USDA Natural Resources Conservation Service

Ecological site R062XY029SD
Stony Hills

Accessed: 04/29/2024

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.

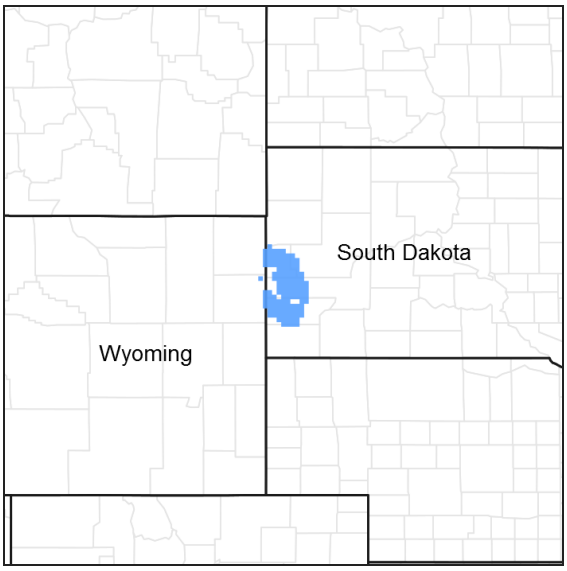

Figure 1. Mapped extent

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- to mid-grass prairie. It has geophysical and biological attributes that are unlike the surrounding area. The Black Hills Foothills, MLRA 61, is a transition zone that essentially rings the Black Hills. MLRA 62 is approximately 3,040 square miles in size, 74 percent of which is located in South Dakota and 26 percent in Wyoming.

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, MLRA: 62 - Black Hills (USDA, NRCS. Ag Handbook 296). The Stony Hills site occurs in the North (A) and South (C) LRUs in the MLRA. Level IV Ecoregions of Conterminous United States, 2013: 17b Black Hills Plateau.

Ecological site concept

This site is located on upland landscapes in the northern and southern portions of the Black Hills Land Resource Units (LRUs) A and C. Soils are deep to very deep with a loamy surface layer ranging from 7 to 8 inches thick. Rounded cobbles and stone-size rocks are at or near the soil surface, and carbonates may or may not be present.

The typical slope ranges from 0 to 40 percent, and the site does not receive additional water from runoff or overflow. Vegetation in the Reference State consists primarily of warm-season grasses, and cool-season grasses are sub-dominant. Warm-season grasses include big and little bluestem, sideoats grama, prairie dropseed, and plains muhly. Cool-season grasses and grass-like plants include western and bearded wheatgrass, porcupinegrass, green needlegrass, prairie Junegrass, and threadleaf sedge. Forbs are common and diverse, but never dominant. Leadplant and rose are common and can account for significant portions of the production. Conifers may be present, but typically do not exceed 5 percent; however, the site is susceptible to pine encroachment.
This site was formally referred to as the Stony Hills and Savanna Range Sites in the South Dakota, Black Hills Technical Guide.

Associated sites

R062XA010SD	**Loamy - North** The Loamy (North) site can be located adjacent to the Stony Hills site. Loamy sites have deep soils with few rock fragments and are more productive.
R062XA024SD	**Shallow Loamy - North** The Shallow Loamy (North) site is commonly associated with the Stony Hills site, but has shallow soil and less productivity.
R062XC010SD	**Loamy - South** The Loamy (South) site can be located adjacent to the Stony Hills site. Loamy sites have deep soils with few rock fragments and are more productive.
R062XC024SD	**Shallow Loamy - South** The Shallow Loamy (South) site is commonly associated with the Stony Hills site, but has shallow soil 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.
R062XY012SD	**Thin Upland** The Thin Upland site has a thin soil surface layer, carbonates to the surface, and fewer rock fragments in the soil profile. The TU plant community can look very similar, but will have lower production and fewer cool-season species.
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	(1) *Amorpha canescens*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Andropogon gerardii*

Physiographic features

This site occurs on gently sloping to steep summits, shoulders, backslopes, and high terraces in the Black Hills.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Ridge (3) Mountain slope

Flooding frequency	None
Ponding frequency	None
Elevation	1,158–1,585 m
Slope	0–40%
Water table depth	203 cm
Aspect	E, S

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) ranges from 22 to 30 inches, and LRU-C (South) receives 17 to 21 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. 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 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.

Table 3. Representative climatic features

Frost-free period (average)	105 days
Freeze-free period (average)	124 days
Precipitation total (average)	584 mm

Climate stations used

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

Influencing water features

Site is not influenced by streams or wetlands.

Soil features

The soils on this site are deep to very deep and well drained. The mineral soil surface layer typically is 7 to 8 inches thick. The surface may be covered by up to an inch of pine needles and duff in some areas. Surface textures are loamy (specific textures are listed below). Soil profile characteristics are dependent upon the source of the parent material. Some soils on this site are derived from limestone and calcareous sandstone and therefore have calcium carbonate in the profile, typically occurring between depths of 12 and 20 inches. Other soils are derived from igneous and metamorphic rocks and do not have carbonates. A key characteristic of this site is the presence of cobble- and stone-sized rock fragments on the surface. The surface of the soil may be covered by up to 20 percent cobbles and stones. The slopes range from 0 to 40 percent.

These soils are mainly susceptible to water erosion. Because of the presence of surface rock fragments, the hazard of water erosion on this site is low until slopes exceed about 20 percent. 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. Erosion on this site will tend to occur as rills around surface fragments and in areas of concentrated flow. Subsurface soil layers are generally nonrestrictive to water movement and root penetration.

The commonly-occurring soils for this site are Hilger and Shirttail.

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

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone and sandstone (2) Alluvium–schist (3) Residuum–granite
Surface texture	(1) Channery loam (2) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderate
Soil depth	102–152 cm
Surface fragment cover <=3"	1–8%
Surface fragment cover >3"	4–15%
Available water capacity (0-101.6cm)	7.62–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
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)	30–70%
Subsurface fragment volume >3" (Depth not specified)	5–35%

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 infestations of mountain pine beetles 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, insects, 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. The Shirttail series appears to be more susceptible to pine encroachment and establishment than the Hilger soils. This is probably due to the

parent materials of schist or granite.
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. The Stony Hills site also can occur on a wide range of slopes and aspects. Steeper slopes, those greater than 20 percent, will tend to have lower total annual production than on slopes less than 20 percent. The plant communities on the shallower slopes may have slightly more cool-season grasses than those on the steeper slopes. Northern and eastern aspects also may produce a slightly higher percentage of cool-season grasses than south-and west-facing slopes.
Kentucky bluegrass occurs on this site and can drive the successional process. Preliminary studies indicate that a 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).
Livestock and wildlife grazing, fire or the lack of fire, and the introduction of non-native cool-season grasses are the dominant drivers of plant community dynamics.
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

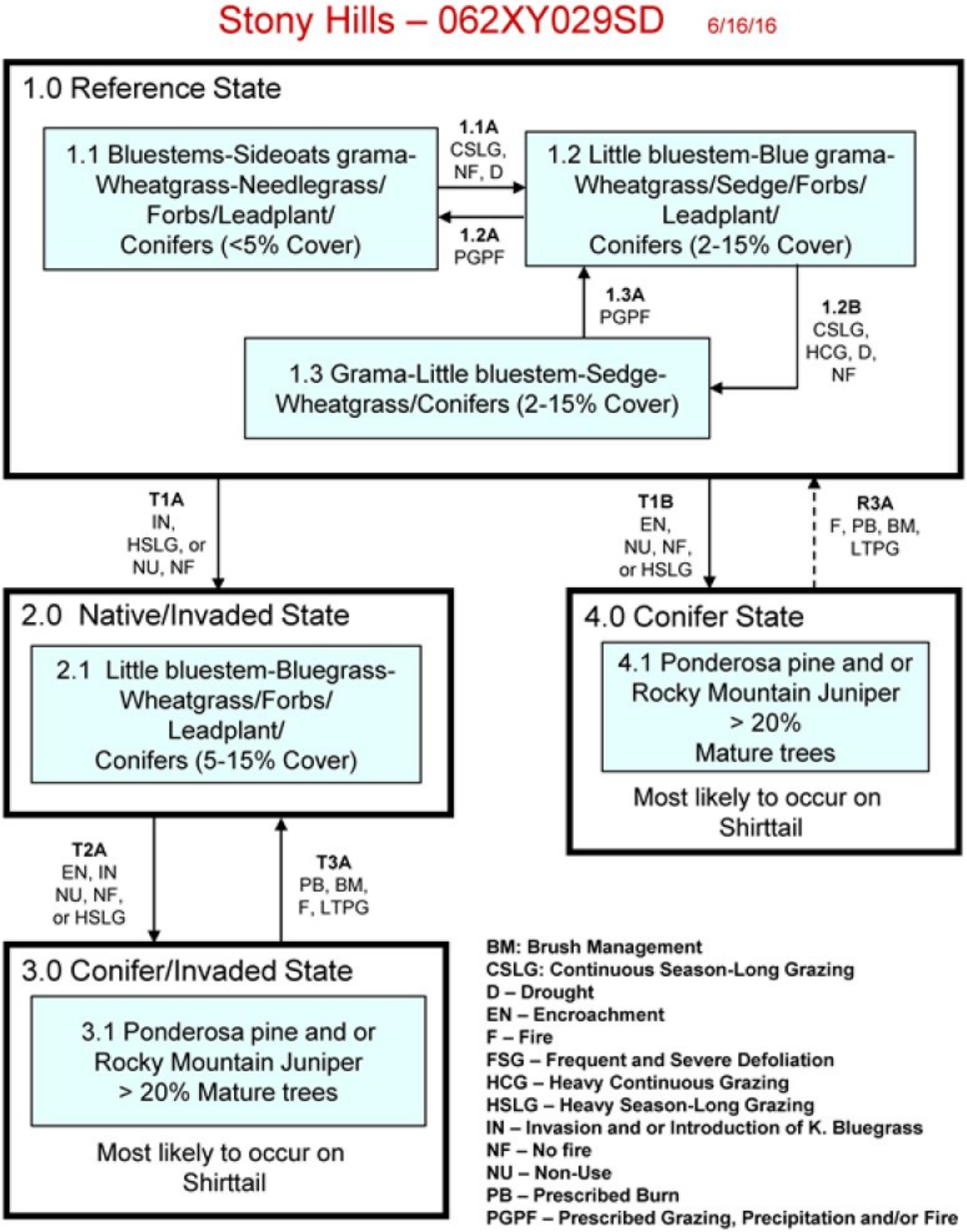

Figure 6. Stony Hills - 062XY029SD

Diagram Legend - Stony Hills - 062XY029SD

T1A	Introduction of non-native cool-season grasses, heavy season-long grazing, or no use, no fire.
T1B	Pine encroachment, no use, no fire, or heavy season-long grazing.
T2A	Pine encroachment, introduction of non-native cool-season grasses, no use, no fire or heavy season-long grazing.
T3A	Prescribed burn, mechanical brush management, fire, followed by long-term prescribed grazing.

R3A	Fire, prescribed burn, mechanical brush management, long-term prescribed grazing.

CP 1.1A	1.1 - 1.2	Continuous season-long grazing, no fire, drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing, normal precipitation following drought and/or fire.
CP 1.2B	1.2 - 1.3	Continuous season-long grazing, heavy continuous grazing, no fire, drought.
CP 1.3A	1.3 - 1.2	Prescribed grazing, normal precipitation following drought and/or fire.

Figure 7. Stony Hills - 062XY029SD

State 1
Reference State

This State represents what is believed to be the natural range of variability that dominated the dynamics of 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 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 this State can be found in areas where proper livestock use has occurred and where encroachment of trees, especially ponderosa pine, has been limited and Kentucky bluegrass occurs in minor amounts.

Community 1.1
Bluestem-Sideoats grama-Wheatgrass-Needlegrass/Forbs/Leadplant/Conifers (< 5% Cover)

Figure 8. Stony Hills - 062XY029SD - PC 1.1

Interpretations are based primarily on the Bluestems-Wheatgrass-Sideoats grama-Needlegrass/Forb/Leadplant/Conifer plant community phase. This is also considered to be the Reference or historic plant community. The potential vegetation is about 75 percent grass and grass-like plants, 10 percent forbs, 10 percent shrubs, and 0 to 5 percent trees. Total annual production for a normal growing year is approximately 2,600 lbs./acre. The community is dominated by warm-season grasses including big and little bluestem, sideoats grama, prairie dropseed, and plains muhly. Cool-season grasses and grass-like plants include western and bearded

wheatgrass, Columbia and green needlegrass, prairie Junegrass, and threadleaf sedge. Forbs are common and diverse, but prairie coneflower almost always is present, as are leadplant and prairie rose. Conifers may be present, but typically do not exceed five percent of the community. This plant community is productive and resilient to disturbances such as drought and fire. It is a sustainable plant community in regard to soil/site stability, watershed function, and biological integrity.

Community 1.2
Little bluestem-Blue grama-Wheatgrass/Sedge/Forbs/Leadplant/Conifers (2-15% Cover)

This plant community phase is the result of continuous season-long grazing without adequate recovery period, no fire, or drought. The potential vegetation is about 75 percent grass and grass-like plants, 10 percent forbs, 5 percent shrubs, and 2 to 5 percent trees. Total annual production for a normal growing year is approximately 2,000 lbs./acre. The more desirable warm-season grasses are greatly reduced and more grazing-resistant species, such as blue grama and upland sedge, have increased. This 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 green needlegrass. Forbs are common and diverse, and prairie coneflower almost always is present. Shrubs include prairie rose, leadplant, and fringed sagewort. This plant community is productive and resilient to disturbances such as drought and fire. It is a sustainable plant community in regard to soil/site stability, watershed function, and biological integrity. Conifers almost always are present, and can increase on this site with the lack of fire.

Community 1.3
Grama-Little bluestem-Sedge-Wheatgrass/Conifers (2-15% Cover)

Figure 9. Stony Hills - 062XY029SD - PC 1.3

This plant community evolved under continuous season-long grazing, heavy continuous grazing, or from overutilization during extended drought periods, and/or no fire. The potential plant community consists of approximately 80 percent grasses and grass-like species, 10 percent forbs, 2 percent shrubs, and 2-5 percent trees. Total annual production for a normal growing year is approximately 1,500 lbs./acre. Dominant grass and grass-like species include blue and hairy grama, threadleaf sedge, and little bluestem. Grasses of secondary importance include western wheatgrass, needlegrasses, sideoats grama, and prairie Junegrass. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, spiny phlox, and fringed sagewort. Conifers almost always are present, and can increase dramatically with the lack of fire.

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. Big bluestem, sideoats grama, and 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.

Pathway 1.2B
Community 1.2 to 1.3

Continuous season-long grazing without adequate recovery periods, heavy continuous grazing, and/or extended periods of drought will cause an increase in short grasses and upland sedge. Little bluestem and wheatgrasses will persist, but in small amounts. Lack of fire will allow conifers to become established and persist on the site.

Pathway 1.3A
Community 1.3 to 1.2

Prescribed grazing that provides adequate recovery and change in season of use, normal precipitation regime, and periodic fire will over time return this plant community phase to 1.2.

State 2
Native/Invaded State

This State has a mixture of native warm and cool-season grasses and non-native cool-season grasses. It resembles the Reference State, but Kentucky bluegrass has altered the dynamics of site. Kentucky blue grass typically will not exceed 20 percent of the plant community, so the site will not likely be dominated by bluegrass. Once the reference plant communities have transitioned to this State, is unlikely that it will return to the Reference State. Proper grazing management and periodic burning will maintain the productivity of this State. Heavy grazing without adequate recovery, or non-use and no fire, will tend to result in an increase in bluegrass and conifers.

Community 2.1
Little bluestem-Bluegrass-Western wheatgrass/Forbs/Leadplant/Conifers (5-15% Cover)

Figure 10. Stony Hills - 062XY029SD - PC 2.1

This plant community evolved under heavy season-long grazing, invasion of non-native cool-season grasses, and/or non-use or no fire. The potential plant community consists of approximately 75 percent grasses and grass-like species, 15 percent forbs, 5 percent shrubs and 1-5 percent trees. Total annual production for a normal growing year is approximately 1,200 lbs./acre. Dominant grass and grass-like species include little bluestem, Kentucky bluegrass, wheatgrass, and upland sedge. Grasses of secondary importance include needlegrass, blue grama, and prairie Junegrass. Forbs include cudweed sagewort, prairie coneflower, spiny phlox, and fringed sagewort. Conifers almost always are present, and can increase dramatically with the lack of fire.

State 3
Conifer/Invaded State

This State is dominated by conifers or deciduous trees mixed with conifers. Conifer encroachment is common on north- and east-facing slopes, and is very common in the northern LRU (A). This State can be confused with a forest site, except it will not exhibit woodland soil characteristics with an “E” horizon. The Conifer/Invaded State is most likely to occur on the Shirttail series and, to a lesser extent, on the Hilger soils. The midstory and understory may also resemble a forest plant community with shade-tolerant shrubs, grasses, grass-likes, and forbs. Because this plant community transitioned form the Native/Invaded State, Kentucky bluegrass will be well established and may make up at least 20 percent of the herbaceous plant community.

Community 3.1
Ponderosa pine and or Rocky Mountain Juniper > 20% Mature trees

This plant community developed due to pine encroachment, no use and or no fire, and heavy season-long grazing. The potential plant community consists of 60 percent grasses and grass-like species, 15 percent forbs, 5 percent shrubs, and 20 percent trees. Total annual production can be variable, depending upon species composition. The dominant grasses and grass-like species are Kentucky bluegrass, poverty oats, rough-leaf ricegrass, Canada wildrye, slender wheatgrass, and sedge. The dominant forbs include Oregon grape, pussytoes, and western yarrow. Trees can include ponderosa pine, and Rocky Mountain juniper. This site in the northern LRU (A) is likely to include bur oak mixed with the conifer, while the south LRU (C) is more likely to have ponderosa pine and juniper in the plant community. Because this plant community transitioned form the Native/Invaded State, Kentucky bluegrass will be well established and may make up at least 20 percent of the herbaceous plant community.

State 4
Conifer State

This State is dominated by conifers or deciduous trees mixed with conifers. Conifer encroachment is common on north- and east-facing slopes, and is very common in the northern LRU (A). This State can be confused with a forest site, except it will not exhibit woodland soil characteristics with an “E” horizon. The Conifer Encroached State is most likely to occur on the Shirttail series and, to a lesser extent, on the Hilger soils. The midstory and understory may also resemble a forest plant community with shade-tolerant shrubs, grasses, grass-likes, and forbs.

Community 4.1
Ponderosa pine and or Rocky Mountain Juniper > 20% Mature trees

Figure 11. Stony Hills - 062XY029SD - PC 4.1

This plant community developed due to pine encroachment, no use and or no fire, and heavy season-long grazing. The potential plant community consists of 60 percent grasses and grass-like species, 15 percent forbs, 5 percent shrubs, and 20 percent trees. Total annual production can be variable, depending upon species composition. The dominant grasses and grass-like species are poverty oats, rough-leaf ricegrass, Canada wildrye, slender wheatgrass, and sedge. The dominant forbs include Oregon grape, pussytoes, cudweed sagewort and western yarrow. Trees can include ponderosa pine, and Rocky Mountain juniper. This site in the northern LRU (A) is likely to include bur oak mixed with the conifer, while the south LRU (C) is more likely to have ponderosa pine and juniper in the plant community.

Transition 1A
State 1 to 2

Heavy season-long grazing above carrying capacity, and invasion or introduction of non-native cool-season grasses, or no use and no fire can cause a transition to the Native Invaded State (2.0).

Transition 1B
State 1 to 4

Encroachment of conifers and no fire will cause a transition to the Conifer State (4.0). No use or heavy season-long grazing also can facilitate or accelerate this transition. The Conifer State is most likely to occur on the Shirttail series and to a lesser extent on Hilger soils.

Transition 2A
State 2 to 3

Encroachment of conifers, introduction of non-native cool-season grasses and no fire will cause a transition to the Conifer/Invaded State (3.0). No use or heavy season-long grazing also can facilitate or accelerate this transition. The Conifer State is most likely to occur on the Shirttail series and, to a lesser extent, on the Hilger soils.

Transition 3A
State 3 to 2

Fire, prescribed burning, or mechanical brush management followed by long-term prescribed grazing can transition this plant community to the Native/Invaded State (2.0). 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. Kentucky bluegrass may increase and become a dominant species in the plant community.

Restoration pathway 3A
State 4 to 1

Fire, prescribed burning, or mechanical brush management followed by long-term prescribed grazing that provided adequate recovery time and change in season 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. If Kentucky bluegrass invades PCP 4.1 the transition will most likely be towards the Native Invaded State (2.0) and not towards the Reference State (1.0).

Additional community tables

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 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.

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

Other references

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Contributors

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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	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

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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:**
