800**	**1200**

Figure 17. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

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

State 4
Renovated (R) Sod State

The forage production potential of a shortgrass plant community can be quickly improved through mechanical renovation. Mechanical renovation creates microrelief that can restore, hydrologic function by increasing infiltration and decreasing runoff. These factors favor cool-season species such as western wheatgrass, green needlegrass, and a variety of forbs. With proper management after renovation, this plant community will have similar plant composition and growth curve characteristics of the Reference State (1.0). Production could be higher, depending on the degree of mechanical alteration. Proper grazing management must be implemented to maintain this plant community.

Community 4.1
(R) Western Wheatgrass-Needlegrass-Blue Grama-Buffalograss Plant Community

With proper management after renovation (R), this plant community will have similar plant composition and growth curve characteristics of the Reference State (1.0). Production could be slightly higher, depending on the degree of mechanical alteration. Proper grazing management must be included in order to derive the benefits of renovation.

Community 4.2
(R) Blue Grama-Buffalograss Sod Plant Community.

This plant community will be similar to the Blue Grama-Buffalograss Sod Plant Community (2.1) in most respects. The main difference is the microrelief created by the renovation. Depending on the renovation technique, the microrelief can remain on the landscape for many decades making vehicular travel across the landscape uncomfortable if not extremely difficult.

Pathway 4.1A
Community 4.1 to 4.2

Heavy continuous season-long grazing or heavy continuous seasonal grazing (spring grazing) or extended drought without change in grazing management can shift the renovated (R) Western Wheatgrass-Needlegrass-Blue Grama-Buffalograss Plant Community (4.1) to the (R) Blue Grama-Buffalograss Sod Plant Community (4.2).

Pathway 4.2A
Community 4.2 to 4.1

This plant community can be returned to (R) Western Wheatgrass-Needlegrass-Blue Grama-Buffalograss Plant Community Phase (4.1) through another mechanical renovation treatment, and possibly inter-seeding, followed by long-term prescribed grazing and normal precipitation patterns. The 2nd mechanical treatment may make travel across the landscape difficult for vehicles and livestock.

State 5
Native/Invaded State

This State has been invaded by Kentucky bluegrass and/or smooth brome but not at the levels where the plant community is dominated by these species. This State is ‘At Risk’ of transitioning to the Invaded State (6.0) which is dominated by smooth brome and/or Kentucky bluegrass.

Community 5.1
Western Wheatgrass-Needlegrass-Non-Native Cool-Season Grasses Plant Community

This plant community develops when Kentucky bluegrass or smooth brome become established on the site. This may occur due to close proximity to seed sources or expansion from road ditches, improved pastures or other invaded sites. No use and no fire or very light stock stocking rates of long periods of time will allow these non-native cool-season grasses to increase in the plant community. 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. Typically, rhizomatous grasses form small colonies because of a lack of tiller stimulation. The potential vegetation is made up of 80 to 85 percent grass or grass-like plants, 5 to 10 percent forbs, and 5 percent shrubs. The dominant grasses will be western wheatgrass, needlegrasses and non-native cool-season grasses, primarily, smooth brome and/or Kentucky bluegrass. Warm-season grasses will include patched of little bluestem and sideoats grama. Forbs will be diverse but not dominate and some shrubs will persist. Forage production can be variable.

State 6
Invaded State

This state is the result of invasion and dominance of introduced 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 would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 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).

Community 6.1
Smooth Brome-Kentucky Bluegrass (>30%) Plant Community

This plant community is dominated by Kentucky bluegrass or smooth brome and/or other non-native cool season grasses (30 percent or more of the PC). This plant community evolved under no use and no fire or heavy continuous season-long grazing with no change in season of use or long-term light grazing. This plant community is made up of approximately 80 to 85 percent grasses and grass-like species, 5 to 10 percent forbs, and 5 percent shrubs. Dominant grasses include Kentucky bluegrass, and smooth brome. Western wheatgrass and some needlegrass may still be found in the plant community. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, scurfpea, and western ragweed. Production will be significantly reduced when compared to the interpretive plant community. The period when palatability is high is relatively short, as Kentucky bluegrass and smooth brome matures rapidly. Energy capture is also reduced. Runoff is high and biological activity in the soil is likely reduced significantly in this phase.

State 7
Disturbed State

This State can be transition to from any Plant Community. The two separate vegetative Plant Communities are highly variable in nature. They are derived through different management scenarios, and are not related

successionally. Infiltration, runoff, and soil erosion varies depending on the vegetation present on the site.

Community 7.1
Go-back or Introduced Plant Communities

The Go-back plant community can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned land, either past or present). During the early successional stages, the species that mainly dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn, bluegrass, smooth brome, annual bromegrass, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, deathcamas, prickly lettuce, marestail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health. The Introduced Plant Community is normally those areas seeded to pubescent or intermediate wheatgrass, alfalfa, crested wheatgrass, or other introduced species. Refer to the associated Forage Suitability Group description for adapted species.

Transition 1A
State 1 to 2

Heavy continuous season-long grazing or heavy continuous seasonal grazing (grazing at the same time of year every year) will shift this plant community to the Shortgrass State (2.0). Drought can expedite this transition. Forage production, species diversity, and ground cover will decrease.

Transition 1B
State 1 to 5

Invasion of non-native cool-season grasses, no use and no fire and long-term light stocking will cause the Reference Plant Communities to transition to a Native/Invaded State (5.0). Forage production may not change however species diversity will become smaller and litter will increase.

Transition 8A
State 1 to 7

Heavy disturbance including tillage, abandoned cropland or seeding to improved pasture species result in a transition to the Disturbed State (7.0).

Restoration pathway 2A
State 2 to 1

Long-term prescribed grazing may potentially convert the plant community to the Western Wheatgrass-Blue Grama-Buffalograss Plant Community (1.2), assuming an adequate seed/vegetative source is present. This could require significant time and input to achieve and in the end may not meet management objectives.

Transition 2A
State 2 to 3

Heavy continuous season-long grazing and/or frequent severe defoliation will likely move this plant community to the Early Seral State (3.0).

Transition 2B
State 2 to 4

Mechanical renovation such as pitting, light disking, chiseling and possible inter-seeding in combination with long-term prescribed grazing will help improve the productivity of the site. This pathway will convert the plant community to the Renovated State (4.0).

Transition 8A
State 2 to 7

Heavy disturbance including tillage, abandoned cropland or seeding to improved pasture species result in a transition to the Disturbed State (7.0).

Restoration pathway 3A
State 3 to 2

After removing the disturbance that created the Early Seral State (3.0) and long-term prescribed grazing, including adequate rest periods, and normal precipitation patterns this plant community will transition back to the Shortgrass State (2.0) and possible through the successional stages eventually leading to the Western Wheatgrass-Blue Grama-Buffalograss Plant Community (1.2). Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly but typically it will take an extended period of time and may not meet management objectives.

Transition 3A
State 3 to 6

If this plant community is invaded by non-native cool-season grasses and the disturbance causing the frequent defoliation is removed this plant community is likely to transition to the Invaded State (6.0).

Transition 8A
State 3 to 7

Heavy disturbance including tillage, abandoned cropland or seeding to improved pasture species result in a transition to the Disturbed State (7.0).

Transition 8A
State 4 to 7

Heavy disturbance including tillage, abandoned cropland or seeding to improved pasture species result in a transition to the Disturbed State (7.0).

Transition 5A
State 5 to 6

Heavy continuous season-long grazing, or no use and no fire, or long-term light grazing will cause a transition of the Native/Invaded State to the Invaded State (6.0). The ecological threshold can be identified by the percentage of non-native cool-season species in the Plant Community. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition (Toledo, D. et al., 2014). Smooth brome is assumed to follow a similar ecological threshold but is not document scientifically.

Transition 8A
State 5 to 7

Heavy disturbance including tillage, abandoned cropland or seeding to improved pasture species result in a transition to the Disturbed State (7.0).

Transition 8A
State 6 to 7

Heavy disturbance including tillage, abandoned cropland or seeding to improved pasture species result in a transition to the Disturbed State (7.0).

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	**Wheatgrass**			910–1300	
	western wheatgrass	PASM	*Pascopyrum smithii*	910–1300	–
2	**Needlegrass**			390–910	
	green needlegrass	NAVI4	*Nassella viridula*	260–650	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	260–520	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–130	–
3	**Tall/Mid Warm-season**			260–390	
	sideoats grama	BOCU	*Bouteloua curtipendula*	130–390	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–130	–
	big bluestem	ANGE	*Andropogon gerardii*	0–130	–
4	**Short Warm-season**			130–260	
	blue grama	BOGR2	*Bouteloua gracilis*	130–260	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–130	–
	threeawn	ARIST	*Aristida*	0–52	–
5	**Other Native Grasses**			0–130	
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–130	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–78	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–52	–
6	**Grass-likes**			26–130	
	threadleaf sedge	CAFI	*Carex filifolia*	26–78	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–52	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–26	–
Forb					
8	**Forbs**			130–260	
	American vetch	VIAM	*Vicia americana*	0–78	–
	Forb, native	2FN	*Forb, native*	0–78	–
	false boneset	BREU	*Brickellia eupatorioides*	0–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–78	–
	milkvetch	ASTRA	*Astragalus*	0–52	–
	dotted blazing star	LIPU	*Liatris punctata*	0–52	–
	desertparsley	LOMAT	*Lomatium*	0–52	–
	scurfpea	PSORA2	*Psoralidium*	0–52	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–52	–
	goldenrod	SOLID	*Solidago*	0–52	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–52	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–52	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–52	–
	prairie clover	DALEA	*Dalea*	0–52	

	prairie clover	DALEA	*Dalea*	0–52	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–52	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–52	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–52	–
	field sagewort	ARCA12	*Artemisia campestris*	0–52	–
	beardtongue	PENST	*Penstemon*	0–26	–
	spiny phlox	PHHO	*Phlox hoodii*	0–26	–
	deathcamas	ZIGAD	*Zigadenus*	0–26	–
	pussytoes	ANTEN	*Antennaria*	0–26	–
	textile onion	ALTE	*Allium textile*	0–26	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	0–26	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–26	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–26	–
Shrub/Vine					
9	**Shrubs**			26–130	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–52	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–52	–
	rose	ROSA5	*Rosa*	0–52	–
	pricklypear	OPUNT	*Opuntia*	0–26	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			200–500	
	western wheatgrass	PASM	*Pascopyrum smithii*	200–500	–
2	**Needlegrass**			100–300	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	100–200	–
	green needlegrass	NAVI4	*Nassella viridula*	100–200	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–40	–
3	**Tall/Mid Warm-Season Grasses**			40–200	
	sideoats grama	BOCU	*Bouteloua curtipendula*	40–200	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–60	–
	big bluestem	ANGE	*Andropogon gerardii*	0–40	–
4	**Short Warm-Season Grasses**			200–600	
	blue grama	BOGR2	*Bouteloua gracilis*	200–500	–
	buffalograss	BODA2	*Bouteloua dactyloides*	20–160	–
	threeawn	ARIST	*Aristida*	0–100	–
5	**Other Native Grasses**			0–100	
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–100	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–40	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–20	–

6	**Grass-likes**			100–200	
	threadleaf sedge	CAFI	*Carex filifolia*	40–160	–
	needleleaf sedge	CADU6	*Carex duriuscula*	20–100	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–60	–
7	**Non-Native Grasses**			0–300	
	smooth brome	BRIN2	*Bromus inermis*	0–300	–
	bluegrass	POA	*Poa*	0–300	–
	cheatgrass	BRTE	*Bromus tectorum*	0–100	–
Forb					
8	**Forbs**			100–200	
	sweetclover	MELIL	*Melilotus*	0–100	–
	Forb, introduced	2FI	*Forb, introduced*	0–80	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–80	–
	Forb, native	2FN	*Forb, native*	0–60	–
	goldenrod	SOLID	*Solidago*	0–60	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–60	–
	scurfpea	PSORA2	*Psoralidium*	0–60	–
	field sagewort	ARCA12	*Artemisia campestris*	0–60	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–40	–
	American vetch	VIAM	*Vicia americana*	0–40	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–40	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–40	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–40	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–40	–
	prairie clover	DALEA	*Dalea*	0–40	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–40	–
	dotted blazing star	LIPU	*Liatris punctata*	0–40	–
	desertparsley	LOMAT	*Lomatium*	0–40	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–20	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	0–20	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–20	–
	pussytoes	ANTEN	*Antennaria*	0–20	–
	textile onion	ALTE	*Allium textile*	0–20	–
	milkvetch	ASTRA	*Astragalus*	0–20	–
	false boneset	BREU	*Brickellia eupatorioides*	0–20	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–20	–
	beardtongue	PENST	*Penstemon*	0–20	–
	spiny phlox	PHHO	*Phlox hoodii*	0–20	–
	vervain	VERBE	*Verbena*	0–20	–
	deathcamas	ZIGAD	*Zigadenus*	0–20	–
Shrub/Vine					
9	**Shrubs**			100–200	

9	**Shrubs**			100–200	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–60	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–60	–
	rose	ROSA5	*Rosa*	0–60	–
	pricklypear	OPUNT	*Opuntia*	0–40	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			65–130	
	western wheatgrass	PASM	*Pascopyrum smithii*	65–130	–
2	**Needlegrass**			0–65	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–65	–
3	**Tall/Mid Warm-Season Grasses**			0–65	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–65	–
4	**Short Warm-Season Grasses**			325–650	
	blue grama	BOGR2	*Bouteloua gracilis*	260–520	–
	buffalograss	BODA2	*Bouteloua dactyloides*	65–195	–
	threeawn	ARIST	*Aristida*	26–130	–
5	**Other Native Grasses**			0–65	
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–39	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–26	–
6	**Grass-likes**			65–195	
	threadleaf sedge	CAFI	*Carex filifolia*	65–156	–
	needleleaf sedge	CADU6	*Carex duriuscula*	13–104	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–65	–
7	**Non-Native Grasses**			0–195	
	bluegrass	POA	*Poa*	0–130	–
	smooth brome	BRIN2	*Bromus inermis*	0–65	–
	cheatgrass	BRTE	*Bromus tectorum*	0–65	–
Forb					
8	**Forbs**			65–130	
	Forb, introduced	2FI	*Forb, introduced*	0–65	–
	sweetclover	MELIL	*Melilotus*	0–65	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–52	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–39	–
	field sagewort	ARCA12	*Artemisia campestris*	0–39	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–39	–
	Forb, native	2FN	*Forb, native*	0–26	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–26	–
	scurfpea	PSORA2	*Psoralidium*	0–26	–
	goldenrod	SOLID	*Solidago*	0–26	–

	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–26	–
	vervain	VERBE	*Verbena*	0–26	–
	deathcamas	ZIGAD	*Zigadenus*	0–13	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–13	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–13	–
	dotted blazing star	LIPU	*Liatris punctata*	0–13	–
	spiny phlox	PHHO	*Phlox hoodii*	0–13	–
	pussytoes	ANTEN	*Antennaria*	0–13	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–13	–
	prairie clover	DALEA	*Dalea*	0–13	–
	fetid marigold	DYPA	*Dyssodia papposa*	0–13	–
Shrub/Vine					
9	**Shrubs**			65–130	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–65	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–65	–
	pricklypear	OPUNT	*Opuntia*	0–65	–
	rose	ROSA5	*Rosa*	0–26	–

Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			0–80	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–80	–
2	**Needlegrass**			0–40	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–40	–
4	**Short Warm-Season Grasses**			120–440	
	threeawn	ARIST	*Aristida*	120–360	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–160	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–120	–
5	**Other Native Grasses**			0–32	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–16	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–16	–
6	**Grass-likes**			8–40	
	needleleaf sedge	CADU6	*Carex duriuscula*	0–40	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–40	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–24	–
7	**Non-Native Grasses**			8–120	
	cheatgrass	BRTE	*Bromus tectorum*	8–120	–
	bluegrass	POA	*Poa*	0–40	–
Forb					
8	**Forbs**			80–160	
	sweetclover	MELIL	*Melilotus*	0–80	–

	Forb, introduced	2FI	*Forb, introduced*	0–80	–
	fetid marigold	DYPA	*Dyssodia papposa*	0–64	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–64	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–40	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–24	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–24	–
	vervain	VERBE	*Verbena*	0–24	–
	field sagewort	ARCA12	*Artemisia campestris*	0–16	–
	pussytoes	ANTEN	*Antennaria*	0–8	–
	Forb, native	2FN	*Forb, native*	0–8	–
	spiny phlox	PHHO	*Phlox hoodii*	0–8	–
	scurfpea	PSORA2	*Psoralidium*	0–8	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–8	–
	deathcamas	ZIGAD	*Zigadenus*	0–8	–
Shrub/Vine					
9	**Shrubs**			80–160	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–80	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–80	–
	pricklypear	OPUNT	*Opuntia*	0–80	–

Animal community

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Western Wheatgrass-Needlegrass Plant Community (1.1)
Average Annual Production (lbs./acre, air-dry): 2600
Stocking Rate* (AUM/acre): 0.71

Western Wheatgrass-Blue Grama-Buffalograss Plant Community (1.2)
Average Annual Production (lbs./acre, air-dry): 2000
Stocking Rate* (AUM/acre): 0.55

Blue Grama-Buffalograss Sod Plant Community (2.1)
Average Annual Production (lbs./acre, air-dry): 1300
Stocking Rate* (AUM/acre): 0.36

Threeawn-Annuals Plant Community (3.1)
Average Annual Production (lbs./acre, air-dry): 800
Stocking Rate* (AUM/acre): 0.22

Other Plant Community Phases have highly variable forage production levels. Actual on-site forage inventories will need to be conducted to determine average annual production and stocking rates.

*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).

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

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups B and C. Infiltration is generally moderate, and runoff potential varies from low to moderate depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. 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, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

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

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

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: April Boltjes, Range

Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Kent Cooley, Soil Scientist, NRCS; Darrin Jons, RMS, USFS: Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. There is 1 SCS-RANGE-417 collected in 1977 in Mellette County, South Dakota.

Other references

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Contributors

Stan Boltz

Approval

Suzanne Mayne-Kinney, 6/26/2024

Acknowledgments

Rick L. Peterson ESD Update - 8/21/16

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/08/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

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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 10 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 3 to 9 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular at least in the upper A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool-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: Rhizomatous wheatgrasses > Mid/tall cool-season bunchgrasses >>

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

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

    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.

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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 1,900-3,400 lbs./acre (air-dry weight). Reference value production is 2,600 lbs./acre (air-dry weight).

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