USDA Natural Resources Conservation Service

Ecological site R063AY012SD
Thin Upland

Last updated: 6/26/2024
Accessed: 05/13/2025

General information

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

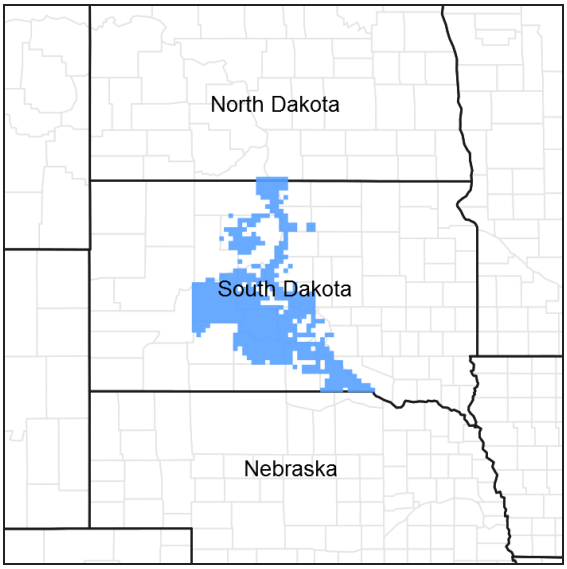


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 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 Ag Handbook 296).
Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

This site occurs throughout the MLRA. It is located on upland landscapes, is a run off site and does not receive additional water from overflow. The typical slope range from 6 to 45 percent but may be up to 60 percent. The soils are deep to very deep, exceeding 20 inches in depth. The surface layer, or “A” horizon, is less than 3 inches in depth with a clay loamy to silty loam texture. Carbonates are present at or near the soil surface (within 6 inches). The vegetation in reference is a mix of cool and warm season grasses. Forbs are common and diverse but never dominant, shrubs can be present but are minor or trace components.

Associated sites

R063AY030SD	**Limy Clay**
R063AY010SD	**Loamy**
R063AY011SD	**Clayey**
R063AY017SD	**Shallow Clay**
R063AY024SD	**Shallow**

Similar sites

R063AY030SD	**Limy Clay** The Limy Clay site will have weathered shale fragments throughout the soil profile, more big bluestem and higher total annual production.
R063AY017SD	**Shallow Clay** Shallow Clay [less little bluestem; slightly lower production; soils shallow to rock, gravel, or other root restrictive layer (20 inches or less)]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Bouteloua curtipendula*

Physiographic features

This site occurs on nearly level to sloping uplands, terrace escarpment and hilly glacial moraines. Parent materials are alluvial sediments, calcareous loess and glacial till.

Table 2. Representative physiographic features

Landforms	(1) Escarpment (2) Ridge (3) Moraine
Flooding frequency	None
Ponding frequency	None
Elevation	488–823 m
Slope	6–45%
Aspect	Aspect is not a significant factor

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)	432-508 mm
Frost-free period (actual range)	104-120 days
Freeze-free period (actual range)	127-132 days
Precipitation total (actual range)	432-508 mm
Frost-free period (average)	113 days
Freeze-free period (average)	130 days
Precipitation total (average)	483 mm

Climate stations used

- (1) CEDAR BUTTE 1NE [USC00391539], White River, SD
- (2) KENNEBEC [USC00394516], Kennebec, SD
- (3) POLLOCK [USC00396712], Pollock, SD
- (4) COTTONWOOD 2 E [USC00391972], Kadoka, SD

Influencing water features

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

Soil features

Soils on this site have clay loam to silt loam surface textures and slopes of 6 to 50 percent. The soils in this site are well to excessively drained and formed in loess, shale or glacial till. The surface layer is typically around 3 inches thick but can be found up to 8 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 commonly occurring soils for this site include: Vivian, Sully, Sutley, Gettys, Colby, Westover and Betts.

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

Table 4. Representative soil features

Parent material	(1) Calcareous loess–limestone and siltstone (2) Alluvium–limestone, sandstone, and shale
Surface texture	(1) Silt loam (2) Gravelly loam
Family particle size	(1) Clayey
Drainage class	Well drained to excessively drained
Permeability class	Slow to moderately rapid
Soil depth	51–203 cm
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	10.16–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	5–30%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (0-101.6cm)	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 that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition.

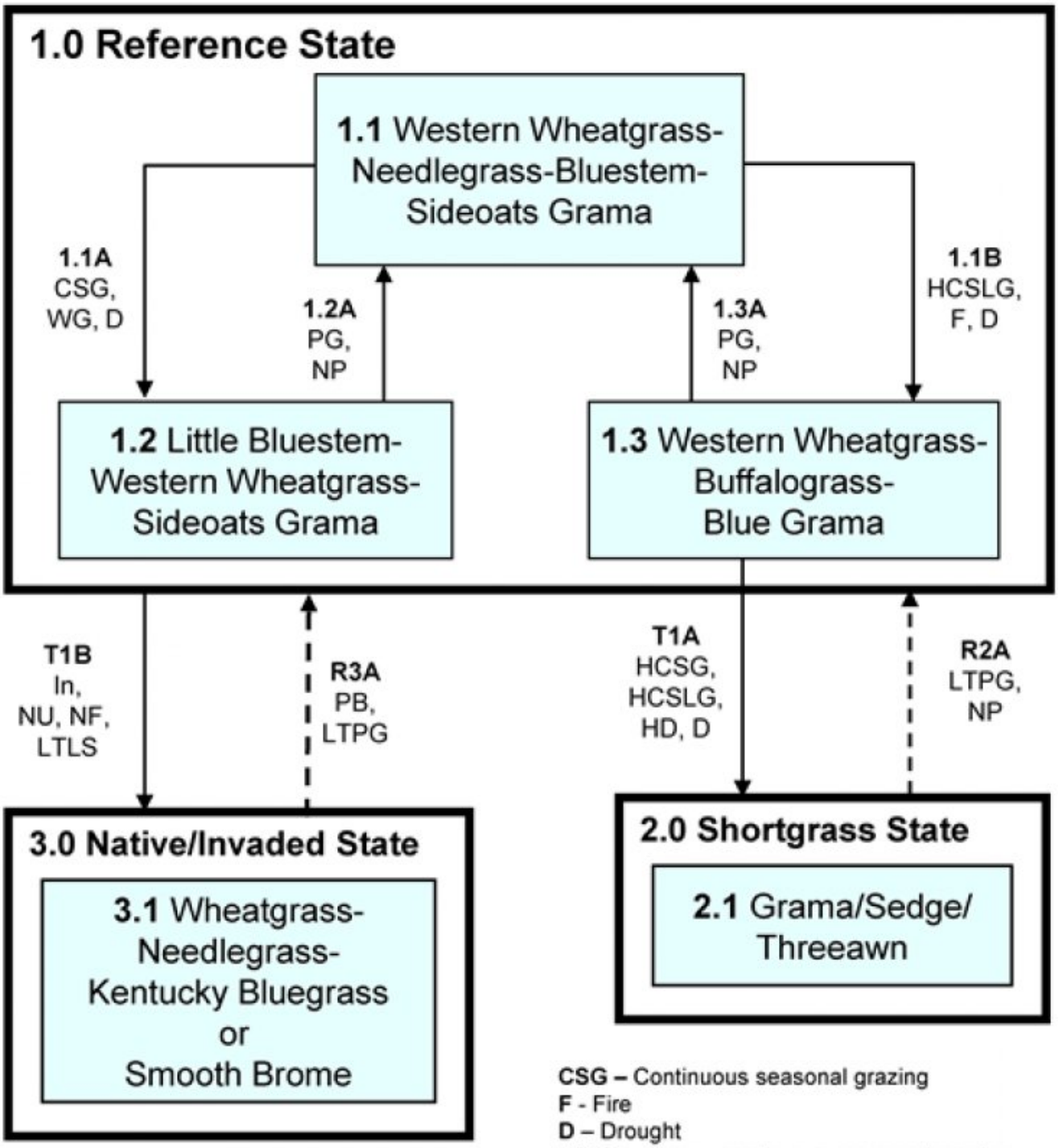
Interpretations are primarily based on the Western Wheatgrass-Needlegrass-Bluestem-Sideoats Grama Plant Community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics 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.

Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence causes this site to depart from the Western Wheatgrass-Needlegrass-Bluestem-Sideoats Grama Plant Community. Species such as sedge and blue grama will increase and begin to dominate if disturbances are intense and long lasting.

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

Thin Upland – R063AY012SD 7/27/16



CSG – Continuous seasonal grazing
F - Fire
D – Drought
HCSG – Heavy continuous seasonal grazing
HCSLG – Heavy continuous season-long grazing
HD – Heavy disturbance
LTLS – Long-term light stocking
LTPG – Long-term prescribed grazing
NF – No fire
NP – Normal precipitation patterns
NU – No use
PB – Prescribed burning
PG – Prescribed grazing
WG – Winter grazing
------> Transition may not be fast and/or feasible

Figure 8. Thin Upland - R063AY012SD

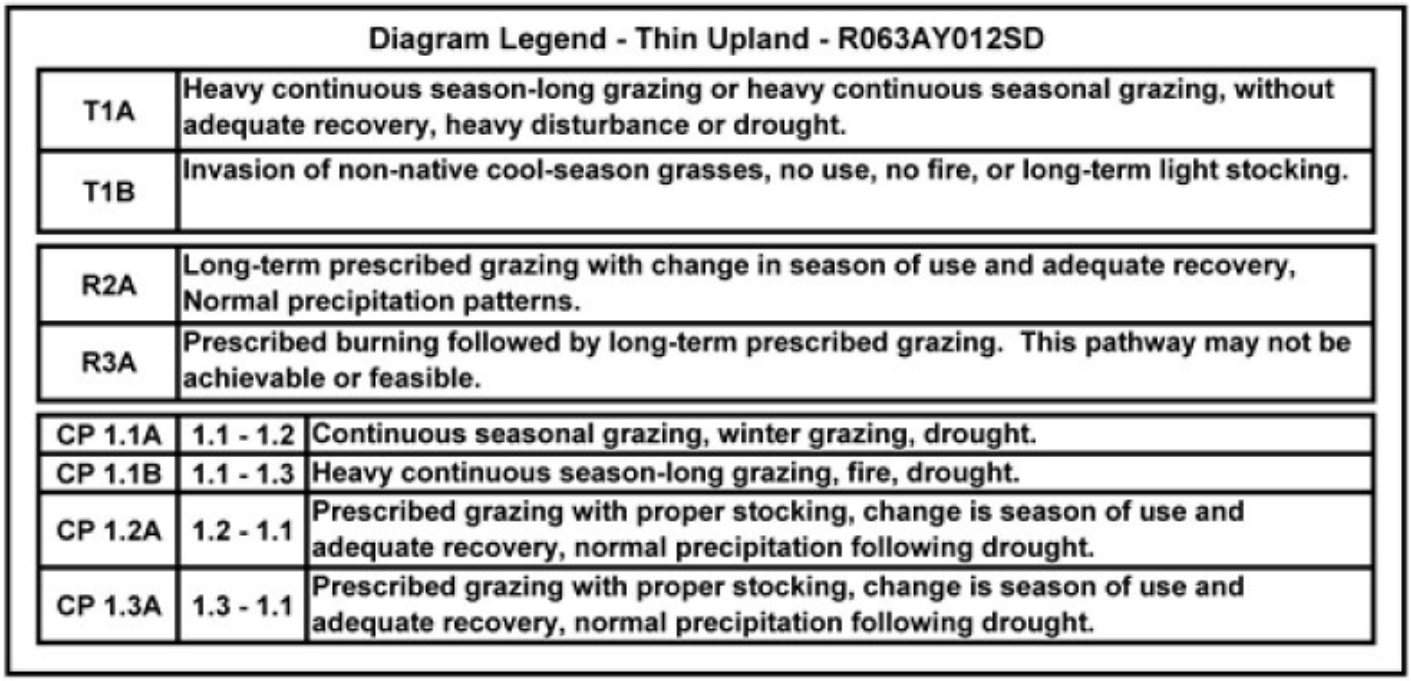


Figure 9. Thin Upland - R063AY012SD

State 1
Reference State

This state represents what is believed to represent the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site is dominated by cool and warm season grasses. 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. This State can be found on areas having a history of proper grazing management, including adequate recovery periods between grazing events.

Community 1.1
Western Wheatgrass-Needlegrass-Bluestem-Sideoats Grama Plant Community

Interpretations are based primarily on the Western Wheatgrass-Needlegrass-Bluestem-Sideoats Grama Plant Community, which is considered to be the reference plant community (1.1). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. Western wheatgrass, green needlegrass, sideoats grama, big bluestem, and little bluestem dominate the plant community. Other grasses and grass-like plants occurring on the site include blue grama, buffalograss, porcupine grass, and sedges. Significant forbs include cudweed sagewort, heath aster, and purple coneflower. Rose is a shrub often found on this site. 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. Plant litter is properly distributed with very little movement offsite and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1356	1905	2634
Forb	106	168	252
Shrub/Vine	106	168	252
Total	**1568**	**2241**	**3138**

Figure 11. Plant community growth curve (percent production by month). SD6302, Pierre Shale Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 1.2
Little Bluestem-Western Wheatgrass-Sideoats Grama Plant Community

This plant community develops from continuous early and or late season and/or winter grazing. This type of grazing will allow overgrazing of cool season species and allows little bluestem to dominate this plant community. Little bluestem will take advantage of soil disturbance (resulting from hoof action, or increased bare ground due to reduced plant vigor under nonuse, over use, or no fire). Although production remains relatively high, little bluestem plants often become “wolfy,” and are largely unavailable in typical grazing scenarios. Other significant grasses or grass-likes include western wheatgrass, sideoats grama, blue grama, buffalograss, and sedges. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1003	1569	2247
Forb	84	135	185
Shrub/Vine	34	90	146
Total	**1121**	**1794**	**2578**

Figure 13. Plant community growth curve (percent production by month). SD6305, Pierre Shale Plains, warm-season dominant.. Warm-season dominant, uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	5	15	25	30	15	7	1	0	0

Community 1.3
Western Wheatgrass-Buffalograss-Blue Grama Plant Community

This plant community is a result of heavily grazing the same area at the same time of year over many years. A decrease in diversity is seen, as the mid/tall warm-season grasses decrease and the shortgrasses increase. The grazing-tolerant blue grama and sedges replace the bluestems and needlegrasses. Sideoats grama remains in the plant community, but is less productive because of competition and grazing pressure. Significant grass or grass-like species that are prevalent on this site include western wheatgrass, buffalograss, blue grama, threeawns, and sedges. Subdominant species include sideoats grama, and little bluestem. Dominant forbs include heath aster and prairie coneflower. The potential vegetation is made up of 80 percent grass or grass-like plants, 10 percent forbs, and 10 percent shrubs. Species composition and production can be found in the plant community composition and group annual production table. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	925	1365	2029
Forb	73	157	241
Shrub/Vine	11	47	84
Total	**1009**	**1569**	**2354**

Figure 15. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous seasonal grazing specifically winter grazing will convert the plant community to a Little Bluestem-Western Wheatgrass-Grama Plant Community. With late/early season grazing and high stock densities, an increase in soil disturbance occurs which favors the little bluestem and decreases the cool-season species with a significant decrease in needlegrasses. Multiple years of below normal precipitation can also move this plant community towards a warm season dominated community.

Pathway 1.1B
Community 1.1 to 1.3

Continuous season-long grazing combined with drought will shift the community to a Western Wheatgrass-Buffalograss-Blue Grama Community. Over grazing the same pasture during the same season every year will cause the tall/mid warm-season grasses to decrease and be replaced by shortgrasses blue grama and buffalograss. Fire can expedite this conversion by removing the residual little bluestem culms which protects the plant from over utilization. Multiple years of below normal precipitation can also move this plant community towards a warm season dominated shortgrass community with remnant western wheatgrass.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing, which allows time for adequate plant recovery, and normal precipitation patterns can shift this plant community back to the Western Wheatgrass-Needlegrass-Bluestem-Sideoats Grama Plant Community (1.1). Periods of nonuse or deferment may be a management option to reach the Reference Plant Community.

Pathway 1.3A
Community 1.3 to 1.1

Prescribed grazing, which allows time for adequate plant recovery, and normal precipitation patterns can shift this plant community back to the Western Wheatgrass-Needlegrass- Bluestem-Sideoats Grama Plant Community (1.1). Periods of nonuse or deferment may be a management option to reach the Reference plant community.

State 2
Short Grass Sod State

This state is dominated by short-grass and grass-like species as a result of grazing regimes that exceed carrying capacity and do not provide adequate recovery and/or drought. In the early stages of this State, mid grass remnants may be present in sufficient quantities to allow for recovery to the Reference State (1.0). The dominant herbaceous species present are well adapted to grazing. Over time, the plant community will become very resistant to change due to higher runoff and reduced infiltration.

Community 2.1
Grama/Sedge/Threeawn Plant Community

This plant community is a result of heavy continuous seasonal grazing, heavy continuous season-long grazing, heavy disturbance or extended periods of drought. Diversity greatly diminishes, as the shortgrasses/sedges become dominant on the site. The grazing tolerant blue grama, sedges, and threeawn replace little bluestem, western wheatgrass, and needlegrasses. Due to low palatability, cudweed sagewort and heath aster become more prevalent in the plant community. Potential vegetation is made up of 75 to 85 percent grass or grass-like plants, 5 to 10 percent forbs, and 5 to 10 percent shrubs. This plant community is resistant to change. The herbaceous species present are less palatable than the dominant species in the climax plant community.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	757	1128	1614
Forb	22	74	129
Shrub/Vine	6	31	50
Total	**785**	**1233**	**1793**

Figure 17. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

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

State 3
Native/Invaded State

This State has a significant amount of Kentucky bluegrass or smooth brome in the plant community but they have not become the dominate species. Preliminary studies would tend to indicate that when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition the ecological process will be dominated by Kentucky bluegrass. Plant communities dominated by Kentucky bluegrass have significantly less cover and diversity of native grasses and forb species. (Toledo, D. et al., 2014). This State is at risk of transitioning to a bluegrass dominated State, however at this point in time, a bluegrass or smooth brome dominated State does not appear to occur on this Ecological Site in MLRA 63A.

Community 3.1
Wheatgrass-Needlegrass-Kentucky Bluegrass Plant Community

This plant community develops when Kentucky bluegrass or smooth brome become established on the site. This may occur due to close proximity to seed sources or expansion from road ditches, improved pastures or other invaded sites. No use and no fire or very light stock stocking rates of long periods of time will allow these non-native cool-season grasses to increase in the pant community. Plant litter accumulates in large amounts when this community first develops. Litter buildup reduces mature native plant vigor and density, and seedling recruitment declines. Eventually litter levels become high enough that plant density decreases. Typically, rhizomatous grasses form small colonies because of a lack of tiller stimulation. The potential vegetation is made up of 80 to 85 percent grass or grass-like plants, 5 to 10 percent forbs, and 5 percent shrubs. The dominate grasses will be western wheatgrass, needlegrasses and non-native cool-season grasses. Warm-season grasses will include patched of big and little bluestem. Forbs will be diverse but not dominate and some shrubs will persist.

Transition 1A
State 1 to 2

Heavy continuous seasonal grazing or heavy continuous season-long grazing or heavy disturbance will convert the

State 1.0 to the Shortgrass State. This is most likely to occur from PCP 1.3. Shortgrasses replace the mid/tall grasses due to heavy grazing over many years. If plant community phases 1.2 or 1.3 are pushed to the point of being at risk, drought can convert the plant community to the Shortgrass State.

Transition 1B
State 1 to 3

Invasion of non-native cool season grasses, heavy continuous season-long grazing or non-use and no fire for extended periods will convert this plant community to the Native/Invaded State (3.0).

Restoration pathway 2A
State 2 to 1

Long-term prescribed grazing, which allows time for adequate plant recovery, and normal precipitation patterns can eventually shift this plant community back to the Reference State. Periods of nonuse or growing season deferment may be management options to help facilitate this restoration. This restoration my take an extended period of time and in the end may not meet management goals.

Restoration pathway 3A
State 3 to 1

Early season prescribed burning followed by long-term prescribed grazing may shift this plant community back to the Reference State (1.0). This transition may not be rapid or feasible and in the end may not meet management objectives.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			336–785	
	western wheatgrass	PASM	*Pascopyrum smithii*	336–785	–
2	**Tall/Mid Warm-Season Grasses**			336–673	
	sideoats grama	BOCU	*Bouteloua curtipendula*	224–448	–
	big bluestem	ANGE	*Andropogon gerardii*	112–336	–
	little bluestem	SCSC	*Schizachyrium scoparium*	45–336	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–112	–
3	**Needlegrass**			224–448	
	green needlegrass	NAVI4	*Nassella viridula*	112–448	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	45–224	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–112	–
4	**Short Warm-Season Grasses**			112–336	
	buffalograss	BODA2	*Bouteloua dactyloides*	45–224	–
	blue grama	BOGR2	*Bouteloua gracilis*	45–224	–
	threeawn	ARIST	*Aristida*	0–112	–
	saltgrass	DISP	*Distichlis spicata*	0–67	–
5	**Other Native Grasses**			22–112	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–67	–
	prairie junegrass	KOMA	*Koeleria macrantha*	22–67	–

	prairie junegrass	KOMA	*Koeleria macrantha*	22–67	
	dropseed	SPORO	*Sporobolus*	0–67	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–22	–
	squirreltail	ELEL5	*Elymus elymoides*	0–22	–
6	**Grass-likes**			45–224	
	needleleaf sedge	CADU6	*Carex duriuscula*	22–179	–
	threadleaf sedge	CAFI	*Carex filifolia*	22–179	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–112	–
Forb					
8	**Forbs**			112–224	
	Forb, native	2FN	*Forb, native*	22–112	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	22–67	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	22–67	–
	white heath aster	SYER	*Symphyotrichum ericoides*	22–67	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–45	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	22–45	–
	goldenrod	SOLID	*Solidago*	22–45	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	22–45	–
	prairie clover	DALEA	*Dalea*	22–45	–
	false boneset	BREU	*Brickellia eupatorioides*	0–45	–
	dotted blazing star	LIPU	*Liatris punctata*	22–45	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	22–45	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	22–45	–
	largebract Indian breadroot	PECU3	*Pediomelum cuspidatum*	0–22	–
	large Indian breadroot	PEES	*Pediomelum esculentum*	0–22	–
	spiny phlox	PHHO	*Phlox hoodii*	0–22	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–22	–
	polygala	POLYG	*Polygala*	0–22	–
	desertparsley	LOMAT	*Lomatium*	0–22	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–22	–
	nineanther prairie clover	DAEN	*Dalea enneandra*	0–22	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	0–22	–
	fleabane	ERIGE2	*Erigeron*	0–22	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–22	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–22	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–22	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–22	–
Shrub/Vine					
9	**Shrubs**			112–224	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–112	–
	leadplant	AMCA6	*Amorpha canescens*	0–67	–
	rose	ROSA5	*Rosa*	22–67	–
	snowberry	SYMPH	*Symphoricarpos*	0–67	–

	skunkbush sumac	RHTR	*Rhus trilobata*	0–45	–
	dwarf false indigo	AMNA	*Amorpha nana*	0–22	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–22	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			90–359	
	western wheatgrass	PASM	*Pascopyrum smithii*	90–359	–
2	**Tall/Mid Warm-Season Grasses**			269–628	
	little bluestem	SCSC	*Schizachyrium scoparium*	179–448	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	90–269	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–90	–
	big bluestem	ANGE	*Andropogon gerardii*	0–90	–
3	**Needlegrass**			0–143	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–90	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–90	–
	green needlegrass	NAVI4	*Nassella viridula*	0–90	–
4	**Short Warm-Season Grasses**			179–359	
	blue grama	BOGR2	*Bouteloua gracilis*	90–269	–
	buffalograss	BODA2	*Bouteloua dactyloides*	36–179	–
	threeawn	ARIST	*Aristida*	18–143	–
	saltgrass	DISP	*Distichlis spicata*	0–90	–
5	**Other Native Grasses**			18–90	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–54	–
	dropseed	SPORO	*Sporobolus*	18–54	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	18–36	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–18	–
	squirreltail	ELEL5	*Elymus elymoides*	0–18	–
6	**Grass-likes**			90–269	
	threadleaf sedge	CAFI	*Carex filifolia*	36–215	–
	needleleaf sedge	CADU6	*Carex duriuscula*	18–179	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
7	**Non-Native Grasses**			0–90	
	cheatgrass	BRTE	*Bromus tectorum*	0–90	–
	bluegrass	POA	*Poa*	0–54	–
Forb					
8	**Forbs**			90–179	
	sweetclover	MELIL	*Melilotus*	0–90	–
	Forb, introduced	2FI	*Forb, introduced*	0–72	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–72	–
	Forb, native	2FN	*Forb, native*	18–54	–

	goldenrod	SOLID	*Solidago*	18–54	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	18–54	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	18–36	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	18–36	–
	yellow salsify	TRDU	*Tragopogon dubius*	18–36	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	18–36	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	18–36	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–36	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	0–18	–
	dotted blazing star	LIPU	*Liatris punctata*	0–18	–
	desertparsley	LOMAT	*Lomatium*	0–18	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–18	–
	false boneset	BREU	*Brickellia eupatorioides*	0–18	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–18	–
	prairie clover	DALEA	*Dalea*	0–18	–
	spiny phlox	PHHO	*Phlox hoodii*	0–18	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–18	–
	polygala	POLYG	*Polygala*	0–18	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–18	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–18	–
Shrub/Vine					
9	**Shrubs**			36–143	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–90	–
	snowberry	SYMPH	*Symphoricarpos*	18–90	–
	rose	ROSA5	*Rosa*	18–54	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–36	–
	leadplant	AMCA6	*Amorpha canescens*	0–18	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			157–471	
	western wheatgrass	PASM	*Pascopyrum smithii*	157–471	–
2	**Tall/Mid Warm-Season Grasses**			0–78	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–78	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–78	–
3	**Needlegrass**			0–78	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–78	–
	green needlegrass	NAVI4	*Nassella viridula*	0–78	–
4	**Short Warm-Season Grasses**			314–628	
	blue grama	BOGR2	*Bouteloua gracilis*	235–471	–
	buffalograss	BODA2	*Bouteloua dactyloides*	78–314	

	buffalograss	BODA2	*Bouteloua dactyloides*	78–314	–
	threeawn	ARIST	*Aristida*	16–157	–
	saltgrass	DISP	*Distichlis spicata*	16–126	–
5	**Other Native Grasses**			0–47	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–47	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–31	–
	dropseed	SPORO	*Sporobolus*	0–31	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–16	–
	squirreltail	ELEL5	*Elymus elymoides*	0–16	–
6	**Grass-likes**			157–314	
	threadleaf sedge	CAFI	*Carex filifolia*	78–235	–
	needleleaf sedge	CADU6	*Carex duriuscula*	31–157	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–78	–
7	**Non-Native Grasses**			16–126	
	bluegrass	POA	*Poa*	16–126	–
	cheatgrass	BRTE	*Bromus tectorum*	0–47	–
Forb					
8	**Forbs**			78–235	
	sweetclover	MELIL	*Melilotus*	0–157	–
	Forb, introduced	2FI	*Forb, introduced*	0–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	16–78	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	16–63	–
	yellow salsify	TRDU	*Tragopogon dubius*	16–63	–
	Forb, native	2FN	*Forb, native*	16–47	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	16–47	–
	goldenrod	SOLID	*Solidago*	16–47	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	16–47	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	16–31	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–31	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–31	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	16–31	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	0–16	–
	dotted blazing star	LIPU	*Liatris punctata*	0–16	–
	desertparsley	LOMAT	*Lomatium*	0–16	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–16	–
	false boneset	BREU	*Brickellia eupatorioides*	0–16	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–16	–
	prairie clover	DALEA	*Dalea*	0–16	–
	polygala	POLYG	*Polygala*	0–16	–
	spiny phlox	PHHO	*Phlox hoodii*	0–16	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–16	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–16	–

Shrub/Vine					
9	**Shrubs**			16–78	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–47	–
	rose	ROSA5	*Rosa*	16–47	–
	snowberry	SYMPH	*Symphoricarpos*	16–47	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–31	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			0–62	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–62	–
2	**Tall/Mid Warm-Season Grasses**			0–37	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–37	–
4	**Short Warm-Season Grasses**			370–616	
	blue grama	BOGR2	*Bouteloua gracilis*	247–493	–
	buffalograss	BODA2	*Bouteloua dactyloides*	62–247	–
	threeawn	ARIST	*Aristida*	25–185	–
	saltgrass	DISP	*Distichlis spicata*	12–123	–
5	**Other Native Grasses**			0–37	
	dropseed	SPORO	*Sporobolus*	0–37	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–25	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–12	–
6	**Grass-likes**			185–370	
	threadleaf sedge	CAFI	*Carex filifolia*	123–308	–
	needleleaf sedge	CADU6	*Carex duriuscula*	25–185	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–62	–
7	**Non-Native Grasses**			12–185	
	cheatgrass	BRTE	*Bromus tectorum*	12–123	–
	bluegrass	POA	*Poa*	0–123	–
Forb					
8	**Forbs**			25–123	
	sweetclover	MELIL	*Melilotus*	0–74	–
	Forb, introduced	2FI	*Forb, introduced*	0–62	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	12–62	–
	Forb, native	2FN	*Forb, native*	0–37	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	12–25	–
	goldenrod	SOLID	*Solidago*	0–25	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–25	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–25	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–25	–
	spiny phlox	PHHO	*Phlox hoodii*	0–12	–

	woolly plantain	PLPA2	*Plantago patagonica*	0–12	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–12	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–12	–
Shrub/Vine					
9	**Shrubs**			12–49	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–37	–
	rose	ROSA5	*Rosa*	0–25	–
	snowberry	SYMPH	*Symphoricarpos*	0–25	–

Animal community

The following table lists annual, suggested initial stocking rates during average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

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. Where little bluestem plants become “wolfy,” changing livestock class (e.g., using yearlings) will often result in considerably higher use of the decadent little bluestem plants.

Western Wheatgrass-Needlegrass-Bluestem-Sideoats Grama Plant Community (1.1)
Average Annual Production (lb./ac. air-dry): 2000
Stocking Rate* (AUM/acre): 0.55

Little Bluestem-Western Wheatgrass-Sideoats Grama Plant Community (1.2)
Average Annual Production (lb./ac. air-dry): 1800
Stocking Rate* (AUM/acre): 0.49

Western Wheatgrass-Buffalograss-Blue Grama Plant Community (1.3)
Average Annual Production (lb./ac. air-dry): 1600
Stocking Rate* (AUM/acre): 0.44

Grama-Sedge-Threeawn Plant Community (2.1)
Average Annual Production (lb./ac. air-dry): 1100
Stocking Rate* (AUM/acre): 0.30

Wheatgrass-Needlegrass-Kentucky Bluegrass or Smooth Brome Plant Community (3.1)
Average Annual Production (lb./ac. air-dry): 1600
Stocking Rate* (AUM/acre): 0.44

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to USDA NRCS, National Range and Pasture Handbook).

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 percent 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. Dominance by blue grama and sedge will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent 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 varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

Seed harvest of native plant species can provide additional income on this site.

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.

This site has a slope range from 6 to 45 percent. Based off hydrology models the steeper slope may need to be broken out as a separate ecological site.

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; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. No SCS-RANGE-417 clipping data forms have been recorded on this site.

Other references

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Contributors

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Approval

Suzanne Mayne-Kinney, 6/26/2024

Acknowledgments

Rick L. Peterson, ESD update 7/28/16

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
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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 15 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. Some soils have subangular blocky structure parting to weak fine granular.

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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 – when dry, subsoil can be hard and appear to be compacted, but no platy structure will be present.

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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: Mid cool-season rhizomatous grasses > Mid/tall warm-season bunchgrasses >>

    Sub-dominant: Mid/tall cool-season bunchgrasses > Short warm-season grasses >

    Other: Grass-likes = Forbs = Shrubs > Short 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):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,400-2,800 lbs./acre (air-dry weight). Reference value production is 2,000 lbs./acre (air-dry weight).

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, annual bromes

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.