USDA Natural Resources Conservation Service

Ecological site R062XY003SD
Subirrigated

Last updated: 2/06/2025
Accessed: 05/10/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 062X–Black Hills

The Black Hills (MLRA 62) is a unique, low lying mountain range situated in the midst of a mixed short and mid-grass prairie. It is a true Island in the Plains, as it has geophysical and biological attributes that are unlike the surrounding area. The Black Hills have strong floristic ties to four of the North American biomes: Cordilleran (Rocky Mountain) Forest, Northern Coniferous Forest, Eastern Deciduous Forest, and Grasslands.

MLRA 62 is approximately 3,040 square miles in size; 74 percent is located in South Dakota, and 26 percent is in Wyoming. The towns of Lead, Deadwood, Hill City, and Custer, South Dakota, are in this area. U.S. Highways 16 and 385 cross the MLRA. The Black Hills National Forest, Custer State Park, Mt. Rushmore National Monument, Wind Cave National Park, and Jewel Cave National Monument are located in this MLRA.

This area forms the core of the Black Hills and the Bear Lodge Mountains where the elevation ranges between 3,600 to 6,565 feet, however, Black Elk Peak (Harney Peak) rises to 7,242 feet. Slopes range from moderately sloping on some of the high plateaus to very steeply sloping along drainageways and on peaks and ridges. Narrow valleys generally are gently sloping to strongly sloping.

The Black Hills uplift is the product of the Laramide mountain-building episodes that produced most of the ranges in the Rocky Mountains. Uplift began near the end of the Cretaceous period, 65 million years ago and ended by 35 million years ago (Froiland 1990). The core of the Black Hills is a plutonic mass of granite with steeply dipping metamorphic rocks, primarily slate and schist, directly surrounding the granite core. A plateau of Mississippian limestone surrounds the igneous and metamorphic rock core. The Madison limestone is broken around the outer edges of the uplifted area. The Permian Minnekahta limestone forms the outermost boundary of the area. Many other tilted sandstone, shale, and limestone units are exposed like a bathtub ring inside the steeply dipping Madison limestone.

The dominant soil orders in this MLRA are Alfisols (forest soils) and Mollisols (grassland soils). The soils in the area have a frigid or cryic soil temperature regime, a udic or ustic soil moisture regime, and mixed, micaceous, or smectitic mineralogy. They are shallow to very deep, generally well drained, and loamy in texture.

The Black Hills MLRA supports open to dense forest vegetation. Ponderosa pine is the dominant species across the Black Hills. White spruce grows at the higher elevations and along the major drainageways. Bur oak is found intermixed with pine in the northern and eastern fringes of the Black Hills, and Rocky Mountain juniper is more common in the southern portion of the Black Hills. Aspen and paper birch are minor components found throughout the Black Hills. Prairie dropseed, roughleaf ricegrass, green needlegrass, poverty oatgrass, Richardson’s needlegrass, slender wheatgrass, and Canada wildrye are the most common native grasses under open forest stands. The most common native shrubs are bearberry, common juniper, grouse whortleberry, poison ivy, and Saskatoon serviceberry.

MLRA 62 land ownership is approximately 47 percent private and 53 percent federal. Rangeland and forestland are

split almost equally between private and federal ownership (47 percent each). Minor areas of land are privately owned cropland and urban development. The forestland in this area is used mainly for timber production, recreation, and grazing.

The major resource concerns are soil erosion and surface compaction caused by logging, mining, wildfires, grazing, and urban expansion. The quality of ground and surface water is another concern, especially in the northern part of the Black Hills. The primary cause is contamination from mine waste and septic systems in areas of rural development and urban expansion (USDA-NRCS, 2006: Ag Handbook 296).

LRU notes

For development of ecological sites, MLRA 62 is divided into three LRU's or physiographic zones (A, B, C, and Y). Each LRU has a set of ecological sites that represents these zones.

The LRU is identified in the Ecological Site ID: R062XY000SD; "062X" identifies the MLRA, the next letter "Y" identifies the LRU. Note: The organization of Ecological Site ID's will likely change in the future.

The North, LRU-A includes the northern Black Hills and Bear Lodge Mountains. It receives between 22 and 30 inches of annual precipitation and has a frigid soil temperature regime.

The High Central, LRU-B includes the high elevation (> 6,200 feet) central core of the Black Hills, which receives between 25 to 35 inches of annual precipitation and has a cryic soil temperature regime.

The South, LRU-C includes the southern portion of the Black Hills and receives between 17 to 21 inches of annual precipitation and has a frigid soil temperature regime.

One additional grouping of ecological sites that are common to the entire MLRA are designated with a "Y" in the ecological site ID.

Classification relationships

USDA
Land Resource Region G—Western Great Plains Range and Irrigated Region:
Major Land Resource Area (MLRA) 62—Black Hills

US Environmental Protection Agency (EPA)
Level IV Ecoregions of the Conterminous United States:
Black Hills Plateau—17b
Black Hills Core Highlands—17c

USDA Forest Service
Ecological Subregions: Sections and Subsections of Conterminous United States:
Black Hills Coniferous Forest Province—M334:
Black Hills Section—334A
Black Hills Limestone Plateau-Core Highlands Subsection—M334Ab

Ecological site concept

The Subirrigated ecological site is found throughout MLRA 62. It is a run-in site located on nearly level alluvial fans, stream terraces, and floodplains. Slopes range from 0 to 3 percent. The soils are very deep and formed in loamy or clayey alluvium of mixed origin. The surface layer is 4 to 9 inches in depth with loam to clay loamy textures. Soils are somewhat poorly drained, with moderate to slow permeability. The textures of the subsurface soils range from loam to clay loam.

A seasonal water table occurs within 2 to 5 feet of the surface. The site is non-saline and non-alkaline.

Vegetation in the Reference State (1.0) is dominated by tall and mid-stature warm-season grasses. Forbs are common and diverse. Dense stands of shrubs and shattered trees can be found across the site.

Associated sites

R062XA010SD	**Loamy - North** The Loamy Overflow - North ecological site, both in the northern and southern Back Hills, is found adjacent to a stream channel. It can also be adjacent to or immediately below the Subirrigated ecological site.
R062XY005SD	**Wet Subirrigated** The Wet Subirrigated ecological site is found adjacent to or intermixed with the Subirrigated ecological site. The Wet Subirrigated ecological site has a shallower permanent water table (1-2 feet) verse (2-5 feet) for the Subirrigated ecological site.

Similar sites

R062XA010SD	**Loamy - North** The Loamy Overflow - North ecological site, both in the northern and southern Black Hills, will have more cool-season grasses; scattered trees; and lower vegetative production than the Subirrigated ecological site.
R062XY005SD	**Wet Subirrigated** The Wet Subirrigated ecological will have more cool-season grasses; more grass-like species; and more shrubs than the Subirrigated ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix bebbiana*
Herbaceous	(1) *Andropogon gerardii* (2) *Panicum virgatum var. virgatum*

Physiographic features

The Subirrigated ecological site occurs on nearly level floodplains adjacent to streams, springs, and ponds, stream terraces, and alluvial fans. A permanent water table occurs within 2 to 5 feet of the surface and persists longer than the wettest part of the growing season, typically extending through the month of July.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace (3) Alluvial fan
Runoff class	Low to high
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	3,500–6,600 ft
Slope	0–3%
Water table depth	24–60 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 62 is in a microclimate caused by the influence of increased elevation which leads to increased precipitation, moderate air temperature, and lower wind velocities as compared to the surrounding Great Plains. In general, the Black Hills climate is a continental type, cold in the winter and hot in the summer.

Annual precipitation in MLRA 62 typically increases with elevation and decreases from west to east and from north to south. The average annual precipitation range for MLRA 62 is 18 to 35 inches. Most of the rainfall occurs as frontal storms early in the growing season, in May and June. Some high-intensity, convective thunderstorms occur in July and August. Precipitation in the winter occurs mostly as snow. Twenty to forty percent of the annual precipitation falls as snow. The annual average snowfall ranges from 23 inches at the lower elevations in the south, to 54 inches in the higher elevations of the central core of the Black Hills.

The average annual temperature ranges from 36°F to 48°F. January is the coldest month, with an average temperature of 22°F in the higher elevation of the central core, and 25°F in the southern part of MLRA 62. July is the warmest month, with an average daily temperature of 67°F in the central core, and 73°F in the southern part of this MLRA. The frost-free period ranges from 129 to 168 days. It is shortest at higher elevations and in the northwestern part of the MLRA. Hourly winds are estimated to average about 11 miles per hour (mph) annually.

Growth of cool-season plants begins in April, slowing or ceasing growth by mid-August. Warm-season plants begin growth in May and continue to mid-September. Regrowth of cool-season plants may occur in September and October, depending upon soil moisture availability.

The average annual precipitation range for MLRA 62 is 18 to 35 inches.

Table 3. Representative climatic features

Frost-free period (characteristic range)	65-103 days
Freeze-free period (characteristic range)	106-129 days
Precipitation total (characteristic range)	19-29 in
Frost-free period (actual range)	36-108 days
Freeze-free period (actual range)	76-130 days
Precipitation total (actual range)	18-30 in
Frost-free period (average)	81 days
Freeze-free period (average)	112 days
Precipitation total (average)	23 in

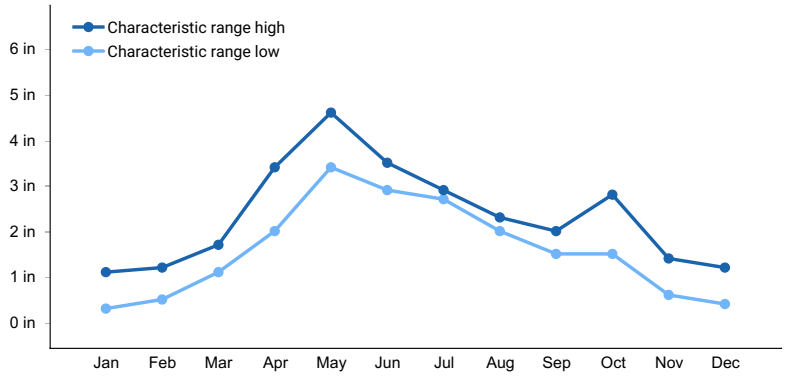


Figure 1. Monthly precipitation range

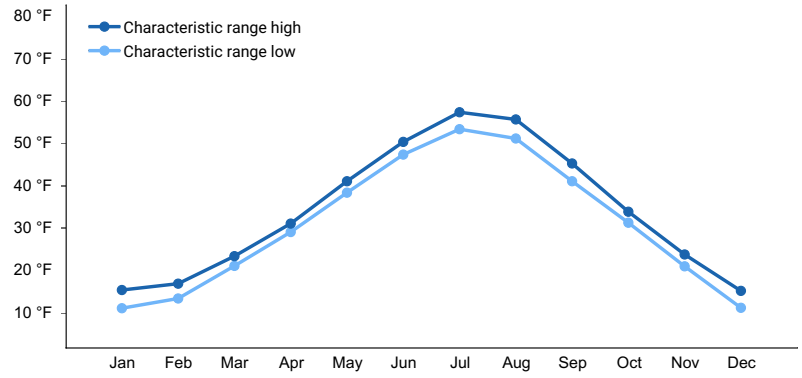


Figure 2. Monthly minimum temperature range

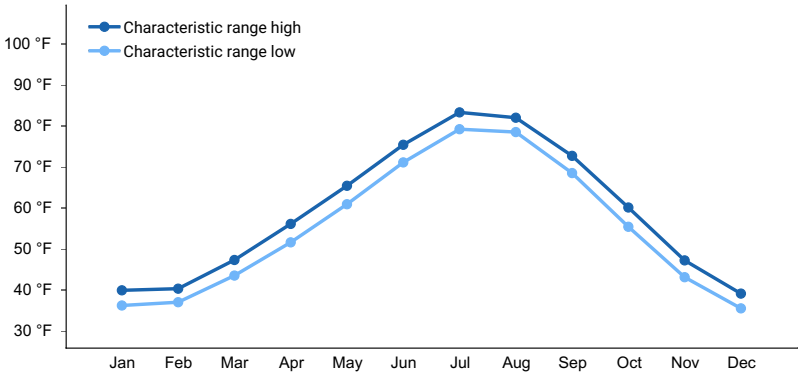


Figure 3. Monthly maximum temperature range

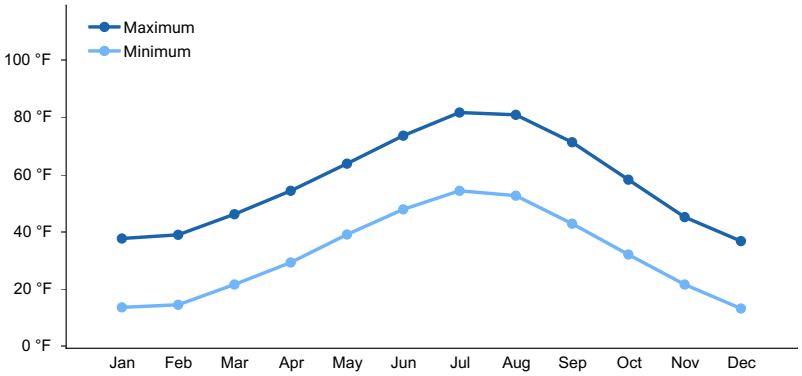


Figure 4. Monthly average minimum and maximum temperature

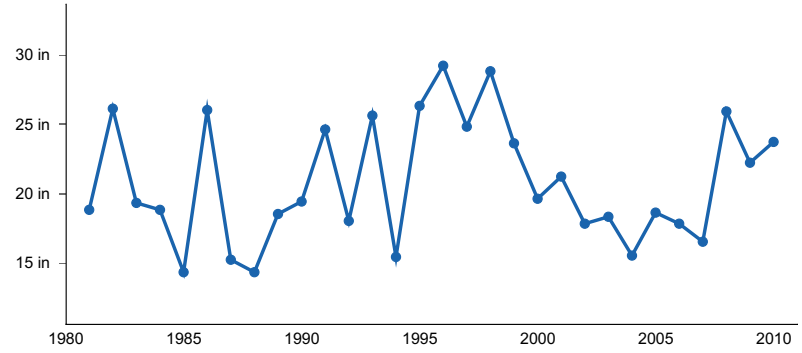


Figure 5. Annual precipitation pattern

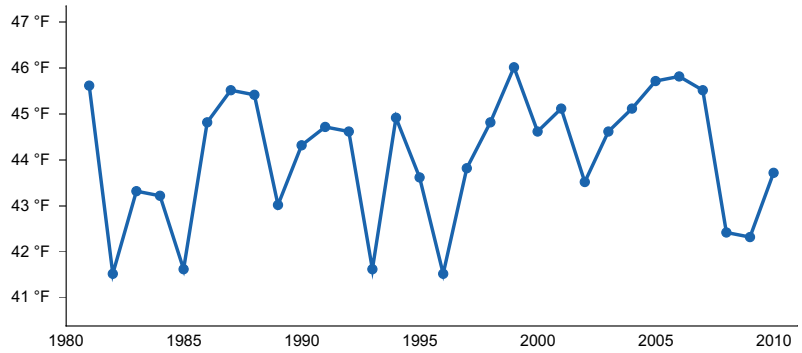


Figure 6. Annual average temperature pattern

Climate stations used

- (1) DEADWOOD [USC00392207], Deadwood, SD
- (2) LEAD [USC00394834], Lead, SD
- (3) JOHNSON SIDING [USC00394343], Rapid City, SD
- (4) PACTOLA DAM [USC00396427], Rapid City, SD
- (5) DEERFIELD 3 SE [USC00392231], Hill City, SD
- (6) HILL CITY [USC00393868], Hill City, SD
- (7) MT RUSHMORE NATL MEM [USC00395870], Keystone, SD
- (8) CUSTER [USC00392087], Custer, SD
- (9) EDGEMONT 23 NNW [USC00392565], Custer, SD
- (10) HOT SPRINGS [USC00394007], Hot Springs, SD
- (11) DEADWOOD 2NE [USC00392209], Whitewood, SD

Influencing water features

Riparian areas and wetland features can be directly associated with the Subirrigated ecological site.

Stream Type: B6, C6
(Rosgen System)

Soil features

Soils common to the Subirrigated ecological site are very deep and formed in alluvium. Subsurface textures are coarse to moderately fine. Soils are somewhat poorly drained with moderate to moderately slow permeability. Water holding capacity is high. These soils have a high-water table (2 to 5 feet from the surface) which keeps the rooting zone moist for a portion of the growing season. Salinity is none to slight and sodicity is typically none to slight. Subsurface soil layers are not restrictive to water movement or root penetration.

This site should show no evidence of rills, wind-scoured areas, or pedestalled plants. No water flow patterns are seen on this site. The soil surface is stable and intact.

Major soil correlated to the Subirrigated ecological site: Marshbrook

Marshbrook is also correlated to the Wet Subirrigated ecological site (R062XY005SD) if a permanent water table is within 12 to 24 inches of the surface.

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

More information regarding the soil is available in soil survey reports. Contact the local USDA Service Center for details specific to your area of interest, or go online to access USDA’s Web Soil Survey.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous and metamorphic rock
Surface texture	(1) Loam (2) Clay loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained
Permeability class	Moderate to moderately slow
Depth to restrictive layer	80 in
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6–7 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (0-40in)	0–15%
Subsurface fragment volume >3" (0-40in)	0–5%

Ecological dynamics

The Subirrigated ecological site developed under Northern Great Plains and Black Hills climatic conditions; light to severe grazing by bison, elk, insects, and small mammals; sporadic, natural or human-caused wildfire (often of light intensities); and other biotic and abiotic factors that typically influence soil and site development. Changes occur in the plant communities due to short-term weather variations, fluctuating water table depth and hydrologic systems; effects of native and non-native plant and animal species, and management actions. Severe disturbances, such as periods of well-below average precipitation, severe defoliation, excessive haying, or non-use and no fire can cause significant shifts in plant communities and species composition.

Placer mining activities during the Black Hills gold rush of the 1870s and 1880s had severe effects in some riparian areas as did transportation routes along streams, and the expansion of agriculture purposes including farming and livestock production that supplied beef and mutton for mining communities (Froiland, 1990).

In addition, long-term fire suppression following Euro-American settlement of the Black Hills has allowed ponderosa pine on upland forest sites to expand dramatically. Of the average annual precipitation in the Black Hills area, approximately 91.6 percent is returned to the atmosphere via evapotranspiration, about 4.9 percent becomes runoff from the land surface, and about 3.5 percent recharges major Black Hills aquifers (Carter, et.al., 2002). These stands of pine also reduce localized aquifer recharge making the valley floors and riparian areas drier.

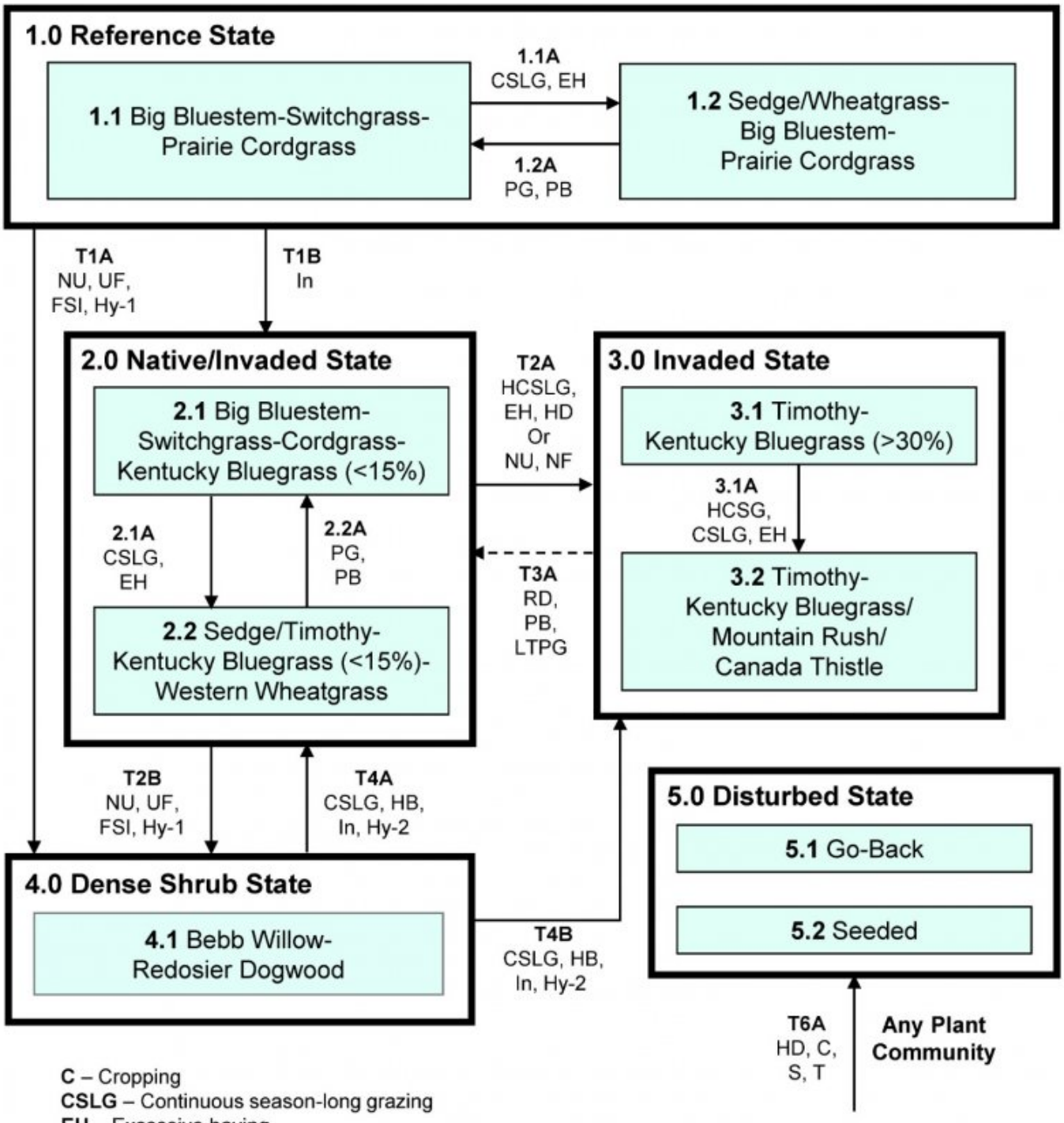
Interpretations are primarily based on the Big Bluestem-Switchgrass-Prairie Cordgrass Plant Community (1.1). It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

It may difficult to locate the Reference Plant Community (1.1) with the spread and establishment of non-native cool-season grasses in MLRA 62. The Native/Invaded State (2.0) is more representative of current conditions than the Reference State (1.0). Because of the persistence of non-native cool-season grasses, a restoration pathway to the Reference State (1.0) is not believed to be achievable.

The following state-and-transition diagram illustrates the common plant communities on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Subirrigated – R062XY003SD 8/12/20



C – Cropping
CSLG – Continuous season-long grazing
EH – Excessive haying
FSI – Forest stand improvement
HB – Heavy browse
HCSLG – Heavy continuous season-long grazing
HCSG – Heavy continuous seasonal grazing
HD – Heavy disturbance
In – Invasion of non-native cool-season grasses
LTPG – Long-term prescribed grazing
Hy-1 – Wetter hydrologic system
Hy-2 – Drier hydrologic system

NF – No fire
NU – No use
PB – Prescribed burning
PG – Prescribed grazing
RD – Removal of disturbance
S – Seeding
T – Tillage
UF – Upland fire that removes forest overstory
- - → Transition may not be rapid or feasible

Diagram Legend: Subirrigated - R062XY003SD

T1A	1.0 to 4.0	Non-use or construction of exclosures to protect shrub regeneration; upland fire or forest stand improvement reducing forest canopy and a shift to a wetter hydrologic system.
T1B	1.0 to 2.0	Invasion of non-native cool-season grasses.
T2A	2.0 to 3.0	Heavy, continuous season-long grazing; excessive haying; heavy disturbance; or no use and no fire.
T2B	2.0 to 4.0	Non-use or construction of exclosures to protect shrub regeneration; upland fire or forest stand improvement, reducing forest canopy and a shift to a wetter hydrologic system.
T3A	3.0 to 2.0	Removal of disturbance; long-term prescribed grazing with proper stocking, change in season of use, and deferment that provides time for adequate recovery; or Prescribed burning followed by prescribed grazing, may also be a management option to facilitate the transition. This transition may not be fast or feasible.
T4A	4.0 to 2.0	Continuous season-long grazing; heavy browsing by livestock or wildlife; invasion of non-native herbaceous species; a shift to a drier hydrologic system.
T4B	4.0 to 3.0	Continuous season-long grazing; heavy browsing by livestock or wildlife; invasion of non-native herbaceous species; a shift to a drier hydrologic system.
T6A	Any Plant Community to 5.0	Heavy disturbance such as tillage; cropping; abandoning cropland; tillage and seeding to introduced perennial forage crops.

1.1A	1.1 to 1.2	Continuous season-long grazing; and/or excessive haying.
1.2A	1.2 to 1.1	Prescribed grazing with proper stocking, change in season of use, adequate time for plant recovery. Possibly prescribed burning followed by prescribed grazing.
2.1A	2.1 to 2.2	Continuous season-long grazing; and/or excessive haying.
2.2A	2.2 to 2.1	Prescribed grazing with proper stocking, change in season of use, adequate time for plant recovery. Possibly prescribed burning followed by prescribed grazing.
3.1A	3.1 to 3.2	Heavy continuous grazing; and/or excessive haying.

State 1
Reference State

The Reference 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 the Reference State (1.0) is typically dominated by warm-season grasses, with occasional shifts to a near co-dominance of cool- and warm-season grasses, grass-likes, and dense stands of shrubs. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and above average precipitation, periodic fire, beaver activity, and herbivory by large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. Today the primary disturbance is from a lack of fire and concentrated livestock grazing and haying. Grasses that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable grasses will occur. Today, a similar state will be difficult to find due to the predominance and invasiveness of non-native cool-season perennial gasses and Canada thistle.

Dominant plant species

- Bebb willow (*Salix bebbiana*), shrub
- redosier dogwood (*Cornus sericea*), shrub
- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass
- prairie cordgrass (*Spartina pectinata*), grass
- American licorice (*Glycyrrhiza lepidota*), other herbaceous
- Rocky Mountain iris (*Iris missouriensis*), other herbaceous

Community 1.1
Big Bluestem-Switchgrass-Prairie Cordgrass

Interpretations are based on the Big Bluestem-Switchgrass-Prairie Cordgrass Plant Community. This is also considered to be Reference Plant Community (1.1). This community evolved with grazing by large herbivores,

occasional prairie fires, beaver activities, and occasional to frequent flooding events. The potential vegetation is about 85 percent grass and grass-like species, 10 percent forbs, and 5 percent shrubs and trees by air-dry weight. The dominant grasses included big bluestem, switchgrass, and prairie cordgrass. Other grass and grass-like species include various sedges, Indiangrass, bluejoint reedgrass, slender wheatgrass, and western wheatgrass. Common forbs are likely American licorice, Rocky Mountain iris, Indian hemp, goldenrod, cinquefoil, and showy milkweed. Shrubs include Bebb willow, redosier dogwood, shrubby cinquefoil, and western snowberry. This plant community is diverse, stable, and productive, and is well adapted to the Black Hills. The high-water table supplies much of the moisture for plant growth. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for the variability of the water table. This is a sustainable plant community in terms of 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	3735	4248	4700
Forb	220	360	550
Shrub/Vine	45	144	250
Tree	0	48	100
Total	**4000**	**4800**	**5600**

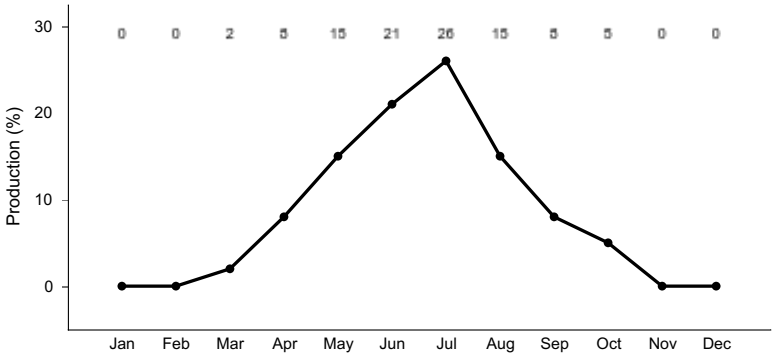


Figure 8. Plant community growth curve (percent production by month). SD6210, Black Hills, lowland warm-season dominant. Lowland warm-season dominant.

Community 1.2
Sedge/Wheatgrass-Big Bluestem-Prairie Cordgrass

This plant community evolved under continuous season-long grazing (grazing at moderate to heavy stocking levels for the full growing season each year without adequate recovery periods following each grazing occurrence) or from excessive haying. The potential plant community is made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs and trees. Dominant grass and grass-like species included sedges, slender wheatgrass, western wheatgrass, big bluestem, and prairie cordgrass. Other grass and grass-like species included plains bluegrass, bluejoint reedgrass, and rushes. Forbs commonly found in this plant community included American licorice, goldenrod, and cinquefoil. Shrubs include Bebb willow, redosier dogwood, shrubby cinquefoil, and western snowberry. When compared to the Big Bluestem-Switchgrass-Prairie Cordgrass Plant Community (1.1), sedges, wheatgrass, and cordgrass have increased. Big bluestem and switchgrass have decreased, and production of all 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 could be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

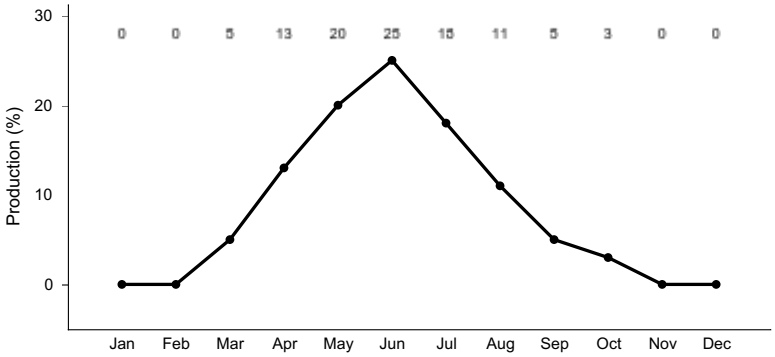


Figure 9. Plant community growth curve (percent production by month). SD6207, Black Hills, lowland cool-season dominant, warm-season sub-dominant. Lowland cool-season dominant, warm-season sub-dominant.

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing without adequate recovery periods; or excessive haying, will convert the Reference Plant Community (1.1) to the Sedge/Wheatgrass-Big Bluestem-Prairie Cordgrass Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that includes proper stocking rates, change in season of use, and adequate time for plant recovery, will shift Plant Community (1.2) to the Big Bluestem-Switchgrass-Prairie Cordgrass Plant Community (1.1). Prescribed burning followed by prescribed grazing may also facilitate this plant community shift.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Native/Invaded State

The Native/Invaded 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 prescribed burning, and sometimes on areas receiving occasional short periods of rest. Native warm- and cool-season species can decline and a corresponding increase in non-native cool-season grasses will occur. Non-native cool-season grasses will make up less than 15 percent of total annual production. Preliminary studies indicate that when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition a threshold has been crossed to an Invaded State (3.0). These invaded plant communities that are dominated by Kentucky bluegrass will have significantly less cover and diversity of native grasses and forb species (Toledo, D. et al., 2014).

Dominant plant species

- Bebb willow (*Salix bebbiana*), shrub
- redosier dogwood (*Cornus sericea*), shrub
- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass
- American licorice (*Glycyrrhiza lepidota*), other herbaceous
- Rocky Mountain iris (*Iris missouriensis*), other herbaceous

Community 2.1

Big Bluestem-Switchgrass-Cordgrass-Kentucky Bluegrass (<15%)

This plant community phase is similar to the Big Bluestem-Switchgrass-Prairie Cordgrass Plant Community (1.1), but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and timothy (up to about 15 percent by air-dry weight). The potential vegetation is about 85 percent grass and grass-like species, 10 percent forbs, and 5 percent shrubs and trees by air-dry weight. The dominant grasses include big bluestem, switchgrass, and prairie cordgrass. Other grass and grass-like species include various sedges, Indiangrass, bluejoint reedgrass, slender wheatgrass, and western wheatgrass. Common forbs are likely American licorice, Rocky Mountain iris, Indian hemp, goldenrod, cinquefoil, and showy milkweed. This site does not typically support a large amount of woody species, but Bebb willow, redosier dogwood, shrubby cinquefoil, and western snowberry can be present. 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 regard to site and soil stability, watershed function, and biologic integrity.

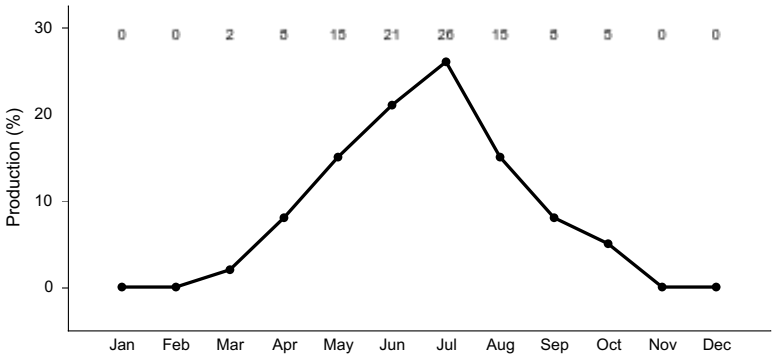


Figure 10. Plant community growth curve (percent production by month). SD6210, Black Hills, lowland warm-season dominant. Lowland warm-season dominant.

Community 2.2
Sedge/Timothy-Kentucky Bluegrass (<15%)-Western Wheatgrass

This plant community is a result of continuous season-long grazing (grazing at moderate to heavy stocking levels for the full growing season each year without adequate recovery periods following each grazing occurrence), or excessive haying. The potential plant community is made up of approximately 87 percent grasses and grass-like species, 10 percent forbs, and 3 percent shrubs and trees. Dominant grass and grass-like species include sedges and western wheatgrass; non-native cool season grasses such as timothy and Kentucky bluegrass are present (up to about 15 percent by air-dry weight). Other grass and grass-like species include plains bluegrass, island bluegrass, bluejoint reedgrass, rushes, and prairie cordgrass. Forbs commonly found in this plant community included American licorice, goldenrod, and cinquefoil. Shrubs include Bebb willow, redosier dogwood, shrubby cinquefoil, and western snowberry. When compared to the Big Bluestem-Switchgrass-Prairie Cordgrass Plant Community (1.1), sedges and non-native cool-season grasses increase. Tall warm-season grasses have decreased. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing or haying; however, species composition can be altered further with long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

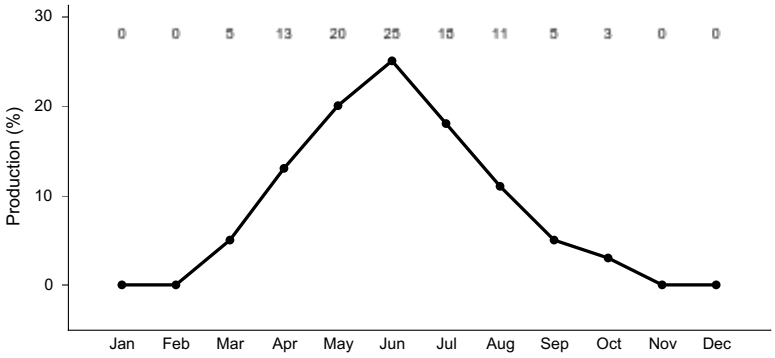


Figure 11. Plant community growth curve (percent production by month). SD6207, Black Hills, lowland cool-season dominant, warm-season sub-dominant. Lowland cool-season dominant, warm-season sub-dominant.

Pathway 2.1A
Community 2.1 to 2.2

Continuous season-long grazing without adequate recovery periods; or excessive haying, will convert Plant Community (2.1) to the Sedge/Timothy-Kentucky Bluegrass (<15%)-Western Wheatgrass Plant Community (2.2).

Pathway 2.2A
Community 2.2 to 2.1

Prescribed grazing with proper stocking rates, change in season of use, and adequate time for plant recovery, will shift Plant Community (2.1) to the Big Bluestem-Switchgrass-Cordgrass-Kentucky Bluegrass (<15%) Plant Community (2.1). Prescribed burning followed by prescribed grazing may also facilitate this plant community shift.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 3
Invaded State

The Invaded State is the result of invasion and dominance of non-native cool-season grass species. This state is characterized by the dominance of Kentucky bluegrass, timothy, and/or smooth bromegrass. Heavy grazing or excessive haying will eventually remove the tall warm-season grasses and promote the increase in the more grazing tolerant non-native cool-season grasses. Non-use and no fire will result in an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade tolerant non-native grass species. The nutrient cycle is also impaired, and the result is typically a higher level of nitrogen which also favors the non-native species. Studies indicate that soil biological activity is altered, and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the invasive grass dominance. Preliminary studies indicate this threshold may exist when Kentucky bluegrass exceeds 30 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). Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very short-term reduction of Kentucky bluegrass. These events may reduce the dominance of Kentucky bluegrass, but due to the large amount of rhizomes in the soil, there is no opportunity for the native species to establish and dominate before Kentucky bluegrass rebounds and again dominates the system.

Dominant plant species

- Kentucky bluegrass (*Poa pratensis*), grass
- timothy (*Phleum pratense*), grass
- smooth brome (*Bromus inermis*), grass
- Canada thistle (*Cirsium arvense*), other herbaceous
- Forb, introduced (*Forb, introduced*), other herbaceous

Community 3.1
Timothy-Kentucky Bluegrass (>30%)

This plant community phase is a result of extended periods of non-use and no fire. It is characterized by a dominance of timothy, Kentucky bluegrass and/or smooth bromegrass. 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. Nutrient cycling is greatly reduced, and native plants have great difficulty becoming established. 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. When dominated by smooth bromegrass, infiltration is moderately reduced, and runoff is moderate. In either case, the period that

palatability is high is relatively short, as these cool-season species mature rapidly. Energy capture is also reduced. In addition to Kentucky bluegrass, timothy, and smooth bromegrass, other species that will be present at varying amounts can include redtop, quackgrass, and Canada thistle.

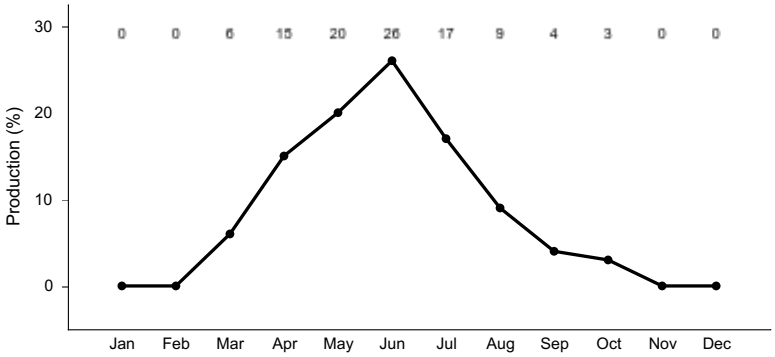


Figure 12. Plant community growth curve (percent production by month). SD6206, Black Hills, lowland cool-season dominant. Lowland cool-season dominant.

Community 3.2
Timothy-Kentucky Bluegrass/Mountain Rush/Canada Thistle

This plant community is a result of heavy, continuous seasonal grazing (grazing at moderate to heavy stocking levels for the full growing season each year without adequate recovery periods following each grazing occurrence); heavy, continuous season-long grazing (grazing at heavy stocking levels, well above sustainable carrying capacity, for the full growing season each year without adequate recovery periods following each grazing occurrence); or excessive haying. This plant community is characterized by a dominance of timothy, Kentucky bluegrass, mountain rush, and Canada thistle. The dominance of non-native cool-season grasses 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. 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 (1.1). The period that palatability is high is relatively short as timothy and Kentucky bluegrass mature rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this plant community.

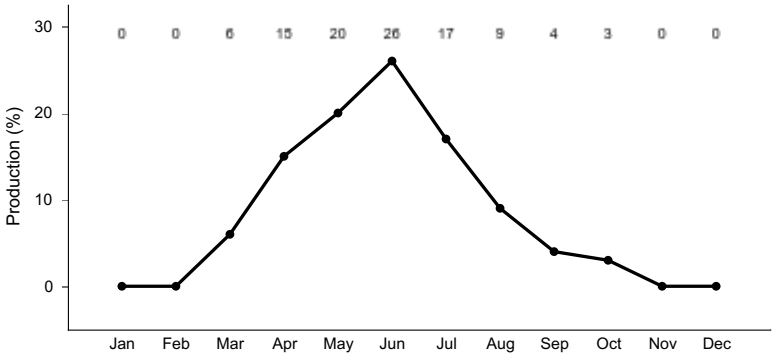


Figure 13. Plant community growth curve (percent production by month). SD6206, Black Hills, lowland cool-season dominant. Lowland cool-season dominant.

Pathway 3.1A
Community 3.1 to 3.2

Heavy, continuous seasonal grazing; continuous season-long grazing without adequate recovery periods; or excessive haying, will convert Plant Community (3.1) to the Timothy-Kentucky Bluegrass/Mountain Rush/Canada Thistle Plant Community (3.2).

State 4
Dense Shrub State

In pre-European times the Dense Shrub State was common along most streams and floodplains throughout the majority of the Black Hills. Today this community is of minor extent. Prior to European settlement, conifer density (primarily ponderosa pine and white spruce) was lower in the uplands, resulting in lower evapotranspiration rates and higher water yields into stream hydrologic systems. The dense shrub plant communities consisted of a mixture of several willow species including Bebb willow, yellow willow, and sandbar willow. Other shrubs included river birch, redosier dogwood, wild rose, raspberry, and currant. Beaver dam complexes were also common on most Black Hills drainages which regulated water flow and maintained high water table levels, creating conditions suitable for dense stands of willow and dogwood. By the latter part of the 1800s, beaver numbers were low and restricted to remote areas of the Black Hills. Riparian ecosystems likely degraded rapidly following beaver removal, generating substantial long-lasting effects. Dramatic changes in the functional and structural groups that make up diverse riparian plant communities are a result of physical disturbances from past and present use and management. Non-native plant species, both introduced as forage species and invasive species, substantially reduced shrub communities and the transitional deciduous trees (Parrash,1996).

Dominant plant species

- Bebb willow (*Salix bebbiana*), shrub
- yellow willow (*Salix lutea*), shrub
- sandbar willow (*Salix interior*), shrub
- river birch (*Betula nigra*), shrub
- redosier dogwood (*Cornus sericea*), shrub
- prairie cordgrass (*Spartina pectinata*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- goldenrod (*Solidago*), other herbaceous
- cinquefoil (*Potentilla*), other herbaceous

Community 4.1
Bebb Willow-Redosier Dogwood

This plant community occurs only as remnant plant communities in fenced exclosures or other protected areas, and areas managed specifically for the dense shrub plant community. The potential plant community is made up of approximately 10 percent grasses and grass-like species, 10 percent forbs, 75 percent shrubs, and 0 to 5 percent trees. Dominant grass and grass-like species include prairie cordgrass, bluejoint reedgrass, and various lowland sedges. Other grass and grass-like species may include northern reedgrass, inland bluegrass, plains bluegrass, and spikerush. Forbs commonly found in this plant community include goldenrod, cinquefoil, American licorice, mint, and Indian hemp. Dominant shrubs include Bebb willow, yellow willow, sandbar willow, redosier dogwood, wild rose, raspberry, and currant. Other shrubs in this plant community can included diamond willow, meadow willow, and river birch. This plant community is diverse, stable, productive, and is well adapted to the Black Hills climate. The high-water table supplies much of the moisture for plant growth. The diversity in plant species allows the water table to vary periodically. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity. Species composition can be altered through long-term grazing, browsing, and/or a shift to a permanently drier hydrologic system. The use of chemical herbicides for the control of noxious weeds can also alter this plant community.

State 5
Disturbed State

This State can be transitioned to from any plant community. The two separate vegetative plant communities, Go-Back and Seeded, are highly variable in nature. They are derived through different management scenarios and are not related successionally. Infiltration, runoff, and soil erosion will vary depending on the vegetation present on the site. The Go-Back Plant Community (5.1) was previously tilled for crop or hay production and then abandoned. The plant community that develops on this site will be greatly influenced by the plant communities that are located on adjacent land. The Seeded Plant Community (5.2) was typically tilled and then seeded to a perennial forage species or mix of species.

Dominant plant species

- Kentucky bluegrass (*Poa pratensis*), grass
- timothy (*Phleum pratense*), grass

- cinquefoil (*Potentilla*), other herbaceous
- Forb, introduced (*Forb, introduced*), other herbaceous

Community 5.1
Go-Back

The Go-back plant community can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned cropland). During the early successional stages, the species that mainly dominate the plant community 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 bluegrass, timothy, cinquefoil, and non-native thistles.

Community 5.2
Seeded

The Seeded Plant Community is normally those areas seeded to forage species. For adapted species and expected production, refer to the USDA-NRCS eFOTG for the Wet Forage Suitability Group description.

Transition T1B
State 1 to 2

Invasion of non-native cool-season grasses will transition the Reference State (1.0) to the Native/Invaded State (2.0).

Transition T1A
State 1 to 4

Non-use or the construction of enclosures to protect shrub regeneration; upland fires or forest stand improvement that reduce the conifer canopy and allows the site to reestablish a wetter hydrologic system will transition the Reference State (1.0) to the Dense Shrub State (4.0).

Conservation practices

Prescribed Burning
Forest stand improvement pre-treating vegetation and fuels preceding a prescribed fire

Transition T6A
State 1 to 5

Heavy disturbance including tillage; abandoned cropland; or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition T2A
State 2 to 3

Heavy, continuous season-long grazing; excessive haying; or heavy disturbance will transition the Native/Invaded State (2.0) to the Invaded State (3.0). Long-term non-use and no fire will also cause the Native/Invaded State (2.0) to transition to the Invaded State (3.0).

Transition T2A
State 2 to 4

Non-use or the construction of enclosures to protect shrub regeneration and upland fires or forest stand improvement that reduce the conifer canopy and allows the site to reestablish a wetter hydrologic system will transition the Native/Invaded State (2.0) to the Dense Shrub State (4.0).

Conservation practices

Prescribed Burning
Forest stand improvement pre-treating vegetation and fuels preceding a prescribed fire

Transition T6A
State 2 to 5

Heavy disturbance including tillage; abandoned cropland; or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition T3A
State 3 to 2

Removal of management induced disturbance; possibly prescribed burning to suppress non-native cool-season grass; and long-term prescribed grazing with proper stocking rates, change in season of use, and deferment that provides adequate recovery time. This may transition the Invaded State (3.0) to the Native/Invaded State (2.0). This will likely take a long period of time and recovery may not be attainable. Success depends on whether native reproductive propagules remain intact on the site.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T6A
State 3 to 5

Heavy disturbance including tillage; abandoned cropland; or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition T4A
State 4 to 2

Continuous season-long grazing, heavy browsing by livestock or wildlife, the invasion of non-native herbaceous species and a shift to a drier hydrologic system will transition the Dense Shrub State (4.0) to the Native/Invaded State (2.0).

Restoration pathway T4B
State 4 to 3

Continuous season-long grazing, heavy browsing by livestock or wildlife, the invasion of non-native herbaceous species and a shift to a drier hydrologic system will transition the Dense Shrub State (4.0) to the Invaded State (3.0).

Transition T6A
State 4 to 5

Heavy disturbance including tillage; abandoned cropland; or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Additional community tables

Table 6. Community 1.1 plant community composition

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

1	**Tall Warm-Season Grasses**			1440–2880	
	big bluestem	ANGE	*Andropogon gerardii*	960–2160	–
	switchgrass	PAVI2	*Panicum virgatum*	144–960	–
	prairie cordgrass	SPPE	*Spartina pectinata*	48–480	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–240	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	0–144	–
2	**Cool-Season Bunchgrass**			240–480	
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	0–240	–
	fowl bluegrass	POPA2	*Poa palustris*	96–240	–
	green needlegrass	NAVI4	*Nassella viridula*	0–240	–
	inland bluegrass	PONEI2	*Poa nemoralis ssp. interior*	96–240	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	48–240	–
	plains bluegrass	POAR3	*Poa arida*	48–144	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–96	–
3	**Rhizomatous Wheatgrass**			48–240	
	western wheatgrass	PASM	*Pascopyrum smithii*	48–240	–
4	**Other Native Grasses**			144–480	
	bluejoint	CACA4	*Calamagrostis canadensis*	48–240	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	48–240	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–240	–
	Grass, perennial	2GP	*Grass, perennial*	48–240	–
5	**Grass-Likes**			240–480	
	shortbeak sedge	CABR10	*Carex brevior*	48–336	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	48–336	–
	spikerush	ELEOC	*Eleocharis*	0–240	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	48–240	–
	fox sedge	CAVU2	*Carex vulpinoidea*	0–240	–
	Hood's sedge	CAHO5	*Carex hoodii*	0–240	–
	clustered field sedge	CAPR5	*Carex praegracilis*	0–240	–
6	**Non-Native Cool-Season Grasses**			0	
Forb					
7	**Forbs**			240–480	
	American licorice	GLLE3	*Glycyrrhiza lepidota*	48–96	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	0–96	–
	cinquefoil	POTEN	*Potentilla*	48–96	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	48–96	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	48–96	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	48–96	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–96	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–96	–
	Rocky Mountain iris	IRMI	*Iris missouriensis*	0–96	–
	showy milkweed	ASSP	*Asclepias speciosa*	48–96	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	0–96	–

	wild bergamot	MOFI	*Monarda fistulosa*	48–96	–
	Forb, native	2FN	*Forb, native*	48–96	–
	stickseed	HACKE	*Hackelia*	0–48	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–48	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–48	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–48	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–48	–
	mint	MENTH	*Mentha*	0–48	–
	northern bedstraw	GABO2	*Galium boreale*	0–48	–
	palespike lobelia	LOSP	*Lobelia spicata*	0–48	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–48	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–48	–
	Forb, introduced	2FI	*Forb, introduced*	0	–
Shrub/Vine					
8	**Shrubs**			48–240	
	chokecherry	PRVI	*Prunus virginiana*	0–240	–
	redosier dogwood	COSE16	*Cornus sericea*	48–144	–
	Bebb willow	SABE2	*Salix bebbiana*	48–144	–
	yellow willow	SALU2	*Salix lutea*	0–144	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–144	–
	shrubby cinquefoil	DAFRF	*Dasiphora fruticosa ssp. floribunda*	48–96	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–96	–
Tree					
9	**Trees**			0–96	
	Tree	2TREE	*Tree*	0–96	–
	peachleaf willow	SAAM2	*Salix amygdaloides*	0–48	–

Animal community

Wildlife Interpretations
The Black Hills and Bear Lodge Mountains of South Dakota and Wyoming are truly a forested island in a grassland sea. To regional Native Americans they are ‘Paha Sapa”, or “hills that are black”, and from a distance, the ponderosa pine-covered slopes do appear like black hills (Larson, 1999).

The Black Hills and Bear Lodge Mountains are located in the drier areas of a northern mixed-grass prairie ecosystem in which sagebrush steppes to the west yield to grassland steppes to the east. Prior to European settlement, MLRA 62 consisted of diverse grassland, shrubland, and forest habitats interspersed with varying densities of depressional instream wetlands and woody riparian corridors. These habitats provided critical life cycle components for many users. Many species of grassland birds, small mammals, reptiles, amphibians, and herds of roaming bison, elk, and pronghorn were among the inhabitants adapted to this semi-arid region. Roaming herbivores, as well as several species of small mammals and insects, were the primary consumers linking the grassland resources to large predators, such as the gray wolf, mountain lion, grizzly bear, and to smaller carnivores, such as the coyote, bobcat, fox, and raptors.

Beaver inhabited surface waters associated with instream wetlands and woody riparian corridors along streams and drainages. Beaver occupation served as a mechanism to maintain water tables along flood plains and valley floors. During pre-European times, the extent of the wet land sites was likely much more wide-spread and persistent during dry periods, however excessive trapping and removal since that time has changed the hydrology and limited the extent of these sites while drying former mesic areas throughout the MLRA.

Grazing Interpretations
Production and accessibility of plant communities described in the Subirrigated ecological site can be highly variable, a complete resource inventory is necessary to document plant composition and production. Accurate estimates of carrying capacity should be calculated using vegetative clipping data, animal preference data, and actual stocking records.

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

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for livestock. During the dormant period, the forage for livestock likely has insufficient protein to meet livestock requirements. Added protein allows ruminants to better utilize the energy stored in grazed plant materials. A forage quality test should be used to determine the level of supplementation needed.

Hydrological functions

This site is dominated by soils in hydrologic groups B and D. Infiltration and runoff potential for this site varies from low to negligible. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

This site provides opportunities for hunting, hiking, photography, and bird watching. The wide variety of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Revision Notes: Provisional
This provisional ecological site description (ESD) has passed quality control (QC) and quality assurance (QA) to ensure the it meets the 2014 NESH standards for a provisional ecological site description. This site should not be considered an Approved ESD, as it is only the foundational site concepts and requires further data collection, site investigations, and final State-and-Transition Model (STM) reviews before it can be used as an Approved ESD meeting NESH standards.

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

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include Stan Boltz, range management specialist (RMS), NRCS; Dan Brady, soil scientist (SS), NRCS; Mitch Faulkner, RMS, NRCS; Rick

Peterson, (RMS), NRCS; Mathew Scott, RMS, USFS; and Jim Westerman, (SS), NRCS. All inventory information and data records are compiled within the Rapid City, SD USDA-NRCS Shared “S” network drive.

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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)	
Contact for lead author	
Date	05/10/2025
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

   _____

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

   _____

3. **Number and height of erosional pedestals or terracettes:**

   _____

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

   _____

5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

---

7. **Amount of litter movement (describe size and distance expected to travel):**

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

---

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:

    Sub-dominant:

    Other:

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

---

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

---

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:

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17. **Perennial plant reproductive capability:**
