USDA Natural Resources Conservation Service

Ecological site R055CY021SD
Clayey Overflow

Accessed: 05/07/2024

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.

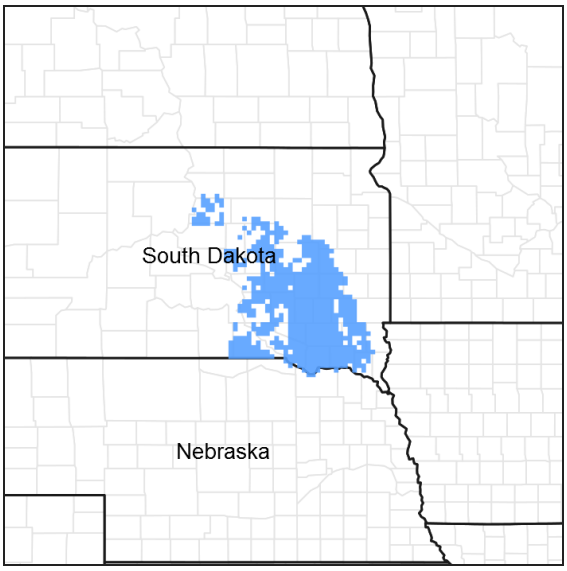


Figure 1. Mapped extent

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.

Classification relationships

Level IV Ecoregions of the Conterminous United States: 42e – Southern Missouri Coteau, 42f – Southern Missouri Coteau Slope, 46n – James River Lowland.

Associated sites

R055CY010SD	**Loamy**
R055CY011SD	**Clayey**

Similar sites

R055CY011SD	**Clayey** (R055CY011SD) – Clayey [less big bluestem; more needlegrass; lower production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	(1) *Pascopyrum smithii* (2) *Andropogon gerardii*

Physiographic features

This site occurs on nearly level lowlands and drainageways.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	396–610 m
Slope	0–1%
Water table depth	30–107 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 55C 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 typically ranges from 19 to 25 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 15°F (Howard, South Dakota (SD)), to about 20°F (Wagner, SD). July is the warmest month with temperatures averaging from about 73°F (Howard, SD), to about 77°F (Wagner, 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 12 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 11 mph 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 mph.

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. Greenup 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)	159 days
Freeze-free period (average)	180 days
Precipitation total (average)	635 mm

Influencing water features

No riparian areas or wetland features are typically associated with this site. However, in some areas, adjacent streams occur and would be classified as follows: Stream Type: B6, C6 (Rosgen System)

Soil features

The soils in this site are somewhat poorly to poorly drained and formed in alluvium. The silty clay loam to silty clay surface layer is typically 7 to 16 inches thick but can be deeper on some soils. These soils have a very slow

infiltration rate. When dry these soils crack. When the soils are wet, surface compaction can occur with heavy traffic. This site typically 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. There are no root restrictive layers in these soils; however, the high shrink-swell potential can cause damage and/or inhibit root growth.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of 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/HomePage.htm) for specific local soils information.

Table 4. Representative soil features

Surface texture	(1) Silty clay (2) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Slow to very slow
Soil depth	203 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

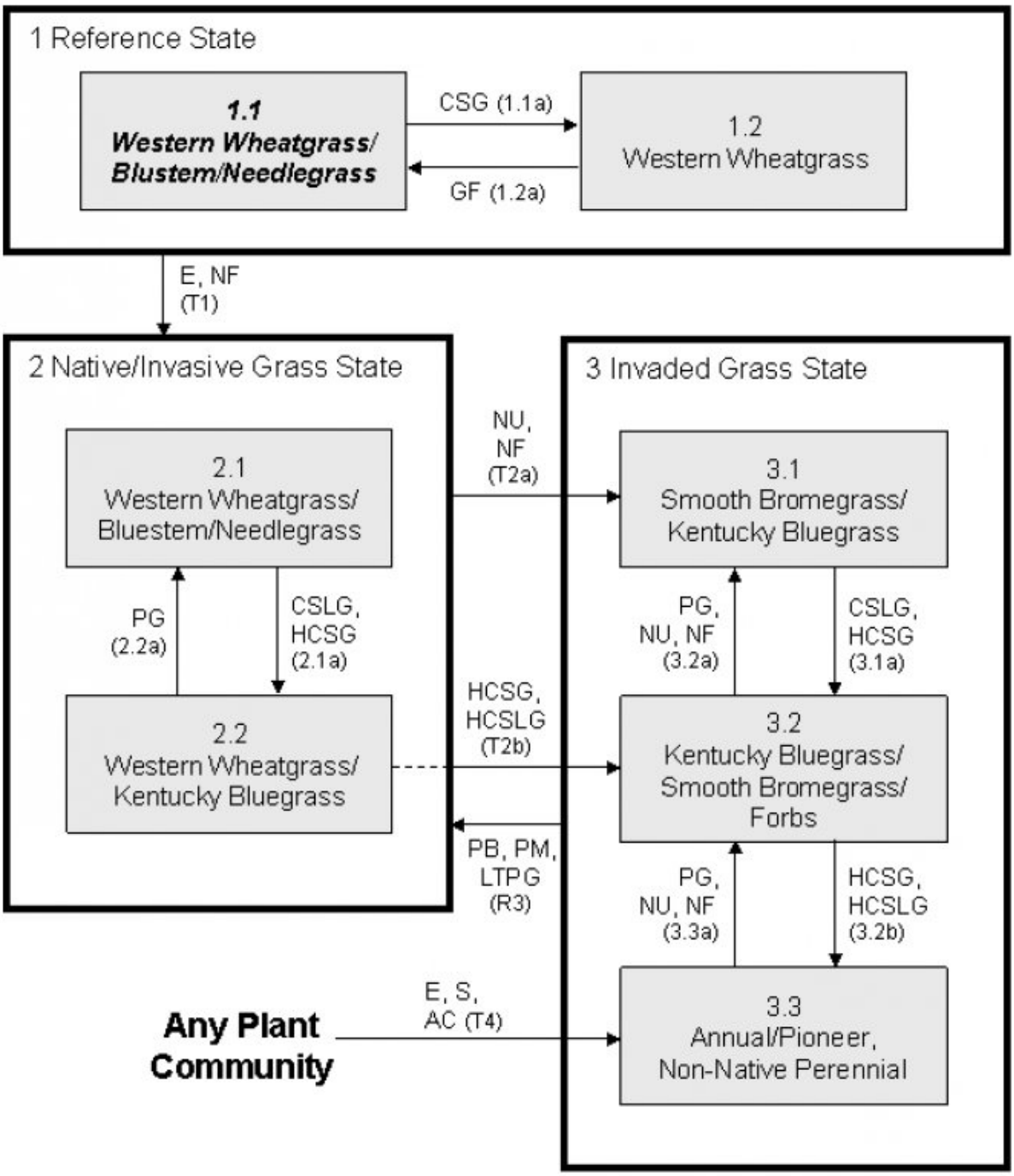
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur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

Continuous season-long grazing (during the typical growing season of May through October) and/or heavy continuous seasonal grazing (i.e., grazing at the same time of year every year) without adequate recovery periods following each grazing occurrence causes this site to depart from the Western Wheatgrass/Bluestem/Needlegrass Plant Community. Western wheatgrass increases initially and will eventually decrease with continuous grazing. Grasses such as green needlegrass, big bluestem, and switchgrass will decrease in frequency and production. With continued disturbance, this site is susceptible to invasion of nonnative species such as Kentucky bluegrass and smooth bromegrass. These species can become dominant and alter the ecological processes drastically.

Interpretations are primarily based on the 1.1 Western Wheatgrass/Bluestem/Needlegrass 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 community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model



Refer to plant community phase narratives for details on pathways: **AC** – Abandonment of cropping; **CSG** – Continuous seasonal grazing; **CSLG** – Continuous season-long grazing; **E** – Encroachment of non-native species; **GF** – Grazing and fire returned to normal disturbance regimes; **HCSG** – Heavy continuous seasonal grazing; **HCSLG** – Heavy continuous season-long grazing; **LTPG** – Long-term prescribed grazing; **NF** – No fire; **NU** – Non-use; **PB** – Prescribed burning; **PG** – Prescribed grazing; **PM** – Pest management (herbicide); **S** – Seeding.

State 1
Reference

This state represents the natural range of variability that dominated the dynamics of this ecological site (ES). This state was dominated by cool-season grasses. In pre-European times, the primary disturbance mechanisms for this

site in the reference condition included somewhat frequent fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. A combination of disturbances such as fire followed by grazing during below average precipitation periods or a severe single disturbance such as extended periods of below average precipitation would have caused a decline in tall warm-season grasses and green needlegrass. This would have resulted in a simplification of the plant community with dominance by western wheatgrass.

Community 1.1
Western Wheatgrass/Bluestem/Needlegrass

Interpretations are based primarily on the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation was about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community was dominated by cool-season grasses. The major grasses included western wheatgrass, big bluestem, and green needlegrass. Other grass and grass-like species included switchgrass, little bluestem, sideoats grama, Indiangrass, tall dropseed, blue grama, buffalograss, and sedges. This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2707	3512	4254
Forb	174	294	460
Shrub/Vine	34	118	219
Total	**2915**	**3924**	**4933**

Figure 5. Plant community growth curve (percent production by month). SD5507, Southern Black Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	13	20	25	18	11	5	3	0	0

Community 1.2
Western Wheatgrass

This plant community evolved under continuous seasonal grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. The dominant grass was western wheatgrass. Grass and grass-like species of secondary importance included big bluestem, tall dropseed, foxtail barley, and sedge. Forbs commonly found in this plant community included American licorice, cudweed sagewort, western yarrow, and woolly verbena. This plant community will have similar plant composition to the 2.2 Western Wheatgrass/Kentucky Bluegrass Plant Community Phase (refer to the plant composition tables). The main difference is that nonnative species such as Kentucky bluegrass and smooth bromegrass would not have been present in this plant community phase. When compared to the Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase (1.1), big bluestem and green needlegrass decreased significantly, while western wheatgrass would have increased. Production and litter cover would have decreased as well and bare ground would have increased. The site would have been the most susceptible to erosion and gully formation during this phase. However, once conditions became more favorable, this plant community phase would have readily shifted back to the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase.

Figure 6. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Pathway 1.1a
Community 1.1 to 1.2

Continuous seasonal grazing which includes grazing at moderate to heavy stocking levels at the same time of year each year or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing would have shifted this community to the 1.2 Western Wheatgrass Plant Community Phase.

Pathway 1.2a
Community 1.2 to 1.1

Grazing and fire returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest would have converted this plant community to the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase.

State 2
Native/Invasive Grass

This state is similar to the reference state in terms dominant plant composition and production. However, the invasion of introduced cool-season sod grasses alters the natural range of variability for this ES. This state is still dominated by mid- and tall native warm- and cool-season grasses, but invasive introduced cool-season sod grasses are now present in all community phases of this state. The primary disturbance mechanisms for this state include grazing by domestic livestock and infrequent fires. Timing and intensity of grazing events coupled with weather dictate the dynamics that occur within this state. The cool-season native grass can decline and an increase in introduced sod grasses will occur. Many times, this state appears as a mosaic of community phases caused primarily by continuous season-long grazing. This state represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire followed by short-term intensive grazing. This state is dominated by cool-season grasses, with warm-season grasses being subdominant. It can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

Community 2.1
Western Wheatgrass/Bluestem/Needlegrass

This plant community phase is similar to the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase but it also contains minor amounts of nonnative invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 15 percent by air-dry weight). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses with warm-season grasses being subdominant. The major grasses include western wheatgrass, big bluestem, and green needlegrass. Other grass and grass-like species include switchgrass, little bluestem, sideoats grama, Indiangrass, tall dropseed, blue grama, buffalograss, and sedges. Major forbs and shrubs include American licorice, sunflower, goldenrod, and western snowberry. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. 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. Refer to the 1.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase for details of the plant composition for this community phase.

Figure 7. Plant community growth curve (percent production by month). SD5507, Southern Black Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	13	20	25	18	11	5	3	0	0

Community 2.2
Western Wheatgrass/Kentucky Bluegrass

This phase is characterized by a shift to mid cool-season rhizomatous grasses with lesser amounts of tall warm-season and mid cool-season bunchgrasses. The vegetation is about 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent shrubs. Dominant grasses would include western wheatgrass and Kentucky bluegrass with minor amounts of needlegrasses, big bluestem, and switchgrass. Major forbs are western ragweed, goldenrods, and western yarrow. Snowberry would be the dominant shrub. Energy capture by this plant community phase has shifted from late spring and summer to early spring through early summer. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2191	2709	3295
Forb	135	228	347
Shrub/Vine	28	90	168
Total	**2354**	**3027**	**3810**

Figure 9. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Pathway 2.1a
Community 2.1 to 2.2

Continuous season-long grazing (grazing at light to moderate stocking levels for a majority of or the entire growing season), heavy continuous seasonal grazing (grazing at moderate to heavy stocking levels for extended portions of the growing season at the same time each year), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 2.2 Western Wheatgrass/Kentucky Bluegrass Plant Community Phase.

Pathway 2.2a
Community 2.2 to 2.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Western Wheatgrass/Bluestem/Needlegrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 3
Invaded

This state is the result of invasion and dominance of introduced species. This state is characterized by the dominance of Kentucky bluegrass and smooth bromegrass 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 and 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. Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very short term reduction of Kentucky bluegrass. These events may reduce the dominance of Kentucky bluegrass but due to the large amount of rhizomes in the soil there is no opportunity for the native species to establish and dominate before Kentucky bluegrass rebounds and again dominates the system.

Community 3.1
Smooth Bromegrass/Kentucky Bluegrass

This plant community phase is a result of extended periods of nonuse and no fire. It is characterized by a dominance of smooth bromegrass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface. Nutrient cycling is greatly reduced, and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short as these cool-season species mature rapidly. Energy capture is also reduced.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2735	3403	4013
Forb	34	167	336
Shrub/Vine	34	129	247
Total	**2803**	**3699**	**4596**

Figure 11. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Community 3.2
Kentucky Bluegrass/Smooth Bromegrass/Forbs

This plant community phase is a result of continuous season-long grazing or heavy, continuous seasonal grazing. It is characterized by a dominance of Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1664	2048	2488
Forb	106	235	409
Shrub/Vine	22	71	129
Total	**1792**	**2354**	**3026**

Figure 13. Plant community growth curve (percent production by month). SD5506, Southern Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	6	15	20	26	17	9	4	3	0	0

Community 3.3
Annual/Pioneer, Non-Native Perennial

This plant community evolved under heavy continuous season-long grazing, heavy continuous seasonal grazing, or from over utilization during extended drought periods. The potential plant community is made up of approximately 50 to 80 percent grasses and grass-like species, 10 to 25 percent forbs, and 5 to 25 percent shrubs and trees. The dominant species are highly variable in this phase, often consisting of invasive species such as annual bromegrass, Kentucky bluegrass, and invasive forbs. Other plant species, from adjacent ESs, can become minor components of this plant community. This plant community is susceptible to invasion of Canada thistle and other nonnative species because of the relatively high percent of bare ground. This plant community phase may also be made up of seeded species such as legumes and intermediate wheatgrass. Refer to the corresponding Forage Suitability Group for production and species adaptation. The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community and the plant communities on adjacent sites. This community can be renovated to improve the production capability; however, if management changes are not made, the vegetation could revert back to a threeawn/annual community.

Pathway 3.1a
Community 3.1 to 3.2

Continuous season-long grazing (grazing at light to moderate stocking levels for a majority of or the entire growing season), heavy continuous seasonal grazing (grazing at moderate to heavy stocking levels for extended portions of the growing season at the same time each year), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 3.2 Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase.

Pathway 3.2a
Community 3.2 to 3.1

Prescribed grazing (alternating season of use and providing adequate recovery periods), extended periods of nonuse and no fire, or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the 3.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase.

Conservation practices

Prescribed Grazing

Pathway 3.2b
Community 3.2 to 3.3

Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season and often at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the 3.3 Annual/Pioneer, Non-Native Perennial Plant Community Phase.

Pathway 3.3a

Community 3.3 to 3.2

Prescribed grazing (alternating season of use and providing adequate recovery periods), extended periods of nonuse and no fire, or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the 3.2 Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase.

Conservation practices

Prescribed Grazing

Transition T1
State 1 to 2

Encroachment of non-native grasses such as Kentucky bluegrass and smooth bromegrass, and disruption of natural disturbance regimes such as periodic fire followed by short-term high intensity grazing would have led this plant community phase over a threshold to the Native/Invasive Grass State (State 2). This occurs as natural and/or management actions (altered grazing and/or fire regime) favored a decline in the composition of the native species and an increase in cool-season sod grasses. Chronic season-long or heavy continuous grazing facilitated this transition. Complete rest from grazing and no fire events could also have accelerated this transition.

Transition T4
State 1 to 3

Encroachment of highly competitive non-native species (e.g., Canada thistle, diffuse knapweed, leafy spurge, etc.), seeding with improved native or non-native forage species, or abandonment after cropping will shift any plant community to the 3.3 Annual/Pioneer, Non-Native Perennial Plant Community Phase within the Invaded Grass State (State 3).

Transition T4
State 2 to 3

Encroachment of highly competitive non-native species (e.g., Canada thistle, diffuse knapweed, leafy spurge, etc.), seeding with improved native or non-native forage species, or abandonment after cropping will shift any plant community to the 3.3 Annual/Pioneer, Non-Native Perennial Plant Community Phase within the Invaded Grass State (State 3).

Transition T2a
State 2 to 3

Non-use and no fire for extended periods of time (typically for 10 or more years) will likely lead this state over a threshold resulting in the 3.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase within the Invaded Grass State (State 3).

Transition T2b
State 2 to 3

Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season and often at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the 3.2 Kentucky Bluegrass/Smooth Bromegrass/Forbs Plant Community Phase in the 3 Invaded Grass State.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			981–1765	

1	**Wheatgrass**			981–1765	
	western wheatgrass	PASM	*Pascopyrum smithii*	981–1765	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–196	–
2	**Tall Warm-Season Grasses**			392–981	
	big bluestem	ANGE	*Andropogon gerardii*	392–981	–
	switchgrass	PAVI2	*Panicum virgatum*	39–314	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–196	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–196	–
3	**Cool-Season Bunchgrasses**			196–588	
	green needlegrass	NAVI4	*Nassella viridula*	196–588	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–196	–
	foxtail barley	HOJU	*Hordeum jubatum*	39–196	–
4	**Mid Warm-Season Grasses**			39–392	
	little bluestem	SCSC	*Schizachyrium scoparium*	39–314	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–196	–
5	**Short Warm-Season Grasses**			0–196	
	buffalograss	BODA2	*Bouteloua dactyloides*	0–196	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–196	–
	saltgrass	DISP	*Distichlis spicata*	0–118	–
6	**Other Native Grasses**			39–196	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–196	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	39–118	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–78	–
7	**Grass-likes**			39–196	
	sedge	CAREX	*Carex*	39–196	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–118	–
Forb					
8	**Forbs**			196–392	
	Forb, native	2FN	*Forb, native*	0–118	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	39–78	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	39–78	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	39–78	–
	false boneset	BREU	*Brickellia eupatorioides*	0–78	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–78	–
	common sunflower	HEAN3	*Helianthus annuus*	0–78	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	39–78	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	39–78	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	39–78	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	39–78	–
	goldenrod	SOLID	*Solidago*	39–78	–
	white heath aster	SYER	*Symphyotrichum ericoides*	39–78	–

	white heath aster	SYER	*Symphyotrichum ericoides*	39–78	–
	American vetch	VIAM	*Vicia americana*	39–78	–
	swamp verbena	VEHA2	*Verbena hastata*	0–39	–
	hoary verbena	VEST	*Verbena stricta*	0–39	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–39	–
	wild bergamot	MOFI	*Monarda fistulosa*	0–39	–
	northern bedstraw	GABO2	*Galium boreale*	0–39	–
	California cranesbill	GECA4	*Geranium californicum*	0–39	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–39	–
Shrub/Vine					
9	**Shrubs**			39–196	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–78	–
	leadplant	AMCA6	*Amorpha canescens*	39–78	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–78	–
	rose	ROSA5	*Rosa*	39–78	–
	snowberry	SYMPH	*Symphoricarpos*	39–78	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–39	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			908–1664	
	western wheatgrass	PASM	*Pascopyrum smithii*	908–1664	–
2	**Tall Warm-Season Grasses**			30–303	
	big bluestem	ANGE	*Andropogon gerardii*	30–242	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–182	–
	switchgrass	PAVI2	*Panicum virgatum*	0–121	–
3	**Cool-Season Bunchgrasses**			30–303	
	foxtail barley	HOJU	*Hordeum jubatum*	30–303	–
	green needlegrass	NAVI4	*Nassella viridula*	0–91	–
4	**Mid Warm-Season Grasses**			0–91	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–61	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–61	–
5	**Short Warm-Season Grasses**			0–151	
	saltgrass	DISP	*Distichlis spicata*	0–151	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–91	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–61	–
6	**Other Native Grasses**			30–151	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–151	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	30–61	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–30	–
7	**Grass-likes**			30–151	

	sedge	CAREX	*Carex*	30–151	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–91	–
8	**Non-Native Grasses**			151–605	
	Kentucky bluegrass	POPR	*Poa pratensis*	151–454	–
	brome	BROMU	*Bromus*	0–212	–
	smooth brome	BRIN2	*Bromus inermis*	0–151	–
Forb					
9	**Forbs**			151–303	
	Forb, introduced	2FI	*Forb, introduced*	0–121	–
	sweetclover	MELIL	*Melilotus*	0–121	–
	Forb, native	2FN	*Forb, native*	0–91	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	30–91	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–91	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	30–91	–
	Canada thistle	CIAR4	*Cirsium arvense*	0–61	–
	common sunflower	HEAN3	*Helianthus annuus*	0–61	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–61	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	30–61	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	30–61	–
	goldenrod	SOLID	*Solidago*	30–61	–
	white heath aster	SYER	*Symphyotrichum ericoides*	30–61	–
	hoary verbena	VEST	*Verbena stricta*	0–61	–
	American vetch	VIAM	*Vicia americana*	0–30	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–30	–
	curly dock	RUCR	*Rumex crispus*	0–30	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–30	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–30	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–30	–
Shrub/Vine					
10	**Shrubs**			30–151	
	snowberry	SYMPH	*Symphoricarpos*	30–91	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–61	–
	rose	ROSA5	*Rosa*	30–61	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–61	–
	leadplant	AMCA6	*Amorpha canescens*	0–30	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–30	–

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			74–555	
	western wheatgrass	PASM	*Pascopyrum smithii*	74–555	–
2	**Tall Warm-Season Grasses**			0–74	

	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–74	–
	big bluestem	ANGE	*Andropogon gerardii*	0–37	–
3	**Cool-Season Bunchgrasses**			37–185	
	foxtail barley	HOJU	*Hordeum jubatum*	37–185	–
	green needlegrass	NAVI4	*Nassella viridula*	0–185	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–111	–
4	**Short Warm-Season Grasses**			0–37	
	saltgrass	DISP	*Distichlis spicata*	0–37	–
5	**Other Native Grasses**			0–185	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–185	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–37	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–37	–
6	**Grass-likes**			0–111	
	sedge	CAREX	*Carex*	0–111	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–74	–
7	**Non-Native Grasses**			1480–2959	
	smooth brome	BRIN2	*Bromus inermis*	740–2589	–
	Kentucky bluegrass	POPR	*Poa pratensis*	370–1110	–
	brome	BROMU	*Bromus*	0–185	–
Forb					
8	**Forbs**			37–296	
	sweetclover	MELIL	*Melilotus*	0–259	–
	Canada thistle	CIAR4	*Cirsium arvense*	0–148	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	37–111	–
	burningbush	BASC5	*Bassia scoparia*	0–111	–
	Forb, introduced	2FI	*Forb, introduced*	0–111	–
	curly dock	RUCR	*Rumex crispus*	0–111	–
	Forb, native	2FN	*Forb, native*	0–74	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	37–74	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–74	–
	hoary verbena	VEST	*Verbena stricta*	0–74	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–37	–
	goldenrod	SOLID	*Solidago*	0–37	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–37	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–37	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–37	–
Shrub/Vine					
9	**Shrubs**			37–222	
	snowberry	SYMPH	*Symphoricarpos*	37–185	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–111	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–37	–

	rose	ROSA5	*Rosa*	0–37	–

Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			47–471	
	western wheatgrass	PASM	*Pascopyrum smithii*	47–471	–
2	**Tall Warm-Season Grasses**			0–118	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–118	–
	big bluestem	ANGE	*Andropogon gerardii*	0–71	–
3	**Cool-Season Bunchgrasses**			47–353	
	foxtail barley	HOJU	*Hordeum jubatum*	47–353	–
	green needlegrass	NAVI4	*Nassella viridula*	0–47	–
4	**Short Warm-Season Grasses**			0–118	
	saltgrass	DISP	*Distichlis spicata*	0–118	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–71	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–24	–
5	**Other Native Grasses**			0–118	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–118	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–24	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–24	–
6	**Grass-likes**			24–118	
	sedge	CAREX	*Carex*	24–118	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–71	–
7	**Non-Native Grasses**			471–1059	
	Kentucky bluegrass	POPR	*Poa pratensis*	353–942	–
	smooth brome	BRIN2	*Bromus inermis*	118–588	–
	brome	BROMU	*Bromus*	24–353	–
Forb					
8	**Forbs**			118–353	
	burningbush	BASC5	*Bassia scoparia*	0–235	–
	sweetclover	MELIL	*Melilotus*	0–235	–
	Forb, introduced	2FI	*Forb, introduced*	0–165	–
	Arizona thistle	CIAR3	*Cirsium arizonicum*	0–141	–
	common sunflower	HEAN3	*Helianthus annuus*	0–94	–
	curly dock	RUCR	*Rumex crispus*	0–94	–
	goldenrod	SOLID	*Solidago*	24–71	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	24–71	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	24–71	–
	Forb, native	2FN	*Forb, native*	0–47	–
	white heath aster	SYER	*Symphyotrichum ericoides*	24–47	–

	hoary verbena	VEST	*Verbena stricta*	0–47	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–24	–
Shrub/Vine					
9	**Shrubs**			24–118	
	snowberry	SYMPH	*Symphoricarpos*	24–71	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–47	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–24	–
	rose	ROSA5	*Rosa*	0–24	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–24	–

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 ES 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/Bluestem/Needlegrass (1.1 & 2.1)
Average Annual Production (lbs./acre, air-dry): 3,500
Stocking Rate* (AUM/acre): 0.96

Western Wheatgrass/Kentucky Bluegrass (2.2)
Average Annual Production (lbs./acre, air-dry): 2,700
Stocking Rate* (AUM/acre): 0.74

Smooth Bromegrass/Kentucky Bluegrass (3.1)
Average Annual Production (lbs./acre, air-dry): 3,300
Stocking Rate* (AUM/acre): 0.90

Kentucky Bluegrass/Smooth Bromegrass/Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 2,100
Stocking Rate* (AUM/acre): 0.58

Annual/Pioneer, Non-Native Perennial (4.3)
Average Annual Production (lbs./acre, air-dry): 1,000
Stocking Rate* (AUM/acre): 0.27

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (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

groups D, with localized areas in hydrologic group C. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS.

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://www.hprcc.unl.edu/)
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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USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (http://nasis.nrcs.usda.gov)
USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Contributors

Stan Boltz

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	12/07/2004
Approved by	Stan Boltz

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.

2. **Presence of water flow patterns:** Barely observable.

3. **Number and height of erosional pedestals or terracettes:** Essentially, non-existent.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than five percent and less than two inches in diameter.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not 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):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class usually 6. Typically high root content, organic matter, and granular structure. Soil surface is very resistant to erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be evident.

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: Tall warm-season grasses > mid and tall cool-season bunchgrasses >

Other: Mid warm-season grasses = forbs > short warm-season grasses = grass-likes = shrubs = short cool-season grasses.

Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth bromegrass do not fit into reference plant community F/S groups.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality.

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14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,600–4,400 lbs./acre air-dry weight, average 3,500 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:** Refer to State and Local Noxious Weed List, also Kentucky bluegrass, smooth bromegrass.

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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
