USDA Natural Resources
Conservation Service

Ecological site R063AY022SD
Loamy Terrace

Accessed: 05/14/2024

General information

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

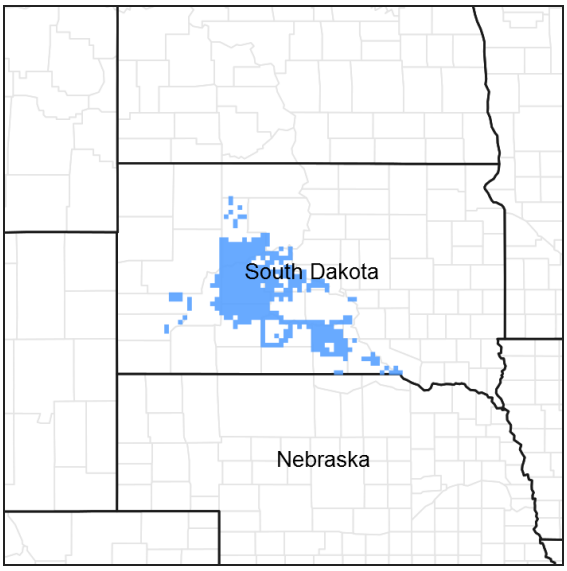

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 063A–Northern Rolling Pierre Shale Plains

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

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

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA): 63A Northern Rolling Pierre Shale Plains, (USDA-NRCS, Ag Handbook 296).

Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Loamy Terrace Ecological Site occurs throughout the MLRA. It is located on old, nearly level stream terraces adjacent to overflow sites. This site does not typically receive additional moisture from overflow unless during high flow events. Runoff from adjacent upland sites do provide addition moisture. Soil surface layer is 4 to 12 inches thick with texture ranges from very fine sandy loam to silty clay loam. This site can have similar vegetative characteristics as the overflow site, especially when looking at the woody components. The difference is that tree regeneration is unlikely to occur on the terrace landscape. Vegetation in reference consists of a mix of cool- and warm-season grasses, however mid-statured, cool-season grasses tend to be the dominant group. Western wheatgrass and green needlegrass are the dominant cool-season grasses. Other grasses and grass-like included needleandthread, big bluestem, sideoats grama, blue grama, buffalograss, prairie sandreed, and sedges. Forbs are common and diverse. Silver sage is almost always present, but western snowberry and leadplant are common. Remnant trees include green ash and plains cottonwood, but in minor amounts.

Associated sites

R063AY010SD	**Loamy**
R063AY020SD	**Loamy Overflow**

Similar sites

R063AY020SD	**Loamy Overflow** Loamy Overflow [more big bluestem; higher production]
R063AY010SD	**Loamy** Loamy [less big bluestem; lower production]

Table 1. Dominant plant species

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

Physiographic features

This site occurs on old, nearly level, stream terraces adjacent to overflow sites.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Terrace (3) Plain
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	488–823 m
Slope	0–3%
Water table depth	203 cm
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 (average)	130 days
Freeze-free period (average)	151 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

This site occurs on old stream terraces adjacent to overflow sites. It does not receive additional water from overflow unless during high flow events. It may receive additional runoff moisture from adjacent upland sites but does not function as a run-in site. No wetland features are directly associated with this site.

Soil features

The soils in this site are well drained and formed in alluvium. The very fine sandy loam to silty clay loam surface layer is 4 to 12 inches thick. The soils have a slow to moderate infiltration rate. 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, but sandy textured surface soils are susceptible to wind erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and/or production.

Soils correlated to the Loamy Terrace include: Bigbend, Craft, Haverson, Hilmoe, Lohmiller, and Nimbro. Bigbend, Haverson, Lohmiller and Nimbo are also correlated to the Loamy Overflow site. The geographic setting of the low stream terrace is rarely flooded whereas the flood plain (overflow) setting is frequently flooded.

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

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Very fine sandy loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–10
Soil reaction (1:1 water) (0-101.6cm)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–10%
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 reference plant community. 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 and/or annual bromegrass. Shrubs and remnant trees can also occur on this site if it has not been hayed or cultivated.

Interpretations are primarily based on the Western Wheatgrass-Green Needlegrass/Silver Sage 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

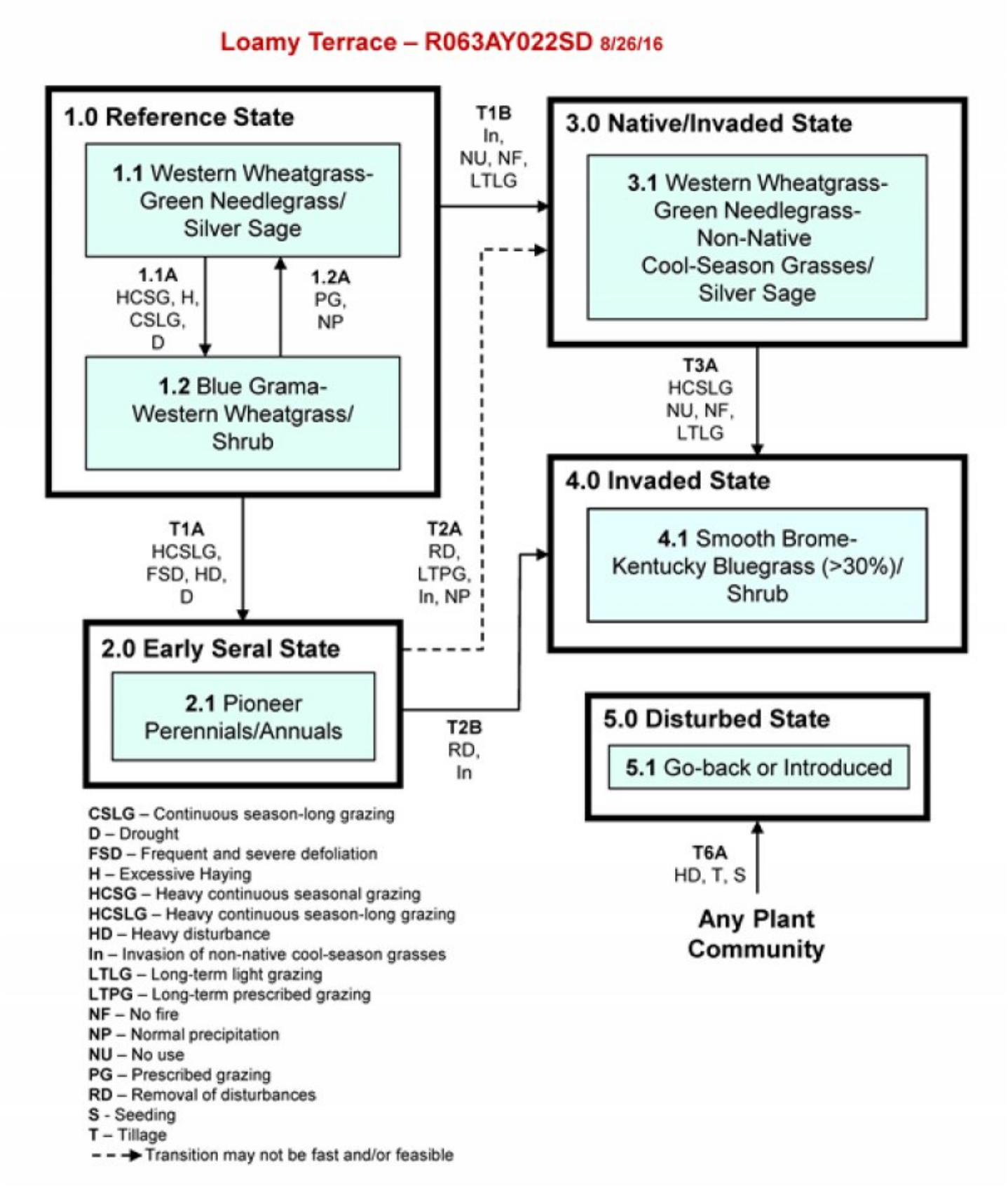

Figure 6. Loamy Terrace - R063AY022SD

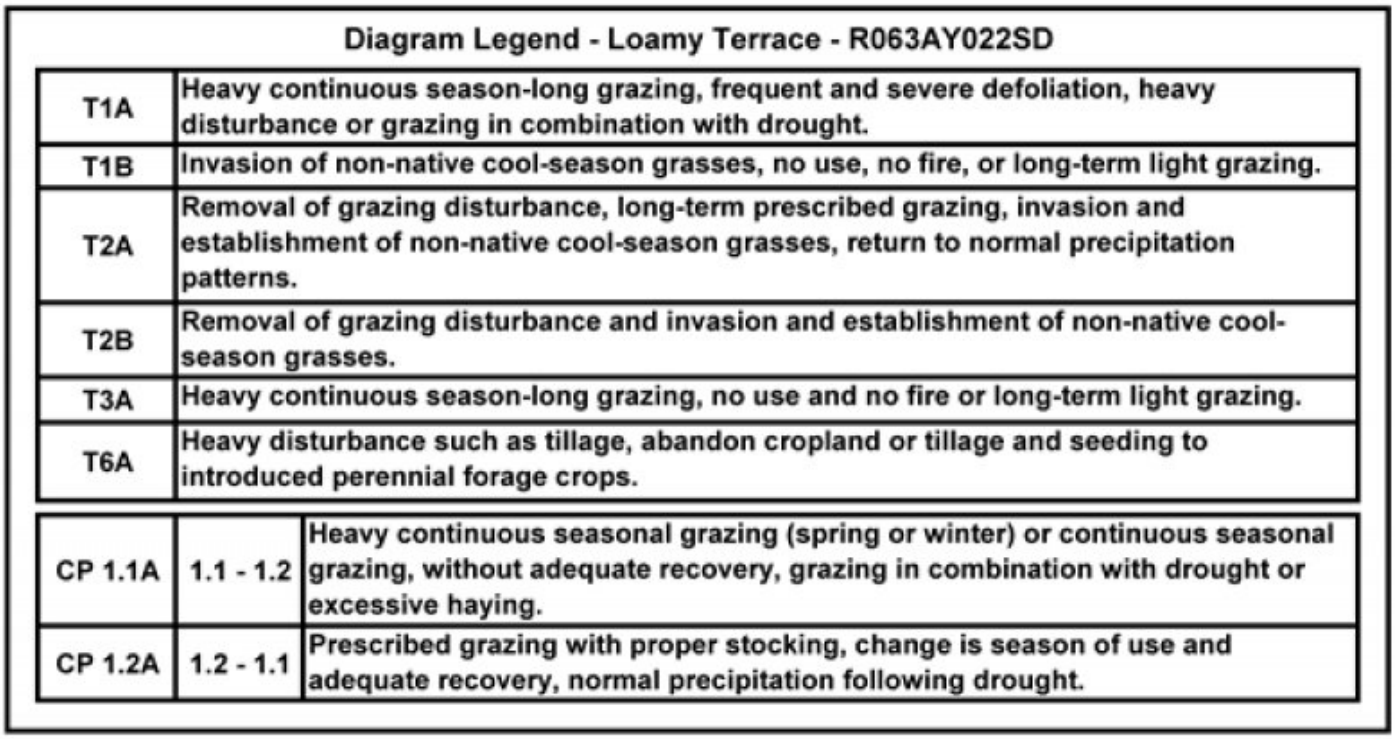

Figure 7. Loamy Terrace - R063A022SD

State 1
Reference State

This State represents what is believed to exist prior to European settlement. This site in reference, is dominated by cool-season grasses and sub-dominant warm-season grass. Forbs are common and diverse. Silver sage is almost always present on this site and other shrubs such as western snowberry, chokecherry, American plum and remnant trees such as green ash and cottonwood can occur. Grazing or the lack of grazing, fire, excessive haying and invasion of non-native cool-season grasses are the major drivers of this State.

Community 1.1
Western Wheatgrass-Green Needlegrass/Silver Sage Plant Community

Interpretations are based primarily on the Western Wheatgrass-Green Needlegrass/Silver Sage Plant Community, which is considered to be the reference plant community. The potential vegetation is 75 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, 5 to 15 percent shrubs, and 0 to 3 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 needleandthread, big bluestem, sideoats grama, blue grama, prairie sandreed, and sedges. Forbs consist of American licorice, goldenrod, Maximilian sunflower, and cudweed sagewort. Woody species found on this site are silver sagebrush, western snowberry and leadplant. Common trees include green ash, and plains cottonwood. 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 biological integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1833	2385	2830
Shrub/Vine	269	471	751
Forb	140	235	359
Tree	–	47	95
Total	**2242**	**3138**	**4035**

Figure 9. Plant community growth curve (percent production by month). SD6301, Pierre Shale Plains, cool-season dominant.. Cool-season dominant on uplands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

Community 1.2
Blue Grama-Western Wheatgrass/Shrub 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. The potential vegetation is 75 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, 5 to 10 percent shrubs, and 0 to 3 percent trees. Blue grama and western wheatgrass are the dominant species. Green needlegrass has been greatly reduced. Buffalograss, bluegrass, and sedges increase. Forb species include cudweed sagewort, western yarrow, scurfpeas, goldenrod, and woolly verbena. Leadplant has been greatly reduced, silver sage and western snowberry may increase in the plant community. Common trees include remnant green ash, and plains cottonwood. 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1154	1584	1933
Shrub/Vine	95	202	347
Forb	95	202	347
Tree	–	30	62
Total	**1344**	**2018**	**2689**

Figure 11. 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 season-long grazing, heavy continuous seasonal grazing, and/or excessive haying, or drought will convert the plant community to the Blue Grama-Western Wheatgrass/Shrub Plant Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that includes proper stocking, change in season of use and adequate time for recovery in combination with normal precipitation patterns will move this plant community back to the Western Wheatgrass-Green Needlegrass/Silver Sage Plant Community (1.1).

State 2
Early Seral State

This state is the result of very heavy, concentrated disturbance such as concentrated rodent activity, or livestock concentration areas. This State can also develop as a result of invasion by highly competitive weed species such as Canada thistle, hound's tongue, leafy spurge, or knapweeds. Extended periods of drought accompanied by heavy grazing can also push an 'At Risk' plant community phase to this state. In most cases, this phase is dominated by pioneer perennial and annual grass and forb species. Bare ground is also much higher than on any other plant community phase.

Community 2.1
Pioneer Perennials/Annuals Plant Community

This plant community develops under severe disturbance, heavy continuous season-long grazing, and/or excessive 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 prairie rose and fringed sagewort. Plant species from adjacent ecological sites may become minor components of this plant community. The community is also 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. 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 mechanically renovated and seeded to improve the production capability, but management changes would be needed to maintain the new plant community.

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

State 3
Native/Invaded State

This State has been invaded by Kentucky bluegrass and/or smooth brome, but not at the levels where the plant community is dominated by these species. The plant community in this state looks very similar to the Reference Plant Community (1.1) and it functions very much like the Reference State. It is 'At Risk' of transitioning to the Invaded State (4.0) which is dominated by smooth brome and/or Kentucky bluegrass.

Community 3.1
Western Wheatgrass-Green Needlegrass-Non-Native Cool-Season Grasses/Silver Sage Plant Community

This plant community develops when Kentucky bluegrass or smooth brome invade and become established on the site. This is due to the 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 for long periods of time, will allow these non-native cool-season grasses to increase in the plant 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 75 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, 5 to 15 percent shrubs, and 0 to 3 percent trees. The dominate grasses will be western wheatgrass, green needlegrass and non-native cool-season grasses, primarily, smooth brome and/or

Kentucky bluegrass. Warm-season grasses will include patched of little bluestem and sideoats grama. Forbs will be diverse but not dominate. Shrubs and trees will occur in similar amounts as in Plant Community Phase (1.1).

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1659	2270	2455
Shrub/Vine	123	280	499
Forb	123	210	319
Tree	–	43	90
Total	**1905**	**2803**	**3363**

State 4
Invaded State

This state is the result of invasion and dominance of introduced species. This state is characterized by the dominance of Kentucky bluegrass and smooth brome, and an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade tolerant introduced grass species. The nutrient cycle is also impaired, the result is typically a higher level of nitrogen which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns thereby shifting competitive advantage to shade tolerant, introduced grass species. Studies indicate that soil biological activity is altered, and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the invasive grass dominance. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. Plant communities dominated by Kentucky bluegrass have significantly less cover and diversity of native grasses and forb species (Toledo, D. et al., 2014).

Community 4.1
Smooth Brome-Kentucky Bluegrass (>30%)/Shrub Plant Community

This plant community develops after an extended period of nonuse or long-term light grazing 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 species include western wheatgrass, blue grama, buffalograss, sand dropseed, and cheatgrass. Common forbs include cudweed sagewort, green sagewort, common mullein, and western yarrow. Shrubs such as silver sagebrush and/or western snowberry may increase. Remnant trees will continue to persist, but no regeneration will occur. This plant community is resistant to change without prescribed grazing and/or fire. The combination of both grazing and fire may move this plant community toward the Native/Invaded State (3.0) but it is unlikely. 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. .

State 5
Disturbed State

Any Plant Community can transition to this State. The two Plant Communities, Go-Back and Introduced, are highly variable in nature. They are derived through different management scenarios, and are not related successionally. Infiltration, runoff, and soil erosion vary depending on the vegetation present on the site.

Community 5.1
Go-back or Introduced Plant Community

The Go-back plant community can be reached whenever a 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 brome, annual bromegrass, 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 Plant Community is normally those areas seeded to pubescent or intermediate wheatgrass, alfalfa, crested wheatgrass, or other introduced species. Refer to the associated Forage Suitability Group description for adapted species.

Transition 1A
State 1 to 2

Heavy continuous season-long grazing, frequent and severe defoliation, heavy disturbance and drought will transition this plant community to the Early Seral State (2.0).

Transition 1B
State 1 to 3

Nonuse and/or no fire for extend periods of time or long-term light grazing and the invasion of non-native, cool-season grasses will shift the Reference State (1.0) to the Native/Invaded State (3.0).

Transition 6A
State 1 to 5

Heavy disturbance including tillage, abandon cropland or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition 2A
State 2 to 3

If the disturbance causing severe defoliation is removed and long-term prescribed grazing is initiated, including adequate rest periods, and normal precipitation patterns return, this plant community may transition to the Native/Invaded State (3.0). With the presence of non-native, cool-season grasses in local plant communities it is assumed the Early Seral State will be invaded by non-native cool-season grasses so a restoration pathway to the Reference State is unlikely. This pathway will take an extended period of time and may not in the end meet management objectives.

Transition 2B
State 2 to 4

If the disturbance causing the severe defoliation is removed and the plant community is invaded by non-native, cool-season grasses this plant community is likely to transition to the Invaded State (4.0).

Transition 6A
State 2 to 5

T6A Heavy disturbance including tillage, abandon cropland or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition 3A
State 3 to 4

Heavy continuous season-long grazing, or no use and no fire, or long-term light grazing will cause a transition of the Native/Invaded State to the Invaded State (4.0). The ecological threshold can be identified by the percentage of non-native cool-season species in the Plant Community. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition (Toledo, D. et al., 2014). Smooth brome is assumed to follow a similar ecological threshold, but is not documented scientifically.

Transition 6A
State 3 to 5

Heavy disturbance including tillage, abandon cropland or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Transition 6A
State 4 to 5

Heavy disturbance including tillage, abandon cropland or seeding to improved pasture species result in a transition to the Disturbed State (5.0).

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			628–1098	
	western wheatgrass	PASM	*Pascopyrum smithii*	628–1098	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–157	–
2	**Cool-Season Bunchgrasses**			471–785	
	green needlegrass	NAVI4	*Nassella viridula*	314–628	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	63–314	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–157	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–157	–
3	**Mid and Tall Warm-Season Grasses**			157–628	
	big bluestem	ANGE	*Andropogon gerardii*	63–314	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	31–157	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	31–157	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–157	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–94	–
4	**Short Warm-Season Grasses**			31–157	
	blue grama	BOGR2	*Bouteloua gracilis*	31–157	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–94	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–63	–
5	**Other Native Grasses**			31–157	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–157	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	31–94	–
	saltgrass	DISP	*Distichlis spicata*	0–63	–
6	**Grass-likes**			31–220	
	sedge	CAREX	*Carex*	31–220	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–94	–
Forb					
8	**Forbs**			157–314	

	Forb, native	2FN	*Forb, native*	31–157	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	31–94	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	31–94	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	31–94	–
	goldenrod	SOLID	*Solidago*	31–94	–
	white heath aster	SYER	*Symphyotrichum ericoides*	31–63	–
	mint	MENTH	*Mentha*	0–63	–
	scurfpea	PSORA2	*Psoralidium*	31–63	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	31–63	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	31–63	–
	prairie clover	DALEA	*Dalea*	31–63	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	31–63	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–63	–
	hoary verbena	VEST	*Verbena stricta*	31–63	–
	American vetch	VIAM	*Vicia americana*	31–63	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–31	–
	rockcress	ARABI2	*Arabis*	0–31	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–31	–
	false boneset	BREU	*Brickellia eupatorioides*	0–31	–
	nettle	URTIC	*Urtica*	0–31	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–31	–
	wood lily	LIPH	*Lilium philadelphicum*	0–31	–
	dotted blazing star	LIPU	*Liatris punctata*	0–31	–
Shrub/Vine					
9	**Shrubs**			157–471	
	silver sagebrush	ARCA13	*Artemisia cana*	63–314	–
	American plum	PRAM	*Prunus americana*	0–251	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–251	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–251	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	31–157	–
	chokecherry	PRVI	*Prunus virginiana*	0–157	–
	rose	ROSA5	*Rosa*	31–94	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–63	–
	leadplant	AMCA6	*Amorpha canescens*	31–63	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–31	–
Tree					
10	**Trees**			0–94	
	Tree	2TREE	*Tree*	0–94	–
	boxelder	ACNE2	*Acer negundo*	0–94	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–94	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–94	–
	American elm	ULAM	*Ulmus americana*	0–94	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			202–504	
	western wheatgrass	PASM	*Pascopyrum smithii*	202–504	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–40	–
2	**Cool-Season Bunchgrasses**			101–202	
	green needlegrass	NAVI4	*Nassella viridula*	40–161	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	20–101	–
3	**Mid and Tall Warm-Season Grasses**			40–161	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–101	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–61	–
	big bluestem	ANGE	*Andropogon gerardii*	0–61	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–40	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–40	–
4	**Short Warm-Season Grasses**			303–605	
	blue grama	BOGR2	*Bouteloua gracilis*	202–504	–
	buffalograss	BODA2	*Bouteloua dactyloides*	20–202	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	20–101	–
5	**Other Native Grasses**			20–101	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–101	–
	saltgrass	DISP	*Distichlis spicata*	0–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–40	–
6	**Grass-likes**			40–202	
	sedge	CAREX	*Carex*	40–202	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–101	–
7	**Non-Native Grasses**			0–202	
	bluegrass	POA	*Poa*	0–161	–
	smooth brome	BRIN2	*Bromus inermis*	0–101	–
	cheatgrass	BRTE	*Bromus tectorum*	0–101	–
Forb					
8	**Forbs**			101–303	
	Forb, introduced	2FI	*Forb, introduced*	0–101	–
	Forb, native	2FN	*Forb, native*	20–101	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	20–101	–
	goldenrod	SOLID	*Solidago*	20–81	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–61	–
	scurfpea	PSORA2	*Psoralidium*	20–61	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	20–61	–
	hoary verbena	VEST	*Verbena stricta*	20–61	–
	common mullein	VETH	*Verbascum thapsus*	0–40	

	common mullein	VETH	*Verbascum thapsus*	0–40	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	20–40	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–40	–
	Canadian horseweed	COCA5	*Conyza canadensis*	0–40	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–40	–
	nettle	URTIC	*Urtica*	0–40	–
	white heath aster	SYER	*Symphyotrichum ericoides*	20–40	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–20	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–20	–
	dotted blazing star	LIPU	*Liatris punctata*	0–20	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–20	–
	prairie clover	DALEA	*Dalea*	0–20	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–20	–
Shrub/Vine					
9	**Shrubs**			101–202	
	silver sagebrush	ARCA13	*Artemisia cana*	40–202	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	20–161	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–101	–
	rose	ROSA5	*Rosa*	20–61	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–40	–
	leadplant	AMCA6	*Amorpha canescens*	0–40	–
	American plum	PRAM	*Prunus americana*	0–40	–
	chokecherry	PRVI	*Prunus virginiana*	0–20	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–20	–
Tree					
10	**Trees**			0–61	
	Tree	2TREE	*Tree*	0–61	–
	boxelder	ACNE2	*Acer negundo*	0–61	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–61	–
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–61	–
	American elm	ULAM	*Ulmus americana*	0–61	–

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-Green Needlegrass/Silver Sage Plant Community (1.1)
Average Annual Production (lbs./acre, air-dry): 2800
Stocking rate* (AUM/acre): 0.70

Blue Grama-Western Wheatgrass/Shrub Plant Community (1.2)

Average Annual Production (lbs./acre, air-dry): 1800
Stocking rate* (AUM/acre): 0.45

Western Wheatgrass-Green Needlegrass-Non-Native Cool-Season Grasses/Shrub Plant Community (3.1)
Average Annual Production (lbs./acre, air-dry): 2500
Stocking rate* (AUM/acre): 0.62

Other Plant Community Phases have highly variable forage production levels. Actual on-site forage inventories will need to be conducted to determine average annual production, stocking rates and timing of grazing.

*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 which is 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 forage production on this site. This site is dominated by soils in hydrologic group B. 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

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.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. No SCS-RANGE-417 clipping data forms have been recorded for this ecological site.

Other references

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Contributors

Stan Boltz
Rick Peterson

Acknowledgments

Rick L. Peterson - ESD update 8/29/16

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/08/2010
Approved by	Stan Boltz
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 4 to 12 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular in the upper A-horizon.

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.

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.

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 cool-season bunchgrasses >

Sub-dominant: Mid/tall warm-season grasses = Shrubs >

Other: Forbs > Grass-likes > Short warm-season grasses > 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 2,000-3,600 lbs./acre (air-dry weight). Reference value production is 2,800 lbs./acre (air-dry weight).

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** State and local noxious weeds, Kentucky bluegrass, annual bromes

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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.
