USDA Natural Resources Conservation Service

Ecological site R062XC020SD
Loamy Overflow - South

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 Loamy Overflow - South ecological site is found in the southern portion of MLRA 62. It is a run-in site located in floodplains and low stream terraces of mountain valleys and canyons. Slopes range from 0 to 6 percent. The soils are very deep and formed in loamy alluvium. The surface layer is 3 to 5 inches in depth with gravelly loam to very gravelly loamy textures. In some areas there can be up to one inch of litter buildup on the surface. Soils are well drained, with moderate to moderately rapid permeability. The textures of the subsurface soils are loamy grading to sandy.

Vegetation in the Reference State (1.0) is a mixed woodland and grassland community with shrubs, sedges, and mid-stature cool- and warm-season grasses in the understory. Dominant shrubs include western snowberry and chokecherry. Trees include green ash, boxelder, possibly bur oak, and scattered ponderosa pine.

The Loamy Overflow sites in MLRA 62 combines the traditional Overflow and Lowland concepts.

Associated sites

R062XY043SD	**Valley Loam** The Valley Loam ecological site is found in mountain valleys and canyons. It can be found adjacent to the Loamy Overflow - South ecological site.
R062XY003SD	**Subirrigated** The Subirrigated ecological site is found adjacent to or intermixed with the Loamy Overflow – South ecological site. The Subirrigated ecological site has a permanent water table at 2-5 feet from the surface.

Similar sites

R062XY003SD	**Subirrigated** The Subirrigated ecological will have more warm-season grasses and fewer deciduous trees than the Loamy Overflow - South ecological site.

Table 1. Dominant plant species

Tree	(1) *Fraxinus pennsylvanica*
Shrub	(1) *Symphoricarpos occidentalis* (2) *Prunus virginiana*
Herbaceous	(1) *Spartina pectinata* (2) *Carex sprengelii*

Physiographic features

The Loamy Overflow - South ecological site ecological site occurs on nearly level stream terraces and floodplains within mountain valleys and canyons.

Table 2. Representative physiographic features

Landforms	(1) Valley > Stream terrace (2) Valley > Flood plain
Runoff class	Low to medium
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Elevation	3,800–6,200 ft
Slope	0–6%
Water table depth	60–80 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 17 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 LRU-C (Southern Black Hills) is 18 to 21 inches.

Table 3. Representative climatic features

Frost-free period (characteristic range)	100-110 days
Freeze-free period (characteristic range)	119-130 days
Precipitation total (characteristic range)	18-20 in
Frost-free period (actual range)	96-110 days
Freeze-free period (actual range)	114-130 days
Precipitation total (actual range)	18-21 in
Frost-free period (average)	104 days
Freeze-free period (average)	124 days
Precipitation total (average)	19 in

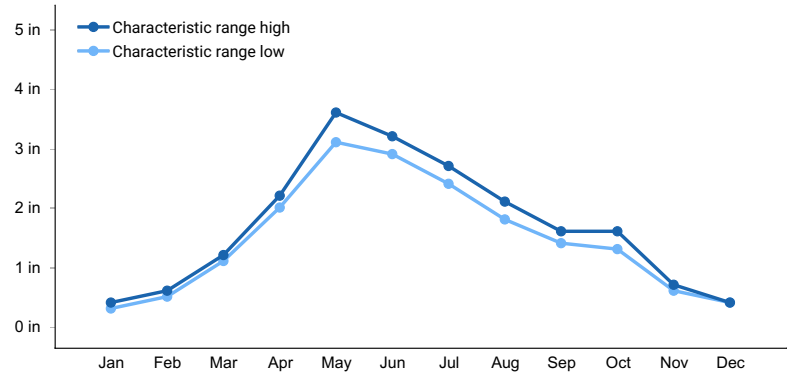


Figure 1. Monthly precipitation range

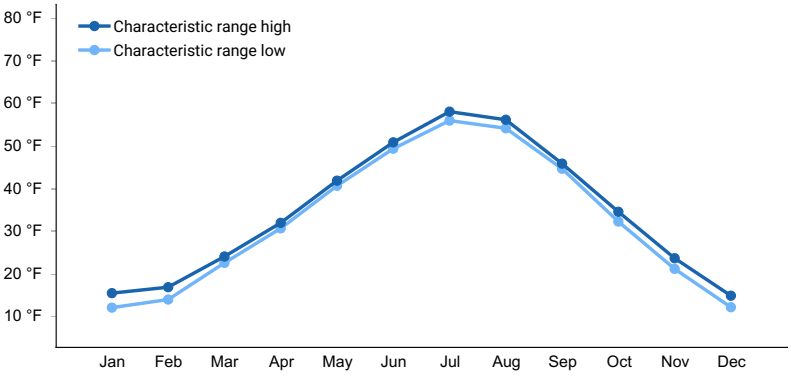


Figure 2. Monthly minimum temperature range

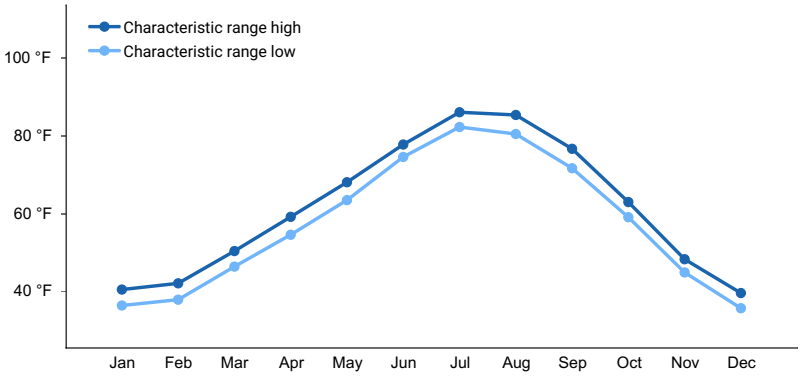


Figure 3. Monthly maximum temperature range

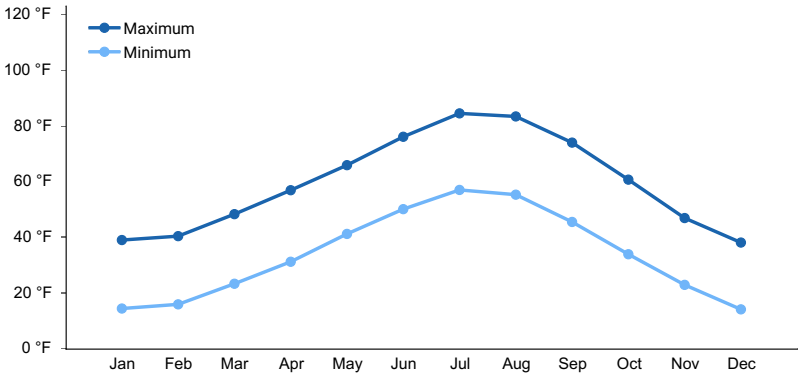


Figure 4. Monthly average minimum and maximum temperature

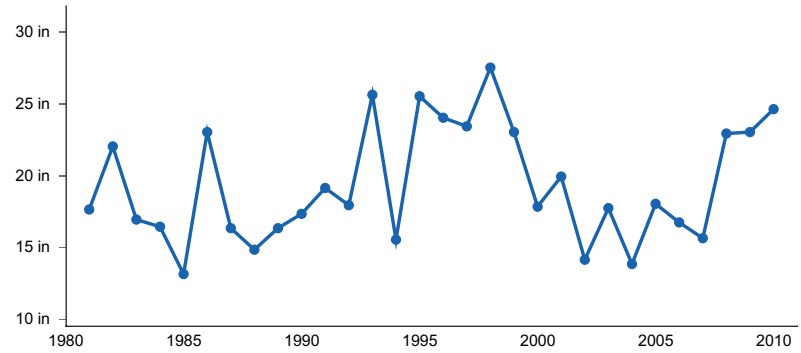


Figure 5. Annual precipitation pattern

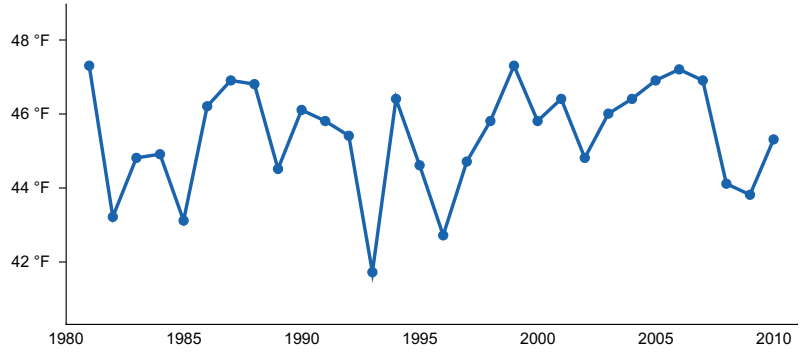


Figure 6. Annual average temperature pattern

Climate stations used

- (1) HOT SPRINGS [USC00394007], Hot Springs, SD
- (2) WIND CAVE [USC00399347], Buffalo Gap, SD
- (3) MT RUSHMORE NATL MEM [USC00395870], Keystone, SD

- (4) JOHNSON SIDING [USC00394343], Rapid City, SD
- (5) EDGEMONT 23 NNW [USC00392565], Custer, SD

Influencing water features

Riparian areas and wetland features can be directly associated with the Loamy Overflow - South ecological site.

Stream Type: B4, B6
(Rosgen System)

Soil features

Soils common to the Loamy Overflow - South ecological site are very deep and well drained. They are typically calcareous throughout. The mineral soil surface layer is typically 3 to 5 inches thick. In some areas, a significant coniferous or deciduous shrub and tree cover contributes to the build-up of a layer of leaves, twigs, and other detritus on the surface of the soil, up to about an inch thick. Surface textures are gravelly to very gravelly loam. The subsurface layers are either loamy, or they grade from loamy in the upper part to sandy in the lower part, and they typically contain more than 35 percent rounded rock fragments. Subsurface soil layers are nonrestrictive to water movement and root penetration. Slopes are typically less than 6 percent.

Major soils correlated to the Loamy Overflow - South ecological site: Barnum Colombo, and Rapidcreek.

Rapidcreek is the most extensive soil series correlated to the Loamy Overflow - South ecological site in MLRA 62's LRU-C.

These soils are mainly susceptible to water erosion. These sites are flooded periodically and are subject to cyclical erosion and deposition. Erosion is most commonly a problem along stream banks. Soils on the flood plain, away from the stream channel, generally are not subject to significant erosion. However, if disturbed, loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production. Pedestalled plants may be common in areas of more frequent flooding and deposition of sediment.

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 sedimentary rock
Surface texture	(1) Gravelly loam (2) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	80 in
Soil depth	80 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	3–9 in
Calcium carbonate equivalent (0-40in)	1–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2

Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (0-40in)	30–80%
Subsurface fragment volume >3" (0-40in)	0–30%

Ecological dynamics

The Loamy Overflow - South ecological site developed under Black Hills climatic conditions; light to severe grazing by bison, elk, insects, and small mammals; beaver activities; 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, effects of native and exotic plant and animal species, and management actions. Severe disturbances, such as high intensity fire, periods of well-below average precipitation, severe defoliation, or non-use and no fire can cause significant shifts in plant communities and species composition.

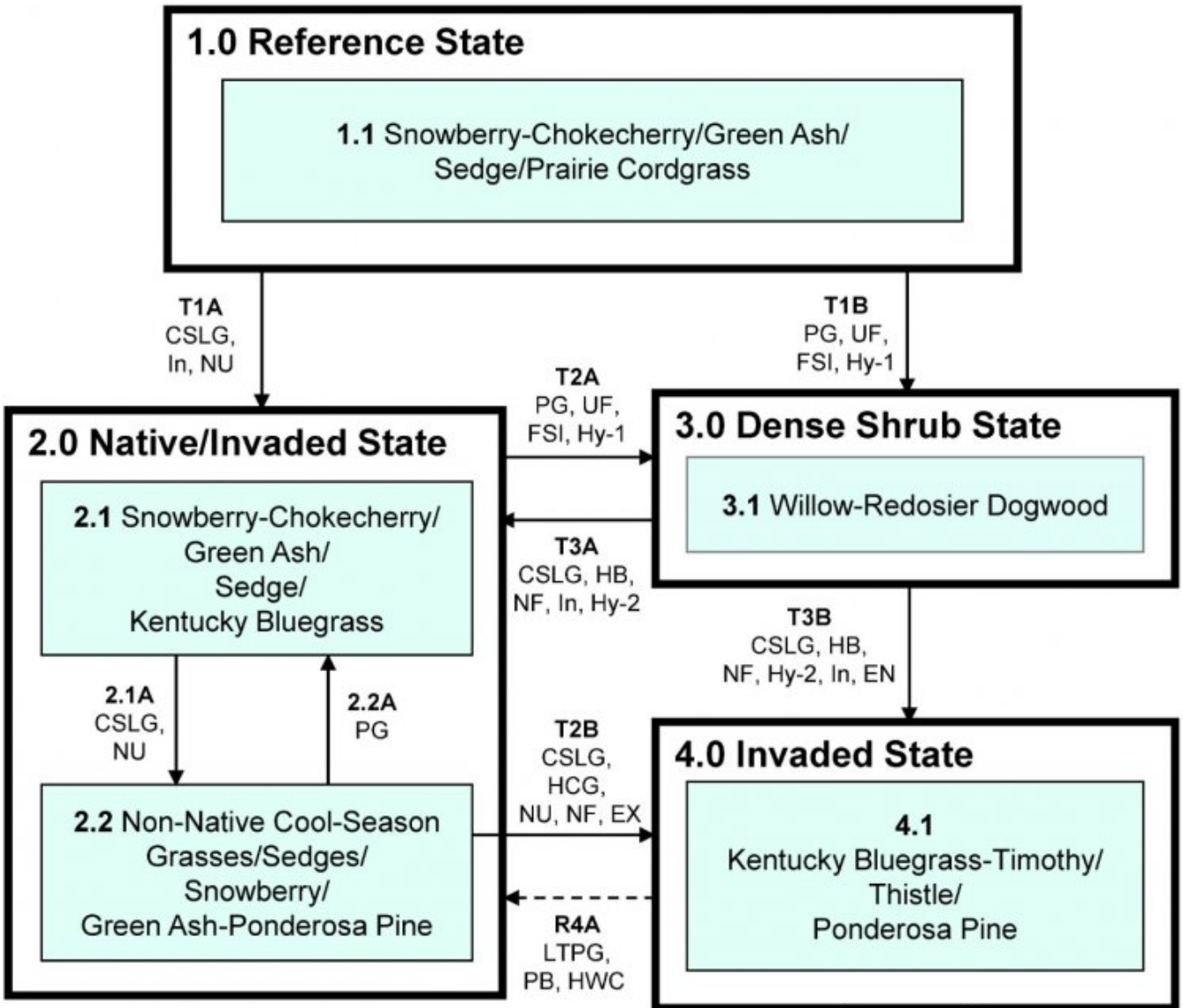
Interpretations are primarily based on the Snowberry-Chokecherry/Green Ash/Sedge/Prairie Cordgrass Plant Community (1.1). It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community 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 be difficult to locate the Reference Plant Community (1.1) with the spread and establishment of non-native cool-season grasses and other anthropogenic disturbances 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

Loamy Overflow (South) – R062XC020SD 6/10/20



CSLG – Continuous season-long grazing
EN – Encroachment of pine
EX – Expansion of pine on the site
F – Fire
FSI – Forest stand improvement
HB – Heavy browse
HCG – Heavy continuous grazing
HWC – Herbaceous weed control
Hy-1 – Wetter hydrologic system
Hy-2 – Drier hydrologic system
In – Invasion of non-native species
LTPG – Long-term prescribed grazing
NF – No fire
NU – No use
PB – Prescribed burn
PG – Prescribed grazing
TH – Timber harvest
UF – Upland fire that removes forest overstory
- - → Transition may not be fast and/or feasible

Diagram Legend: Loamy Overflow (South) - R062XC020SD

T1A	1.0 to 2.0	Continuous season-long grazing; invasion and establishment of non-native cool-season grasses; extended periods of non-use.
T1B	1.0 to 3.0	Prescribed grazing specifically designed to promote shrub establishment and maintenance; upland fire or forest stand improvement which allows for a wetter hydrological system in the lowland landscape.
T2A	2.0 to 3.0	Prescribed grazing specifically designed to promote shrub establishment and maintenance; upland fire or forest stand improvement which allows for a wetter hydrological system in the lowland landscape.
T2B	2.0 to 4.0	Continuous season-long grazing; heavy continuous grazing; non-use, no fire, and expansion of pine on the site.
T3A	3.0 to 2.0	Continuous season-long grazing and heavy browse; invasion of non-native cool-season grasses; no upland fire and a shift to a drier hydrologic system.
T3B	3.0 to 4.0	Continuous season-long grazing and heavy browse; invasion of non-native cool-season grasses and forbs; no upland fire and a shift to a drier hydrologic system; expansion of pine on the site.
T4A	4.0 to 5.0	Continuous season-long grazing; no fire; encroachment and expansion of pine on the site.
T5A	5.0 to 4.0	Fire or timber harvest to remove pine from site.

R4A	4.0 to 2.0	Long-term prescribed grazing with proper stocking, change in season of use, and adequate time for plant recovery; possibly prescribed burning and herbaceous weed control. This transition may not be fast or meet management objectives.

2.1A	2.1 to 2.2	Continuous seasonal grazing without change in season of uses or adequate rest following grazing events, or long-term non-use.
2.2A	2.2 to 2.1	Prescribed grazing with proper stocking, change in season of use, and adequate time for plant recovery.

State 1
Reference State

The Reference State represents what is believed to show the natural range of variability that dominated the dynamics of the Loamy Overflow - South ecological site prior to European settlement. This site in the Reference State (1.0) is typically dominated by shrubs, cool- and warm-season grasses and sedges in the understory, an overstory of deciduous trees, and scattered ponderosa pine. 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 browsing 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 the lack of fire, concentrated livestock grazing, and wildlife browse. Grasses that are desirable for livestock and wildlife can decline, and a corresponding increase in less desirable or more grazing resistant grasses will occur. Favorable growing conditions occurred during the spring and the warm months of June through August. 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

- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- chokecherry (*Prunus virginiana*), shrub
- prairie cordgrass (*Spartina pectinata*), grass
- sedge (*Carex*), grass
- goldenrod (*Solidago*), other herbaceous
- mint (*Mentha*), other herbaceous

Community 1.1
Snowberry-Chokecherry/Green Ash/Sedge/Prairie Cordgrass

Interpretations are based primarily on the Snowberry-Chokecherry/Green Ash/Sedge/Prairie Cordgrass Plant Community. This is also considered to be Reference Plant Community (1.1). This community evolved with beaver activity, grazing and browsing by large herbivores, occasional fires, and occasional flooding events. The potential vegetation (composition by weight) is approximately 35 percent grass and grass-like species, 15 percent forbs, 30 percent shrubs, and 20 percent deciduous trees. The dominant grasses and grass-likes included prairie cordgrass,

Sprengel's sedge, Virginia wildrye, native bluegrasses, and green needlegrass. Common forbs are goldenrod, mint, wild bergamot, and American vetch. The dominant shrubs are western snowberry and chokecherry. Other shrubs will include wild rose, Bebb willow, and sandbar willow. Green ash, and boxelder will up the overstory which ranges between 5 and 25 percent cover. There will also be scattered individual ponderosa pine occurring across the Loamy Overflow site as well as small stands of quaking aspen and possibly paper birch. In pre-European times, a dense shrub community occurred throughout the majority of the Black Hills, along streams, low stream terraces and floodplains. They 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 (Froiland, 1990). These dense shrub components now only occur as scattered patches. This plant community is diverse, stable, and productive, and is well adapted to the Black Hills. The access to a 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	1470	1820	2150
Shrub/Vine	550	650	800
Forb	220	400	550
Tree	160	330	500
Total	**2400**	**3200**	**4000**

Table 6. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	–	–	–
>2 <= 4.5	2-5%	5-20%	–	–
>4.5 <= 13	3-15%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

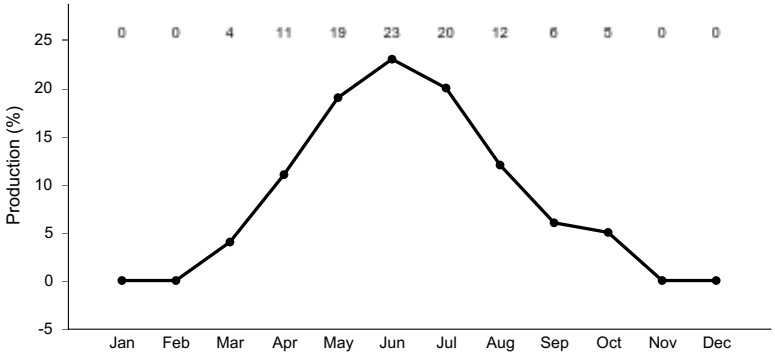


Figure 8. Plant community growth curve (percent production by month). SD6208, Black Hills, lowland cool-season/warm-season co-dominant. Lowland cool-season, warm-season co-dominant.

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 shrubs, cool- and warm-season grasses and sedges, and an overstory of deciduous trees. It can be found on areas that are properly managed with grazing and on some areas receiving periodic rest. Native cool- and warm-season grasses and sedges will decline as non-native cool-season grasses increase. 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

- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- chokecherry (*Prunus virginiana*), shrub
- prairie cordgrass (*Spartina pectinata*), grass
- sedge (*Carex*), grass
- goldenrod (*Solidago*), other herbaceous
- mint (*Mentha*), other herbaceous

Community 2.1
Snowberry-Chokecherry/Green Ash/Sedge/Kentucky Bluegrass

This plant community phase is similar to the Reference Plant Community (1.1), but it contains up to 15 percent non-native cool-season grasses (by air-dry weight) such as Kentucky bluegrass, timothy, smooth brome, or redtop. The potential vegetation is about 35 percent grass and grass-like species, 15 percent forbs, 30 percent shrubs, and 20 percent deciduous trees. The dominant grasses and grass-likes include prairie cordgrass, sedge species, and non-native cool-season grasses. Common forbs are goldenrod, mint, and wild bergamot. Canada thistle and bull thistle will likely be present. The dominant shrubs are western snowberry and chokecherry. Other shrubs will include wild rose, Bebb willow, and sandbar willow. Green ash, boxelder, and possibly bur oak will make up the overstory which ranges between 5 and 25 percent cover. Scattered individual ponderosa pine will also be scattered across the site. This plant community is resilient and well adapted to the Black Hills climatic conditions. This is a sustainable plant community in regard to site and soil stability, watershed function, and biologic integrity.

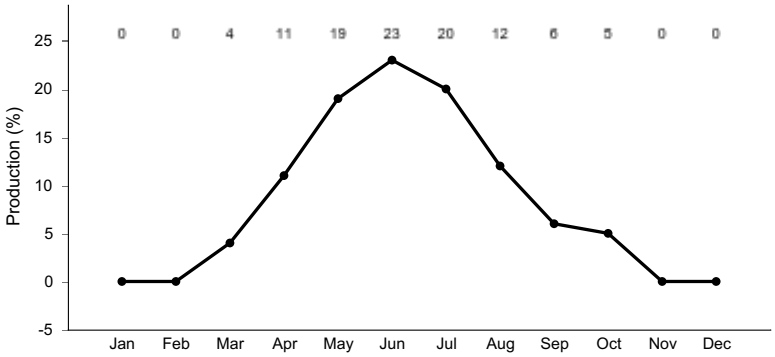


Figure 9. Plant community growth curve (percent production by month). SD6208, Black Hills, lowland cool-season/warm-season co-dominant. Lowland cool-season, warm-season co-dominant.

Community 2.2
Non-Native Cool-Season Grasses/Sedges/Snowberry/Green Ash-Ponderosa Pine

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 long-term non-use. The potential vegetation is approximately 50 percent grass and grass-like species, 10 percent forbs, 30 percent shrubs and 10 percent deciduous trees by air-dry weight. The dominant grasses and grass-likes

include non-native cool-season grasses and native sedges. Common forbs are goldenrod, mint, and wild bergamot. Canada thistle and bull thistle will likely be present. The dominant shrub is western snowberry. Other shrubs will include wild rose, willow species, and chokecherry. Green ash and ponderosa pine will be the dominant tree species with the overstory ranging between 5 and 10 percent cover. When compared to the Reference Plant Community (1.1) the non-native cool-season grasses have increased, and prairie cordgrass and sedges have decreased in composition and production. Forbs are still diverse but invasive species are increasing. Shrub and tree diversity have decreased, and less regeneration is present. The canopy cover of deciduous trees has also decreased.

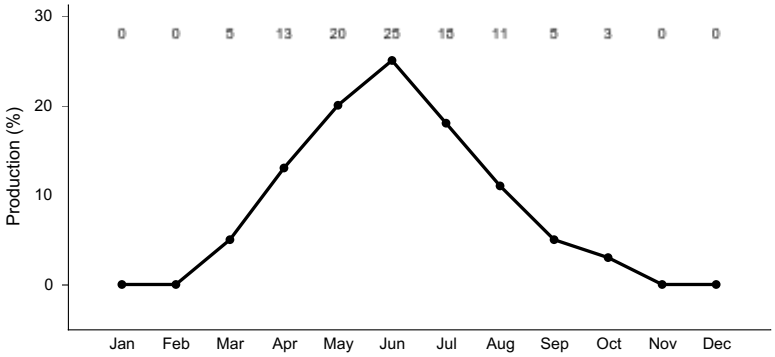


Figure 10. Plant community growth curve (percent production by month). SD6207, Black Hills, lowland cool-season dominant, warm-season sub-dominant. Lowland cool-season dominant, warm-season sub-dominant.

Pathway 2.1A
Community 2.1 to 2.2

Continuous season-long grazing without change in season of use or adequate recovery periods following grazing event, or long-term non-use will convert Plant Community 2.1 to the Non-Native Cool-Season Grasses/Sedges/Snowberry/Green Ash-Ponderosa Pine 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 following grazing event, will shift Plant Community 2.2 to the Snowberry-Chokecherry/Green Ash/Sedge/Kentucky Bluegrass Plant Community (2.1). Prescribed burning may also be used to facilitate this plant community shift.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 3
Dense Shrub State

In pre-European time 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, ponderosa pine density was lower in the uplands, resulting in lower evapo-transpiration 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 populations were restricted to remote areas of the Black Hills. Riparian ecosystems likely degraded rapidly following beaver removal, generating substantial long-lasting effects. Placer mining activities during the Black Hills gold rush of the 1870s and 1880s had severe effects in some riparian areas as did the transportation routes along streams, and the expansion of agriculture including farming and livestock production that supplied beef and mutton for mining communities (Froiland, 1990). 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 transitional deciduous trees (Parrash,1996).

Dominant plant species

- redosier dogwood (*Cornus sericea*), shrub
- Bebb willow (*Salix bebbiana*), shrub
- prairie cordgrass (*Spartina pectinata*), grass
- Virginia wildrye (*Elymus virginicus*), grass
- goldenrod (*Solidago*), other herbaceous
- cinquefoil (*Potentilla*), other herbaceous

Community 3.1
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, Virginia wildrye, marsh muhly, and various native lowland sedges. Other grass and grass-like species may include inland bluegrass and fowl bluegrass. Forbs commonly found in this plant community include goldenrod, cinquefoil, mint, and wild bergamot. Dominant shrubs will include Bebb willow, yellow willow, sandbar willow, redosier dogwood, wild rose, raspberry, and currant. Other shrubs in this plant community can include diamond willow, meadow willow, and river birch. This plant community is diverse, stable, productive, and is well adapted to the Black Hills climate. The permanent high-water table supplies much of the moisture for plant growth and plant diversity. 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 permanent drier hydrologic system. The use of chemical herbicides for the control of noxious weeds can also alter this plant community.

State 4
Invaded State

The Invaded State is the result of invasion and dominance of non-native cool-season grass species on the site. Dominate grasses include Kentucky bluegrass, timothy, redtop, and smooth brome. Continuous season-long grazing or heavy continuous grazing will result in an increase of non-native grasses and forbs. Non-use and no fire will result in an increasing thatch layer that tends to favor the more shade tolerant introduced grass species. The nutrient cycle is impaired, resulting in a higher level of nitrogen which also favors introduced 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 this 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).

Dominant plant species

- ponderosa pine (*Pinus ponderosa*), tree
- Kentucky bluegrass (*Poa pratensis*), grass
- timothy (*Phleum pratense*), grass
- red clover (*Trifolium pratense*), other herbaceous
- goldenrod (*Solidago*), other herbaceous

Community 4.1
Kentucky Bluegrass-Timothy/Thistle/Ponderosa Pine

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 heavy continuous grazing; and the expansion of ponderosa pine, or extended periods of non-use and no fire and

the expansion of ponderosa pine. It is characterized by a dominance of non-native cool-season grasses, including Kentucky bluegrass, timothy, smooth brome, and redtop. Native sedges and forbs will still be present, but red clover, white clover, Canada thistle, and bull thistle will likely be increasing. Native shrubs and deciduous trees will decline or be removed from the plant community as regeneration is reduced due to the thick herbaceous sod. Ponderosa pine is likely to expand at first in this plant community. When compared to the Reference Plant Community (1.1) the non-native cool-season grasses have increased in composition and production. Forbs are still diverse, but invasive species are increasing. Shrub and deciduous tree diversity have decreased with little or no regeneration. The canopy cover of ponderosa pine has increased.

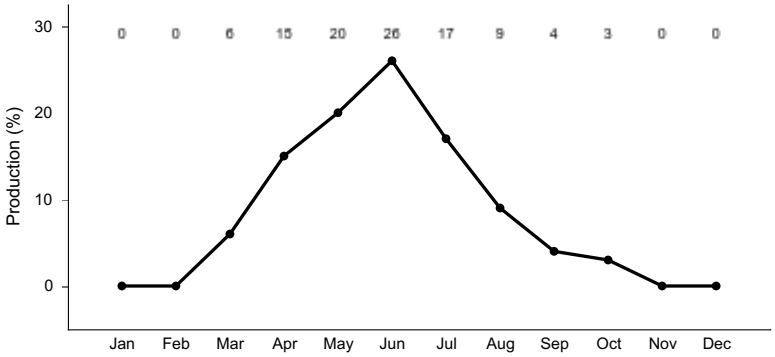


Figure 11. Plant community growth curve (percent production by month). SD6206, Black Hills, lowland cool-season dominant. Lowland cool-season dominant.

State 5
Conifer State

This Conifer State consists of areas where tree canopy increases to a level that impedes the reproductive capability of the major native perennial grass species. The increase in conifer canopy is a result of encroachment from forest sites, or the expansion of ponderosa pine due to long-term fire suppression. This state is reached when mature ponderosa pine canopy cover reaches approximately 25 percent or more. With continued long-term fire suppression and no timber management, the conifer canopy can eventually become closed with much of the herbaceous understory lost.

Dominant plant species

- ponderosa pine (*Pinus ponderosa*), tree

Community 5.1
Ponderosa Pine

This plant community develops where trees from adjacent forest sites encroach, or trees naturally occurring on the site increase and begin to shade out the herbaceous component. With long-term suppression of fire and no timber management the tree canopy cover eventually becomes closed and most of the herbaceous understory is lost. As mature tree canopy approaches 45 percent or higher the competition slows the growth rate of the trees. A few cool-season species may survive, as well as shrubs and possibly vines. This plant community may only be altered through timber management or possibly fire. This plant community is at high risk for insects, disease, and catastrophic fire. This plant community will also be accompanied by a relatively thick layer of acidic duff from the needles of the trees which will further reduce the establishment of herbaceous species.

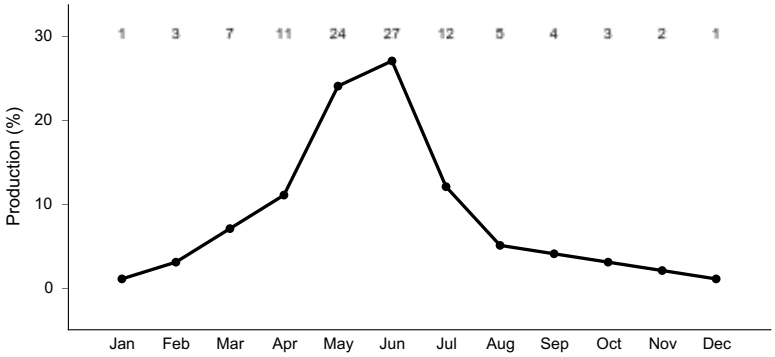


Figure 12. Plant community growth curve (percent production by month). SD6211, Black Hills, heavy conifer canopy. Mature ponderosa pine overstory.

Transition T1A
State 1 to 2

Continuous season-long grazing; or long-term non-use and the invasion of non-native cool-season grasses will transition the Reference State (1.0) to the Native/Invaded State (2.0).

Transition T1B
State 1 to 3

The transition from the Reference State (1.0) to the Dense Shrub State (3.0) may be accomplished with prescribed grazing that is specifically designed to promote willow establishment and maintenance. This may require extended periods of non-use or the construction of enclosures to protect shrub regeneration and establishment. Upland fire or forest stand improvement in the watershed may be needed to reduce conifer canopy and reestablish a wetter hydrologic system along the drainage.

Conservation practices

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

Transition T2A
State 2 to 3

Prescribed grazing that is specifically designed to promote willow and dogwood establishment and maintenance. This may include extended periods of non-use or the construction of enclosures to protect shrub regeneration; upland fires or forest stand improvement that reduce the conifer canopy in the watershed and allows the site to reestablish a wetter hydrologic system may transition the Reference State (1.0) to the Dense Shrub State (3.0).

Conservation practices

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

Transition T2B
State 2 to 4

Continuous season-long grazing; or heavy continuous grazing; the expansion of invasive non-native grasses and forbs, and the expansion of ponderosa pine will transition the Native/Invaded State (2.0) to the Invaded State (4.0). Long-term non-use and no fire and the expansion of ponderosa pine will also cause the Native/Invaded State (2.0) to transition to the Invaded State (4.0). This transition is most likely to originate from plant community 2.2.

Transition T3A
State 3 to 2

Continuous season-long grazing and/or heavy browsing of shrubs; the invasion of non-native cool-season grasses; no upland fire, and a shift to a drier hydrologic system will transition the Dense Shrub State (3.0) to the Native/Invaded State (2.0).

Transition T3B
State 3 to 4

Continuous season-long grazing and/or heavy browsing of shrubs; no upland fire, and a shift to a drier hydrologic system; the invasion of non-native cool-season grasses; and the expansion of ponderosa pine will transition the Dense Shrub State (3.0) to the Invaded State (4.0).

Restoration pathway R4A
State 4 to 2

This transition will require long-term prescribed grazing with proper stocking rates, change in season of use, and deferment that provides adequate time for plant recovery. Prescribed burning may be needed to suppress non-native cool-season grass and herbaceous weed control to treat invasive forbs. These treatments may facilitate a transition from the Invaded State (4.0) to the Native/Invaded State (2.0). This will take a long period of time, and recovery may not meet management objectives. Success will largely depend on whether native reproductive propagules remain intact on the site.

Conservation practices

Prescribed Burning
Prescribed Grazing
Herbaceous Weed Control

Transition T4A
State 4 to 5

Continuous season-long grazing; no fire, and the encroachment and expansion of ponderosa pine will transition the Invaded State (4.0) to the Conifer State (5.0).

Transition T5A
State 5 to 4

A significant reduction of tree canopy can be accomplished through fire and or timber harvest, which will likely transition the Conifer State (5.0) to the Invaded State (4.0).

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-Season Bunchgrass**			480–960	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	64–320	–
	Virginia wildrye	ELSU	*Elymus submuticus*	64–320	–
	fowl bluegrass	POPA2	*Poa palustris*	32–320	–
	green needlegrass	NAVI4	*Nassella viridula*	64–320	–
	inland bluegrass	PONEI2	*Poa nemoralis ssp. interior*	32–160	–

	Canada wildrye	ELCA4	*Elymus canadensis*	32–160	–
2	**Tall & Mid- Warm-Season Grasses**			160–480	
	prairie cordgrass	SPPE	*Spartina pectinata*	64–480	–
	big bluestem	ANGE	*Andropogon gerardii*	64–160	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	64–160	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	32–64	–
	switchgrass	PAVI2	*Panicum virgatum*	32–64	–
3	**Other Native Grasses**			32–160	
	Grass, perennial	2GP	*Grass, perennial*	32–160	–
	mountain brome	BRMA4	*Bromus marginatus*	0–64	–
4	**Grass-Likes**			160–480	
	Sprengel's sedge	CASP7	*Carex sprengelii*	64–320	–
	clustered field sedge	CAPR5	*Carex praegracilis*	32–160	–
	woolly sedge	CAPE42	*Carex pellita*	32–160	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	32–160	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–64	–
	shortbeak sedge	CABR10	*Carex brevior*	0–64	–
5	**Non-Native Cool-Season Grasses**			0	
Forb					
6	**Forbs**			320–480	
	goldenrod	SOLID	*Solidago*	64–320	–
	mint	MENTH	*Mentha*	64–320	–
	stinging nettle	URDI	*Urtica dioica*	32–160	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	32–160	–
	American vetch	VIAM	*Vicia americana*	64–160	–
	cinquefoil	POTEN	*Potentilla*	32–160	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	32–160	–
	wild bergamot	MOFI	*Monarda fistulosa*	64–160	–
	Forb, native	2FN	*Forb, native*	64–160	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	32–64	–
	Indianhemp	APCA	*Apocynum cannabinum*	32–64	–
Shrub/Vine					
7	**Shrubs**			480–800	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	320–800	–
	chokecherry	PRVI	*Prunus virginiana*	160–480	–
	Bebb willow	SABE2	*Salix bebbiana*	32–320	–
	redosier dogwood	COSE16	*Cornus sericea*	32–160	–
	sandbar willow	SAIN3	*Salix interior*	32–160	–
	Woods' rose	ROWO	*Rosa woodsii*	32–160	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	32–160	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	32–64	–
Tree					
8	**Deciduous Trees**			160–480	

	green ash	FRPE	*Fraxinus pennsylvanica*	32–320	–
	boxelder	ACNE2	*Acer negundo*	32–160	–
	bur oak	QUMA2	*Quercus macrocarpa*	0–160	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–64	–
	paper birch	BEPA	*Betula papyrifera*	0–64	–
	peachleaf willow	SAAM2	*Salix amygdaloides*	0–64	–
	quaking aspen	POTR5	*Populus tremuloides*	0–64	–
	Tree	2TREE	*Tree*	0–64	–
9	**Conifer Trees**			32–64	
	ponderosa pine	PIPO	*Pinus ponderosa*	32–64	–
	Tree	2TREE	*Tree*	0–32	–

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 Loamy Overflow - South 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 C. Infiltration and runoff potential for this site varies from

moderate to low, depending on soil hydrologic group, slope and ground cover. 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

Typically, there will be no appreciable wood products 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 that 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; 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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Approval

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Acknowledgments

This ecological site description developed by Rick L. Peterson on June 12, 2020.

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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:**

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:**

---

17. **Perennial plant reproductive capability:**
