USDA Natural Resources Conservation Service

Ecological site R063AY032SD
Clayey Terrace

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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: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Clayey Terrace Ecological Site occurs throughout the MLRA. This site occurs on nearly level areas that receive additional water from rare stream flooding events. Runoff from adjacent upland sites do provide addition moisture. Soil surface layer is 5 to 8 inches thick with texture ranges from silty clay to clay.

Associated sites

R063AY011SD	**Clayey**
R063AY017SD	**Shallow Clay**
R063AY021SD	**Clayey Overflow**
R063AY022SD	**Loamy Terrace**

Similar sites

R063AY011SD	**Clayey** Clayey [more green needlegrass; lower production]
R063AY022SD	**Loamy Terrace** Loamy Terrace [less western wheatgrass, more green needlegrass and big bluestem; higher production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Symphoricarpos occidentalis*
Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Physiographic features

This site occurs on nearly level areas that receive additional water from rare stream flooding events.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Stream terrace (3) Flood plain
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	1,600–2,700 ft
Slope	0–2%
Water table depth	42–80 in
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 much sunshine. Extremes in temperature may also abound. 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

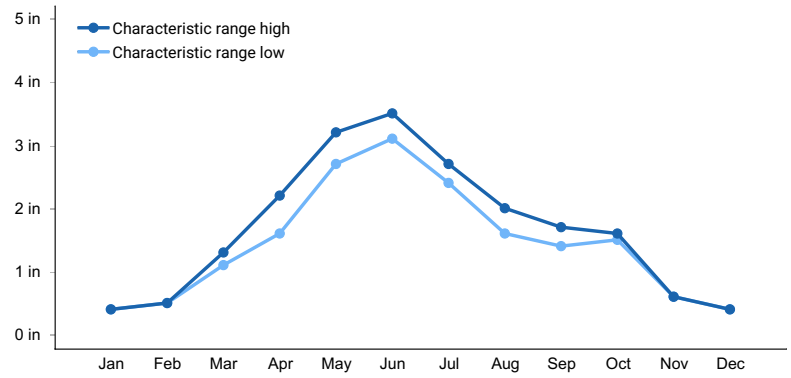


Figure 1. Monthly precipitation range

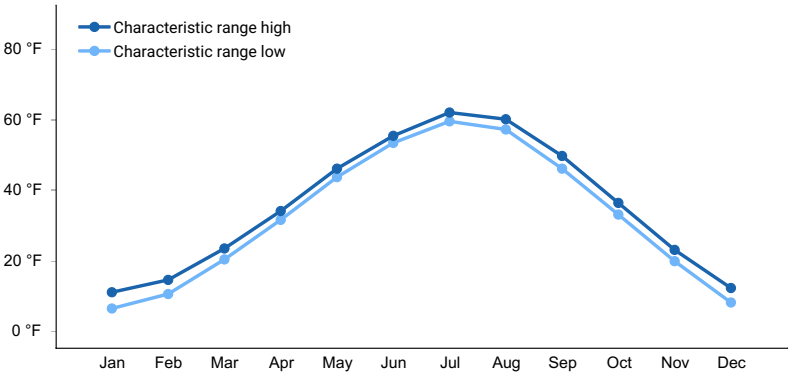


Figure 2. Monthly minimum temperature range

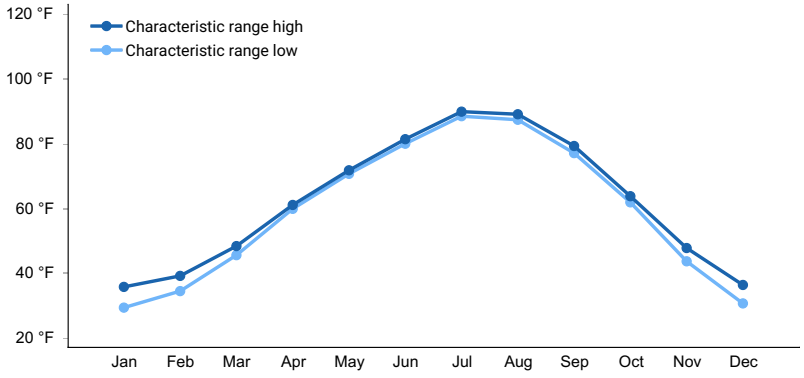


Figure 3. Monthly maximum temperature range

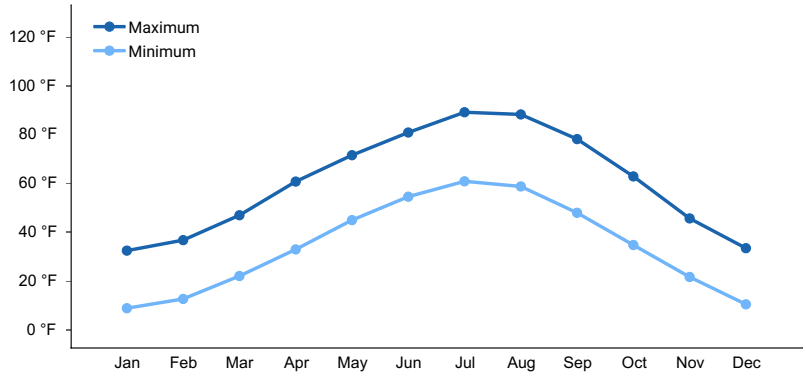


Figure 4. Monthly average minimum and maximum temperature

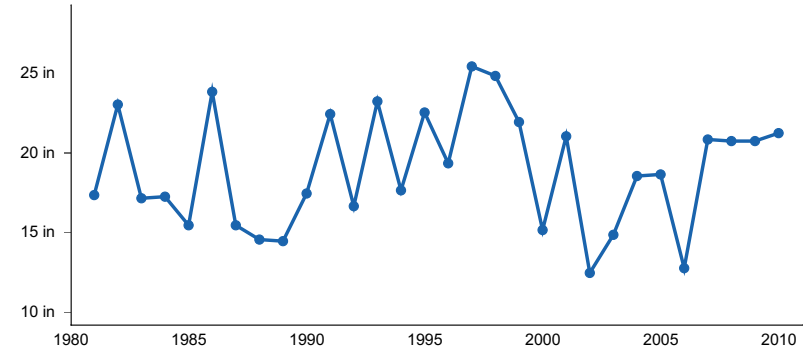


Figure 5. Annual precipitation pattern

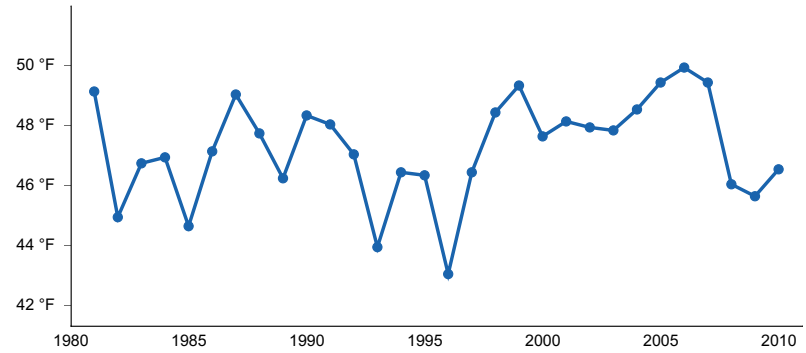


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

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

Soil features

The soils in this site are moderately well drained and formed in clayey alluvium. The silty clay or clay surface layer is five to eight inches thick. The soils have a slow infiltration rate. Subsoil textures range from silty clay loam to clay and are stratified. This site should show no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact.

These soils are mainly susceptible to water erosion if vegetative cover is inadequate or highly disturbed. A drastic loss of the soil surface layer on this site can result in a shift in species composition and/or production.

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

Table 4. Representative soil features

Parent material	(1) Alluvium–calcareous shale
Surface texture	(1) Silty clay (2) Clay
Family particle size	(1) Clayey
Drainage class	Moderately well drained
Permeability class	Slow
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–6 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, 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.

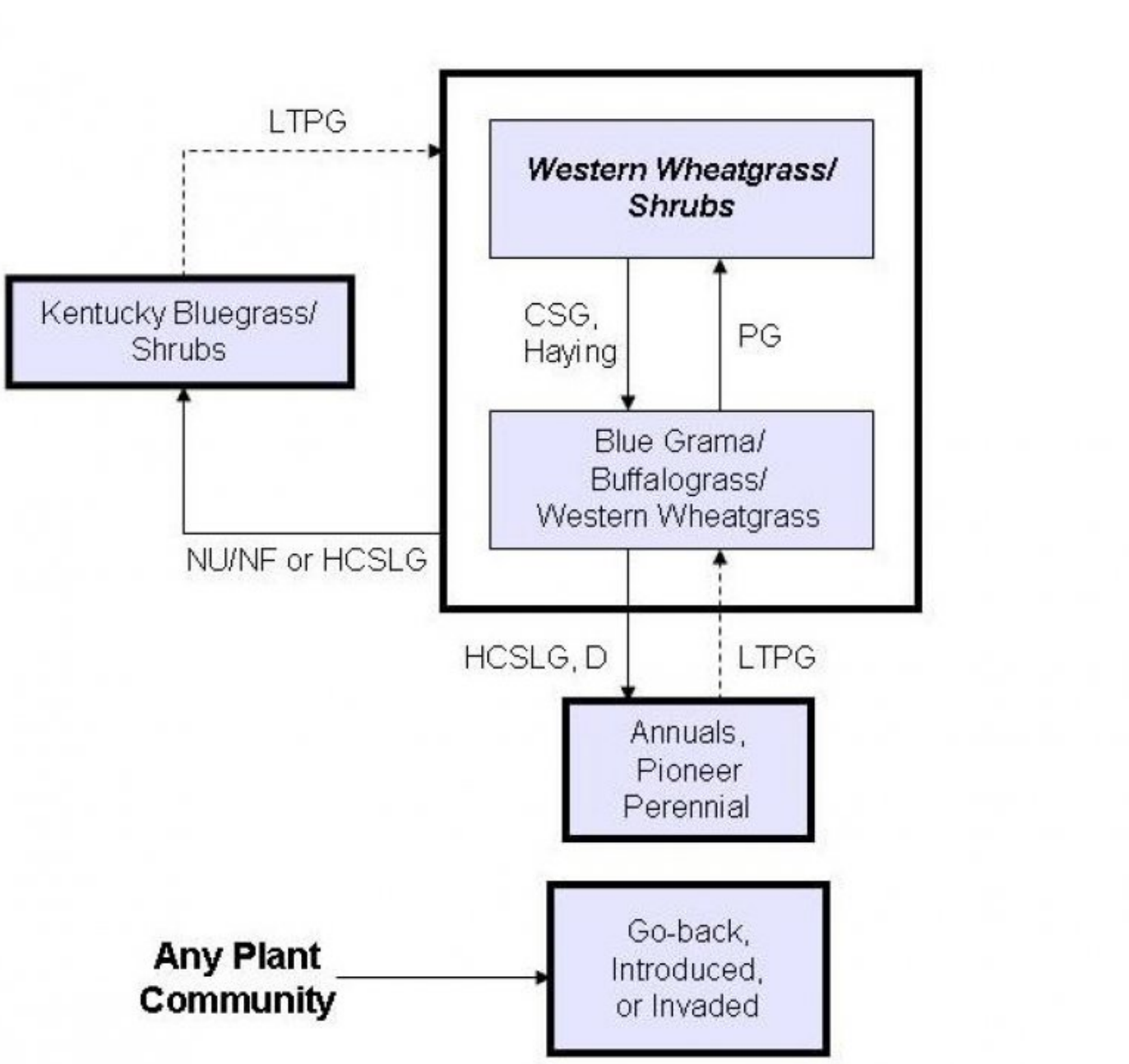
A high percentage of these areas have been tilled in the past, and have been planted to alfalfa for haying or are in a winter wheat/fallow rotation. Also, many of these areas are located in good winter livestock areas and are used as calving/feeding areas. Very few areas exist that have not had severe soil disturbance. Many areas that have not been tilled have been continuously hayed resulting in a mono-culture of western wheatgrass. Continuous seasonal grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the climax species. Species such as blue grama will initially increase. Western wheatgrass, green needlegrass, and sideoats grama will decrease in frequency and production. Extended periods of non-use and/or lack of fire or heavy, continuous season-long grazing will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass, smooth bromegrass, and/or annual bromegrass and in time, shrubs and trees such as western snowberry and green ash.

Interpretations are primarily based on the Western Wheatgrass/Shrubs 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.

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model



CSG – Continuous seasonal grazing (grazing a unit for an entire portion of a growing season, and the same season every year); **D** – Defoliation; **HCSLG** – Heavy, continuous season-long grazing; **LTPG** – Long-term prescribed grazing; **NU/NF** – Extended period of non-use & no fire; **PG** – Prescribed grazing (planned, controlled harvest of vegetation with grazing or browsing animals – see FOTG, Section IV, 528).

State 1
Western Wheatgrass/Shrubs Plant Community

Community 1.1
Western Wheatgrass/Shrubs Plant Community

Interpretations are based primarily on the Western Wheatgrass/Green Needlegrass/Shrub Plant Community, which is considered to be climax. The potential vegetation is between 70-90 percent grasses or grass-like plants, 2-8 percent forbs, 10-20 percent shrubs, and 0-2 percent trees. The community is dominated by cool-season grasses. The major grasses include western wheatgrass and green needlegrass. Other prominent grasses and grass-likes include Canada wildrye, blue grama, and buffalograss. Forbs consist of cudweed sagewort, goldenrod, purple prairie clover, silverleaf scurfpea, and white prairie aster. Shrub species found on this site are leadplant, rose, snowberry, and wild plum. Common trees include American elm, boxelder, green ash, and plains cottonwood. Regeneration of trees is not common due to the lack of flooding, lower water table, and high grass cover. This plant community is productive and diverse. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity. Transitions or pathways leading to other plant communities are as follows: • Continuous seasonal grazing and/or haying will convert the plant community to the Blue Grama/Buffalograss/Western Wheatgrass Plant Community. • Nonuse and/or no fire or heavy, continuous season-long grazing will shift plant community to a Kentucky Bluegrass/Shrubs Plant Community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1725	2054	2285
Shrub/Vine	225	390	625
Forb	50	130	235
Tree	0	26	55
Total	**2000**	**2600**	**3200**

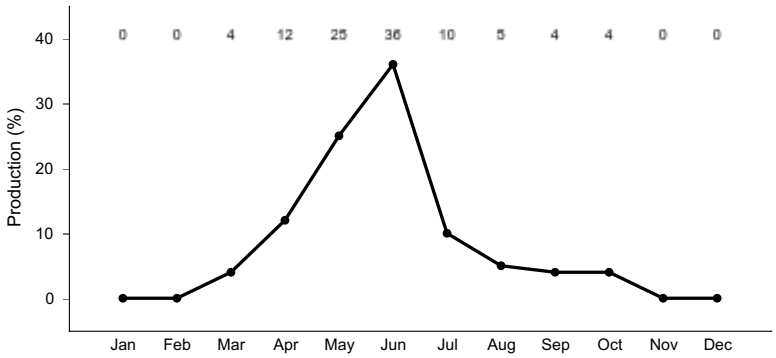


Figure 8. Plant community growth curve (percent production by month). SD6301, Pierre Shale Plains, cool-season dominant.. Cool-season dominant on uplands..

State 2
Blue Grama/Buffalograss/Western Wheatgrass Plant Community

Community 2.1
Blue Grama/Buffalograss/Western Wheatgrass Plant Community

This plant community can slowly develop from the adverse effects of continuous seasonal grazing without adequate recovery periods between each grazing event during the growing season. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. Blue grama, buffalograss, and western wheatgrass are the dominant species. Green needlegrass has been reduced, while sedges have increased slightly, along with nonnative grasses. Forb species include cudweed sagewort, goldenrod, silverleaf scurfpea, and western yarrow. Leadplant has been reduced while western snowberry has increased. Common trees include American elm, boxelder, bur oak, green ash, hackberry, and plains cottonwood. Regeneration of trees is still lacking. This plant community is relatively stable and less productive than the climax community. Reduction of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, increased runoff and high evapotranspiration rates. This plant community can occur throughout the site, on spot grazed areas, and around water sources where season-long grazing patterns occur. Soil erosion will be minimal due to the sod forming habit of blue grama.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1030	1413	1725
Shrub/Vine	85	180	310
Forb	85	180	310
Tree	0	27	55
Total	**1200**	**1800**	**2400**

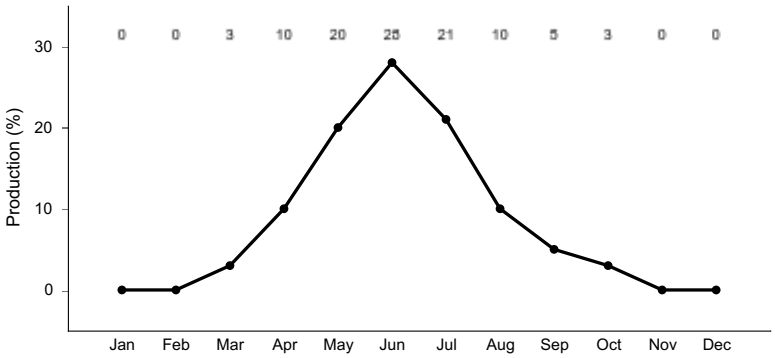


Figure 10. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

State 3
Kentucky Bluegrass/Shrubs Plant Community

Community 3.1
Kentucky Bluegrass/Shrubs Plant Community

This plant community develops after an extended period of non-use and exclusion of fire or from heavy continuous season-long grazing. Eventually litter levels become high enough to reduce native grass vigor, diversity and density. Kentucky bluegrass dominates this plant community. Other grass and grass-like species include blue grama, buffalograss, foxtail barley, cheatgrass, smooth bromegrass, and needleleaf sedge. Common forbs include

cudweed sagewort, goldenrod, western ragweed, and western yarrow. Shrubs such as western snowberry and/or silver sagebrush will increase in density and cover and eventually tree species such as green ash, boxelder, bur oak, green ash, hackberry, plains cottonwood, and American elm will do the same. Tree regeneration is still lacking. This plant community is resistant to change without prescribed grazing and/or fire. The combination of both grazing and fire is most effective in moving this plant community toward the Western Wheatgrass/Shrubs Plant Community. Soil erosion is low. Runoff is similar to the climax community. 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. The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	710	1064	1280
Shrub/Vine	125	210	320
Forb	65	105	155
Tree	0	21	45
Total	**900**	**1400**	**1800**

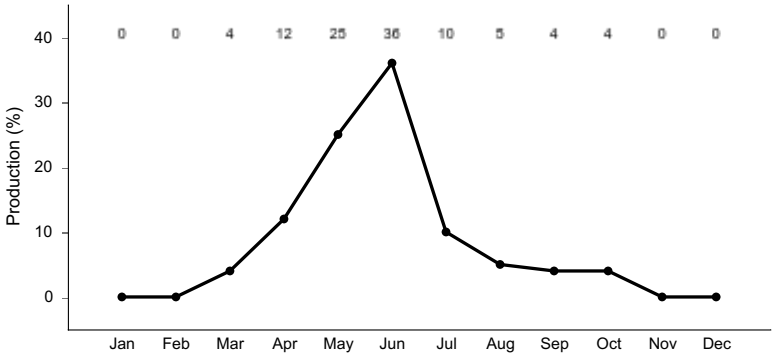


Figure 12. Plant community growth curve (percent production by month). SD6301, Pierre Shale Plains, cool-season dominant.. Cool-season dominant on uplands..

State 4
Annuals, Pioneer Perennial Plant Community

Community 4.1
Annuals, Pioneer Perennial Plant Community

This plant community develops under severe disturbance, heavy continuous season-long grazing, and/or defoliation. This can result from heavy livestock or wildlife concentration, and cropping abandonment (Go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include sixweeks fescue, smooth bromegrass, annual brome, crested wheatgrass, needleandthread, prairie Junegrass, and western wheatgrass. The dominant forbs may include curlycup gumweed, lambsquarter, salsify, kochia, field bindweed, thistles, western ragweed, and other early successional species. Shrubs that may be present include rose and fringed sagewort. Plant species from adjacent ecological sites may become minor components of this plant community. The community also is susceptible to invasion of other nonnative species due to severe soil disturbances and relatively high percent of bare ground. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Soil erosion is potentially high in this vegetation state. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates. Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage and a more productive plant community. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. This plant

community can be renovated to improve the production capability, but management changes would be needed to maintain the new plant community. Transitions or pathways leading to other plant communities are as follows: • Under long-term prescribed grazing, including adequate rest periods, this plant community will move through the successional stages eventually leading to the Western Wheatgrass/Shrubs Plant Community. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly. Go-back, Introduced, or Invaded This group includes three separate vegetation states that are highly variable in nature. They are derived through three distinct management scenarios and are not related successionally. Infiltration, runoff, and soil erosion varies depending on the vegetation present on the site. The Go-back Land state can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned land, either past or present). During the early successional stages, the species that mainly dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn, bluegrass, smooth bromegrass, annual brome, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, deathcamas, prickly lettuce, marestail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health. The Introduced state is normally those areas seeded to crested wheatgrass, pubescent wheatgrass, intermediate wheatgrass, alfalfa, or other introduced species. Refer to the associated Forage Suitability Group description for adapted species. The Invaded state includes areas that have been invaded by species such as smooth bromegrass, bluegrass, nonnative thistles, field bindweed, knapweeds, leafy spurge, hoary cress, and other introduced species.

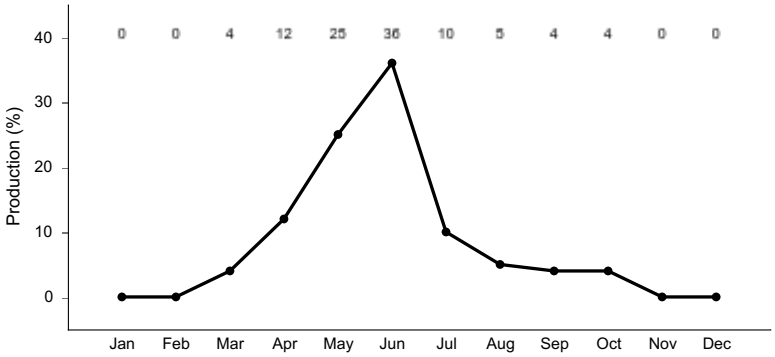


Figure 13. Plant community growth curve (percent production by month). SD6301, Pierre Shale Plains, cool-season dominant.. Cool-season dominant on uplands..

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	**WHEATGRASSES**			560–980	
	western wheatgrass	PASM	*Pascopyrum smithii*	560–980	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–140	–
2	**COOL-SEASON BUNCHGRASSES**			420–700	
	green needlegrass	NAVI4	*Nassella viridula*	280–560	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	56–280	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–140	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–140	–
3	**MID WARM-SEASON GRASSES**			140–560	
	big bluestem	ANGE	*Andropogon gerardii*	56–280	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	28–140	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	28–140	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–140	–

	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–84	–
4	**SHORT WARM-SEASON GRASSES**			28–140	
	blue grama	BOGR2	*Bouteloua gracilis*	28–140	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–84	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–56	–
5	**OTHER NATIVE GRASSES**			28–140	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–140	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	28–84	–
	saltgrass	DISP	*Distichlis spicata*	0–56	–
6	**GRASS-LIKES**			28–196	
	sedge	CAREX	*Carex*	28–196	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–84	–
Forb					
8	**FORBS**			140–280	
	Forb, native	2FN	*Forb, native*	28–140	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	28–84	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	28–84	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	28–84	–
	goldenrod	SOLID	*Solidago*	28–84	–
	white heath aster	SYER	*Symphyotrichum ericoides*	28–56	–
	mint	MENTH	*Mentha*	0–56	–
	scurfpea	PSORA2	*Psoralidium*	28–56	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	28–56	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	28–56	–
	prairie clover	DALEA	*Dalea*	28–56	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	28–56	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–56	–
	hoary verbena	VEST	*Verbena stricta*	28–56	–
	American vetch	VIAM	*Vicia americana*	28–56	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–28	–
	rockcress	ARABI2	*Arabis*	0–28	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–28	–
	false boneset	BREU	*Brickellia eupatorioides*	0–28	–
	nettle	URTIC	*Urtica*	0–28	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–28	–
	wood lily	LIPH	*Lilium philadelphicum*	0–28	–
	dotted blazing star	LIPU	*Liatris punctata*	0–28	–
Shrub/Vine					
9	**SHRUBS**			280–560	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	28–280	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–224	–
	American plum	PRAM	*Prunus americana*	0–224	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–224	–

	chokecherry	PRVI	*Prunus virginiana*	0–140	–
	leadplant	AMCA6	*Amorpha canescens*	28–140	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–140	–
	rose	ROSA5	*Rosa*	28–84	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–56	–
Tree					
10	**TREES**			0–84	
	Tree	2TREE	*Tree*	0–84	–
	boxelder	ACNE2	*Acer negundo*	0–84	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–84	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–84	–
	American elm	ULAM	*Ulmus americana*	0–84	–

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**WHEATGRASSES**			180–450	
	western wheatgrass	PASM	*Pascopyrum smithii*	180–450	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–36	–
2	**COOL SEASON BUNCHGRASSES**			90–180	
	green needlegrass	NAVI4	*Nassella viridula*	36–144	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	18–90	–
3	**MID&TALL warm-SEASON GRASSES**			36–144	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–90	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–54	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–54	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–36	–
	big bluestem	ANGE	*Andropogon gerardii*	0–36	–
4	**SHORT WARM-SEASON GRASSES**			270–540	
	blue grama	BOGR2	*Bouteloua gracilis*	180–450	–
	buffalograss	BODA2	*Bouteloua dactyloides*	18–180	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	18–90	–
5	**OTHER NATIVE GRASSES**			18–90	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–90	–
	saltgrass	DISP	*Distichlis spicata*	0–90	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	18–36	–
6	**GRASS-LIKES**			36–180	
	sedge	CAREX	*Carex*	36–180	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–90	–
7	**NON-NATIVE GRASSES**			0–80	
	bluegrass	POA	*Poa*	0–144	–
	smooth brome	BRIN2	*Bromus inermis*	0–90	–

	cheatgrass	BRTE	*Bromus tectorum*	0–90	–
Forb					
8	**forbs**			90–270	
	Forb, introduced	2FI	*Forb, introduced*	0–90	–
	Forb, native	2FN	*Forb, native*	18–90	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–90	–
	goldenrod	SOLID	*Solidago*	18–72	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–54	–
	scurfpea	PSORA2	*Psoralidium*	18–54	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	18–54	–
	hoary verbena	VEST	*Verbena stricta*	18–54	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–38	–
	nettle	URTIC	*Urtica*	0–36	–
	white heath aster	SYER	*Symphyotrichum ericoides*	18–36	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	18–36	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–36	–
	Canadian horseweed	COCA5	*Conyza canadensis*	0–36	–
	common mullein	VETH	*Verbascum thapsus*	0–36	–
	prairie clover	DALEA	*Dalea*	0–18	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–18	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–18	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–18	–
	dotted blazing star	LIPU	*Liatris punctata*	0–18	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–18	–
Shrub/Vine					
9	**SHRUBS**			90–270	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	36–180	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–90	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–90	–
	rose	ROSA5	*Rosa*	18–54	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–36	–
	American plum	PRAM	*Prunus americana*	0–36	–
	leadplant	AMCA6	*Amorpha canescens*	0–36	–
	chokecherry	PRVI	*Prunus virginiana*	0–18	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–18	–
Tree					
10	**TREES**			0–54	
	Tree	2TREE	*Tree*	0–54	–
	boxelder	ACNE2	*Acer negundo*	0–54	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–54	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–54	–
	American elm	ULAM	*Ulmus americana*	0–54	–

Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**WHEATGRASSES**			28–140	
	western wheatgrass	PASM	*Pascopyrum smithii*	28–140	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–14	–
2	**COOL SEASON BUNCHGRASSES**			0–70	
	green needlegrass	NAVI4	*Nassella viridula*	0–70	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–28	–
3	**MID&TALL WARM-SEASON GRASSES**			0–42	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–42	–
4	**SHORT WARM-SEASON GRASSES**			210–420	
	buffalograss	BODA2	*Bouteloua dactyloides*	210–420	–
	blue grama	BOGR2	*Bouteloua gracilis*	210–420	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–112	–
5	**OTHER NATIVE GRASSES**			0–70	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–70	–
	saltgrass	DISP	*Distichlis spicata*	0–56	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–14	–
6	**GRASS-LIKES**			14–70	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–70	–
	sedge	CAREX	*Carex*	17–70	–
7	**NON-NATIVE GRASSES**			280–560	
	bluegrass	POA	*Poa*	210–490	–
	smooth brome	BRIN2	*Bromus inermis*	0–210	–
	cheatgrass	BRTE	*Bromus tectorum*	14–140	–
Forb					
8	**forbs**			70–140	
	Forb, introduced	2FI	*Forb, introduced*	0–112	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	14–70	–
	Canadian horseweed	COCA5	*Conyza canadensis*	0–56	–
	Forb, native	2FN	*Forb, native*	14–56	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	14–56	–
	common mullein	VETH	*Verbascum thapsus*	0–56	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–56	–
	hoary verbena	VEST	*Verbena stricta*	14–42	–
	goldenrod	SOLID	*Solidago*	14–42	–
	white heath aster	SYER	*Symphyotrichum ericoides*	14–42	–
	yellow salsify	TRDU	*Tragopogon dubius*	14–42	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–42	–
	scurfpea	PSORA2	*Psoralidium*	14–28	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	14–28	–

	nettle	URTIC	*Urtica*	0–28	–
Shrub/Vine					
9	**SHRUBS**			140–280	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	70–210	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–140	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–70	–
	American plum	PRAM	*Prunus americana*	0–42	–
	rose	ROSA5	*Rosa*	14–28	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–14	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–14	–
Tree					
10	**TREES**			0–42	
	Tree	2TREE	*Tree*	0–42	–
	boxelder	ACNE2	*Acer negundo*	0–42	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–42	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–42	–
	American elm	ULAM	*Ulmus americana*	0–42	–

Animal community

The following table lists annual, suggested initial stocking rates with 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.

Western Wheatgrass/Shrubs
Average Annual Production(lbs./acre,air-dry)2600

Stocking Rate(AUM.acre) .71
Blue Grama/Buffalograss/Western Wheatgrass
Ave Annual Production(lbs.acre,air-dry) 1800

Stocking Rate(AUM.acre) .49
Kentucky Bluegrass/Shrubs
Ave Annual Production(lbs./acre,air-dry)1400

Stocking Rate(AUM/acre) .38
Blue Grama/Buffalograss/Western Wheatgrass 1800 0.49
Kentucky Bluegrass/Shrubs 1400 0.38

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 30 percent harvest efficiency (refer to USDA NRCS, National Range and Pasture Handbook).

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.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration varies from moderately slow to moderate and runoff potential varies from low to moderate depending on soil hydrologic group 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 exception would be where shortgrasses form a dense sod and dominate the site. 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 aesthetic value that appeals to visitors.

Wood products

Wood products are limited mainly to harvest of aged trees for firewood.

Other products

Seed harvest of native plant species can provide additional income on this 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: April Boltjes, Range Management Specialist, NRCS; Stan Boltz, Range Management Specialist, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, Range Management Specialist, NRCS; L. Michael Stirling, Range Management Specialist, NRCS. Ocular estimates of plant composition and production have been collected to develop this site description.

Other references

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USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://wcc.nrcs.usda.gov)

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Contributors

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Approval

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	05/08/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

2. **Presence of water flow patterns:** None, or barely visible and discontinuous.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 5 percent is typical.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement of smallest size class litter is possible, but not normal.

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.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 5 to 8 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular 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 – when dry, B horizons 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 >>

    Sub-dominant: Shrubs > Mid/tall cool-season bunchgrasses >

    Other: Short warm-season grass > Forbs > Mid/tall warm-season grass = Grass-likes = Mid/short cool-season grass > Trees

    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 2,000-3,200 lbs./acre (air-dry weight). Reference value production is 2,600 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, Kentucky bluegrass, smooth bromegrass

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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.