USDA Natural Resources Conservation Service

Ecological site R063AY026SD
Thin Breaks

Last updated: 6/26/2024
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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): 063A–Northern Rolling Pierre Shale Plains

MLRA 63A is approximately 10,160 square miles in size, the majority of which is in South Dakota and a very small portion in North Dakota. The MLRA extends west of the northern half of the South Dakota reach of the Missouri River. All five of the major rivers draining western South Dakota cross this area. From north to south, these are the Grand, Moreau, Cheyenne, Bad, and White Rivers.

Elevation range from 1,300 to 1,640 feet on the bottom land along the Missouri River to 1,640 to 2,950 feet on the shale plain uplands. Cretaceous Pierre Shale underlies almost all of this area. This is a marine sediment having layers of volcanic ash that has been altered to smectitic clays. These clays shrink as they dry and swell as they get wet. Tertiary and Quaternary river deposits, remnants of erosion from the Black Hills uplift, cap isolated highlands in this area. Deposits of alluvial sand and gravel occur on the valley floors adjacent to the major streams in the area. The average annual precipitation in this area is 15 to 20 inches.
The vegetation in this area is a transition from eastern tall grass prairie to a western mixed grass prairie, (USDA-NRCS, Ag Handbook 296).

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA): 63A Northern Rolling Pierre Shale Plains, (USDA-NRCS, Ag Handbook 296).
Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Thin Breaks Ecological Site occurs throughout the MLRA. It is located on steep slopes, escarpments, river breaks or slump area with exposed bedrock at or near the surface. Typical slope ranges from 15 to 60 percent. Soils are typically calcareous and of varying depths (very shallow to deep). The surface layer is typically 3 to 8 inches thick. Surface and subsurface textures range from clay to loam. The combination of slope and the interbedded soils and rock makes the establishment of deciduous trees and shrubs common. The vegetation in reference consists of a mix of cool- and warm-season grasses and deciduous trees and shrubs. The dominate grasses include big bluestem, marsh muhly, Canada wildrye, and prairie sandreed. Common trees and shrubs include green ash, bur oak, juniper, American plum, chokecherry and silver buffaloberry. The steepness of slope, terrain and dense shrub thickets, often makes this site inaccessible to livestock. It can be excellent habitat for wildlife.

Associated sites

R063AY010SD	**Loamy** Loamy. More grasses, less shrubs.

R063AY012SD	**Thin Upland** Thin Upland [more western wheatgrass, sideoats, bluestems, fewer shrubs, no trees; less production]
R063AY017SD	**Shallow Clay** Shallow Clay

Similar sites

R063AY012SD	**Thin Upland** Thin Upland [more western wheatgrass, sideoats, bluestems, fewer shrubs, no trees; less production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Shepherdia argentea* (2) *Symphoricarpos occidentalis*
Herbaceous	(1) *Muhlenbergia racemosa* (2) *Andropogon gerardii*

Physiographic features

This site occurs on moderate to very steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Escarpment
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,600–2,700 ft
Slope	15–60%
Water table depth	80 in
Aspect	N, E

Climatic features

MLRA 63A is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and abundant sunshine. Extreme temperature fluctuations are also common. The climate is the result of this MLRA’s location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 16 to 20 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 11°F (Pollock, South Dakota (SD)), to about 22°F (Cedar Butte, SD). July is the warmest month with temperatures averaging from about 72°F (Pollock, SD), to about 76° F (Cedar Butte, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Green up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	108-117 days
Freeze-free period (characteristic range)	129-131 days
Precipitation total (characteristic range)	17-20 in
Frost-free period (actual range)	104-120 days
Freeze-free period (actual range)	127-132 days
Precipitation total (actual range)	17-20 in
Frost-free period (average)	113 days
Freeze-free period (average)	130 days
Precipitation total (average)	19 in

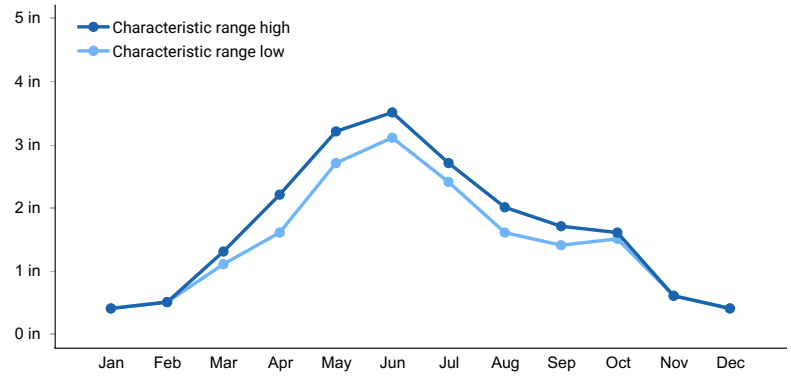

Figure 1. Monthly precipitation range

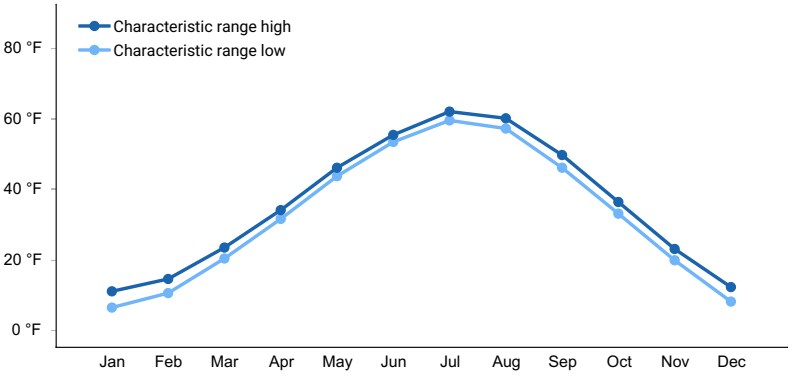

Figure 2. Monthly minimum temperature range

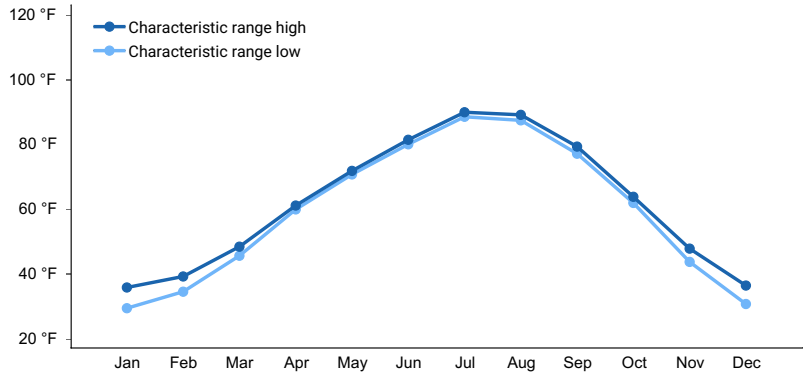

Figure 3. Monthly maximum temperature range

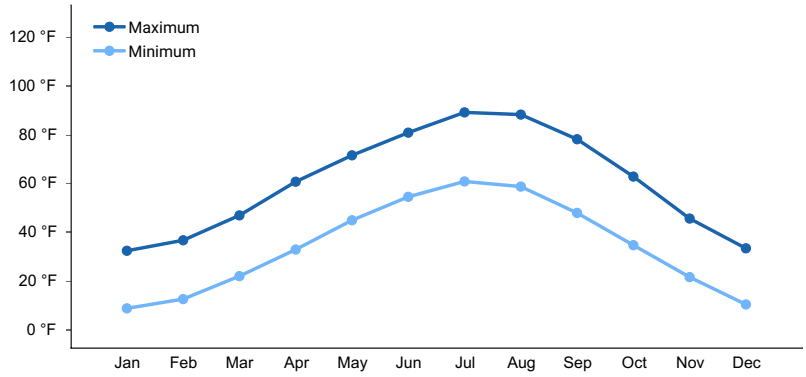

Figure 4. Monthly average minimum and maximum temperature

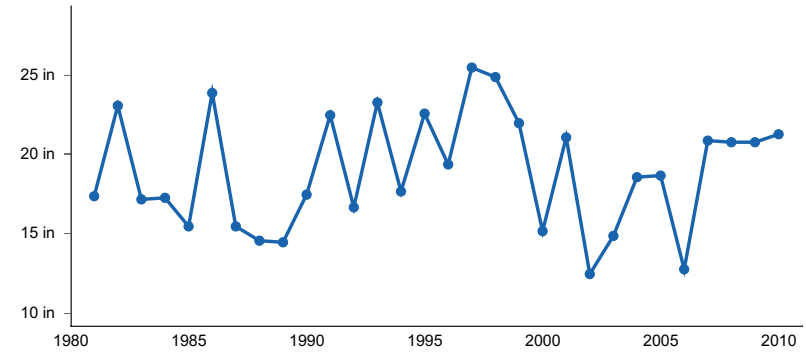

Figure 5. Annual precipitation pattern

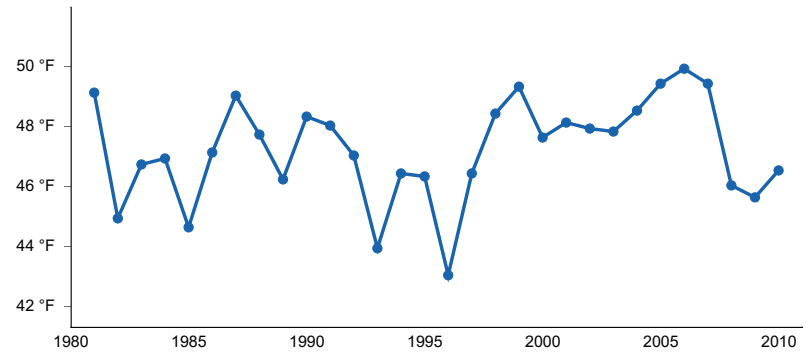

Figure 6. Annual average temperature pattern

Climate stations used

- (1) KENNEBEC [USC00394516], Kennebec, SD
- (2) POLLOCK [USC00396712], Pollock, SD
- (3) CEDAR BUTTE 1NE [USC00391539], White River, SD

- (4) COTTONWOOD 2 E [USC00391972], Kadoka, SD

Influencing water features

No riparian areas or wetland features are directly associated with this site.

Wetland description

Not Applicable.

Soil features

The features common to soils in this site are the clay to loam textured surface layers and slopes of 15 to 60 percent. The soils in this site are well to excessively drained and formed in residuum from clay shale or glacial till. The surface layer is three to eight inches thick. The texture of the subsurface layers ranges from clay to loam. The soils have a slow to moderately rapid infiltration rate. These soils are typically calcareous at or near the surface; however, carbonates are not always distinguishable in the upper layers. The soil profile should show evidence of weak development (i.e., thin A horizon, pale colors, lack of argillic horizon). This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

These soils are susceptible to wind and water erosion. The hazard of water erosion increases on slopes greater than about 15 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.

The only soil(s) correlated to this site is "Badlands" and is a miscellaneous area, not a major or minor soil component, as it is mix of soil and rock layers (interbedded soils and rock). Further soils investigations are need for this ecological site.

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

Table 4. Representative soil features

Parent material	(1) Residuum–clayey shale
Surface texture	(1) Silty clay (2) Clay (3) Loam
Family particle size	(1) Clayey
Drainage class	Well drained to excessively drained
Permeability class	Slow to moderately rapid
Soil depth	20–80 in
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	4–5 in
Calcium carbonate equivalent (0-40in)	5–30%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–3
Soil reaction (1:1 water) (0-40in)	7.4–8.4

Subsurface fragment volume <=3" (Depth not specified)	0–45%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions between communities that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition.

This site evidently played an important role in the pre-European development of associated woody draw plant communities. During favorable climatic conditions and the lack of fire in a given area, the woody species which dominate this site would tend to expand into the more favorable soils of the associated overflow sites. With extended dry periods or increased fire activity, the woody species would tend to be eliminated or greatly reduced on overflow sites, but the Thin Breaks site often acts as a refugium for many woody species. It is thought that the current extent of woody draws in the associated overflow sites is largely due to fire suppression efforts post-settlement.

Apparently this site continues to develop largely through natural climatic cycles and as a result of plant species that can tolerate cooler conditions and natural plant decadence and mortality. With time, the woody species begin to dominate. Eventually, conifer species such as eastern redcedar and/or Rocky Mountain juniper can establish in the deciduous overstory, and eventually dominate this site. This represents a lower condition on this site in regards to biotic integrity, soil stability, and the hydrologic functions of the site.

This site tends to be on landscapes where snow drifting and snow accumulation occurs naturally. The establishment of woody species increases the amount of snow collection and the amount of available moisture to the plant community. Those sites with north and east aspect will tend to have more tree shrub cover and diversity. Those sites with south and west aspect will tend to have fewer trees more drought tolerant shrubs and grasses.

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

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

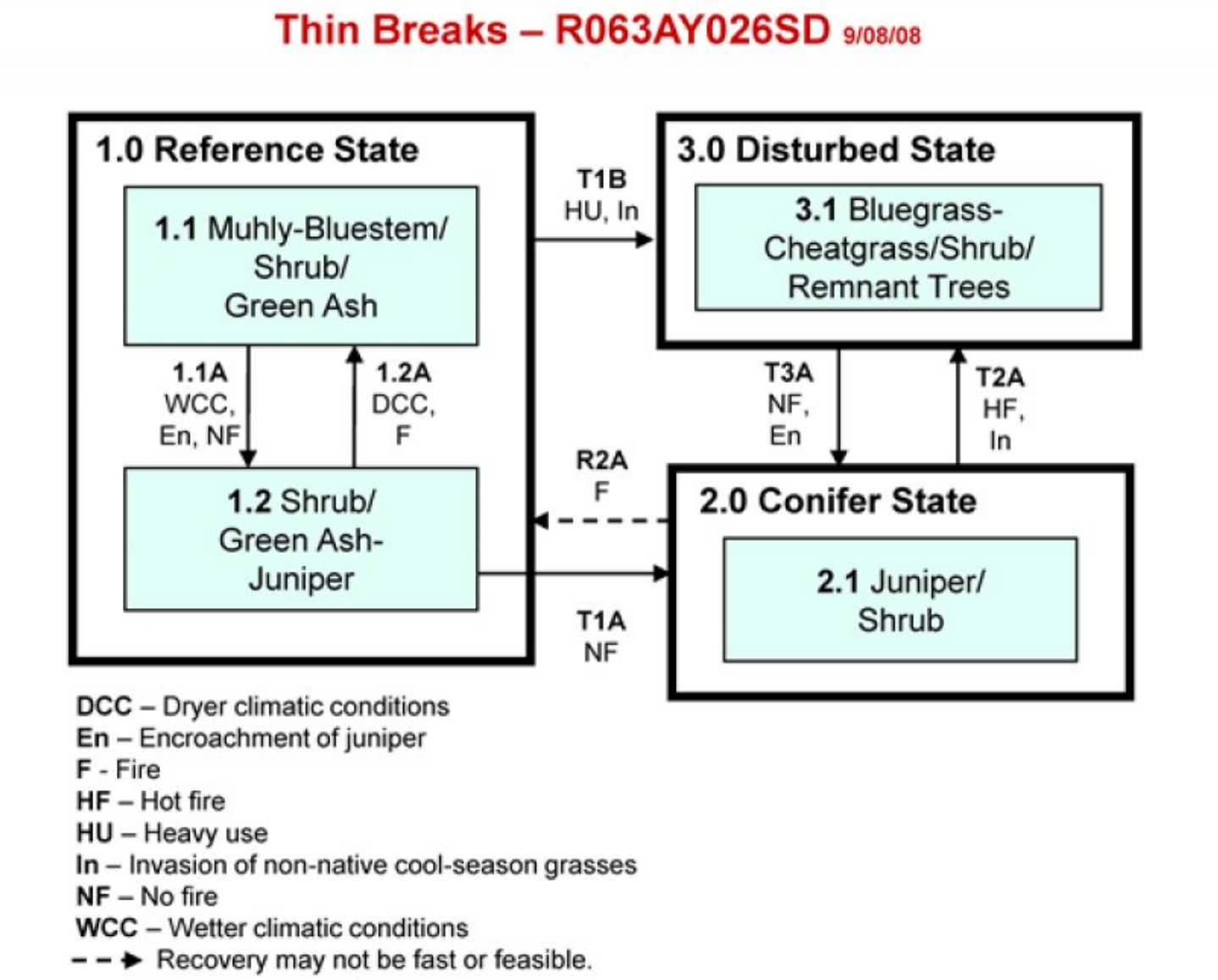

Figure 7. Thin Breaks - R063AY026SD

Diagram Legend - Thin Breaks - R063AY026SD

T1A		No fire over an extended period of time, expansion of juniper.
T1B		Heavy use area, (livestock concentration or loafing areas) and invasion of non-native cool-season grasses.
T2A		Hot, stand replacement fire and the invasion of non-native, cool-season grasses.
T3A		No fire over an extended period of time, encroachment of juniper.
R2A		Natural successional process and the re-sprouting of shrubs, that restore the native plant community.
CP 1.1A	1.1 - 1.2	Periods of wetter than normal climatic conditions, no fire, encroachment of juniper species.
CP 1.2A	1.2 - 1.1	Periods of dryer than normal climatic conditions, and/or fire.

Figure 8. Thin Breaks - R063AY026SD

State 1
Reference State

This State represents what is believed to show the natural range of variability that dominated the dynamics of the ecological site prior to European settlement. This site in Reference, is a mix of grasses, grass-like, forbs, shrubs and tree species. Wet and dry climatic cycles, fire, no fire and encroachment of junipers are the major drivers between plant communities. In general, grazing pressure is limited because of limited accessibility however on flatter slopes, livestock will utilize the site for shade and loafing.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- bur oak (*Quercus macrocarpa*), tree
- hackberry (*Celtis*), tree
- American elm (*Ulmus americana*), tree
- American plum (*Prunus americana*), shrub
- silver buffaloberry (*Shepherdia argentea*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- green muhly (*Muhlenbergia ramulosa*), grass
- big bluestem (*Andropogon gerardii*), grass
- Canada wildrye (*Elymus canadensis*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- green needlegrass (*Nassella viridula*), grass
- porcupinegrass (*Hesperostipa spartea*), grass
- sedge (*Carex*), grass
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- purple coneflower (*Echinacea*), other herbaceous
- white prairie aster (*Symphyotrichum falcatum*), other herbaceous

Community 1.1
Muhly-Bluestem/Shrub/Green Ash Plant Community

Interpretations are based primarily on the Muhly-Bluestem/Shrub/Green Ash Plant Community, which is considered to be the reference plant community. The climatic factors and natural plant mortality had a larger part in the development of this site than herbivory or fire. The potential vegetation is about 50 to 80 percent grasses or grass-like plants, 5 to 10 percent forbs, 10 to 20 percent shrubs, and 5 to 20 percent trees. Green muhly, big bluestem, and Canada wildrye dominate the plant community understory. Other grasses and grass-like plants occurring on the site include sideoats grama, little bluestem, green needlegrass, porcupine grass, and sedges. Significant forbs include cudweed sagewort, purple coneflower, and white prairie aster. American plum, silver buffaloberry, and snowberry are the dominant shrubs that can be found on this site. Trees commonly found on this site include green ash, bur oak and hackberry. An occasionally an American elm may occur. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning at the sites potential.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1510	1820	1940
Tree	125	350	670
Shrub/Vine	240	420	670
Forb	125	210	320
Total	**2000**	**2800**	**3600**

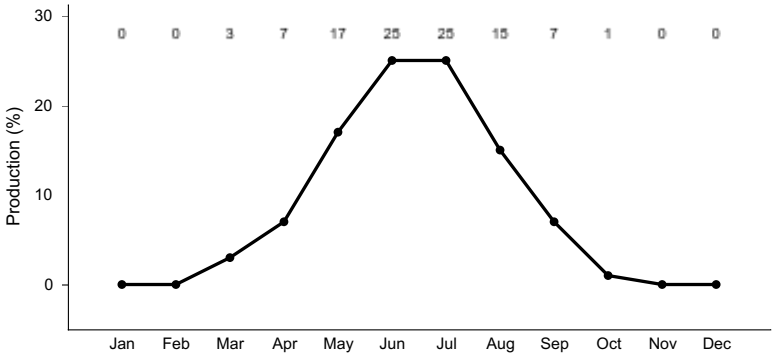

Figure 10. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Community 1.2
Shrub/Green Ash-Juniper Plant Community

This plant community develops from extended periods of no fire, wetter climatic conditions and the encroachment of juniper species. The shrub and tree component increases while the grass and grass-like component decreases. The grasses and grass-likes make up between 35 to 65 percent of the plant community, 2 to 10 percent for forbs, 20 to 35 percent for shrubs, and 10 to 20 percent for trees. Dominant grasses and grass-likes include green muhly, Canada wildrye, and plains muhly. Common forbs include cudweed sagewort, and starry false Solomon’s-seal. American plum, silver buffaloberry, and snowberry are dominant shrubs found on this site. Green ash, bur oak and hackberry are the common trees on this site. This plant community is moderately resistant to change. However, juniper species are beginning to become established in the understory, and without fire, they will eventually dominate the plant community.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	705	927	1025
Shrub/Vine	300	495	755
Tree	160	270	420
Forb	35	108	200
Total	**1200**	**1800**	**2400**

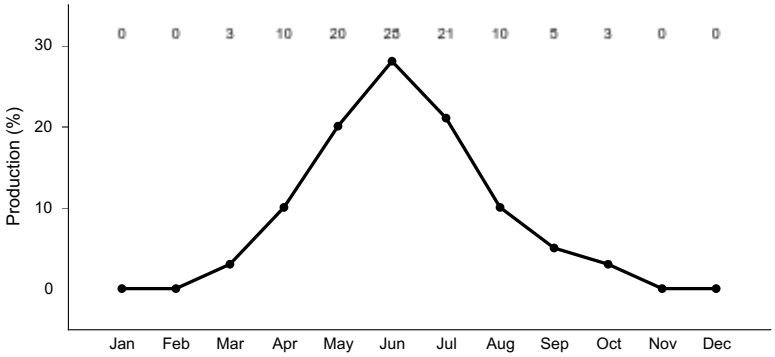

Figure 12. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

Pathway 1.1A
Community 1.1 to 1.2

Periods of wetter than normal climatic condition, no fire and encroachment of juniper will convert this plant community to the Shrub/Green Ash-Juniper Plant Community (1.2). Grass production will decrease and woody species will increase.

Pathway 1.2A
Community 1.2 to 1.1

Dryer than normal climatic conditions and fire will shift this plant community back to the Muhly-Bluestem/Shrub/Green Ash Plant Community (1.1).

State 2
Conifer State

This State occurs when eastern redcedar and/or Rocky Mountain juniper encroach onto the site. As the juniper becomes established, the herbaceous component declines and more bare ground is exposed. It appears that juniper is creating the condition for continuing encroachment. As bare ground increases juniper establishes more readily.

Dominant plant species

- American plum (*Prunus americana*), shrub
- silver buffaloberry (*Shepherdia argentea*), shrub
- Rocky Mountain juniper (*Juniperus scopulorum*), shrub
- chokecherry (*Prunus virginiana*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- eastern redcedar (*Juniperus virginiana*), shrub
- Canada wildrye (*Elymus canadensis*), grass
- bluegrass (*Poa*), grass
- cheatgrass (*Bromus tectorum*), grass
- white sagebrush (*Artemisia ludoviciana*), other herbaceous
- northern bedstraw (*Galium boreale*), other herbaceous
- starry false lily of the valley (*Maianthemum stellatum*), other herbaceous

Community 2.1
Juniper/Shrub Plant Community

This plant community is a result from lack of fire over an extended time period. This plant community is made up of 15 to 40 percent grass and grass-likes species, 1 to 10 percent forbs, 35 to 55 percent shrubs, and 10 to 20 percent trees (based on herbage production to a height of 4½ feet). Compared to the reference plant community, a decrease in diversity is seen as the grasses and forbs decrease, and the shrubs and trees increase. The deciduous

trees decrease as the conifers increase. Some of the grasses found in lesser amounts on this site include Canada wildrye, bluegrass, and cheatgrass. There is potential for cudweed sagewort, northern bedstraw, and starry false Solomon's-seal to be present on-site. Dominant shrubs are American plum, silver buffaloberry, chokecherry, and snowberry. Common trees include eastern redcedar, Rocky Mountain juniper and remnant green ash. The potential exists for this to be a closed canopy of the juniper species with little herbaceous production and decadence of other trees. This plant community is highly resistant to change. The absence of fine fuels reduces the likelihood of fire, and hot, stand replacing fire is necessary to eliminate the strongly competitive juniper species. The hydrology as a result of this plant community is highly altered, to the point of reducing flows from intermittent streams. There is also a higher incidence of slumping and water erosion due to a lack of a well distributed fine root layer.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	290	450	660
Grass/Grasslike	210	345	505
Tree	95	150	225
Forb	5	55	110
Total	**600**	**1000**	**1500**

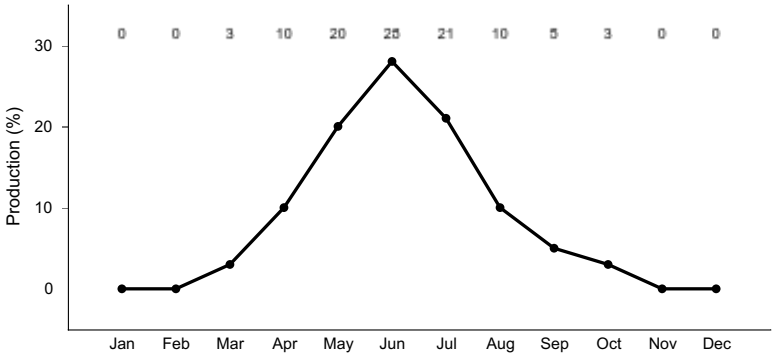

Figure 14. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

State 3
Disturbed State

This State is the result of a stand replacing fire that removes the majority of the woody component from the site. Before the re-sprouting shrubs can stabilize the site and native grasses and forbs can reestablish, non-native, cool-season grasses invade the site and become the dominate species. This State can also be the result of heavy use by livestock.

Dominant plant species

- western snowberry (*Symphoricarpos occidentalis*), shrub
- chokecherry (*Prunus virginiana*), shrub
- American plum (*Prunus americana*), shrub
- silver buffaloberry (*Shepherdia argentea*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- cheatgrass (*Bromus tectorum*), grass
- smooth brome (*Bromus inermis*), grass
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- slender wheatgrass (*Elymus trachycaulus*), grass
- sedge (*Carex*), grass
- curlycup gumweed (*Grindelia squarrosa*), other herbaceous
- lambsquarters (*Chenopodium album*), other herbaceous

- yellow salsify (*Tragopogon dubius*), other herbaceous
- thistle (*Cirsium*), other herbaceous
- Cuman ragweed (*Ambrosia psilostachya*), other herbaceous

Community 3.1
Bluegrass-Cheatgrass/Shrub/Remnant Trees Plant Community

This plant community develops after a hot, stand replacing wildfire. The fire kills the majority of trees and allows non-native, cool-season grasses to invade the site. This plant community can also develop where livestock use it for shad and loafing areas. Kentucky bluegrass, smooth brome and cheatgrass dominate this plant community, along with shrubs. Other grass and grass-like species found in this plant community may include blue grama, western wheatgrass, slender wheatgrass and sedge. The dominant forbs may include curlycup gumweed, lambsquarter, salsify, kochia, field bindweed, thistles, western ragweed, and other early successional species. Common shrubs such as western snowberry, chokecherry, American plum and silver buffaloberry can be present on site. This plant community can be resistant to change. Soil erosion is potentially high in this vegetative state. Reduced surface cover, low plant density, low plant vigor and loss of root biomass, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates. Once the advanced stage of this plant community is reached, time and external resources will be needed to see a recovery in the diversity of the site.

Transition 1A
State 1 to 2

Over time, no fire will convert the plant community to the Conifer State (2.0). Shrubs and trees replace the grasses and forbs due to no fire over many years. This transition is most likely to occur through Plant Community Phase (1.2).

Transition 1B
State 1 to 3

Heavy use (livestock concentration or loafing areas) and invasion on non-native, cool-season grasses will transition this site to the Disturbed State (3.0).

Restoration pathway 2A
State 2 to 1

In areas where non-native, cool-season grasses are not common in the adjacent plant communities, the natural successional process of shrubs and tree regeneration can transition this plant community back to the Reference State (1.0).

Transition 2A
State 2 to 3

Hot, stand replacing fire and the invasion of non-native, cool-season grasses will convert the plant community to the Invaded State (3.0).

Transition 3A
State 3 to 2

No fire and the encroachment of juniper will transition this plant community back to the Conifer State (2.0).

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**TALL WARM-SEASON GRASSES**			140–560	

	marsh muhly	MURA	*Muhlenbergia racemosa*	140–560	–
	big bluestem	ANGE	*Andropogon gerardii*	56–280	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–140	–
2	**MID WARM-SEASON GRASSES**			140–560	
	sideoats grama	BOCU	*Bouteloua curtipendula*	56–280	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	56–280	–
	little bluestem	SCSC	*Schizachyrium scoparium*	28–140	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–140	–
3	**COOL-SEASON BUNCHGRASSES**			280–560	
	Canada wildrye	ELCA4	*Elymus canadensis*	140–420	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	56–280	–
	green needlegrass	NAVI4	*Nassella viridula*	56–280	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–140	–
4	**OTHER NATIVE GRASSES**			140–280	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–140	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	28–140	–
	western wheatgrass	PASM	*Pascopyrum smithii*	28–140	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–84	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	28–56	–
5	**GRASS-LIKES**			56–224	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–140	–
	needleleaf sedge	CADU6	*Carex duriuscula*	28–140	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	28–140	–
Forb					
7	**FORBS**			140–280	
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	28–84	–
	Forb, native	2FN	*Forb, native*	28–84	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	28–84	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	28–84	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	28–56	–
	old man's whiskers	GETR	*Geum triflorum*	28–56	–
	dotted blazing star	LIPU	*Liatris punctata*	28–56	–
	starry false lily of the valley	MAST4	*Maianthemum stellatum*	0–56	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–56	–
	beardtongue	PENST	*Penstemon*	28–56	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	28–56	–
	goldenrod	SOLID	*Solidago*	28–56	–
	northern bedstraw	GABO2	*Galium boreale*	0–28	–
	cinquefoil	POTEN	*Potentilla*	0–28	–
	milkvetch	ASTRA	*Astragalus*	0–28	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–28	–
Shrub/Vine					

8	**SHRUBS**			280–560	
	silver buffaloberry	SHAR	*Shepherdia argentea*	28–280	–
	American plum	PRAM	*Prunus americana*	28–168	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	28–140	–
	snowberry	SYMPH	*Symphoricarpos*	28–140	–
	currant	RIBES	*Ribes*	0–112	–
	rose	ROSA5	*Rosa*	28–84	–
	chokecherry	PRVI	*Prunus virginiana*	28–84	–
	American bittersweet	CESC	*Celastrus scandens*	0–56	–
	creeping barberry	MARE11	*Mahonia repens*	0–56	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–56	–
Tree					
9	**TREES**			140–560	
	green ash	FRPE	*Fraxinus pennsylvanica*	28–280	–
	bur oak	QUMA2	*Quercus macrocarpa*	28–280	–
	American elm	ULAM	*Ulmus americana*	0–224	–
	boxelder	ACNE2	*Acer negundo*	0–224	–
	Tree	2TREE	*Tree*	0–140	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–84	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–84	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**GRASS-LIKES**			0–180	
	marsh muhly	MURA	*Muhlenbergia racemosa*	0–180	–
	big bluestem	ANGE	*Andropogon gerardii*	0–90	–
2	**MID WARM-SEASON GRASSES**			36–144	
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	18–90	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–72	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–72	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–54	–
3	**COOL-SEASON BUNCHGRASSES**			90–360	
	Canada wildrye	ELCA4	*Elymus canadensis*	90–270	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–90	–
	green needlegrass	NAVI4	*Nassella viridula*	0–90	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–54	–
4	**OTHER NATIVE GRASSES**			18–180	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–90	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–90	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–54	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–36	–

	hairy grama	BOHI2	*Bouteloua hirsuta*	0–18	–
5	**GRASS-LIKES**			0–90	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–90	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–90	–
6	**NON-NATIVE GRASSES**			36–216	
	bluegrass	POA	*Poa*	18–180	–
	cheatgrass	BRTE	*Bromus tectorum*	18–90	–
Forb					
7	**FORBS**			36–180	
	Forb, introduced	2FI	*Forb, introduced*	0–90	–
	Forb, native	2FN	*Forb, native*	18–72	–
	starry false lily of the valley	MAST4	*Maianthemum stellatum*	18–64	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–36	–
	dotted blazing star	LIPU	*Liatris punctata*	0–36	–
	northern bedstraw	GABO2	*Galium boreale*	0–36	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–36	–
	goldenrod	SOLID	*Solidago*	0–36	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–36	–
	old man's whiskers	GETR	*Geum triflorum*	0–18	–
	milkvetch	ASTRA	*Astragalus*	0–18	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–18	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–18	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–18	–
	beardtongue	PENST	*Penstemon*	0–18	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–18	–
Shrub/Vine					
8	**SHRUBS**			360–630	
	American plum	PRAM	*Prunus americana*	18–270	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	18–270	–
	snowberry	SYMPH	*Symphoricarpos*	18–180	–
	chokecherry	PRVI	*Prunus virginiana*	18–144	–
	currant	RIBES	*Ribes*	0–144	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	18–144	–
	American bittersweet	CESC	*Celastrus scandens*	0–80	–
	creeping barberry	MARE11	*Mahonia repens*	0–54	–
	rose	ROSA5	*Rosa*	18–54	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–54	–
Tree					
9	**TREES**			180–360	
	green ash	FRPE	*Fraxinus pennsylvanica*	36–270	–
	bur oak	QUMA2	*Quercus macrocarpa*	36–270	–
	American elm	ULAM	*Ulmus americana*	0–180	–
	boxelder	ACNE2	*Acer negundo*	0–180	–

	common hackberry	CEOC	*Celtis occidentalis*	0–180	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	25–126	–
	eastern redcedar	JUVI	*Juniperus virginiana*	25–126	–
	Tree	2TREE	*Tree*	0–90	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**GRASSES&GRASS-LIKES**			0–180	
	marsh muhly	MURA	*Muhlenbergia racemosa*	0–180	–
	big bluestem	ANGE	*Andropogon gerardii*	0–90	–
2	**MID WARM-SEASON GRASSES**			0–180	
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	18–90	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–72	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–72	–
3	**COOL-SEASON BUNCHGRASSES**			90–360	
	Canada wildrye	ELCA4	*Elymus canadensis*	90–270	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–90	–
	green needlegrass	NAVI4	*Nassella viridula*	0–90	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–54	–
4	**OTHER NATIVE GRASSES**			18–180	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–90	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–90	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–54	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–36	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–18	–
5	**NON-NATIVE GRASSES**			36–216	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–90	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–90	–
6	**GRASS-LIKES**			0–90	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–90	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–90	–
7	**FORBS**			36–180	
	Forb, introduced	2FI	*Forb, introduced*	0–90	–
	Forb, native	2FN	*Forb, native*	18–72	–
	starry false lily of the valley	MAST4	*Maianthemum stellatum*	18–54	–
	goldenrod	SOLID	*Solidago*	0–36	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–36	–
	dotted blazing star	LIPU	*Liatris punctata*	0–36	–
	northern bedstraw	GABO2	*Galium boreale*	0–36	–

	scarlet beeblossom	GACO5	*Gaura coccinea*	0–36	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–36	–
	milkvetch	ASTRA	*Astragalus*	0–18	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–18	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–18	–
	old man's whiskers	GETR	*Geum triflorum*	0–18	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–18	–
	beardtongue	PENST	*Penstemon*	0–18	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–18	–
Shrub/Vine					
8	**SHRUBS**			360–630	
	American plum	PRAM	*Prunus americana*	18–270	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	18–270	–
	snowberry	SYMPH	*Symphoricarpos*	18–180	–
	chokecherry	PRVI	*Prunus virginiana*	18–144	–
	currant	RIBES	*Ribes*	0–144	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	18–144	–
	king's scepter gentian	GESC	*Gentiana sceptrum*	18–144	–
	creeping barberry	MARE11	*Mahonia repens*	0–54	–
	rose	ROSA5	*Rosa*	18–54	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–54	–
Tree					
9	**TREES**			180–360	
	green ash	FRPE	*Fraxinus pennsylvanica*	36–270	–
	bur oak	QUMA2	*Quercus macrocarpa*	36–270	–
	American elm	ULAM	*Ulmus americana*	0–180	–
	boxelder	ACNE2	*Acer negundo*	0–180	–
	common hackberry	CEOC	*Celtis occidentalis*	0–180	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	80–126	–
	eastern redcedar	JUVI	*Juniperus virginiana*	80–126	–
	Tree	2TREE	*Tree*	0–90	–

Animal community

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Because of the great variability in species composition and the lack of livestock accessibility, determining stocking rates will need to be calculated through on-site forage inventories.

This site can provide critical food sources and thermal and escape cover for many wildlife species.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups B and D. Infiltration and runoff potential for this site varies from very slow to moderately rapid depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

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

Wood products

The site index and productivity of the tree stands on this site are relatively low. The trees are slow growing and typically not highly productive. When juniper species are present, some local harvest may take place mainly for post production.

Other products

Seed harvest of native plant species can provide additional income on this site as can the sell of jelly's from native fruit (plum, chokecherry, buffaloberry).

Other information

Revision Notes: “Previously Approved Provisional
This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site. This is an updated “Previously Approved” ESD which represents a first generation tier of documentation that prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirement as an Approved ESD as laid out in the 2003 National Range and Pasture Handbook (NRPH). The document fully describe the reference state and community phase in the state and transition model. All other alternative states are at least described in narrative form. The “Previously Approved” ESD has been field tested for a minimum of five years and is a proven functional document for conservation planning. The “Previously Approved” ESD does not contain all tabular and narrative entries as required in the current Approved level of documentation but it is expected that the “Previously Approved” ESD will continue refinement towards an Approved status.

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.

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: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. Ocular estimates were used to develop plant composition and productions values for this site.

Other references

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Contributors

Betty Bisch
Stan Boltz
Rick Peterson

Approval

Suzanne Mayne-Kinney, 6/26/2024

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Rick L. Peterson, Updated ESD 9/9/16

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)	Stan Boltz
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/09/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slight to none, typically on steeper slopes and discontinuous.

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2. **Presence of water flow patterns:** None, or barely visible and discontinuous with numerous debris dams when present.

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3. **Number and height of erosional pedestals or terracettes:** Few pedastalled plants typically on steeper slopes.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 10 percent is typical.

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5. **Number of gullies and erosion associated with gullies:** None should be present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short distances, some medium size class litter will move very short distances. Litter debris dams are occasionally present.

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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):** Soil aggregate stability ratings should typically be 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 3 to 8 inches thick with light to dark brownish gray colors. Structure should typically be fine granular at least in the upper A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration.

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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):** None.

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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: Tall warm-season grasses > Tall/mid cool-season bunchgrasses >

    Sub-dominant: Shrubs = Mid warm-season grasses = Trees

    Other: Forbs > Grass-likes = Mid cool-season rhizomatous grasses > Short warm- and cool-season bunchgrasses

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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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):** Production ranges from 2,000-3,600 lbs./acre (air-dry weight). Reference value production is 2,800 lbs./acre (air-dry weight).

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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:** State and local noxious weeds

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17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses should have vigorous rhizomes or tillers.
