USDA Natural Resources Conservation Service

Ecological site R066XY054NE
Sandy 22-25 P.Z.

Accessed: 05/19/2024

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

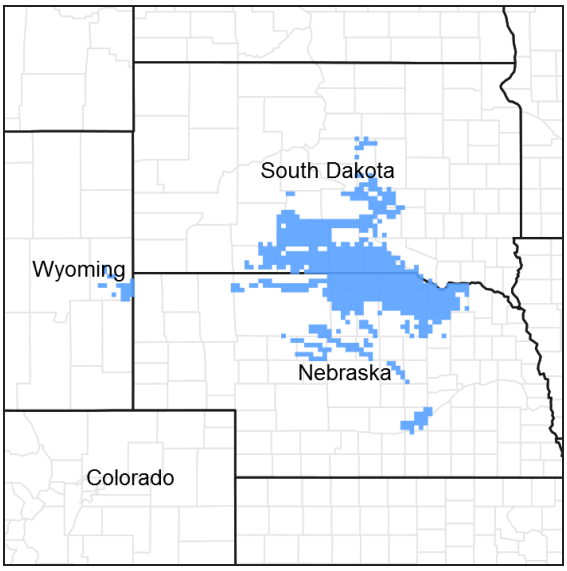


Figure 1. Mapped extent

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: 43i Keya Paha Tablelands.

Associated sites

R066XY032NE	**Sandy 18-22" P.Z.** Sandy 18-22" P.Z.
R066XY046NE	**Subirrigated** Subirrigated
R066XY055NE	**Sands 22-25 P.Z.** Sands 22-25" P.Z.
R066XY062NE	**Shallow To Gravel** Shallow to Gravel

Similar sites

R066XY055NE	**Sands 22-25 P.Z.** Sands 22-25" P.Z. (steeper slope; lower production; sand bluestem dominant; less little bluestem)

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on tablelands, ancient high terraces, interdunes of uplands and on the sides of valleys.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Hill (3) Interdune
Elevation	579–914 m
Slope	0–15%
Ponding depth	0 cm
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 66 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 the winds move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 22 to 25 inches per year. The normal average annual temperature is about 48° F. January is the coldest month with average temperatures ranging from about 19° F (Bonesteel, SD) to about 23° F (Ainsworth, NE). July is the warmest month with temperatures averaging from about 74° F (Lynch, NE) to about 75° F (Gregory, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 54° F. This large annual range attests to the continental nature of this area's climate. Hourly winds average about 10 miles per hour annually, ranging from about 11 miles per hour during the spring to about 9 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 native cool season plants begins mid to late March and continues to late June. Native warm season plants begin growth in early May and continue to late August. 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)	154 days
Freeze-free period (average)	173 days
Precipitation total (average)	635 mm

Influencing water features

No significant water features influence this site.

Soil features

The features common to all soils in this site are the loam to fine sand textured surface layers and slopes of 0 to 15

percent. The soils in this site are from well drained to excessively drained. They formed primarily in eolian deposits, sandy and gravelly alluvium, and material weathered from petrocalcic horizons. Pivot soils are formed in sandy and gravelly alluvium. O'Neill soils formed in loamy material over sandy and gravelly alluvium. Anselmo soils formed in mixed loamy and sandy eolian material. Dunday soils formed in eolian sands. Brunswick, Duda, Holt, and Ronson soils formed in material weathered from petrocalcic horizons. McKelvie soils formed in eolian sands and sandy material weathered from petrocalcic horizons. The surface layer is 3 to 19 inches thick. The texture of the control section generally ranges from loam to fine sand. This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are not restrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 10 percent.

More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Loamy fine sand (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderate to rapid
Soil depth	51–203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–55%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

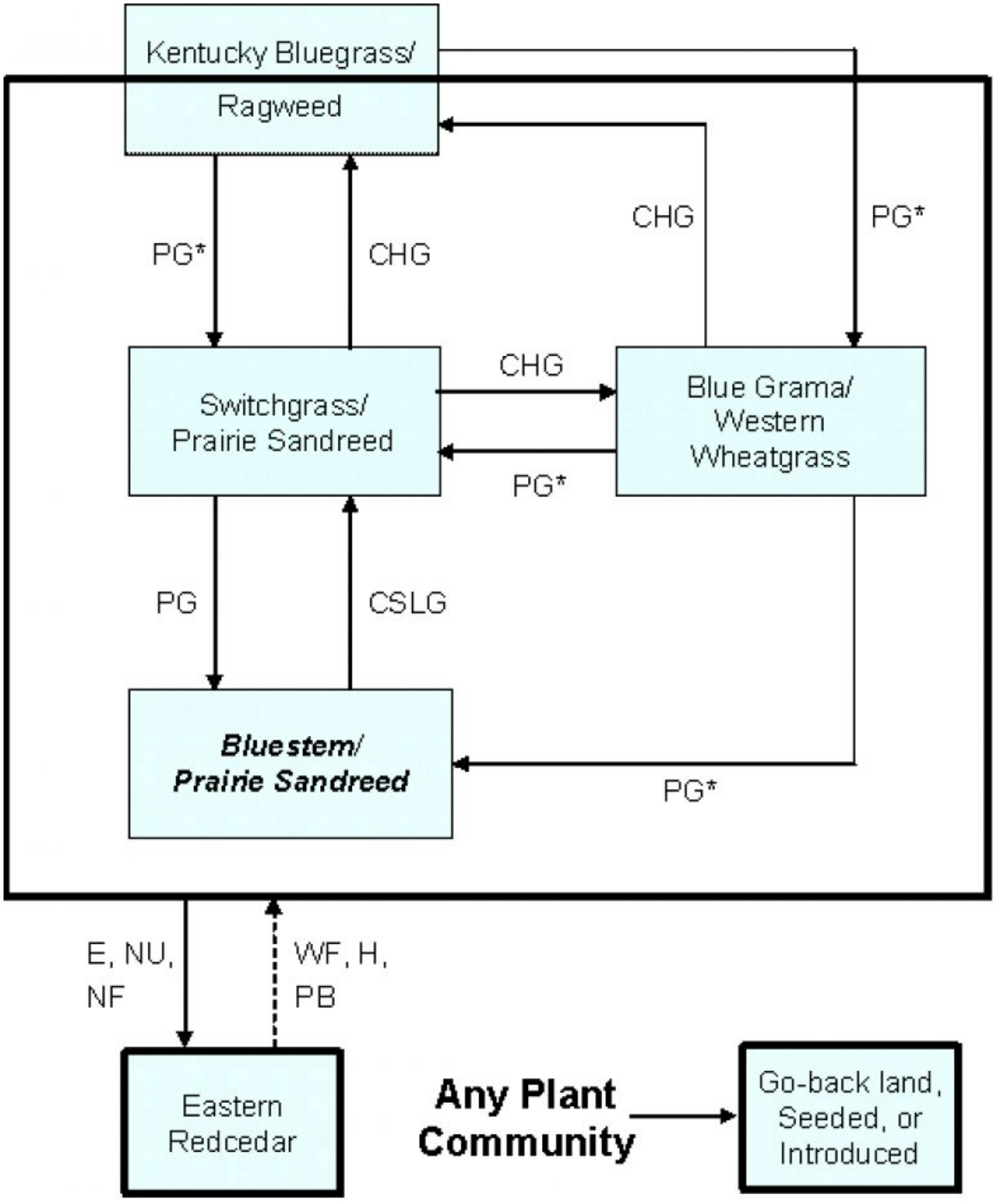
Historically, large areas of blowing sand resulted in the active movement of the sand dunes. Evaporation from the soil surface was extremely high due to the large areas of bare ground, lack of litter, and sparse plant populations. The transpiration rate of these sparse plant populations was also high due to the harsh soil environment. Occasional wild fires, severe grazing by transient bison herds, and drought contributed to the lack of stability of the sand dunes. This lack of stability caused the dunes to go back and forth through multiple stages of plant succession over the course of time. Early perennial plants such as sandhill muhly, blowout grass and blowout penstemon were common due to their ability to tolerate the movement of the sand and droughty conditions. As these plants began to colonize and stabilize the sand movement, other perennials such as prairie sandreed, sand bluestem, hairy grama, lemon scurfpea, and rose slowly became evident on the site. Annual plants such as sandbur, Texas croton, and

annual sunflower eventually colonized the areas between the perennials.

As this site deteriorates, species such as prairie sandreed, little bluestem, sand dropseed, and blue grama will increase initially. Species such as sand and/or big bluestem, switchgrass, and Indiangrass will decrease in frequency and production. With continued improper management, prairie sandreed and little bluestem will also decrease. The site is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought resistance.
Interpretations are primarily based on the Bluestem/Prairie Sandreed 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. Subclimax 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



CHG - continuous heavy grazing; **CSLG -** continuous season-long grazing; **E** - Encroachment; **H** - Harvest; **NF** - No fire; **NU** - Non-use; **PB** - Prescribed burning; **PG** - prescribed grazing w/ adequate recovery period; **WF** - Wildfire; *If tall warm-season grass remnants are present

State 1
Bluestem/Prairie Sandreed Plant Community

Community 1.1
Bluestem/Prairie Sandreed Plant Community

Interpretations are primarily based on the Bluestem/Prairie Sandreed Plant Community. The site evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. This plant community can be found on areas that are properly managed. The potential vegetation is about 85% grasses or grass-like plants, 10% forbs, and 5% shrubs. Warm-season mid and tall grasses dominate this plant community. Principal grasses are prairie sandreed, sand bluestem, big bluestem, and little bluestem. The cool season grasses, needleandthread, and western wheatgrass are important. Grama grasses and sedges occur as an understory. Forbs and shrubs are not abundant. Natural fire played a significant role in the succession of this site by limiting eastern redcedar from becoming established. Wildfires have been actively controlled in recent times, allowing occasional eastern redcedar encroachment. The diversity in plant species allows for high drought tolerance. This is a healthy and sustainable plant community (site/soil stability, watershed function, and biologic integrity). The following growth curve shows the estimated monthly percentages of total annual growth of the dominant species expected during a normal year: Growth curve number: NE6637 Growth curve name: Eroded Tableland, warm-season dominant, cool-season sub-dominant. Growth curve description: Warm-season dominant, cool-season sub-dominant. Transitional pathways and/or community pathways leading to other plant communities are as follows: Continuous season-long grazing will convert the plant community to the Switchgrass/Prairie Sandreed Plant Community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2387	3009	3385
Forb	163	252	364
Shrub/Vine	28	101	174
Total	**2578**	**3362**	**3923**

Figure 5. Plant community growth curve (percent production by month). NE6637, Eroded Tableland, warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	8	15	24	23	15	5	5		

State 2
Switchgrass/Prairie Sandreed Plant Community

State 3
Blue Grama/Western Wheatgrass Plant Community

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Bluestem**			673–1177	
	sand bluestem	ANHA	*Andropogon hallii*	673–1177	–
	big bluestem	ANGE	*Andropogon gerardii*	0–336	–
2	**Prairie Sandreed**			504–841	

	prairie sandreed	CALO	*Calamovilfa longifolia*	504–841	–
3	**Little Bluestem**			504–841	
	little bluestem	SCSC	*Schizachyrium scoparium*	504–841	–
4	**Needlegrass**			168–504	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	168–336	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–168	–
5	**Grama**			101–336	
	blue grama	BOGR2	*Bouteloua gracilis*	101–336	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–168	–
6	**Other Warm-Season Grasses**			504–1009	
	switchgrass	PAVI2	*Panicum virgatum*	336–673	–
	Indiangrass	SONU2	*Sorghastrum nutans*	168–504	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–168	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–168	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–168	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–168	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	0–101	–
7	**Native Grass/Grass-Likes**			168–336	
	sedge	CAREX	*Carex*	34–168	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	34–168	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	34–168	–
	western wheatgrass	PASM	*Pascopyrum smithii*	34–168	–
	Grass, perennial	2GP	*Grass, perennial*	0–67	–
Forb					
9	**Forbs**			168–336	
	white heath aster	SYER	*Symphyotrichum ericoides*	0–67	–
	Forb, perennial	2FP	*Forb, perennial*	0–67	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–67	–
	blazing star	LIATR	*Liatris*	0–67	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–34	–
	beardtongue	PENST	*Penstemon*	0–34	–
	scurfpea	PSORA2	*Psoralidium*	0–34	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–34	–
	goldenrod	SOLID	*Solidago*	0–34	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–34	–
	thistle	CIRSI	*Cirsium*	0–34	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–34	–
	spiderwort	TRADE	*Tradescantia*	0–34	–
	vervain	VERBE	*Verbena*	0–34	–
	Forb, annual	2FA	*Forb, annual*	0–34	–
Shrub/Vine					
10	**Shrubs**			34–168	
	Shrub (> 5m)	2SHRUB	*Shrub (> 5m)*	34–101	–

	Shrub (>1.0m)	2SHRUB	*Shrub (>1.0m)*	0–101	–
	leadplant	AMCA6	*Amorpha canescens*	0–101	–
	rose	ROSA5	*Rosa*	0–67	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–34	–

Animal community

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide year-long 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 well drained portions of this site. Soils on this site are in Hydrologic Soil Group A and B. Some areas have high water tables. On well drained portions of this site, infiltration potential is high. On well drained areas, significant runoff is expected to occur only during intense storms (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

For the interpretive plant community, rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present in well drained areas. Pedestals are only slightly present in association with bunchgrasses such as little bluestem. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present but only cover 1-2% of the soil surface. Overall this site has the appearance of being extremely stable and productive.

Recreational uses

This site provides hunting opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

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: Wayne Bachman, Soil Scientist, NRCS; Stan Boltz, Range Management Specialist, NRCS; Anna Ferguson, Soil Conservationist, NRCS; Roger Hammer, Soil Scientist, NRCS; Dana Larsen, Range Management Specialist, NRCS; Dave Schmidt, Rangeland Management Specialist, NRCS; Kim Stine, Rangeland Management Specialist, NRCS.

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://hpccsun.unl.edu)

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://wcc.nrcs.usda.gov)
USDA, NRCS. National Range and Pasture Handbook, September 1997

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, 2002. National Soil Survey Handbook, title 430-VI. (http://soils.usda.gov/procedures/handbook/main.htm)

Contributors

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Rangeland health reference sheet

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

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Date	08/01/2006
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:** Typically non-existent, but steeper areas may have limited pedastalling of bunchgrasses. No exposed roots should be present.

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 6 to 20 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular at least 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.

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: Tall warm-season rhizomatous grasses >>

    Sub-dominant: Mid, warm-season bunchgrasses >

    Other: Mid, cool-season grasses = short, warm-season grasses = forbs > grass-like species = shrubs

    Additional: Other grasses in other functional groups occur in minor amounts.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

14. **Average percent litter cover (%) and depth (in):** Litter cover typically 50 to 70 percent, with depth 0.25 to 0.5 inches.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 2,300 to 3,500 pounds/acre, with the reference value being 3,000 pounds/acre (air-dry basis).

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.

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.