USDA Natural Resources Conservation Service

Ecological site R060AY015SD
Thin Claypan

Last updated: 6/25/2024
Accessed: 05/11/2025

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.

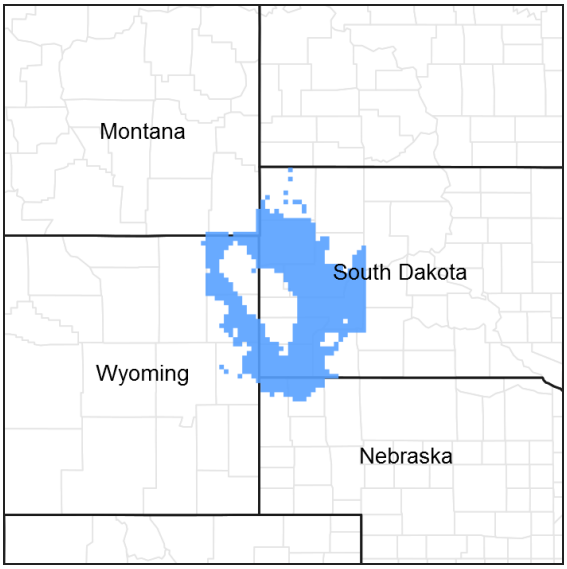


Figure 1. Mapped extent

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): 060A–Pierre Shale Plains

The Pierre Shale Plains (MLRA 60A) consists of approximately 10,150 square miles, the majority of which is located in South Dakota (70 percent) and small portions are in Montana (2 percent), Nebraska (8 percent), and Wyoming (20 percent). It encircles the Black Hills (MLRA 62) and the Dakota Hogback (MLRA 61). MLRA 60A includes portions of the Oglala, Buffalo Gap, and Thunder Basin National Grasslands. It also includes small sections of the Pine Ridge Indian Reservation, Badlands National Park, and Black Hills National Forest. The Cheyenne and Belle Fourche Rivers flow through the MLRA.

MLRA 60A is in the unglaciated section of the Missouri Plateau, of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been deeply eroded. Cretaceous Pierre Shale underlies almost all of this MLRA. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clay. These clays shrink as they dry and swell as they receive moisture. Soils are shallow to very deep and generally are well drained and clayey.

Elevations generally range from 2,620 to 3,610 feet throughout the MLRA, but can range up to 4,260 feet. The average annual precipitation for the western side of the MLRA is 13 to 16 inches, whereas the eastern side receives 16 to 18 inches. A suite of ecological sites have been written specifically for these two precipitation zones. The Locator Map shows the break between the two precipitation zones.

This area supports a mixed natural prairie vegetation consisting of both cool- and warm-season grasses and forbs. Wyoming big sagebrush occurs primarily in the drier western portion of the MLRA, however, small remnant stands can be found in the eastern portion. Dominant land uses of the area are primarily ranching and, to a lesser extent, farming. Major resource concerns to this MLRA are wind erosion and surface water quality.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 60A – Pierre Shale Plains.

EPA - Level IV Ecoregions of the Continental United States: 43e – Sagebrush Steppe, 43g Semiarid Pierre Shale Plains, and 43k – Dense Clay Prairie.

Ecological site concept

The Thin Claypan site occurs throughout the MLRA. It is located on level to gently undulating or rolling uplands. Slopes range from 0 to 15 percent. Soils surface textures are fine sandy loam to clay loam, 1 to 5 inches thick. The Btn horizon typically occurs within 4 inches of the surface and is extremely hard clay. The columnar or prismatic structured subsoil has a rounded or “biscuit-shaped” top. The Btn horizon is high in sodium and can have a whitish coloration.

The vegetation in reference is a mix of cool- and warm-season grasses, mostly rhizomatous wheatgrass, blue grama, and buffalo grass. Prickly pear or fragile cactus are often present. Bare ground will increase with erosion, resulting in exposed whitish “biscuit-tops.”

Associated sites

R060AY018SD	**Dense Clay** The Dense Clay site has deep, very clayey (> 55% clay) soils that can be can be found adjacent to the Thin Claypan site.
R060AY040SD	**Clayey 16-18" P.Z.** The Clayey 16-18” PZ site has deep soils and can be found adjacent to or intermixed with the Thin Claypan site.
R060AY011SD	**Clayey 13-16" P.Z.** The Clayey 13-16
R060AY013SD	**Claypan** The Claypan site has deeper soils and can be found adjacent to or intermixed with the Thin Claypan site.

Similar sites

R060AY040SD	**Clayey 16-18" P.Z.** More green needlegrass; higher production
R060AY011SD	**Clayey 13-16" P.Z.** More green needlegrass; higher production
R060AY013SD	**Claypan** More production; more western wheatgrass and green needlegrass

Table 1. Dominant plant species

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

Physiographic features

This site occurs on nearly level to gently undulating or rolling uplands.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Alluvial flat (3) Hill
Flooding frequency	None
Elevation	2,500–4,300 ft
Slope	0–15%
Water table depth	48–80 in
Aspect	Aspect is not a significant factor

Climatic features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains, where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation for the entire MLRA ranges from 13 to 18 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air masses from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but the more severe occur during late fall, late winter, and spring.

The normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 19°F (Moorcroft CAA, WY) to about 22°F (Belle Fourche, SD). July is the warmest month with temperatures averaging from about 70°F (Moorcroft CAA, WY) to about 72°F (Belle Fourche, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 51°F. 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 generally are 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 can 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)	98-105 days
Freeze-free period (characteristic range)	123-129 days
Precipitation total (characteristic range)	15-18 in
Frost-free period (actual range)	76-108 days
Freeze-free period (actual range)	113-133 days
Precipitation total (actual range)	14-18 in
Frost-free period (average)	97 days
Freeze-free period (average)	124 days
Precipitation total (average)	16 in

Climate stations used

- (1) WASTA [USC00398911], Owanka, SD
- (2) UPTON [USC00489205], Upton, WY
- (3) MOORCROFT 3S [USW00024088], Moorcroft, WY
- (4) REDBIRD [USC00487555], Lance Creek, WY
- (5) ARDMORE 1 NW [USC00390236], Edgemont, SD
- (6) BELLE FOURCHE [USC00390559], Belle Fourche, SD

Influencing water features

No significant water features influence this site.

Wetland description

Not Applicable.

Soil features

The soils in this site are moderately well to well drained and formed in soft sandstone, siltstones, shales, and alluvium. The fine sandy loam to clay loam surface layer is 1 to 5 inches thick. The extremely hard clayey Btn horizon has round-topped or “bun-shaped” columnar or prismatic structure. These Btn horizons are high in sodium. The soils have a moderate to slow infiltration rate and very slow saturated hydraulic conductivity. Wet surface compaction can occur with heavy traffic. 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.

Soils correlated to the Thin Claypan site: Arvada, Bone, Hisle, and Petrie.

Soil Map Units that include the Thin Claypan site often have inclusions of “slick spots” which are considered Non-Sites (R060AY999SD) in MLRA 60A. These “slick spots” are primarily areas of bare ground that are affected by high sodium concentrations and are typically dominated by cactus.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 9 percent. More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to slow
Soil depth	6–20 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1–3 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–16 mmhos/cm
Sodium adsorption ratio (0-40in)	13–50

Soil reaction (1:1 water) (0-40in)	5.1–9.5
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–10%

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 specify 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.

Shrubs such as big sagebrush, saltbush, greasewood, winterfat, and silver sagebrush occur more frequently on the western portion of this MLRA. In areas where the shrubs are more prevalent, they can comprise as much as 20 to 30 percent of the plant community.

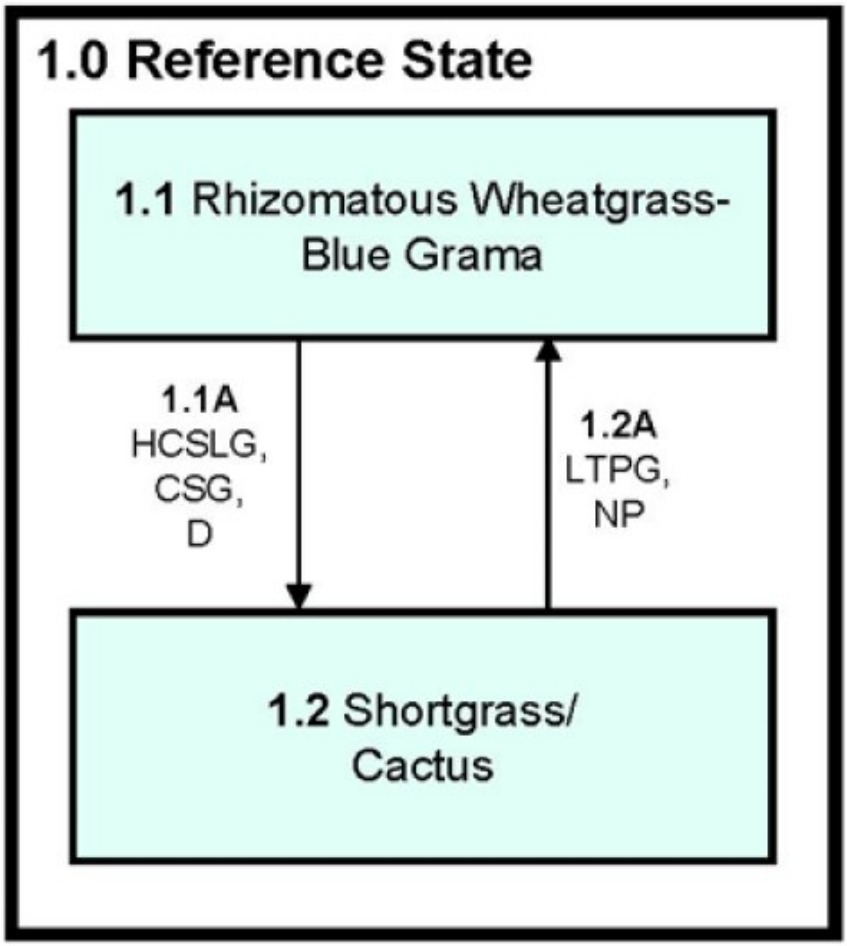
In association with this site are areas where the Btn horizon is exposed. These “slick spots” are primarily areas of bare ground that are affected by high sodium concentrations, and are typically dominated by cactus. The soil factors are the dominant influence and grazing management is not necessarily the primary influence of these areas. These areas can occur as a complex with this site, sometimes being difficult to differentiate between the two. They are classified as Non-Sites in MLRA 60A (R060AY999SD) and are not included in the State and Transition Model (STM) as a State or Plant Community Phase (PCP). In some MLRAs, Slick Spots are identified as a distinct PCP within an Eroded State.

The plant community upon which the interpretations are primarily based is the Reference Plant Community (1.1). The Reference Plant Community has been determined by studying 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 are discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Thin Claypan – R060AY015SD 5/16/17



CSG – Continuous seasonal grazing
D – Drought
HCSLG – Heavy, continuous season-long grazing without adequate recovery periods
LTPG – Long-term prescribed grazing, including adequate recovery opportunity and change in season of use
NP – Return to normal precipitation patterns

Figure 8. Thin Claypan - R060AY015SD

Diagram Legend - Thin Claypan - R060AY015SD

CP 1.1A	1.1 - 1.2	Heavy, continuous season-long grazing, continuous early season grazing, or drought.
CP 1.2A	1.2 - 1.1	Long-term prescribed grazing with proper stocking, change in season of use, adequate time for recovery, and a return to normal precipitation patterns.

Figure 9. Thin Claypan - R060AY015SD

State 1
Reference State

This state represents what is believed to show the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site, in Reference, is dominated by a mix of cool-season rhizomatous wheatgrasses and warm-season short grasses. Heavy grazing will cause the plant community to transition to a community dominated by warm-season short grasses and a minor amount of cool-season rhizomatous wheatgrasses and needle grasses. Cactus can increase dramatically and in the western portion of the MLRA, greasewood can also establish. Erosion of the surface horizon is a potential outcome with heavy grazing. In pre-European times the primary disturbances included grazing by large ungulates and small mammals, and drought. Favorable growing conditions occurred during the spring and the warm months of June through August. Today a similar state can be found in areas where proper livestock use has occurred.

Community 1.1
Rhizomatous Wheatgrass-Blue Grama

Figure 10. Plant Community Phase 1.1

The plant community upon which interpretations are primarily based is the Rhizomatous Wheatgrass-Blue Grama Plant Community (1.1). This is also considered to be the Reference Plant Community. This plant community can be found on areas with a history of proper grazing management, including adequate recovery periods between grazing events. The potential vegetation is about 75 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, and 5 to 15 percent shrubs. The rhizomatous wheatgrasses dominate the plant community, while blue grama is also prevalent. Other grasses and grass-like plants occurring on the site include green needlegrass, needle and thread, buffalograss, Sandberg bluegrass, and sedges. Significant forbs include scarlet globemallow, cudweed sagewort, and heath aster. Shrubs occurring in this plant community include cactus, saltbush, and fringed sagewort. In the western portion of the MLRA, big sagebrush and greasewood can also 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. Plant litter is properly distributed with some movement off-site and natural plant mortality is low. Low to moderate available water capacity coupled with high accumulations of sodium and slow permeability strongly influences the soil-water-plant relationships.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	420	738	955
Shrub/Vine	40	90	140
Forb	40	68	95
Moss	0	4	10
Total	**500**	**900**	**1200**

Figure 12. Plant community growth curve (percent production by month). SD6002, Pierre Shale Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant..

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
Shortgrass/Cactus

This plant community can develop from the adverse effects of heavy, continuous season-long grazing and/or annual, spring seasonal grazing. Short grasses and cactus increase to dominate the site and annual production decreases dramatically. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation, which gives blue grama a competitive advantage over cool-season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Blue grama and cactus are the dominant species. Other grasses and grass-likes occurring include western wheatgrass, sedge, buffalograss, inland saltgrass, needle and thread, prairie Junegrass, and annual grasses. Forbs such as broom snakeweed, cudweed sagewort, heath aster and western yarrow may also be present. Some non-native species will begin to invade this plant community including salsify, sweetclover, and annual bromes. Shrubs occurring in this plant community include cactus, saltbush, and fringed sagewort. In the western portion of the MLRA, big sagebrush and greasewood will also occur. There is usually more than 25 percent bare ground. This plant community is quite resilient. The thick sod and competitive advantage prevents other species from establishing. This plant community is less productive than the Reference Plant Community. Runoff increases and infiltration will decrease. 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	210	308	600
Shrub/Vine	70	150	230
Forb	20	38	55
Moss	0	4	15
Total	**300**	**500**	**900**

Figure 14. Plant community growth curve (percent production by month). SD6005, Pierre Shale Plains, warm-season dominant. Warm-season dominant..

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

Pathway 1.1A
Community 1.1 to 1.2

Heavy, continuous season-long, or early season grazing, or drought will convert the plant community to the

Shortgrass/Cactus Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Long-term prescribed grazing and a return to normal precipitation patterns can shift this plant community back to the Rhizomatous Wheatgrass-Blue Grama Plant Community (1.1).

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrasses**			180–360	
	western wheatgrass	PASM	*Pascopyrum smithii*	180–360	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–90	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–90	–
2	**Short Warm Season**			135–225	
	blue grama	BOGR2	*Bouteloua gracilis*	135–225	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–45	–
3	**Cool Season Grasses**			45–180	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	9–90	–
	green needlegrass	NAVI4	*Nassella viridula*	9–90	–
	Sandberg bluegrass	POSE	*Poa secunda*	9–45	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–45	–
4	**Other Native Grasses**			18–45	
	Grass, perennial	2GP	*Grass, perennial*	9–45	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–45	–
	saltgrass	DISP	*Distichlis spicata*	0–27	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–18	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–18	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–18	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	0–9	–
	Grass, annual	2GA	*Grass, annual*	0–9	–
5	**Grass-likes**			18–90	
	needleleaf sedge	CADU6	*Carex duriuscula*	9–72	–
	threadleaf sedge	CAFI	*Carex filifolia*	9–72	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–45	–
Forb					
7	**Forb**			45–90	
	Forb, annual	2FA	*Forb, annual*	0–18	–
	Forb, perennial	2FP	*Forb, perennial*	0–18	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	9–18	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	9–18	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	9–18	

	upright prairie coneflower	RACO3	*Ratibida columnifera*	9–18	–
	white heath aster	SYER	*Symphyotrichum ericoides*	9–18	–
	common yarrow	ACMI2	*Achillea millefolium*	5–15	–
	onion	ALLIU	*Allium*	9	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	9	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–9	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–9	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	9	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–9	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–9	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	9	–
	spiny phlox	PHHO	*Phlox hoodii*	0–9	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–9	–
	sticky cinquefoil	POGL9	*Potentilla glandulosa*	0–9	–
Shrub/Vine					
8	**Shrubs**			45–135	
	big sagebrush	ARTR2	*Artemisia tridentata*	0–90	–
	saltbush	ATRIP	*Atriplex*	9–45	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–45	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–45	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–27	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–27	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–27	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	9–18	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–18	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–9	–
Moss					
9	**Matt-Forming Forb**			0–9	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–9	–

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Rhizomatous Wheatgrasses**			25–75	
	Montana wheatgrass	ELAL7	*Elymus albicans*	0–50	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–50	–
2	**Short Warm Season Grasses**			125–200	
	blue grama	BOGR2	*Bouteloua gracilis*	125–200	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–25	–
3	**Cool Season Grasses**			25–50	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–50	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	5–50	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–25	–

	green needlegrass	NAVI4	*Nassella viridula*	0–10	–
4	**Other Native Grasses**			25–75	
	saltgrass	DISP	*Distichlis spicata*	0–50	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–25	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–25	–
	Grass, annual	2GA	*Grass, annual*	0–25	–
	Grass, perennial	2GP	*Grass, perennial*	0–25	–
	threeawn	ARIST	*Aristida*	0–25	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–5	–
5	**Grass-likes**			10–50	
	threadleaf sedge	CAFI	*Carex filifolia*	5–50	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–25	–
	needleleaf sedge	CADU6	*Carex duriuscula*	0–25	–
6	**Non-native Grasses**			5–25	
	cheatgrass	BRTE	*Bromus tectorum*	5–25	–
	cheatgrass	BRTE	*Bromus tectorum*	0	–
Forb					
7	**Forbs**			25–50	
	sweetclover	MELIL	*Melilotus*	0–25	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	5–15	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–15	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–15	–
	common yarrow	ACMI2	*Achillea millefolium*	5–15	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–15	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–15	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	5–15	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–15	–
	sticky cinquefoil	POGL9	*Potentilla glandulosa*	0–10	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–10	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–10	–
	onion	ALLIU	*Allium*	0–10	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–10	–
	Forb, annual	2FA	*Forb, annual*	0–10	–
	Forb, perennial	2FP	*Forb, perennial*	0–10	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–10	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–10	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–10	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–10	–
	spiny phlox	PHHO	*Phlox hoodii*	0–10	–
Shrub/Vine					
8	**Shrubs**			75–225	
	plains pricklypear	OPPO	*Opuntia polyacantha*	50–150	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–90	–

	silver sagebrush	ARCA13	*Artemisia cana*	0–50	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–45	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–35	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	5–35	–
	prairie sagewort	ARFR4	*Artemisia frigida*	15–35	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–25	–
	saltbush	ATRIP	*Atriplex*	0–5	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–5	–
Moss					
9	**Matt-Forming Forb**			0–10	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–10	–

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). Therefore, 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

Plant Community = Western Wheatgrass-Blue Grama (1.1)
Average Annual Production (lbs./ac, air-dry) = 900
Stocking Rate (AUM/ac) = 0.25

Plant Community = Blue Grama/Cactus (1.2)
Average Annual Production (lbs./ac, air-dry) = 500
Stocking Rate (AUM/ac) = 0.14

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

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been reduced to reflect only preferred or desirable forage species.

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 herbage production on this site. The site is dominated by soils in hydrologic group D. Infiltration varies from moderate to very slow and runoff potential varies from medium to very high, depending on 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 exception would be where a dense sod of short grasses dominates the site. Normally 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 opportunities for upland game species. The wide varieties of plants, which bloom from spring until fall, have an aesthetic value that appeals to visitors.

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 requirements as an “Approved” ESD as laid out in the 1997, rev.1, 2003 National Range and Pasture Handbook (NRPH). The document fully described 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, is needed to validate the information in this Provisional Ecological Site Description. 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. The final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

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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 description include: Stan Boltz, Range Management Specialist, NRCS; Mitch Faulkner, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; Rick Peterson, Range Management Specialist, NRCS; and Mike Stirling, Range Management Specialist, NRCS.

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Contributors

Stan C. Boltz

Approval

Suzanne Mayne-Kinney, 6/25/2024

Acknowledgments

ESD updated by Rick L, Peterson, 5/17/17

MLRA 60A Provisional Level Quality Control (QC) Process
9/28/17

Ecological Site from MLRA 60A were Previously Approved ESDs and meet the requirements as stated in the 2003 National Range and Pasture Handbook.

The Sites were updated to the Provisional Level by Rick L. Peterson, ESS, Rapid City, SSO in FY17.

The sites were reviewed by George Gamblin, RMS, Wheatland, WY and Mitch Faulkner, RMS, Belle Fourche, SD. Mitch Faulkner acted as the Provisional QC. The Sites were then reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS.
Worked closely with Kent Cooley, Area SS, with MLRA key development and soils narratives

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, Ryan Beer, Mitch Iverson, Thad Berrett, Cheryl Nielsen
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	06/04/2008
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:** Broken or irregular in appearance or discontinuous with numerous debris dams.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are somewhat common, but few exposed roots would occur.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5 to 20 percent is typical; this does not include associated slickspots that are not a soil/ecological site.

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):** 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.

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 3 or greater. Surface organic matter adheres to the soil surface in most cases. Soil surface fragments will typically retain structure for short periods when dipped in distilled water. Some fragments will dissolve in less than 1 minute.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon not present at the surface, but has light colored E-horizon 1 to 4 inches thick. Structure is thin platy parting to fine granular.

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-season grasses) with fine and coarse roots positively influences infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None – natural pan appears at roughly 1 to 4 inches with “biscuit-top” appearance at top of pan.

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: Short warm-season grasses > cool-season bunchgrasses > shrubs >

    Other: Forbs = grass-like species

    Additional:

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.

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 500-1,200 lbs./acre (air-dry weight). Reference value production is 900 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, cactus

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.