USDA Natural Resources
Conservation Service

Ecological site F062XB059SD
Highland Hills Pine Forest (60+% Slope)

Last updated: 2/06/2025
Accessed: 03/14/2026

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, 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) 61—Black Hills Foot Slopes
Major Land Resource Area (MLRA) 62—Black Hills

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

USDA Forest Service Ecological Subregions: Sections and Subsections of the Conterminous United States:
Black Hills Coniferous Forest Province—M334:
Black Hills Section—334A
Black Hills Foothills Subsection—M334Aa
Black Hills Limestone Plateau-Core Highlands Subsection—M334Ab

Ecological site concept

Occurring throughout the Black Hills, ponderosa pine is the dominant species for most of the area occurring across a variety of landforms and soils. The central concept of this ecological site focuses on dividing the region into three LRU's, and three slope classes. This ecological site encompasses the higher elevation of the MLRA, LRU B, reaching from 6,200-7,200 feet with slopes of 60% or more on what is considered the high Limestone Plateau. In the higher elevations, there exists cooler and moister conditions than in most of the surrounding hills. Often this site is dominated by an understory of shrubs, along with forbs and cool season bunchgrasses- with less frequent fires compared to the dryer and warmer lower elevations.

Associated sites

F062XB056SD	**Highland Cool Valley Slopes and Depressions** This ecological site occurs in the same region as the Highland Hills ecological site, often on cool steep slopes or areas of increased moisture.
F062XY057SD	**Cool Fringe Mixed Hardwood Forest** This ecological site often occurs adjacent to or intermixed with the Highland Hills ecological site in areas of increased moisture.

Similar sites

F062XA051SD	**Low Elevation Northern Hills Pine Forest(0-15% Slope)** This site occurs in the northern range of the Black Hills and is warmer.
F062XC053SD	**Low Elevation Dry Southern Hills Pine Forest** This site occurs in the southern range of the Black Hills, and is dryer and warmer.

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa*
Shrub	(1) *Symphoricarpos albus* (2) *Arctostaphylos uva-ursi*
Herbaceous	(1) *Oryzopsis asperifolia* (2) *Elymus trachycaulus ssp. subsecundus*

Physiographic features

The Highland Hills ecological site occupies elevation ranging from 6200-7200 feet across a wide variety of landforms and slopes commonly of 60%- 90%, or possibly higher, encompassing the central region of the Black Hills known as LRU B and the high limestone plateau.

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope (2) Ridge (3) Hill
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,890–2,195 m
Slope	60–90%
Ponding depth	0 cm

Water table depth	203 cm
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 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.

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.

Table 3. Representative climatic features

Frost-free period (characteristic range)	17 days
Freeze-free period (characteristic range)	54 days
Precipitation total (characteristic range)	533 mm
Frost-free period (actual range)	17 days
Freeze-free period (actual range)	54 days
Precipitation total (actual range)	533 mm
Frost-free period (average)	17 days
Freeze-free period (average)	54 days
Precipitation total (average)	533 mm

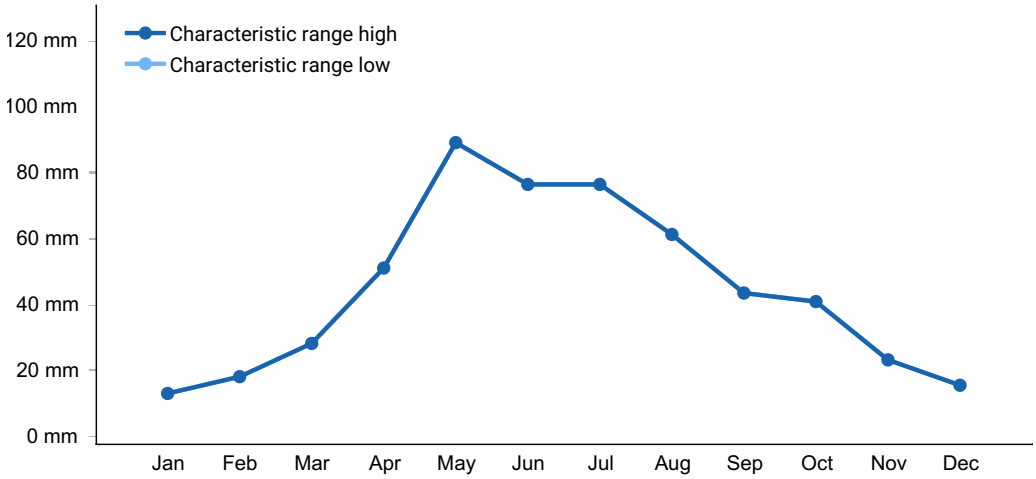


Figure 1. Monthly precipitation range

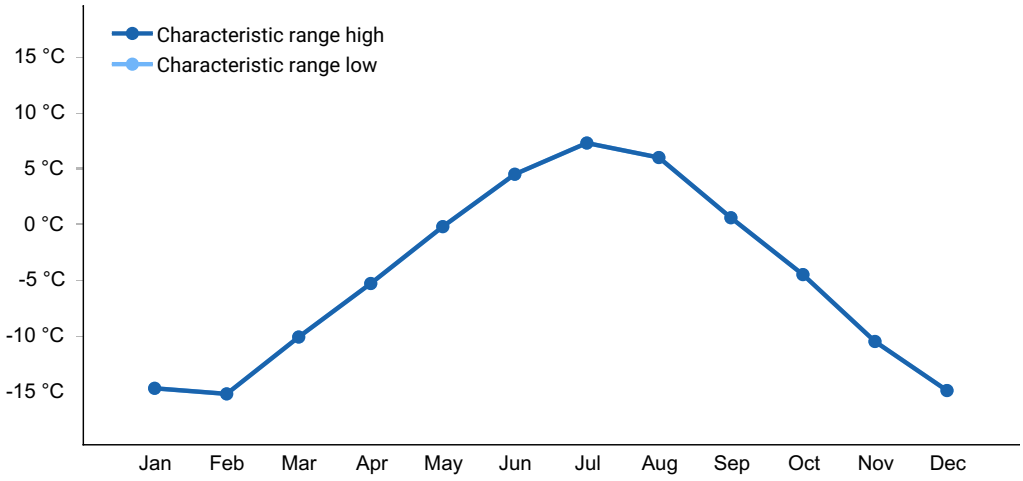


Figure 2. Monthly minimum temperature range

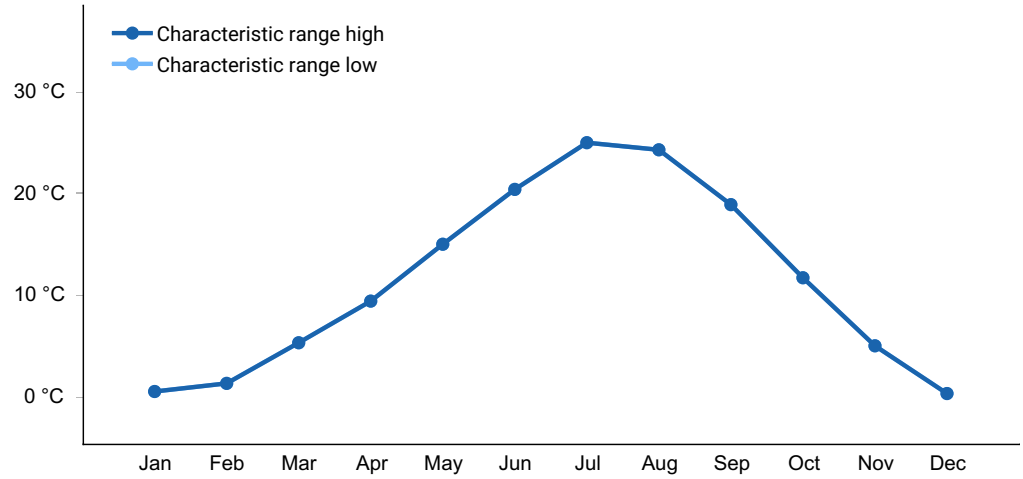


Figure 3. Monthly maximum temperature range

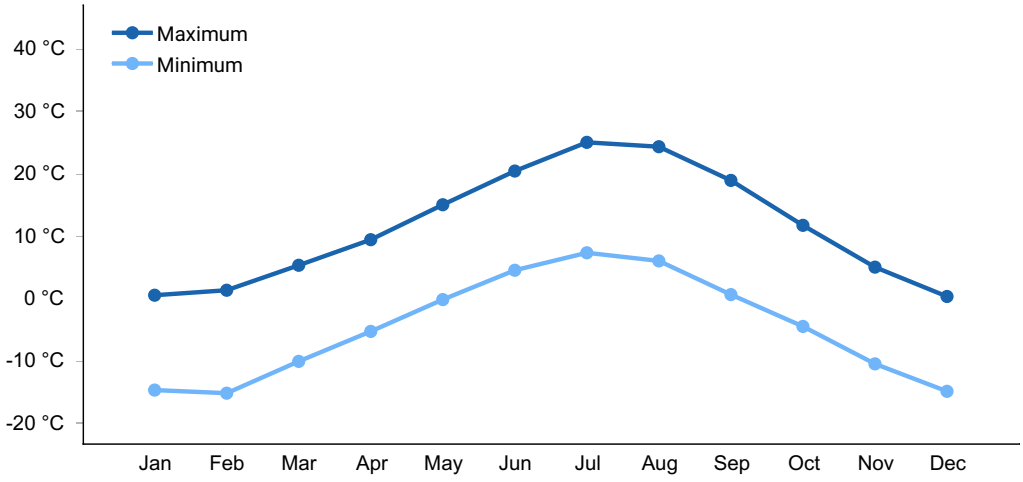


Figure 4. Monthly average minimum and maximum temperature

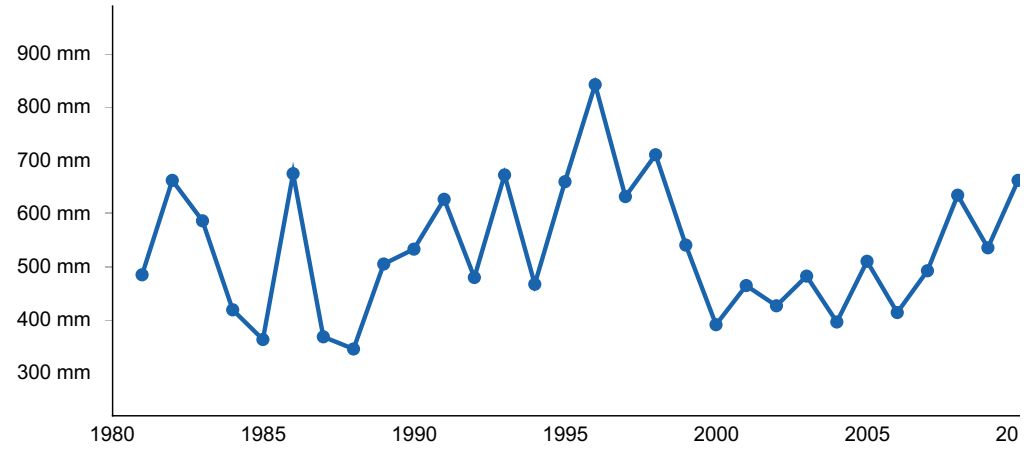


Figure 5. Annual precipitation pattern

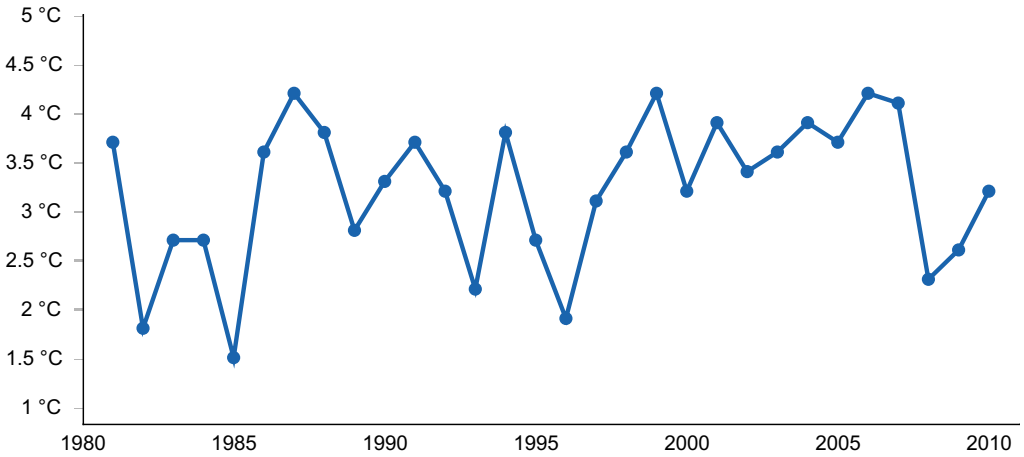


Figure 6. Annual average temperature pattern

Climate stations used

- (1) DEERFIELD 3 SE [USC00392231], Hill City, SD

Influencing water features

Riparian areas and wetland features are not associated with this site.

Wetland description

Not Applicable.

Soil features

This site is represented by the Riflepit and Stovho Soils of map units with 60% slope or more. Soils in this region that were historically forest often show evidence of an “E” eluviated horizon from decades of eluviation of acidic materials from needle and leaf litter. Acidity at the surface is often in the range of 5.0-6.5 pH while the subsurface from 0-40 inches is within the 5.1 to 8.4 pH range. A thin organic horizon is commonly present at the

surface.

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) Residuum–limestone and sandstone (2) Colluvium–schist (3) Alluvium–rhyolite
Surface texture	(1) Loam (2) Channery silt loam (3) Very gravelly sandy loam (4) Clay
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to rapid
Soil depth	51–203 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	2.54–21.59 cm
Calcium carbonate equivalent (0-101.6cm)	0–40%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–65%
Subsurface fragment volume >3" (Depth not specified)	0–65%

Ecological dynamics

Dominated by ponderosa pine, the Highland Hills (60+% Slope) ecological site occupies much of the area of LRU B. There exists a historic reference state, a native/invaded state, and a managed state. Given the history of intensive use of the Black Hills and its forestry

resources, much of the area today would be found in a managed state with few areas remaining in either the native or native/invaded states. This LRU is defined by the cooler temperatures, increased moisture, and a long stretching portion of limestone as the base parent material over much of the area. Natural disturbances such as fire, wind, ice storms, and pests determined the structure and appearance of this ecological site. Fires in this region occurred less often than the surrounding areas due to the increased moisture and cooler temperatures.

Historically the Black Hills consisted of a diverse landscape mosaic that varied from grasslands, open stands of ponderosa pine forest with small numbers of large trees, and dense stands of ponderosa pine, with many similar-sized and -aged trees. Spatial heterogeneity was present not only across the Black Hills but also within the smaller dense pine patches (Brown, 2006). Ponderosa pine is the dominant tree species in the Black Hills and tends to have dark colored bark (blackjacks) until it reaches 75 to 100 years of age, after which the bark progressively changes to a buff or orange color.

Fires in this region occurred less often than the surrounding areas due to the increased moisture and cooler temperatures, often with an interval ranging from 30-33 years (Hunter et al. 2007). Prior to Euro-American settlement, the Black Hills fire regime was mixed-severity, with both surface and crown fires being components of the ecosystem (Hunter et al. 2007). "Long fire-free periods were historically common in the Black Hills (Brown and Sieg 1996), which may have led to fuel build-up and high tree density - conditions conducive to crown fire spread (Hunter et al. 2007)". The occurrence of surface fires and stand-replacing fires, coupled with other disturbance agents, led to a complex mosaic of forest structure composed of dense forests, moderately stocked forests, and treeless openings (Hunter et al. 2007).

Pests, disease, and other natural disturbances played integral roles in maintain diversity in structure and density of this area. The mountain pine beetle (Dendroctonus ponderosae) plays an important part in the natural disturbance regime in the Black Hills and have long been a driver of forest structure. The mountain pine beetle was first described in the Black Hills in 1901 by Andrew D. Hopkins and the first documented epidemic of bark beetles in the Black Hills occurred in 1895 (Graham et al. 2016). These beetles are native in the Black Hills and have cyclical events of emergence, there has been a continuous endemic and several epidemics in the Black Hills over the last 129 years (Graham et al. 2016). "Mountain pine beetle outbreaks in the Black Hills from 1894 through 2014 had a mean return interval of 20 years and a mean duration of 13 years" (Graham et al. 2016). The latest mountain pine beetle occurred in the early 2000's and caused massive damage due to an abundance of dense stands and drought, allowing the insects to multiply in favorable years. In addition to the mountain pine beetle pine engraver (Ips pini) are also present and native to the Black Hills. Pine engraver beetles are non-aggressive and breed in windthrown ponderosa pine trees, trees damaged by wind, ice storms, or other non-standing tree’s. Armillaria (Armillaria ostoyae) has been seen as a potentially important root disease of ponderosa pine in the Black Hills since the 1930s, however it is just a part of this ecological sites natural disturbances (Boldt and Van Deusen 1974; Holah 1993;

Lundquist 1991; Shepperd, Wayne D.; Battaglia, Michael A. 2002).

Studies have shown the current forest contains about the same basal area (ft2/ac) on average as the historic forest. The difference, however, is that the historic forest was dominated by fewer, but much larger trees, than those present today. This suggests that there has been a simplification in structure at stand to landscape scales, with increased tree density leading to fewer gaps and more even spacing and size distributions within groups (Brown, 2008).

Relative increases in tree density and simplification of structure have contributed to greater vertical and horizontal fuel continuity, and thus increased likelihood for incidence and extent of crown fires. More pole-sized trees (5-to-9-inch DBH) within stands also increases the likelihood of bark beetle (Dendroctonus ponderosae) outbreaks. This is a concern in the Black Hills where pine beetle outbreaks have been a major disturbance agent during the 20th and early 21st centuries.

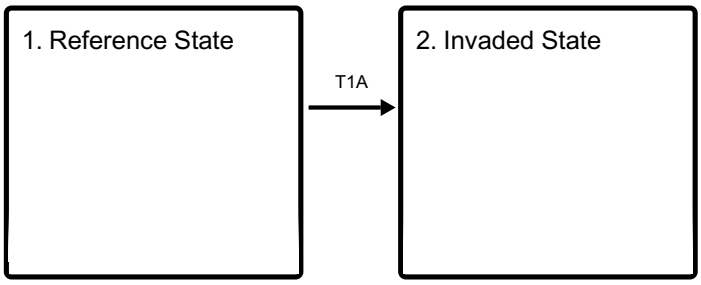
It is also important to note the change in composition in recent decades of ponderosa pine stands, whereby mainly through the mechanism of fire suppression, the dominance of white spruce has grown by an estimated 5% or more from the original 1.5% composition covered historically (Tatina R.E., Hanberry B.B., 2022).

Due to the spread and establishment of non-native cool-season grasses and other anthropogenic disturbances in MLRA 62, the Reference Plant Community (1.1) will only be a close analogy of the pre-settlement plant community.

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.

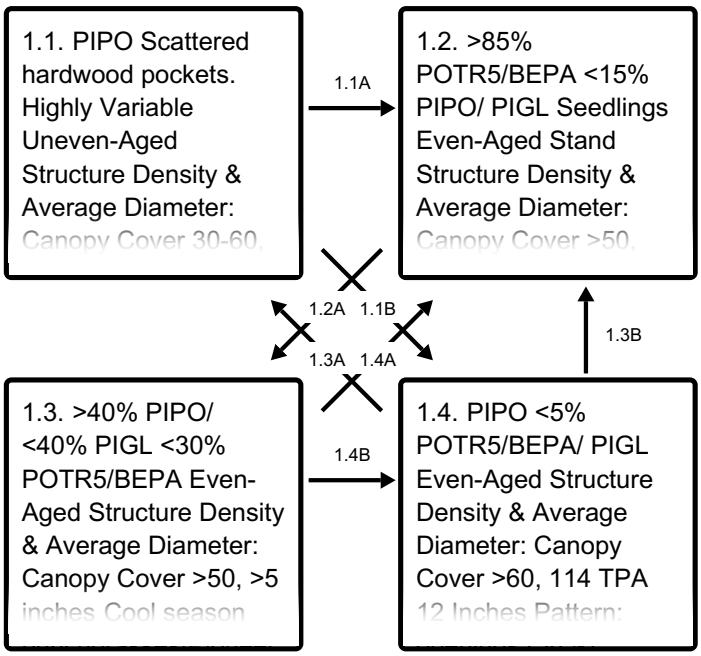
State and transition model

Ecosystem states



T1A - Invasion by invasive, sod forming grasses

State 1 submodel, plant communities



1.1A - Mixed Severity Large Patch (>20 acres) Disturbance

1.1B - Time with no disturbance (60+ years)

1.2A - Time with no disturbance (20-40 years)

1.4A - Infrequent Mixed Severity Large Patch (>20 acres) Disturbance

1.4B - Time with no disturbance (40+ years)

1.3A - Frequent Mixed Severity Small Patch (<20 acres) Disturbances

1.3B - Infrequent Mixed Severity Large Patch (>20 acres) Disturbance

State 1
Reference State

The Reference State represents what is believed to show the natural range of variability that dominated the dynamics of the Mod Steep to Steep Low Mountain Slopes forest ecological site prior to European settlement. Because of the pervasiveness of non-native cool-season grasses and long-term fire suppression in the region, the true Reference State (1.0) does not exist. This description represents the natural range of variability and dynamics under current conditions. This site in the Reference State (1.0) is dominated by a ponderosa pine overstory, typically with a canopy cover ranging from 30 to 60 percent. The understory consists of shrubs, forbs, and cool-season bunchgrasses and sedges. Predominant shrubs will include common snowberry, bearberry (kinnikinnick), Oregon grape, and russet buffaloberry. Forbs are common and diverse. Dominant cool-season bunchgrasses will include roughleaf ricegrass, bearded wheatgrass, slender wheatgrass, poverty oatgrass, and Rocky Mountain fescue. Sedges will include Hood's sedge, dryspike sedge, and Richardson's sedge. Other trees occurring on this site can included quaking aspen, scattered white spruce in the north, and Rocky Mountain juniper in the south. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periodic severe drought, episodic insect and disease outbreaks in the

ponderosa pine stands, relatively frequent (10 to 20 year interval) low-intensity surface fires, and rare (> 100 year interval) high-intensity stand replacing fires. Severe weather events in the Black Hills are also a significant disturbance that can result in overstory damage and treefall. Severe weather events that are relatively common in the Black Hills are hailstorms, heavy snow fall, ice storms, tornados, and microbursts. Any of these disturbances, usually in combination, can affect the ponderosa pine overstory and dictate the dynamics that can occur within the natural range of variability of this site. This variability in plant communities can range from old growth forest to early successional shrub and herbaceous plant communities. Today the primary disturbances are lack of fire, insect and disease, high-intensity fires, severe weather events, wildlife grazing and browsing, and the predominance of non-native cool-season perennial gasses. Some of the steeper slopes (25-30 percent), grazing by cattle will not be a significant disturbance on this site. On less sloping areas livestock grazing and browsing will occur.

Dominant plant species

- ponderosa pine (*Pinus ponderosa*), tree
- quaking aspen (*Populus tremuloides*), tree
- paper birch (*Betula papyrifera*), tree
- common snowberry (*Symphoricarpos albus*), shrub
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- creeping barberry (*Mahonia repens*), shrub
- russet buffaloberry (*Shepherdia canadensis*), shrub
- roughleaf ricegrass (*Oryzopsis asperifolia*), grass
- oatgrass (*Danthonia*), grass
- sedge (*Carex*), grass
- bearded wheatgrass (*Elymus caninus*), grass
- slender wheatgrass (*Elymus trachycaulus*), grass
- poverty oatgrass (*Danthonia spicata*), grass
- Rocky Mountain fescue (*Festuca saximontana*), grass

Community 1.1
PIPO Scattered hardwood pockets. Highly Variable Uneven-Aged Structure Density & Average Diameter: Canopy Cover 30-60, 84 TPA 13 Inches Pattern: openings (58%), individuals (6%), groups (36%) Oatgrass, Sedges, CS bunchgrasses, Spruce

Interpretations are based primarily on the Ponderosa Pine >9” DBH (30-60% CC)/ Oatgrass, Sedges/ Cool Season Bunchgrasses Plant Community. This is also considered to be Reference Plant Community (1.1). This community evolved with periodic severe drought, episodic insect and disease outbreaks, mixed-severity, with both surface and crown fires with a return interval of 30 to 33 years, rare high-intensity, stand-replacing fires that occurred on a greater than 100-year interval, and severe weather events that include hailstorms, heavy snow fall, tornados, and microbursts. Light to moderate levels of wildlife browsing and grazing also occurred on this site prior to European-American settlement.

The expected forest canopy cover ranges from 30-60% with approximately 84 TPA around 13 inches DBH. The spatial arrangement of ponderosa pine consists of 36% groupings, 6% individual trees, and 58% openings. The dominant tree species on this site is ponderosa pine with a diameter at breast height (DBH) ranging from 9 to 15 inches. Other trees scattered throughout the site may include scattered quaking aspen, paper birch and white spruce. Common understory species include roughleaf ricegrass, oatgrass, and upland sedges. As the canopy cover increases the herbaceous understory will decrease in production and species diversity. Shrubs may tend to increase initially then decrease as the canopy closes. This community self sustains itself with moderate frequency mixed severity small patch disturbance (1-20 acres). This plant community is diverse, stable, productive, and is well adapted to the high elevation Black Hills. 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. 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	319	745
Shrub/Vine	129	202	280
Forb	95	151	207
Total	**336**	**672**	**1232**

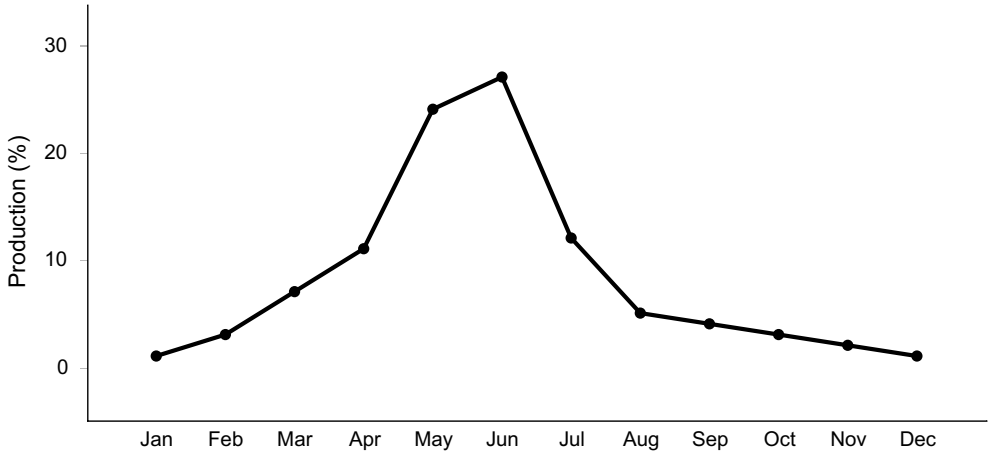


Figure 8. Plant community growth curve (percent production by month). SD6211, Black Hills, heavy conifer canopy. Mature ponderosa pine overstory.

Community 1.2
>85% POTR5/BEPA <15% PIPO/ PIGL Seedlings Even-Aged Stand Structure Density & Average Diameter: Canopy Cover >50, <5inches CS Bunchgrasses, Pioneer Forbs, and Shrubs

Overstory canopy cover is less then 50% with a ponderosa pine (PIPO) component often less than 15%, and paper birch (BEPA) and quaking aspen (POTR5) seedling/saplings now representing 85% of the forest community. This community, being more open and cooler, contains higher amounts of cool season bunchgrasses, pioneer forbs, and shrubs.

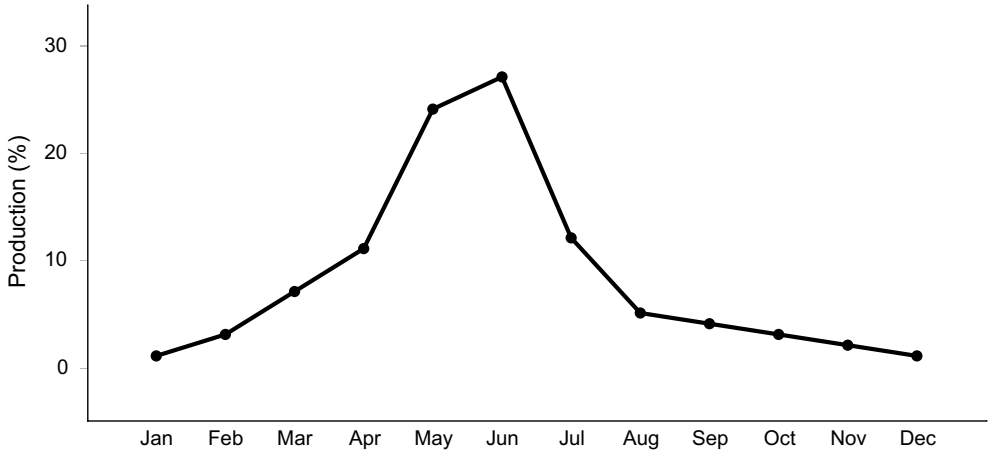


Figure 9. Plant community growth curve (percent production by month). SD6211, Black Hills, heavy conifer canopy. Mature ponderosa pine overstory.

Community 1.3
>40% PIPO/ <40% PIGL <30% POTR5/BEPA Even-Aged Structure Density & Average Diameter: Canopy Cover >50, >5 inches Cool season bunchgrasses/Pioneer forbs and shrubs

Canopy cover greater than 50% with pole sized (5-9 inches in diameter at breast height) trees approximately 40+% ponderosa pine (PIPO), <40% white spruce (PIGL), and less than 30% quaking aspen (POTR5) and/or paper birch (BEPA). Cool season bunchgrasses, pioneer forbs, and shrubs are present in the understory.

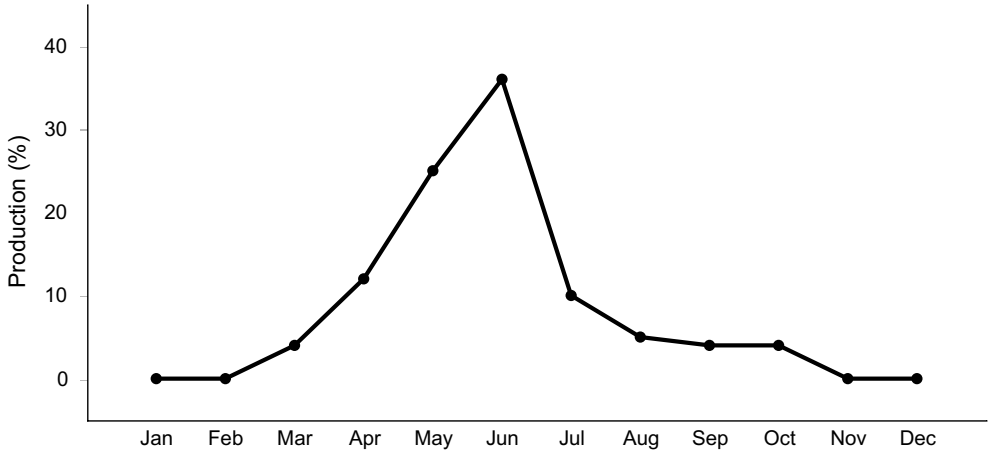


Figure 10. Plant community growth curve (percent production by month). SD6201, Black Hills, cool-season dominant. Cool-season dominant.

Community 1.4

PIPO <5% POTR5/BEPA/ PIGL Even-Aged Structure Density & Average Diameter: Canopy Cover >60, 114 TPA 12 Inches Pattern: openings (38%), individuals (2%), groups (60%) Sedge. CS Bunchgrasses, Oregon grape

This community is dominated by mature ponderosa pine (PIPO) less then 60% canopy cover with approximately density of 114 Trees Per Acre (TPA). The average tree size is around 12 inches Diameter at Breast Height (DBH). Less than 5% of other tree species may exist such as white spruce, quaking aspen (POTR5) or paper birch (BEPA). The spatial arrangement of the ponderosa pine consists of 60% of trees in groupings, 2% in individual trees, and 38% as openings without trees. This community contains higher amounts of sedges, cool season bunchgrasses, and Oregon grape. This community self sustains with infrequent low severity disturbance.

Pathway 1.1A
Community 1.1 to 1.2

Mixed Severity Large Patch (>20 acres) Disturbance such as fire, insects and disease, or severe weather.

Conservation practices

Prescribed Burning
Forest Stand Improvement

Pathway 1.1B
Community 1.1 to 1.4

Time with no disturbance (60+ years)

Pathway 1.2A
Community 1.2 to 1.3

Time with no disturbance (20-40 years)

Conservation practices

Prescribed Burning
Forest Stand Improvement

Pathway 1.4A
Community 1.3 to 1.2

Infrequent Mixed Severity Large Patch (>20 acres) Disturbance such as fire, insects and disease, or severe weather.

Conservation practices

Prescribed Burning
Forest Stand Improvement
Prescribed Grazing

Pathway 1.4B
Community 1.3 to 1.4

Time with no disturbance (40+ years)

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.4 to 1.1

Frequent Mixed Severity Small Patch (<20 acres) Disturbances, such as fire, insects and disease, or severe weather.

Pathway 1.3B
Community 1.4 to 1.2

Infrequent Mixed Severity Large Patch (>20 acres) Disturbance such as fire, insects and disease, or severe weather.

State 2
Invaded State

This state exists as non-native cool season grasses dominate the understory of many sites. The site functions similarly to the reference state and is the most common found condition this site is in today.

Dominant plant species

- ponderosa pine (*Pinus ponderosa*), tree
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- redtop (*Agrostis gigantea*), grass
- oxeye daisy (*Leucanthemum vulgare*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous
- cinquefoil (*Potentilla*), other herbaceous

- Canada thistle (*Cirsium arvense*), other herbaceous

Transition T1A
State 1 to 2

Invasion by invasive, sod forming grasses

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-Season Bunchgrass**			135–269	
	slender wheatgrass	ELTRS	*Elymus trachycaulus ssp. subsecundus*	13–101	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	13–101	–
	roughleaf ricegrass	ORAS	*Oryzopsis asperifolia*	13–101	–
	poverty oatgrass	DASP2	*Danthonia spicata*	13–67	–
	Richardson's needlegrass	ACRI8	*Achnatherum richardsonii*	7–67	–
	Porter brome	BRPO2	*Bromus porteri*	7–34	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	7–34	–
	mountain brome	BRMA4	*Bromus marginatus*	7–34	–
	false melic	SCHIZ	*Schizachne*	7–13	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–13	–
	Rocky Mountain fescue	FESA	*Festuca saximontana*	7–13	–
	timber oatgrass	DAIN	*Danthonia intermedia*	0–13	–
	green needlegrass	NAVI4	*Nassella viridula*	0–7	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–7	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–7	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–7	–
	Scribner's rosette	DIOL5	*Dichanthelium oligosanthes*	0–7	–

	Scribner's rosette grass	DICLS	*Dichanthelium oligosanthes var. scribnerianum*	0–7	
2	**Mid-Warm-Season Grasses**			13–67	
	prairie dropseed	SPHE	*Sporobolus heterolepis*	7–34	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	7–34	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–13	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–13	–
3	**Other Native Grasses**			13–34	
	inland bluegrass	PONEI2	*Poa nemoralis ssp. interior*	7–20	–
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	7–20	–
	big bluestem	ANGE	*Andropogon gerardii*	0–13	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–7	–
	downy ryegrass	LEIN6	*Leymus innovatus*	0–7	–
	onespike danthonia	DAUN	*Danthonia unispicata*	0–7	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–7	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–7	–
4	**Grass-Likes**			67–135	
	Hood's sedge	CAHO5	*Carex hoodii*	7–34	–
	Richardson's sedge	CARI	*Carex richardsonii*	7–34	–
	Sprengel's sedge	CASP7	*Carex sprengelii*	0–20	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–13	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–13	–
5	**Non-Native Cool-Season Grasses**			–	
Forb					
6	**Forbs**			101–202	
	alpine milkvetch	ASAL7	*Astragalus alpinus*	7–34	–
	American vetch	VIAM	*Vicia americana*	7–34	–
	cream pea	LAOC2	*Lathyrus ochroleucus*	7–34	–
	goldenrod	SOLID	*Solidago*	7–34	–
	larkspur	DELPH	*Delphinium*	0–34	–

	looseflower milkvetch	ASTE5	*Astragalus tenellus*	7–34	–
	lupine	LUPIN	*Lupinus*	7–34	–
	prairie milkvetch	ASLAR	*Astragalus laxmannii var. robustior*	7–34	–
	pussytoes	ANTEN	*Antennaria*	7–34	–
	smooth blue aster	SYLA3	*Symphyotrichum laeve*	7–34	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	7–34	–
	Forb, native	2FN	*Forb, native*	0–13	–
	northern bedstraw	GABO2	*Galium boreale*	7–13	–
	bluebell bellflower	CARO2	*Campanula rotundifolia*	7–13	–
	western brackenfern	PTAQ	*Pteridium aquilinum*	0–13	–
	cinquefoil	POTEN	*Potentilla*	0–13	–
	gentian	GENTI	*Gentiana*	0–7	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–7	–
	shootingstar	DODEC	*Dodecatheon*	0–7	–
	mountain deathcamas	ZIEL2	*Zigadenus elegans*	0–7	–
Shrub/Vine					
7	**Shrubs**			135–269	
	common snowberry	SYAL	*Symphoricarpos albus*	34–67	–
	kinnikinnick	ARUV	*Arctostaphylos uva-ursi*	34–67	–
	russet buffaloberry	SHCA	*Shepherdia canadensis*	13–67	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	13–67	–
	ninebark	PHYSO	*Physocarpus*	7–34	–
	creeping barberry	MARE11	*Mahonia repens*	13–34	–
	rose	ROSA5	*Rosa*	13–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	7–34	–
	American red raspberry	RUID	*Rubus idaeus*	7–34	–
	beaked hazelnut	COCO6	*Corylus cornuta*	7–13	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	7–13	–

	snowberry				
	grouse whortleberry	VASC	*Vaccinium scoparium*	7–13	–
	Jersey tea	CEHE	*Ceanothus herbaceus*	0–7	–
	leadplant	AMCA6	*Amorpha canescens*	0–7	–
	white spirea	SPBE2	*Spiraea betulifolia*	0–7	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–7	–
	common juniper	JUCO6	*Juniperus communis*	0–7	–

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
ponderosa pine	PIPOS	*Pinus ponderosa var. scopulorum*	Native	3–16.8	30–60	22.9–38.1	–
Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	Native	1.5–4.6	0–10	2.5–12.7	–
white spruce	PIGL	*Picea glauca*	Native	2.7–15.2	0–5	12.7–25.4	–
bur oak	QUMA2	*Quercus macrocarpa*	Native	1.5–4.6	0–5	2.5–12.7	–
quaking aspen	POTR5	*Populus tremuloides*	Native	3–10.7	1–5	2.5–22.9	–
Tree	2TREE	*Tree*	Native	–	0–1	–	–

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, Ezra Hoffman(Ecological Site Specialist)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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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	03/14/2026
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:**