USDA Natural Resources
Conservation Service

Ecological site R062XY012SD
Thin Upland

Last updated: 7/31/2024
Accessed: 05/12/2025

General information

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

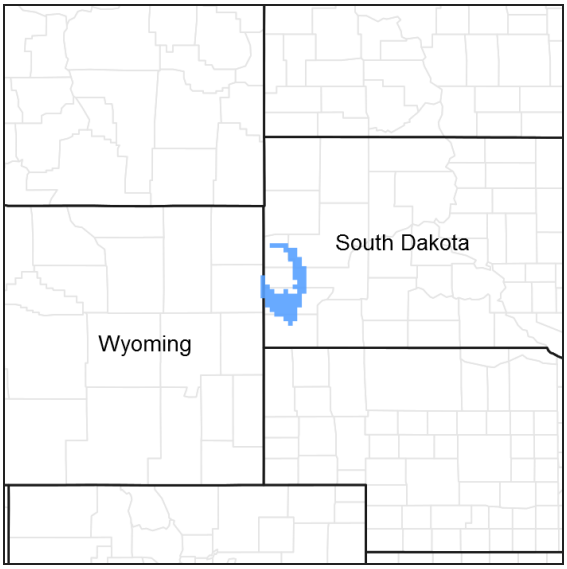

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 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, Jewel Cave National Monument, and Wind Cave National Park 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 1999). The core of the Black Hills is a plutonic mass of granite with steeply dipping metamorphic rocks, primarily slate and schist, which directly surrounds 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 most common in the southern portion of the Black Hills. Aspen is of minor extent throughout the Black Hills area. Roughleaf ricegrass, slender wheatgrass, bearded wheatgrass, poverty oatgrass, Richardson's needlegrass, and mountain ricegrass are the most common native grasses under open forest stands. The most common native shrubs are common snowberry, bearberry, common juniper, Oregon grape, 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 Land Resource Units (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.

LRU-A includes the northern Black Hills and Bear Lodge Mountains (22-30" PZ); LRU-B includes the high elevation central core of the Black Hills (25-35" PZ); and LRU-C includes the southern portion of the Black Hills (17-21" PZ).

The Forest ecological sites are representative of sites in the Black Hills, Bear Lodge Mountains (MLRA-62), and the surrounding Dakota Hogback (MLRA-61). These sites are separated by elevation, soil temperature regimes, and slope.

The Low Mountain area includes all of the Black Hills, Bear Lodge Mountains, and Dakota Hogback below 6,200 feet in elevation (LRU's A and C). The soils in this area have a frigid soil temperature regime.

The High Mountain area includes all of the Black Hills above 6,200 feet elevation (LRU-B). The soils in this area have a cryic soil temperature regime.

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

This site occurs on upland landscapes in both the northern and southern portion of the Black Hills, Land Resource Unit (LRU-A and C). Soils are deep to very deep and typically calcareous to the surface. The soil surface texture is loamy and ranges from 3 to 5 inches thick. Subsurface textures are loamy, loamy skeletal, or sandy skeletal. The typical slope ranges from 6 to 80 percent and the site does not receive additional water from runoff or overflow. Vegetation in reference consist primarily of warm-season grasses with cool-season grasses being sub-dominant. Dominant warm-season grasses include little bluestem, sideoats grama, blue and hairy grama, and plains muhly. Cool-season grasses and grass-like plants include western and bearded wheatgrass, porcupine grass, prairie junegrass and threadleaf sedge. Forbs, especially purple coneflower, are common and diverse but never dominant. Shrubs include prairie rose and fringed sagewort. Ponderosa pine is almost always present, but in minor amounts. The site is very susceptible to pine encroachment, especially in LRU-A.

Associated sites

R062XA010SD	**Loamy - North** The Loamy (North) site can be located adjacent to the Thin Upland site. Loamy sites have deep non-calcareous soils and are more productive.
R062XA024SD	**Shallow Loamy - North** The Shallow Loamy (North) site is commonly associated with the Thin Upland site, but has shallower soils and less productivity.
R062XC010SD	**Loamy - South** The Loamy (South) site can be located adjacent to the Thin Upland site. Loamy sites have deep non-calcareous soils and are more productive.
R062XC024SD	**Shallow Loamy - South** The Shallow Loamy (South) site is commonly associated with the Thin Upland site, but has shallower soils and less productivity.

Similar sites

R062XC024SD	**Shallow Loamy - South** The Shallow Loamy (South) has shallow soils. The plant community can look very similar, but will have lower production.
R062XA024SD	**Shallow Loamy - North** The Shallow Loamy (North) has shallow soils. The plant community can look similar, but will have lower production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua curtipendula*

Physiographic features

This site occurs on gently sloping to steep ridge shoulders, backslopes, and footslopes on all aspects in the Black Hills.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Mountain slope (3) Structural bench
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	3,500–5,200 ft
Slope	6–80%
Water table depth	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 north to south. The average annual precipitation range for MLRA 62 is 17 to 30 inches; LRU-A (North) is 22 to 30 inches, and LRU-C (South) is 17 to 21 inches. Most of the rainfall occurs as frontal storms early in the growing season, May and June. Some high-intensity, convective thunderstorms occur in July and August. Precipitation in the winter occurs mostly as snow. The annual average snowfall ranges from 23 inches at the lower elevations in the south to 54 inches at the higher elevations in the central part of MLRA 62. Average annual temperature ranges from 36 to 48 degrees F. January is the coldest month, with an average temperature of 22 °F in the central part 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 part and 73 °F in the southern part of this MLRA. The frost free period ranges from 105 to 124 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 on soil moisture availability.

Table 3. Representative climatic features

Frost-free period (characteristic range)	72-100 days
Freeze-free period (characteristic range)	105-119 days
Precipitation total (characteristic range)	20-24 in
Frost-free period (actual range)	62-108 days
Freeze-free period (actual range)	104-120 days
Precipitation total (actual range)	19-28 in
Frost-free period (average)	86 days
Freeze-free period (average)	112 days
Precipitation total (average)	22 in

Climate stations used

- (1) DEADWOOD [USC00392207], Deadwood, SD
- (2) WIND CAVE [USC00399347], Buffalo Gap, SD
- (3) SUNDANCE [USC00488705], Sundance, WY
- (4) HILL CITY [USC00393868], Hill City, SD

Influencing water features

The Thin Upland site does not receive additional moisture from streams or wetlands; however, additional moisture may be received as runoff, but the majority does not stay on-site.

Soil features

The soils on this site are deep to very deep and well drained. Encroachment of ponderosa pine is common in many areas, especially on north-, east-, and west-facing slopes. In areas of significant encroachment, the mineral soil surface may be covered with 1 to 2 inches of pine needles and duff. The mineral soil surface layer typically is 3 to 5 inches thick. Surface textures are loamy (specific textures are listed below). Subsurface textures range from loamy to sandy-skeletal. The soils are typically calcareous to the surface, but may be leached a few inches in some places. A few areas have been observed where the soils formed in residuum from noncalcareous sandstone and lack free carbonates. The soils typically are alkaline throughout, but in some places may be neutral. Where pine encroachment has been continuous for long periods of time, the upper 2 or 3 inches of the surface layer may be neutral or slightly acidic. The slopes generally range from 6 to 80 percent; however, there is a “transition zone” between slopes of about 6 and 9 percent, where soil and site characteristics may overlap with the Loamy ecological site.

These soils mainly are susceptible to water erosion. The hazard of water erosion increases as slope increases. 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. Rills and gullies tend to form under prolonged exposure of the soil surface. On steeper slopes, concentrated flow increases the hazard of gully erosion. Subsurface soil layers above 40 inches generally are nonrestrictive to water movement and root penetration.

The commonly-occurring soils for this site are Colnevee, Hopdraw, Pesowyo, and Sawdust. Minor components include Opechekahta and Schaeferville soils.

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

Figure 8. Thin Upland Soil Profile

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone and sandstone
Surface texture	(1) Loam (2) Gravelly loam (3) Gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained

Permeability class	Moderate to moderately rapid
Soil depth	40–120 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–3%
Available water capacity (0-40in)	3–9 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–75%
Subsurface fragment volume >3" (Depth not specified)	0–50%

Ecological dynamics

Black Hills vegetation types consist of a mixture of forest and grasslands resulting from the varied topography, geology, soils, climate and natural disturbances. Frequent fires, periodic drought, and episodic mountain pine beetle infestations all contribute to the maintenance of large open grasslands scattered throughout the Black Hills. Ponderosa pine is the dominant tree species in the Black Hills. It is a fire adapted species that coexists with frequent, low-intensity fires that consume small seedlings, prune lower branches from larger trees, and reduce fuel loads.

This site developed under Black Hills climatic conditions with short-term weather variations, light to severe grazing by bison, elk and small mammals, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. The natural fire regime maintained this site as a grassland and the plant communities were free of non-native cool season grasses.

Fire, or the lack of fire, grazing and pine encroachment are major drivers that shape this site as well as adjacent ecological sites. Between 1388 and 1900, fire intervals in the Black Hills ranged from 16 to 20 years (Brown, 1996). In the absence of fire, encroachment of ponderosa pine is likely to occur on this site. This is especially true in the Northern LRU where the Thin Upland site is often wooded. The Thin Upland site is typically dominated by warm season grasses which do not provide direct competition with pine seedlings early in the growing season.

Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species. Severe disturbances such as periods of well-below average precipitation, severe defoliation, soil erosion and no fire and no use will also cause changes in plant community dynamics. The Thin Upland site occurs on a wide range of slopes and aspects. The steeper slopes, greater than 20 percent will tend to have lower total annual production than the slopes on slopes less than 20 percent. The plant communities on less steep slopes may have slightly more cool season grasses than those on the steeper slopes. North and east aspects may also produce slightly higher percentage of cool season grasses than south and west facing slopes.

Kentucky bluegrass occurs on this site but has not become a dominant species that drives the successional process as it can in other ecological sites in this MLRA. On slopes greater than 40 to 45 percent, livestock grazing will not likely contribute significantly to plant community dynamics. Wildlife grazing may contribute somewhat but fire or the lack of fire will be the dominant driver.

The following diagram illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current

knowledge and experience, and changes will be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model

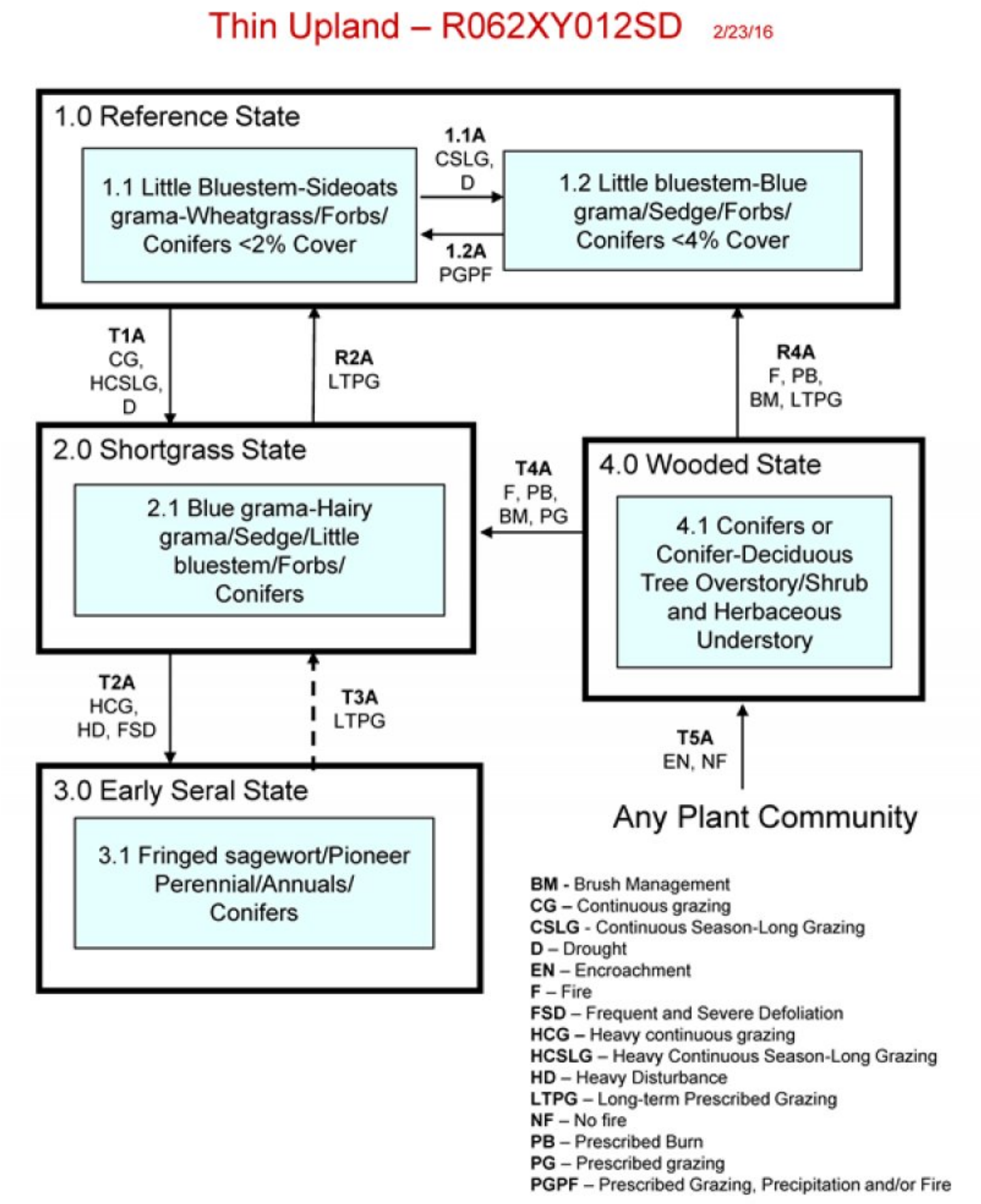

Figure 9. Thin Upland - 062XY012SD

Diagram Legend - Thin Upland - 062XY012SD

T1A	Continuous grazing, heavy season-long grazing and/or drought
T2A	Heavy continuous grazing, heavy disturbance, frequent and severe defoliation
T3A	Long-term prescribed grazing. May take an extended period of time and may not meet management objectives
T4A	Fire, prescribed burning, brush management, prescribed grazing
T5A	Encroachment, no fire

R2A	Long-term prescribed grazing
R4A	Fire, prescribed burn, brush management, long-term prescribed grazing

CP 1.1A	1.1 - 1.2	Continuous season-long grazing, drought
CP 1.2A	1.2 - 1.1	Prescribed grazing, normal precipitation following drought and/or fire

Figure 10. Thin Upland - 062XY012SD

State 1
Reference

This state represents what is believed to represent the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site is dominated by warm-season grasses. Cool-season grasses are sub-dominant. In pre-European times the primary disturbances included fire and grazing by large ungulates and small mammals. Favorable growing conditions occurred during the spring, and continue through the warm months of June through August. Routine and/or occasional fires reduced tree cover and contributed to the ecological processes that maintained the reference plant community. Today a similar state can be found in areas where proper livestock use has occurred and where the encroachment of trees, especially ponderosa pine, has been limited.

Community 1.1
Little Bluestem-Sideoats Grama-Wheatgrass/Forbs/Conifers <2% Cover

Figure 11. Thin Upland PCP 1.1

Interpretations are based primarily on the Little bluestem-Sideoats grama-Wheatgrass/Forbs/Conifers <2% Cover plant community phase. This site is considered the Reference or historic plant community. The potential vegetation consists of about 80 percent grass and grass-like plants, 15 percent forbs, 5 percent shrubs and 0 to 2 percent trees. Total annual production for a normal growing year is approximately 2,000 lbs./ac. The community is dominated by warm-season grasses including little bluestem, sideoats grama, blue and hairy grama and plains muhly. Cool-season grasses and grass-like plants include western and bearded wheatgrass, porcupine grass, prairie junegrass, and threadleaf sedge. Forbs are common and diverse, but prairie coneflower almost always is present. Shrubs include prairie rose and fringed sagewort. Conifers may be present, but in small amounts. This plant community is productive and resilient to disturbances such as drought and fire. It is a sustainable plant community in regards to soil/site stability, watershed function, and biological integrity.

Forest overstory. Ponderosa Pine

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1465	2016	2550
Forb	115	240	375
Shrub/Vine	20	132	250
Tree	0	12	25
Total	**1600**	**2400**	**3200**

Figure 13. Plant community growth curve (percent production by month). SD6204, Black Hills, warm-season dominant, cool-season sub-dominant. Warm-season dominant, cool-season sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Community 1.2
Little bluestem-Blue grama/Sedge/Forbs/Conifers <4% Cover

This plant community phase is the result of continuous season-long grazing without adequate recovery period, and no fire or drought. The potential vegetation is about 75 percent grass and grass-like plants, 15 percent forbs, 5 percent shrubs, and 0 to 5 percent trees. Total annual production for a normal growing year is approximately 1,600 lbs./ac. The community is dominated by warm-season grasses including little bluestem, blue and hairy grama and plains muhly. Cool-season grasses and grass-like plants include prairie junegrass, threadleaf sedge, western and bearded wheatgrass, and porcupine grass. Forbs are common and diverse, and prairie coneflower almost always is present. Shrubs include prairie rose and fringed sagewort. This plant community is productive and resilient to disturbances such as drought and fire. It was a sustainable plant community in regard to soil/site stability, watershed function, and biological integrity.

Forest overstory. Ponderosa Pine

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing without adequate recovery periods and/or drought will cause an increase in short-grass species and upland sedge. Sideoats grama and the wheatgrasses will decrease, but little bluestem will persist in the plant community. Lack of fire will allow conifers to become established, but in relatively small amounts.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that provides a recovery period after grazing, along with normal precipitation and periodic fire, will allow this plant community to return to the reference plant community.

State 2
Shortgrass State

This state is dominated by short-grass and grass-like species as a result of continuous grazing, or heavy, continuous season-long grazing without adequate recovery, or extended periods of drought. In the early stages of this State, mid-grass remnants may be present in sufficient quantities to allow for recovery to the Reference State. The dominant herbaceous species present are well adapted to grazing. Over time, the plant community will become very resistant to change due to higher runoff and reduced infiltration. Conifers may increase in this state due to the reduction of fine fuels, which is typical of short- statured grass communities.

Community 2.1
Blue grama-Hairy grama/Sedge/Little bluestem/Forbs/Conifers

This plant community evolved under continuous grazing, heavy, continuous season-long grazing, or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, 5 percent shrubs, and 0-5 percent trees. Total annual production for a normal growing year is approximately 1,200 lbs./ac. Dominant grass and grass-like species include blue grama, hairy grama, threadleaf sedge, and little bluestem. Sub-dominant grasses include western wheatgrass, needleandthread, sideoats grama, and prairie junegrass. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, spiny phlox, and fringed sagewort. Conifers are almost always present but typically in small amounts; however, they can increase dramatically with the lack of fire.

Forest overstory. Ponderosa Pine

State 3
Early Seral State

This state is dominated by annual grasses and forbs, perennial pioneer species, short-grass and grass-like species, and half-shrubs. This is a result of heavy, continuous grazing without adequate recovery, frequent and severe defoliation, or heavy disturbance. In the early stages of this state, short-grass remnants may be present in sufficient quantities to allow for recovery to the Short Grass State. This state may have very diverse plant communities, depending upon the species that become established as soil disturbance and the percentage of bare ground is high. Runoff is high and infiltration is low. Soil erosion can be excessive, especially on steeper slopes. Conifers will commonly be present and may have increased beyond what was present in State 2.

Community 3.1
Fringed sagewort/Pioneer Perennials/Annuals/Conifers

This plant community developed under heavy, continuous grazing, heavy disturbances such as heavy use areas, and frequent and severe defoliation such as confined feeding areas and rodent concentrations. The potential plant community is made up of 60-80 percent grasses and grass-like species, 15 to 35 percent forbs, and 2 to 5 percent shrubs. Conifers may make up 0-10 percent. Total annual production can vary greatly depending upon species composition. The dominant grass often is threeawn. Other grasses may include annual bromegrass (field brome and cheatgrass), sedge, blue grama, sand dropseed, bluegrass, and western wheatgrass. The dominant forbs include fetid marigold, sweetclover, western ragweed, cudweed sagewort, and other invader-like species. The dominant shrubs include fringed sagewort, and broom snakeweed. A wide variety of other early seral plant species can occupy this site in varying amounts. This plant community is susceptible to invasion of Canada thistle, leafy spurge, and other non-native species because of the relatively high percent of bare ground. In most cases, this phase is dominated by annual and/or pioneer perennial species. Bare ground is typically much higher than on any other plant community phase.

Forest overstory. Ponderosa Pine

State 4
Wooded State

This state is dominated by conifer or conifer and deciduous tree overstory. This state is common on north- and east-facing slopes, and very common in the northern LRU (A). This state can be confused with a forest site, except it will not exhibit woodland soil characteristics such as an E soil horizon. Where conifer encroachment has been continuous for long periods of time, carbonates may have leached into the soil profile and the upper 2 to 3 inches may be neutral or slightly acidic. The midstory and understory may also resemble a forest plant community with shade-tolerant shrubs, grasses, grass-likes, and forbs. This state is the result of non-use and no fire. This state may also be droughty, as ponderosa pine canopy was found to significantly reduce precipitation reaching the forest floor by an average of 30 percent due to interception in area of intermediate and dense canopy (Wrage, 1994).

Community 4.1
Conifers or Conifer-Deciduous Tree Overstory/Shrub/Herbaceous Understory.

Figure 14. Thin Upland - PCP 4.1, Ponderosa Pine

Figure 15. Thin Upland PCP 4.1, Pine and Deciduous Trees

This plant community developed due to pine encroachment, no use and or no fire. The potential plant community is made up of 55 percent grasses and grass-like species, 10 percent forbs, 10 percent shrubs, and 25 percent trees. Total annual production can be very variable depending upon species composition. The dominant grass and grass-like species are poverty oats, bluegrass, rough-leaf ricegrass, Canada wildrye, slender wheatgrass, and sedge. The dominant forbs include Oregon grape, pinedrops, pussy toes, and western yarrow. The dominant shrubs include western snowberry, hop hornbeam, common juniper, and creeping juniper. Trees can include ponderosa pine, Rocky Mountain juniper, paper birch, and bur oak. The sites in the northern LRU are more likely to have the mixed conifer and deciduous tree species. The south LRU is more likely to have ponderosa pine and juniper in this plant community.

Forest overstory. Ponderosa Pine

Transition 1A
State 1 to 2

Continuous season-long grazing without adequate recovery periods or heavy, continuous season-long grazing above the carrying capacity, and/or extended periods of drought will cause a transition to the Shortgrass State (2.0).

Transition 5A
State 1 to 4

Encroachment of conifers and the lack of periodic fire will allow the transition to the Wooded State (4.0). In the North LRU this can include ponderosa pine and deciduous trees species, including paper birch and bur oak; in the South LRU, tree species include ponderosa pine and, to a lesser extent, Rocky Mountain juniper.

Restoration pathway 2A

State 2 to 1

Long-term prescribed grazing that provides adequate recovery time and change in seasons of use can restore this plant community to the Reference State (1.0). This process can take an extended period of time, especially if mid-stature cool- and warm-season species make up only a small percentage of the plant community. Prescribed fire or brush management may be required if conifers have become established and are increasing.

Transition 2A
State 2 to 3

Heavy continuous season-long grazing without adequate recovery periods, heavy disturbance, or frequent and severe defoliation will cause a transition to the Early Seral State (3.0).

Transition 5A
State 2 to 4

Encroachment of conifers and the lack of periodic fire will allow the transition to the Wooded State (4.0). In the North LRU this can include ponderosa pine and deciduous trees species including paper birch and bur oak; in the South LRU, ponderosa pine and, to a lesser extent, Rocky Mountain juniper.

Transition 3A
State 3 to 2

Long-term prescribed grazing that provided adequate recovery time and a change in seasons of use may restore this plant community to the Short Grass State (2.0). This process can take an extended period of time, and may not be successful or meet management goals. Seeding native species may be an option to restore this State but the outcome can be vary greatly and may not be successful. Prescribed fire or brush management may be required if conifers have become established and are increasing.

Transition 5A
State 3 to 4

Encroachment of conifers and the lack of periodic fire will allow the transition to the Wooded State (4.0). In the North LRU this can include ponderosa pine and deciduous trees species, including paper birch and bur oak; in the South LRU, ponderosa pine and, to a lesser extent, Rocky Mountain juniper.

Restoration pathway 4A
State 4 to 1

Fire or prescribed burning or brush management in concert with long-term prescribed grazing can restore this plant community to the reference state (1.0). On slopes greater than 40 to 45 percent, livestock grazing will not likely be a factor in the plant community dynamics post-fire. Aerial seeding operations immediately after a fire have proven to be successful; however, the outcome may not meet management goals other than erosion control.

Transition 4A
State 4 to 2

Fire or prescribed burning or brush management in concert with prescribed grazing that allows for proper stocking rate, and a change in the season of use can transition this plant community to the Shortgrass State (2.0). This transition is more likely to occur on shallower slopes where livestock use contributed to the plant community dynamics.

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 and Mid- Warm-Season Grasses**			960–1440	
	little bluestem	SCSC	*Schizachyrium scoparium*	360–720	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	240–480	–
	big bluestem	ANGE	*Andropogon gerardii*	120–240	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–48	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	0–48	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–48	–
2	**Cool-Season Bunchgrass**			120–240	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	120–240	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	24–120	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–120	–
	slender wheatgrass	ELTRS	*Elymus trachycaulus ssp. subsecundus*	0–120	–
	green needlegrass	NAVI4	*Nassella viridula*	0–120	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–48	–
3	**Cool-Season Rhizomatous Grass**			24–240	
	western wheatgrass	PASM	*Pascopyrum smithii*	24–240	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–48	–
4	**Short Warm-Season Grasses**			120–240	
	blue grama	BOGR2	*Bouteloua gracilis*	120–240	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	24–120	–
	threeawn	ARIST	*Aristida*	0–120	–
5	**Other Native Grasses**			0–120	
	Grass, perennial	2GP	*Grass, perennial*	0–120	–
6	**Grass-Likes**			120–240	
	needleleaf sedge	CADU6	*Carex duriuscula*	24–240	–
	threadleaf sedge	CAFI	*Carex filifolia*	24–240	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–120	–
	Richardson's sedge	CARI	*Carex richardsonii*	0–48	–
	sedge	CAREX	*Carex*	24–48	–
7	**Non-Native Cool-Season Grasses**			0	
Forb					
8	**Forbs**			120–360	
	goldenrod	SOLID	*Solidago*	24–120	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	24–120	–
	scurfpea	PSORA2	*Psoralidium*	24–48	–
	spiny phlox	PHHO	*Phlox hoodii*	24–48	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–48	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–48	–
	wild bergamot	MOFI	*Monarda fistulosa*	0–48	–
	Forb, perennial	2FP	*Forb, perennial*	0–48	–
	fleabane	ERIGE2	*Erigeron*	0–48	–

	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–48	–
	mariposa lily	CALOC	*Calochortus*	0–48	–
	beardtongue	PENST	*Penstemon*	0–48	–
	prairie clover	DALEA	*Dalea*	0–48	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–48	–
	old man's whiskers	GETR	*Geum triflorum*	0–48	–
	pussytoes	ANTEN	*Antennaria*	24–48	–
	dotted blazing star	LIPU	*Liatris punctata*	24–48	–
	American vetch	VIAM	*Vicia americana*	0–48	–
	blanketflower	GAAR	*Gaillardia aristata*	0–48	–
	Lewis flax	LILE3	*Linum lewisii*	0–48	–
	bluebell bellflower	CARO2	*Campanula rotundifolia*	0–48	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	24–48	–
	deathcamas	ZIGAD	*Zigadenus*	0–24	–
	downy paintedcup	CASE5	*Castilleja sessiliflora*	0–24	–
Shrub/Vine					
9	**Shrubs**			24–240	
	prairie sagewort	ARFR4	*Artemisia frigida*	24–120	–
	leadplant	AMCA6	*Amorpha canescens*	0–120	–
	rose	ROSA5	*Rosa*	24–120	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–48	–
	soapweed yucca	YUGL	*Yucca glauca*	0–48	–
	smooth sumac	RHGL	*Rhus glabra*	0–48	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–48	–
	common juniper	JUCO6	*Juniperus communis*	0–48	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–48	–
	field sagewort	ARCA12	*Artemisia campestris*	0–48	–
Tree					
10	**Trees**			0–24	
	ponderosa pine	PIPO	*Pinus ponderosa*	0–24	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–24	–

Other information

Revision Notes:
This PROVISIONAL ecological site concept has been QCd to ensure that the site meets the NESH standards for a provisional ecological site description (ESD) that provides basic compiled information in one location. This site should not be considered an Approved ESD, as it is only the foundational site concepts and requires further data collection—specifically high-intensity data characterizations and full 232 soil

descriptions and further site investigations and final STM reviews before it can be used as an Approved ESD meeting NESH standards. This site was not previously described in MLRA 62.

Site Development and Testing Plan:
Future work, as described in a Project Plan, is needed to validate the information in this Provisional Ecological Site

Description. This will include field activities to collect low, medium, and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.
Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel also were used. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; Dan Brady, Soil Scientist, NRCS; Rick Peterson, Ecological Site Specialist, NRCS; and Jim Westerman, Soil Scientist, NRCS. All inventory information and data records are compiled within the Rapid City, SD USDA-NRCS Shared “S” network drive.

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Contributors

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Approval

Suzanne Mayne-Kinney, 7/31/2024

Acknowledgments

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

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	05/12/2025
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):

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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:

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

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

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

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

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17. **Perennial plant reproductive capability:**
