

Ecological site R102DY012SD

Thin Upland

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 102D–Prairie Coteau

This area makes up about 7,867 square miles (20,375 square kilometers), consisting mostly of nearly level to undulating till plains with potholes and moraines. Elevation ranges from 1,150 to 2,130 feet (350 to 650 meters). The average annual precipitation is 22 to 29 inches (559 to 734 millimeters). The average annual temperature is 42 to 45 degrees F (6 to 7 degrees C). The dominant soil order in this MLRA is Mollisols. The soils in this area dominantly have a frigid temperature regime, and an aquic or udic moisture regime. They are generally very deep and loamy. Soils range from well drained to very poorly drained. Parent materials are dominantly fine-loamy till to clayey material, with smaller amounts of outwash, glaciofluvial deposits, eolian deposits, alluvium, and, to a lesser extent, loess and organic materials.

Classification relationships

Fenneman (1916) Physiographic Regions

Division - Interior Plains

East:

Province - Central Lowland

Section - Western Lake / Dissected Till Plains (12b/12e)

USFS (2007) Ecoregions

Domain - Humid Temperate

Division - Prairie

Province - Prairie Parkland (Temperate)

Section - North-Central Glaciated Plains (251B)

EPA Ecoregions (Omernik 1997)

I - Great Plains (9)

II - Temperate Prairies (9.2)

III - Aspen Parkland/Northern Glaciated Plains (9.2.1)

Ecological site concept

The Thin Upland ecological site occurs on the shoulder slopes in the upland areas. Soils are well drained and will effervesce with acid at or near the surface. Precipitation tends to runoff, leaving less soil moisture for plant growth, production is lower, and species composition will tend towards more drought tolerant. In some areas the surface layer may consist of stony to extremely stony. Slopes can range from 0 to 45 percent. Vegetation in the Reference State includes little bluestem, needlegrasses, and prairie dropseed. Forbs include goldenrods, sageworts, heath aster, and scurfpeas. Non-native grasses such as Kentucky bluegrass, smooth brome and quackgrass may invade the site due to changes in disturbance regime.

Associated sites

R102DY010SD	Loamy These sites occur on upland areas. The soils are well drained and have less than 40 percent clay in the surface and subsoil.
R102DY020SD	Loamy Overflow These sites occur in upland swales. The Soils are moderately well drained, which have water flow into and over/through the site.
R102DY011SD	Clayey These sites occur on upland areas. The soils are well drained and have greater than 40 percent clay in the surface and subsoil.

Similar sites

R102DY001SD	Shallow Marsh The Loamy site occurs in a backslope landscape position and do not effervesce with acid at or near the surface. A Loamy site will have more big bluestem, less little bluestem and higher production than a Thin Upland site.
R102DY011SD	Clayey The Clayey site occurs in a backslope landscape position and do not effervesce with acid at or near the surface. A Clayey site will have more needlegrasses, less little bluestem, and higher production than a Thin Upland site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Hesperostipa spartea</i>

Physiographic features

This site occurs on moraines and plains in upland areas.

Table 2. Representative physiographic features

Landforms	(1) Upland > Moraine (2) Upland > Plain
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,000–2,000 ft
Slope	3–40%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 22 to 28 inches. Half or more of the precipitation falls during the growing season. Rainfall typically occurs during high-intensity, convective thunderstorms in summer. In the western part of the MLRA, rainfall is less abundant and not always adequate for full maturation of crops. Precipitation in winter is typically snow. The average annual temperature is 42 to 45 degrees F. The freeze-free period averages 142 days and ranges from 131 to 150 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	114-129 days
Freeze-free period (characteristic range)	138-146 days
Precipitation total (characteristic range)	24-27 in
Frost-free period (actual range)	110-131 days
Freeze-free period (actual range)	131-150 days
Precipitation total (actual range)	22-28 in
Frost-free period (average)	122 days
Freeze-free period (average)	142 days
Precipitation total (average)	25 in

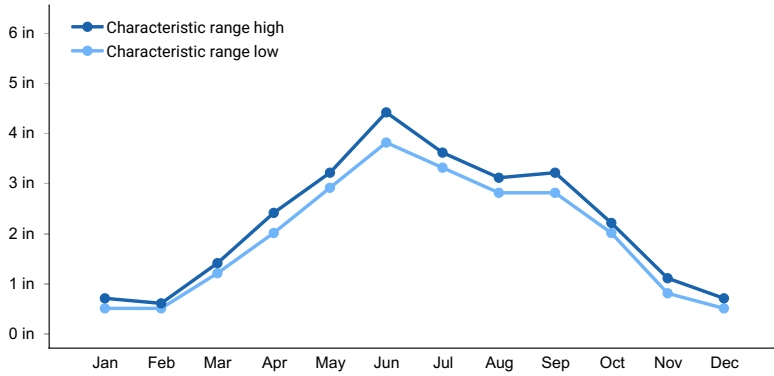


Figure 1. Monthly precipitation range

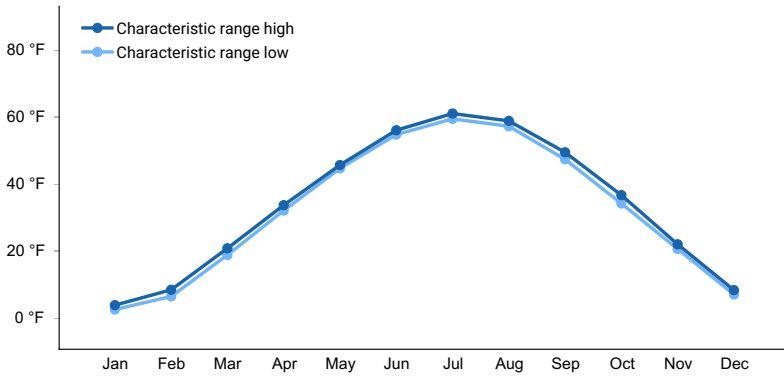


Figure 2. Monthly minimum temperature range

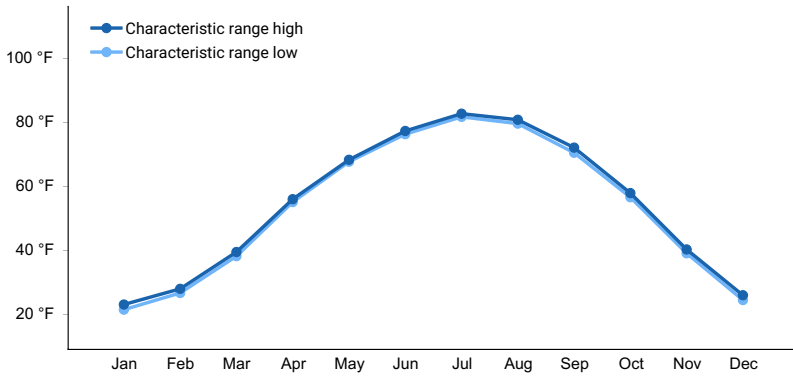


Figure 3. Monthly maximum temperature range

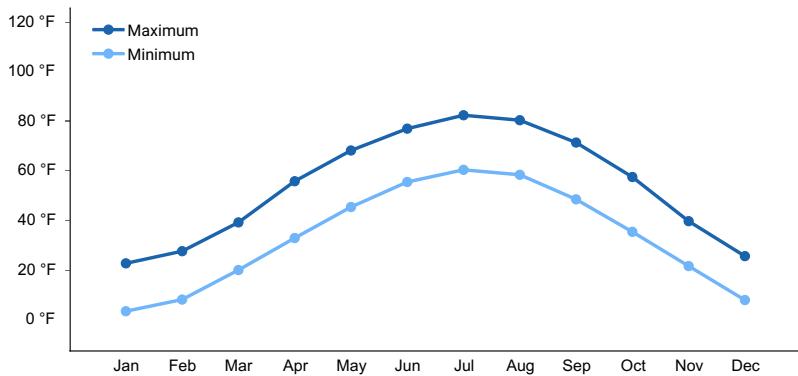


Figure 4. Monthly average minimum and maximum temperature

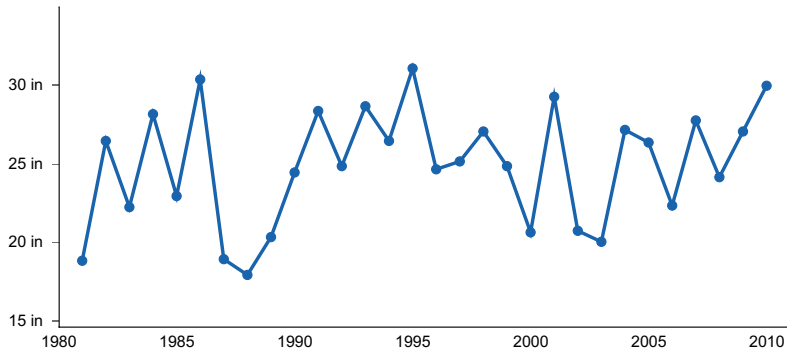


Figure 5. Annual precipitation pattern

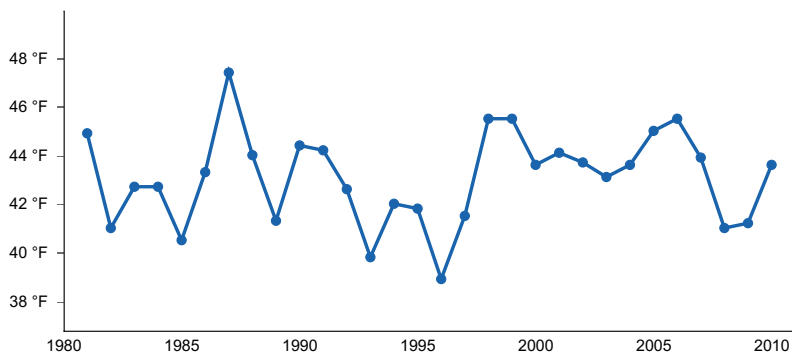


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ASTORIA 4S [USC00390422], White, SD
- (2) CLEAR LAKE [USC00391777], Clear Lake, SD
- (3) ROY LAKE [USC00397326], Lake City, SD
- (4) WAUBAY NWR [USC00398980], Waubay, SD
- (5) WEBSTER [USC00399004], Webster, SD
- (6) WATERTOWN RGNL AP [USW00014946], Watertown, SD
- (7) WATERTOWN 1W [USC00398930], Watertown, SD
- (8) CASTLEWOOD [USC00391519], Castlewood, SD
- (9) BROOKINGS 2 NE [USC00391076], Brookings, SD
- (10) TYLER [USC00218429], Tyler, MN

Influencing water features

No wetland features are associated with this site.

Soil features

Soils are primarily formed in till. Surface textures are primarily loam, but may also be clay loam, silty clay loam, or silt loam. Soils are well drained.

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Loam (2) Clay loam (3) Silty clay loam (4) Silt loam
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6.6–6.9 in
Soil reaction (1:1 water) (0-10in)	7.4–8.4
Subsurface fragment volume <=3" (0-60in)	2–5%
Subsurface fragment volume >3" (0-60in)	0%

Ecological dynamics

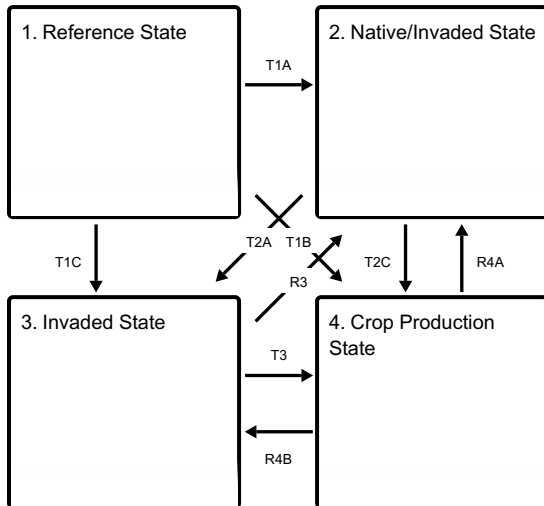
The site which is located in the Prairie Pothole Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase. This community phase and the Reference State have 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 considered.

This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. 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 grazing events causes departure from the 2.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase. Little bluestem, western wheatgrass (*Pascopyrum smithii*), sideoats grama (*Bouteloua curtipendula*), and blue grama (*Bouteloua gracilis*) will increase. Eventually blue grama, quackgrass (*Elymus repens*), and Kentucky bluegrass (*Poa pratensis*) may develop into a sod. Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), porcupine grass, green needlegrass (*Nassella viridula*), sideoats grama, and little bluestem will decrease in frequency and production. 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 Kentucky bluegrass, smooth brome grass (*Bromus inermis*), and green needlegrass.

Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

State and transition model

Ecosystem states



T1A - Heavy continuous grazing, non-use, no fire, invasion

T1C - Non-native encroachment/seeding

T1B - Tillage

T2A - Non-use, no fire, heavy continuous grazing

T2C - Tillage

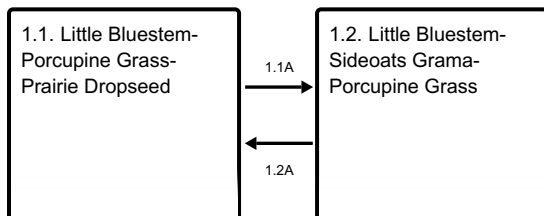
R3 - Long-term prescribed grazing, prescribed burning

T3 - Tillage

R4A - Seeding

R4B - Seeding, abandonment of cropping

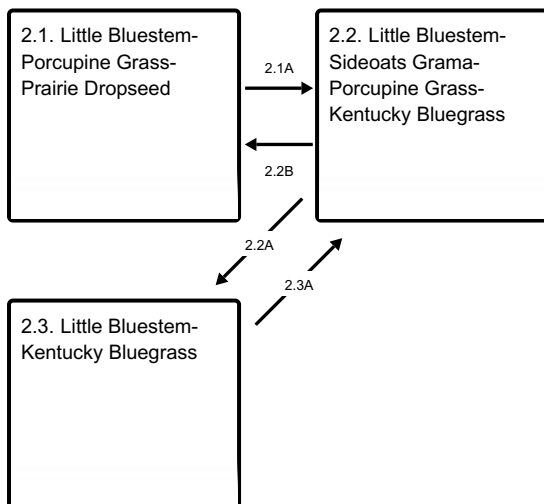
State 1 submodel, plant communities



1.1A - Heavy continuous grazing

1.2A - Prescribed grazing with recovery periods, prescribed burning

State 2 submodel, plant communities



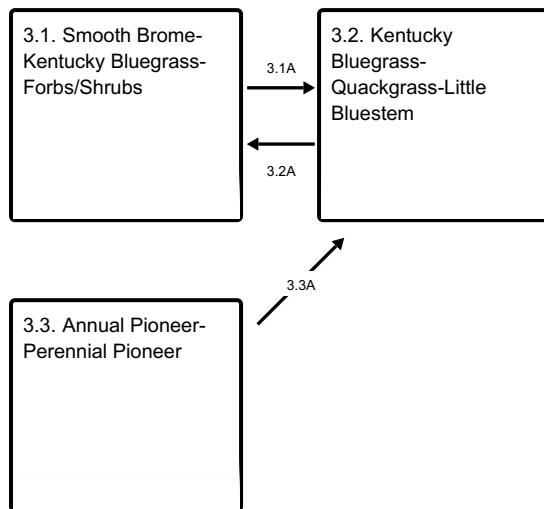
2.1A - Heavy continuous grazing

2.2B - Prescribed grazing with recovery periods, prescribed burning

2.2A - Heavy continuous grazing

2.3A - Prescribed grazing with recovery periods, prescribed burning

State 3 submodel, plant communities

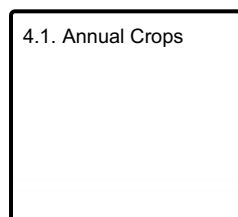


3.1A - Heavy continuous grazing

3.2A - Prescribed grazing with recovery periods

3.3A - Time without disturbances

State 4 submodel, plant communities



State 1 Reference State

The Reference State represents the natural range of variability that dominated the dynamics of this ecological site (ES). This state was dominated by warm-season grasses, with cool-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and/or above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined and cool-season bunchgrasses and short to mid-statured warm-season grasses would have increased. Today, a similar state, the Native/Invaded State (State 2) 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.

Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- rose (*Rosa*), shrub
- prairie sagewort (*Artemisia frigida*), shrub
- little bluestem (*Schizachyrium scoparium*), grass
- big bluestem (*Andropogon gerardii*), grass
- porcupinegrass (*Hesperostipa spartea*), grass
- threadleaf sedge (*Carex filifolia*), grass

- blacksamson echinacea (*Echinacea angustifolia*), other herbaceous
- stiff sunflower (*Helianthus pauciflorus*), other herbaceous
- blazing star (*Liatris*), other herbaceous

Community 1.1

Little Bluestem-Porcupine Grass-Prairie Dropseed

Interpretations are based primarily on the 1.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase (this is also considered to be climax). The potential vegetation was about 80 percent grasses or grass-like plants, 10 percent forbs, and 8 percent shrubs. The community was dominated by warm-season grasses, with cool-season grasses being subdominant. The major grasses included little bluestem, porcupine grass, prairie dropseed, big bluestem, Indiangrass, sideoats grama, and green needlegrass. Other grass or grass-like species included plains muhly (*Muhlenbergia cuspidata*), switchgrass (*Panicum virgatum*), Canada wildrye (*Elymus Canadensis*), needleandthread (*Hesperostipa comata*), slender wheatgrass (*Elymus trachycaulus*), western wheatgrass, blue grama, and threadleaf sedge (*Carex filifolia*). This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was 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	1980	2610	3180
Forb	135	225	345
Shrub/Vine	85	165	275
Total	2200	3000	3800

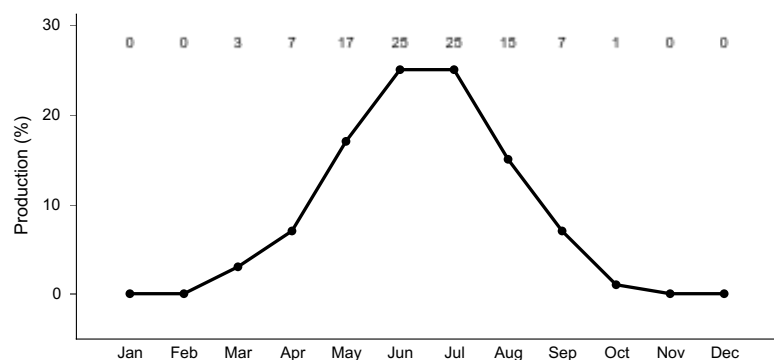


Figure 8. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Community 1.2

Little Bluestem-Sideoats Grama-Porcupine Grass

This plant community evolved under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses included little bluestem, sideoats grama, and porcupine grass. Grasses of secondary importance included big bluestem, porcupine grass, blue grama, western wheatgrass, prairie dropseed, and threadleaf sedge. Forbs commonly found in this plant community included goldenrod (*Solidago*), cudweed sagewort (*Artemisia ludoviciana*), heath aster (*Symphotrichum ericoides*), scurfpea (*Psoralidium*), western ragweed (*Ambrosia psilostachya*), and western yarrow (*Achillea millefolium*). This plant community had similar plant composition to the 2.2 Little Bluestem-Sideoats Grama-Porcupine Grass-Kentucky Bluegrass Plant Community Phase. The main difference is that this plant community phase did not have the presence of nonnative invasive species such as Kentucky bluegrass and smooth brome grass. When compared to the 1.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase, little bluestem and sideoats grama increased. Production of tall warm-season grasses was reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition

could be altered through long-term overgrazing. If the herbaceous component was intact, it tended to be resilient if the disturbance was not long-term. Most of the components of the ecological processes would have been functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses would have been reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allowed for an increase in shorter-statured (and shallower rooted) species.

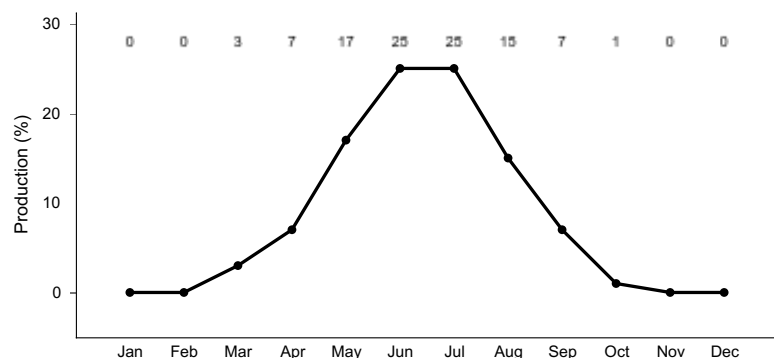


Figure 9. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Pathway 1.1A Community 1.1 to 1.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Little Bluestem-Sideoats Grama-Porcupine Grass Plant Community Phase.

Pathway 1.2A Community 1.2 to 1.1

Prescribed Grazing, and/or prescribed burning returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest would have converted this plant community to the 1.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase.

State 2 Native/Invaded State

This state represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire due to fire suppression. This state is dominated by cool- and warm-season grasses. It 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. Taller warm-season species can decline and a corresponding increase in short statured grass will occur.

Dominant plant species

- snowberry (*Symphoricarpos*), shrub
- smooth sumac (*Rhus glabra*), shrub
- rose (*Rosa*), shrub
- little bluestem (*Schizachyrium scoparium*), grass
- big bluestem (*Andropogon gerardii*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- green needlegrass (*Nassella viridula*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- goldenrod (*Solidago*), other herbaceous
- white heath aster (*Symphotrichum ericoides*), other herbaceous
- scurfpea (*Psoralidium*), other herbaceous
- Canada thistle (*Cirsium arvense*), other herbaceous

Community 2.1

Little Bluestem-Porcupine Grass-Prairie Dropseed

This plant community phase is similar to the 1.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and smooth brome grass (up to about 10 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 8 percent shrubs. This community is dominated by warm-season grasses, with cool-season grasses being subdominant. The major grasses include little bluestem, porcupine grass, prairie dropseed, big bluestem, Indiangrass, sideoats grama, and green needlegrass. Other grass or grass-like species include plains muhly, switchgrass, Canada wildrye, needleandthread, slender wheatgrass, western wheatgrass, blue grama, Kentucky bluegrass, and threadleaf sedge. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

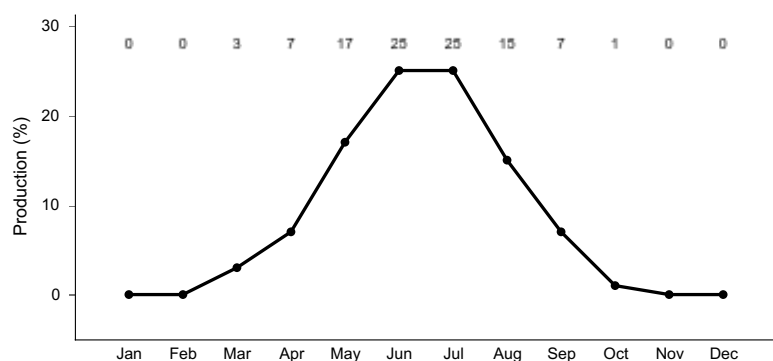


Figure 10. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Community 2.2

Little Bluestem-Sideoats Grama-Porcupine Grass-Kentucky Bluegrass

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include little bluestem, sideoats grama, and Porcupine Grass. Grasses of secondary importance include big bluestem, porcupine grass, blue grama, western wheatgrass, prairie dropseed, and threadleaf sedge. Forbs commonly found in this plant community include goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow. When compared to the 1.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase, little bluestem, sideoats grama, and Kentucky bluegrass have increased. Production of tall warm-season grasses is 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. Most of the components of the ecological processes are functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses are reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allows for an increase in shorter-statured (and shallower rooted) species. The introduction of non-native invasive species such as Kentucky bluegrass and smooth brome grass results in alterations to the soil profile. Organic matter levels tend to decrease and begin to be concentrated more in the surface layers, and the structure will begin to be modified. These changes favor the shallow-rooted species and hasten their eventual dominance if steps are not taken to reduce these species.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1590	1980	2305
Forb	105	240	420
Shrub/Vine	105	180	275
Total	1800	2400	3000

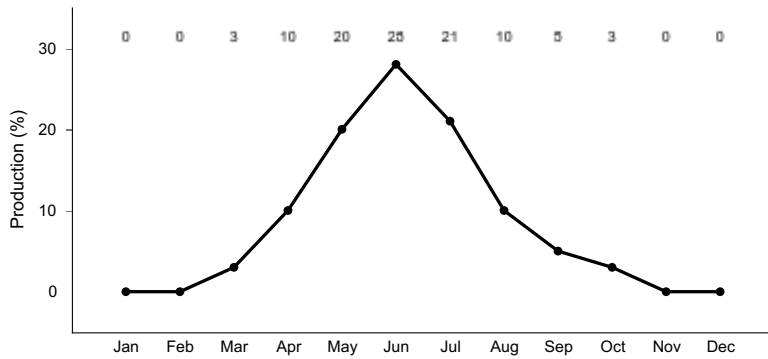


Figure 12. Plant community growth curve (percent production by month). SD0203, Rolling Till Prairie, cool-season/warm-season codominant.. Cool-season, warm-season codominant..

Community 2.3 Little Bluestem-Kentucky Bluegrass

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include little bluestem and Kentucky bluegrass. Grass and grass-like species of secondary importance include sideoats grama, blue grama, western wheatgrass, threadleaf sedge, green needlegrass, big bluestem, and quackgrass. Forbs commonly found in this plant community include goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow. When compared to the 1.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase, little bluestem and Kentucky bluegrass have increased. Production of mid- and tall warm- and cool-season grasses is 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. A reduction of the dominant functional groups as found in the interpretive plant community phase allows for an increase in shorter-statured (and shallower rooted) species. The introduction of nonnative invasive species such as Kentucky bluegrass and smooth brome grass results in alterations to the soil profile. Organic matter levels tend to decrease and begin to be concentrated more in the surface layers, and the structure will begin to be modified. These changes favor the shallow-rooted species and hasten their eventual dominance if steps are not taken to reduce these species.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1400	1815	2165
Forb	100	220	385
Shrub/Vine	100	165	250
Total	1600	2200	2800

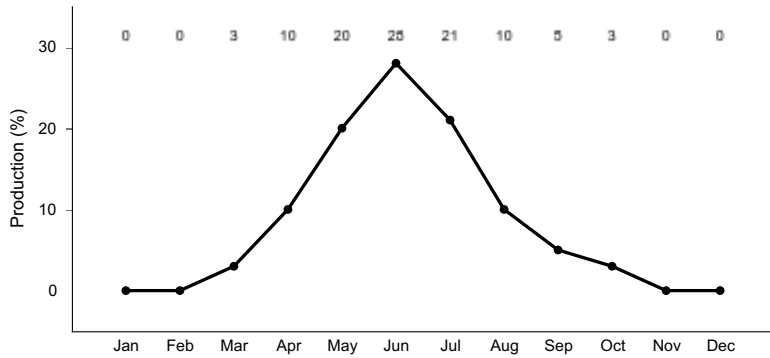


Figure 14. Plant community growth curve (percent production by month). SD0203, Rolling Till Prairie, cool-season/warm-season codominant.. Cool-season, warm-season codominant..

Pathway 2.1A Community 2.1 to 2.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 2.2 Little Bluestem-Sideoats Grama-Porcupine Grass-Kentucky Bluegrass Plant Community Phase.

Pathway 2.2B Community 2.2 to 2.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest and/or prescribed burning with late season fire or at infrequent intervals (greater than 5 years) will convert this plant community to the 2.1 Little Bluestem-Porcupine Grass-Prairie Dropseed Plant Community Phase.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 2.2A Community 2.2 to 2.3

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 2.3 Little Bluestem-Kentucky Bluegrass Plant Community Phase.

Pathway 2.3A Community 2.3 to 2.2

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest and/or prescribed burning with late season fire or at infrequent intervals (greater than 5 years) will convert this plant community to the 2.2 Little Bluestem-Sideoats Grama-Porcupine Grass-Kentucky Bluegrass Plant Community Phase.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 3 Invaded State

This state is a result of encroachment mainly by invasive introduced cool-season grasses. The ecological processes are not functioning, especially the biotic processes and the hydrologic functions. The introduced cool-season grasses cause reduced infiltration and increased runoff. 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. The opportunity for high intensity spring burns is severely reduced by early green up and increased moisture and humidity at the soil surface and grazing pressure cannot cause a reduction in sodgrass dominance. Production is limited to the sod forming species. Infiltration continues to decrease and runoff increases and energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominant species.

Dominant plant species

- snowberry (*Symphoricarpos*), shrub
- smooth sumac (*Rhus glabra*), shrub
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- quackgrass (*Elymus repens*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- green needlegrass (*Nassella viridula*), grass
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- goldenrod (*Solidago*), other herbaceous
- white heath aster (*Symphotrichum ericoides*), other herbaceous
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous

Community 3.1 Smooth Brome-Kentucky Bluegrass-Forbs/Shrubs

This plant community phase is a result of extended periods of nonuse and no fire or occasionally light levels of grazing over several years. It is characterized by dominance of smooth brome grass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface and eventually a thatch-mat layer may develop at the surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. When dominated by smooth brome grass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short as these cool-season species mature rapidly. Energy capture is also reduced. The dominance of these introduced species has been shown to alter the biotic component of the soil, as well as, organic matter levels and eventually the soil structure. These alterations perpetuate the dominance of Kentucky bluegrass and smooth brome grass and tend to make establishment of native species extremely difficult.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1750	2240	2600
Forb	125	280	500
Shrub/Vine	125	280	500
Total	2000	2800	3600

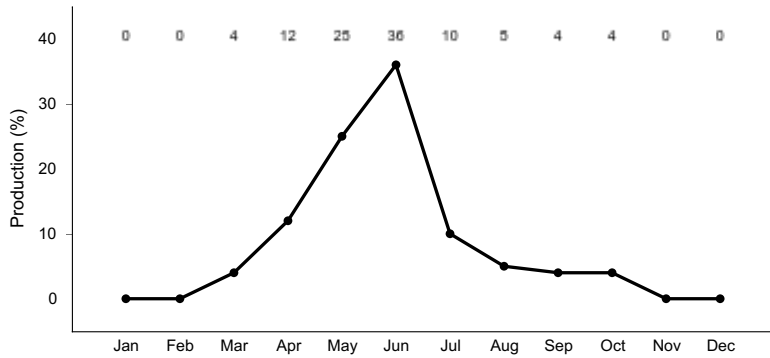


Figure 16. Plant community growth curve (percent production by month). SD0201, Rolling Till Prairie, cool-season dominant.. Cool-season dominant..

Community 3.2 Kentucky Bluegrass-Quackgrass-Little Bluestem

This plant community phase is a result of heavy continuous grazing or a combination of disturbances such as extended periods of below-average precipitation combined with heavy continuous grazing. It is characterized by a dominance of Kentucky bluegrass and quackgrass and occasionally with significant levels of little bluestem. The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface and a thatch-mat layer often develops at the surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short, as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1080	1512	1890
Forb	85	180	310
Shrub/Vine	35	108	200
Total	1200	1800	2400

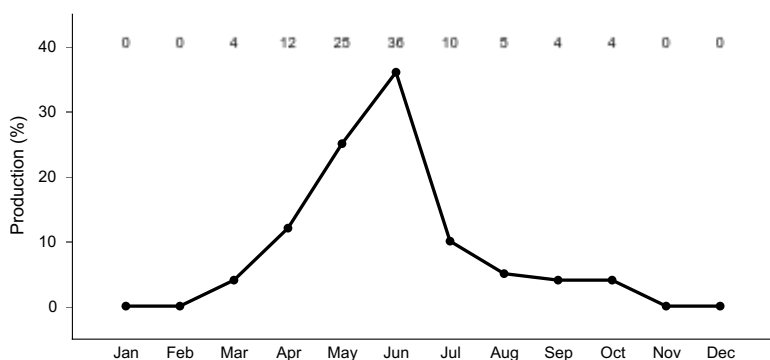


Figure 18. Plant community growth curve (percent production by month). SD0201, Rolling Till Prairie, cool-season dominant.. Cool-season dominant..

Community 3.3 Annual Pioneer-Perennial Pioneer

This plant community developed under continuous heavy grazing or other excessive disturbances. The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and 0 to 5 percent shrubs. The species present in this phase are highly variable, but often include nonnative invasive and/or early seral species. Plant diversity is low (plant richness may be high but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall

soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites.

Pathway 3.1A **Community 3.1 to 3.2**

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 3.2 Kentucky Bluegrass-Quackgrass-Little Bluestem Plant Community Phase.

Pathway 3.2A **Community 3.2 to 3.1**

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 3.1 Smooth Bromegrass-Kentucky Bluegrass-Forbs/Shrubs Plant Community Phase.

Pathway 3.3A **Community 3.3 to 3.2**

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will lead to the 3.2 Kentucky Bluegrass-Quackgrass-Little Bluestem Plant Community Phase.

State 4 **Crop Production State**

This state is characterized by the production of annual crops using a variety of tillage and cropping systems along with management practices.

Dominant plant species

- corn (*Zea*), grass
- wheat (*Triticum*), grass
- soybean (*Glycine*), other herbaceous

Community 4.1 **Annual Crops**

This plant community developed with the use of a variety of tillage systems and cropping systems for the production of annual crops including corn, soybeans, wheat, sugar beet and a variety of other crops.

Transition T1A **State 1 to 2**

Non-use and/or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, and/or heavy continuous grazing or invasion of non-native plant species will likely lead this state over a threshold resulting in the Native/Invaded State (State 2).

Transition T1C **State 1 to 3**

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer, Non-native Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T1B **State 1 to 4**

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

Transition T2A **State 2 to 3**

Non-use and/or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, will likely lead this state over a threshold leading to the 3.1 Smooth Bromegrass-Kentucky Bluegrass-Forbs/Shrubs Plant Community Phase within the Invaded State (State 3). Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season and often at the same time of year each year), will likely lead this state over a threshold leading to the 3.2 Kentucky Bluegrass-Quackgrass-Little Bluestem Plant Community Phase within the Invaded State (State 3). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Transition T2C **State 2 to 4**

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

Restoration pathway R3 **State 3 to 2**

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) coupled with prescribed burning may lead this plant community phase over a threshold to the Native/Invaded State (State 2).

Conservation practices

Prescribed Grazing

Transition T3 **State 3 to 4**

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

Restoration pathway R4A **State 4 to 2**

Seeding may lead this Crop Production State (State 4) over a threshold to the Native/Invaded State (State 2).

Restoration pathway R4B **State 4 to 3**

Seeding may lead this Crop Production State (State 4) over a threshold to the Invaded State (State 3). Cropping followed by abandonment may lead this plant community phase over a threshold to the 3.3 Annual Pioneer-Perennial Pioneer Plant Community Phase within the Invaded State (State 3).

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			750–1500	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	450–1050	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	150–450	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	150–450	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	30–150	–
2	Tall Warm-season Grasses			300–750	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	150–450	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	150–450	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–150	–
3	Cool-season Bunchgrasses			300–600	
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	150–450	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	90–300	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	30–150	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	30–90	–
4	Wheatgrass			60–150	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	60–150	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–90	–
5	Other Native Grasses			60–150	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–150	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	30–90	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	30–90	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–60	–
6	Grass-likes			30–90	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	30–90	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–60	–
Forb					
7	Forbs			150–300	
	Forb, native	2FN	<i>Forb, native</i>	30–90	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	30–90	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	30–60	–
	blazing star	LIATR	<i>Liatris</i>	30–60	–
	large Indian breadroot	PEES	<i>Pediomelum esculentum</i>	0–60	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	30–60	–
	cutleaf anemone	DIIPAM	<i>Pulsatilla patens ssp. multifida</i>	30–60	–

	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	30–60	–
	compassplant	SILA3	<i>Silphium laciniatum</i>	30–60	–
	goldenrod	SOLID	<i>Solidago</i>	30–60	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	30–60	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	30–60	–
	American vetch	VIAM	<i>Vicia americana</i>	30–60	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	30–60	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	30–60	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–30	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–30	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–30	–
	aromatic aster	SYOB	<i>Symphyotrichum oblongifolium</i>	0–30	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–30	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	0–30	–
	onion	ALLIU	<i>Allium</i>	0–30	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–30	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–30	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–30	–
Shrub/Vine					
8	Shrubs			90–240	
	leadplant	AMCA6	<i>Amorpha canescens</i>	30–120	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–60	–
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–60	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–60	–
	rose	ROSA5	<i>Rosa</i>	30–60	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	30–60	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–30	–

Table 11. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			600–1080	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	480–960	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	120–480	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–120	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–48	–
2	Tall Warm-season Grasses			24–240	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	24–192	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–72	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–48	–
3	Cool-season Bunchgrasses			120–360	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	48–240	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–192	–

	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–96	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–48	–
4	Wheatgrass			0–144	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–144	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–48	–
5	Other Native Grasses			24–168	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	24–144	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	24–120	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–48	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–48	–
6	Grass-likes			24–120	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	24–120	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–72	–
7	Non-Native Grasses			24–288	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	24–240	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–120	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–72	–
Forb					
8	Forbs			120–360	
	goldenrod	SOLID	<i>Solidago</i>	24–72	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	24–72	–
	scurfpea	PSORA2	<i>Psoralegium</i>	24–72	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	24–72	–
	Forb, native	2FN	<i>Forb, native</i>	0–72	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	24–72	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	24–48	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	24–48	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–48	–
	blazing star	LIATR	<i>Liatris</i>	24–48	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–48	–
	cutleaf anemone	PUPAM	<i>Pulsatilla patens ssp. multifida</i>	0–24	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–24	–
	compassplant	SILA3	<i>Silphium laciniatum</i>	0–24	–
	American vetch	VIAM	<i>Vicia americana</i>	0–24	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–24	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–24	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–24	–
	large Indian breadroot	PEES	<i>Pediomelum esculentum</i>	0–24	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–24	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–24	–
	onion	ALLIU	<i>Allium</i>	0–24	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–24	–

	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–24	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–24	–
Shrub/Vine					
9	Shrubs			120–240	
	snowberry	SYMPH	<i>Symphoricarpos</i>	24–120	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–72	–
	rose	ROSA5	<i>Rosa</i>	24–48	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–48	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–48	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–48	–
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–24	–

Table 12. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			550–1100	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	550–1100	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	44–330	–
2	Tall Warm-season Grasses			0–110	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–110	–
3	Cool-season Bunchgrasses			0–176	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–132	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–66	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–44	–
4	Wheatgrass			0–154	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–154	–
5	Other Native Grasses			44–176	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	44–176	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–110	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–22	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–22	–
6	Grass-likes			22–154	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	22–154	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–110	–
7	Non-Native Grasses			110–440	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	44–440	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–110	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–66	–
Forb					
8	Forbs			110–330	
	Forb, introduced	2FI	<i>Forb, introduced</i>	22–132	–

	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–110	–
	goldenrod	SOLID	<i>Solidago</i>	22–110	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	22–88	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	22–88	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	22–88	–
	Forb, native	2FN	<i>Forb, native</i>	0–66	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–66	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	22–66	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–22	–
	onion	ALLIU	<i>Allium</i>	0–22	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–22	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–22	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–22	–
	blazing star	LIATR	<i>Liatris</i>	0–22	–
Shrub/Vine					
9	Shrubs			110–220	
	snowberry	SYMPH	<i>Symphoricarpos</i>	22–154	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–88	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–66	–
	rose	ROSA5	<i>Rosa</i>	22–44	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–44	–

Table 13. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			0–280	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–224	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–140	–
2	Tall Warm-season Grasses			0–140	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–140	–
3	Cool-season Bunchgrasses			0–224	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–224	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–84	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–56	–
4	Wheatgrass			0–196	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–196	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–84	–
5	Other Native Grasses			0–140	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–140	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–112	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–28	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–28	–

6	Grass-likes			28–140	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	28–140	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–56	–
7	Non-Native Grasses			840–1680	
	smooth brome	BRIN2	<i>Bromus inermis</i>	420–1540	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	140–980	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–168	–
Forb					
8	Forbs			140–420	
	Forb, introduced	2FI	<i>Forb, introduced</i>	28–280	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	28–168	–
	goldenrod	SOLID	<i>Solidago</i>	28–168	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	28–112	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	28–112	–
	scurfpea	PSORA2	<i>Psoralegium</i>	28–112	–
	Forb, native	2FN	<i>Forb, native</i>	0–84	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	0–56	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–28	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–28	–
	American vetch	VIAM	<i>Vicia americana</i>	0–28	–
	blazing star	LIATR	<i>Liatris</i>	0–28	–
Shrub/Vine					
9	Shrubs			140–420	
	snowberry	SYMPH	<i>Symphoricarpos</i>	140–420	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–280	–
	rose	ROSA5	<i>Rosa</i>	0–56	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–56	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–28	–

Table 14. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			18–216	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	18–216	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–54	–
2	Tall Warm-season Grasses			0–54	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–54	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–36	–
3	Cool-season Bunchgrasses			0–54	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–54	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–36	–
4	Wheatgrass			0–36	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–36	–

5	Other Native Grasses			0–90	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–90	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–54	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–18	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–18	–
6	Grass-likes			36–180	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	36–180	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–36	–
7	Non-Native Grasses			630–1260	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	360–1080	–
	quackgrass	ELRE4	<i>Elymus repens</i>	90–540	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	18–126	–
Forb					
8	Forbs			90–270	
	goldenrod	SOLID	<i>Solidago</i>	18–108	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	18–108	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	18–108	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	18–72	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	18–72	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	18–72	–
	scurfpea	PSORA2	<i>Psoralegium</i>	18–54	–
	Forb, native	2FN	<i>Forb, native</i>	0–36	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–36	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–36	–
Shrub/Vine					
9	Shrubs			36–180	
	snowberry	SYMPH	<i>Symphoricarpos</i>	18–108	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	18–72	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–72	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–36	–
	rose	ROSA5	<i>Rosa</i>	0–18	–

Animal community

Animal Community – Grazing Interpretations

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

Bluestem/Needlegrass/Prairie Dropseed (1.1 & 1.2)

Average Annual Production (lbs./acre, air-dry): 3000
Stocking Rate* (AUM/acre): 0.82

Little Bluestem/Grama/Needlegrass/Bluegrass (2.2)
Average Annual Production (lbs./acre, air-dry): 2400
Stocking Rate* (AUM/acre): 0.66

Little Bluestem/Bluegrass (2.3)
Average Annual Production (lbs./acre, air-dry): 2200
Stocking Rate* (AUM/acre): 0.60

Smooth Bromegrass/Kentucky Bluegrass/Forbs/Shrubs (3.1)
Average Annual Production (lbs./acre, air-dry): 2800
Stocking Rate* (AUM/acre): 0.77

Kentucky Bluegrass/Quackgrass/Little Bluestem (3.2)
Average Annual Production (lbs./acre, air-dry): 1800
Stocking Rate* (AUM/acre): 0.49

Annual/Pioneer, Non-Native Perennial (3.3)
Average Annual Production (lbs./acre, air-dry): 1000
Stocking Rate* (AUM/acre): 0.27

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), National Range and Pasture Handbook).

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

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B. Infiltration is typically moderate to moderately slow and runoff potential for this site varies from medium 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. Dominance by blue grama, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. 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.

Inventory data references

MLRA 102D was created in 2022 with Agricultural Handbook 296 updated. This area was MLRA 102A prior to this time. Information was copied from MLRA 102A ESDs to create the MLRA 102D ESDs.

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; and Bruce Kunze, Soil Scientist, NRCS.

Data Source Sample Period State County
SCS-RANGE-417 (1008546039) 1985 SD Deuel
SCS-RANGE-417 (0018646029) 1986 SD Codington
SCS-RANGE-417 (0018746029) 1987 SD Codington
NP-ESC-1 (0120746039) 2007 SD Deuel

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Rangeland health reference sheet

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

Author(s)/participant(s)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/07/2004
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** Barely observable.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 10% and less than 2 inches in diameter.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.
-
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class usually 6. Typically high root content. Soil surface is very resistant to erosion.
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be evident.
-
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Mid warm-season bunch grass > tall warm-season rhizomatous grass
- Sub-dominant: > tall cool-season bunch grass > mid warm-season rhizomatous grass >> short cool-season grass = short warm-season grass = forb = shrubs
- Other:
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality.
-
14. **Average percent litter cover (%) and depth (in):** 60-70%, roughly 0.5 inch thick or less. Litter cover is in contact with soil surface.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2600 – 3300 lbs./acre air-dry weight, average 3,000 lbs./acre air-dry weight
-
16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state**

for the ecological site: Refer to State and Local Noxious Weed List

17. **Perennial plant reproductive capability:** All species are capable of reproducing.
-