USDA Natural Resources Conservation Service

Ecological site R066XY055NE
Sands 22-25 P.Z.

Accessed: 05/20/2024

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.

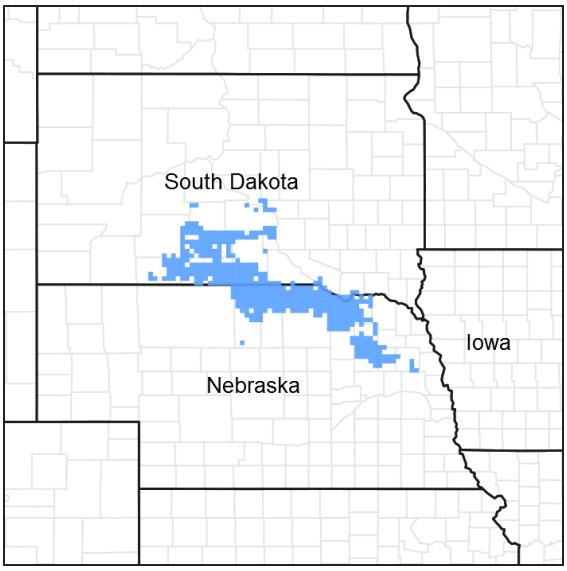


Figure 1. Mapped extent

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; 44a - Nebraska Sand Hills.

Associated sites

R065XY024NE	**Subirrigated** Subirrigated
R065XY032NE	**Sandy Medium P.Z. 17-22** Sandy 17-22" P.Z.
R065XY041NE	**Shallow To Gravel** Shallow to Gravel 17-25" P.Z.
R066XY056NE	**Choppy Sands** Choppy Sands

Similar sites

R065XY032NE	**Sandy Medium P.Z. 17-22** Sandy 17-22" P.Z. (slope not as steep; higher production; prairie sandreed dominant)

R065XY034NE	**Choppy Sands Medium P.Z. 17-22** Choppy Sands 17-22" P.Z. (steeper slope; lower production; blowout grass present; shrubs more evident)

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Dune
Elevation	792–1,219 m
Slope	3–24%
Ponding depth	0 cm
Water table depth	0 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

None noted.

Soil features

The features common to all soils in this site are the sandy textured surface soils and slopes of 3 to 24 percent. The

soils in this site are excessively drained and formed in eolian sand. The surface layer is 2 to 9 inches thick. The subsurface texture ranges from loamy fine sand to fine sand. Runoff as evidenced by patterns of rill, gully or other water flow is low to very low due to the very high intake rate of these soils. Cryptobiotic crusts are present, but their function is not well understood. Some pedestalling of plants occurs, but it is not very evident on casual observation and occurs on less than 5% of the plants.

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 sand (2) Loamy fine sand (3) Sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	2%
Subsurface fragment volume >3" (Depth not specified)	0%

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 native plants such as sandbur, woolly Indianwheat, annual eriogonum, and annual sunflower eventually colonized the areas between the perennials.

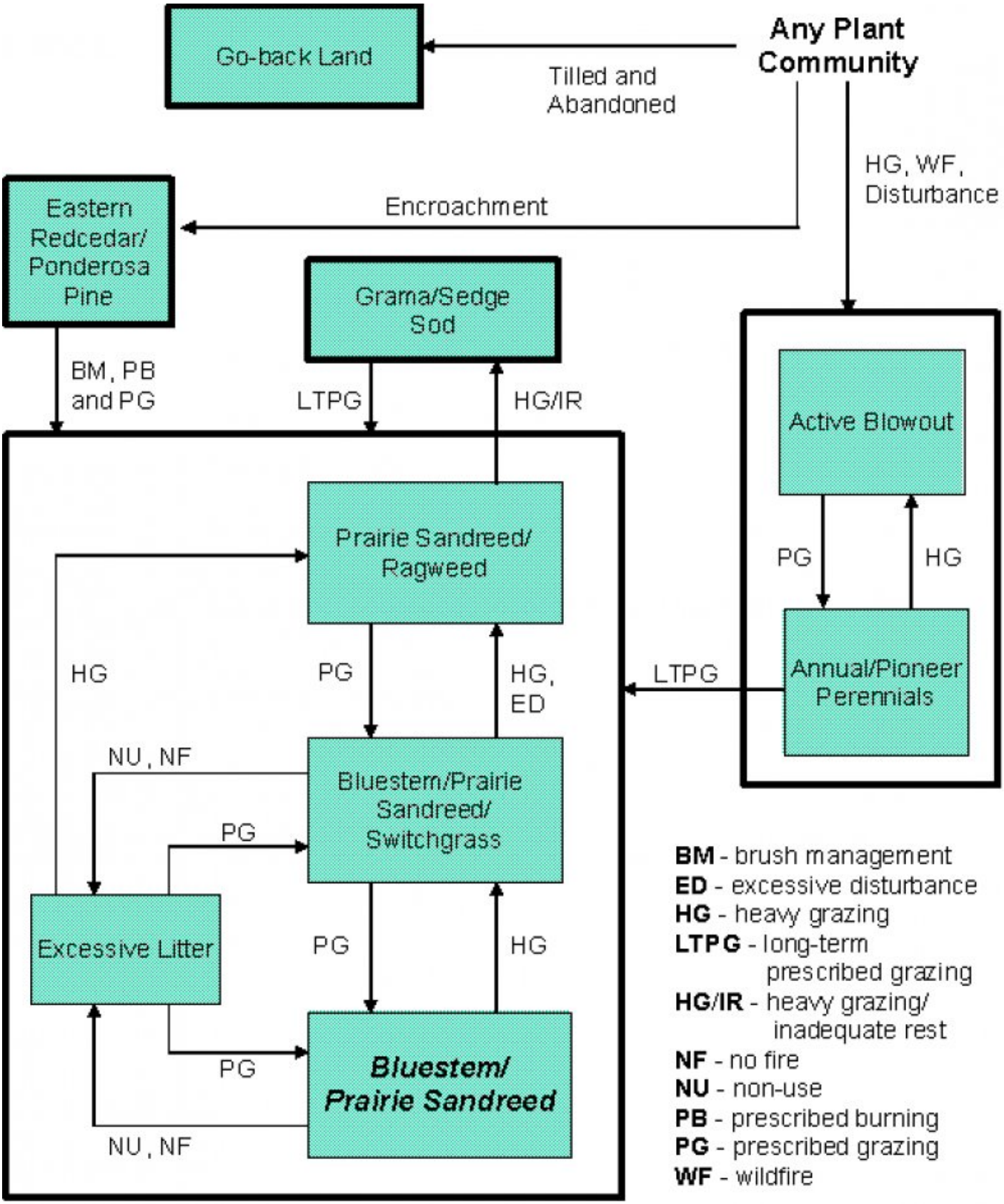
As this site deteriorates, prairie sandreed, sand dropseed, and blue grama will increase. Species such as sand bluestem and switchgrass will decrease in frequency and production. The site is extremely resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant 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



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. This 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 with grazing and/or prescribed burning, and sometimes on areas receiving occasional periods of rest. This plant community consists chiefly of tall and mid warm season grasses. Principle dominants are sand bluestem, prairie sandreed, and little bluestem. Grasses of secondary importance are Indiangrass, needlegrasses, switchgrass, sand lovegrass, and hairy or blue grama. Sedges occur in the understory. Forbs and shrubs such as gayfeather, stiff sunflower, leadplant, rose, and sandcherry are significant. This plant community is about 85% grasses, 10% forbs, and 5% shrubs by weight. This plant community is extremely resilient and well adapted to the Northern Great Plains climatic conditions. This is a sustainable plant community in terms of site/soil stability, watershed function, and biologic integrity. Plant litter is properly distributed with some movement off-site and natural plant mortality is low. The diversity in plant species allows for high drought tolerance. Moderate or high available water capacity provides a favorable soil-water-plant relationship. 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: NE6634 Growth curve name: Nebraska/South Dakota Sandhills, Native Grasslands Growth curve description: Warm-season dominant, cool-season subdominant, mid & tall grasses. Transitional pathways and/or community pathways leading to other plant communities are as follows: Heavy grazing (usually including improper rest periods) will convert this plant community to the Bluestem/Prairie Sandreed/Switchgrass Plant Community. Continuous heavy grazing tends to accelerate this movement. Non-use and no fire can convert this plant community to the Excessive Litter Plant Community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1950	2809	3312
Forb	151	235	336
Shrub/Vine	28	94	163
Total	**2129**	**3138**	**3811**

Figure 5. Plant community growth curve (percent production by month). NE6534, NE/SD Sandhills, Native Grasslands. Warm-season dominant, cool-season subdominant, mid- and tallgrasses.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	5	15	25	30	10	7	3		

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	**Sand Bluestem**			785–1255	
	sand bluestem	ANHA	*Andropogon hallii*	785–1255	–
2	**Prairie Sandreed**			471–942	
	prairie sandreed	CALO	*Calamovilfa longifolia*	471–942	–
3	**Little Bluestem**			471–785	
	little bluestem	SCSC	*Schizachyrium scoparium*	471–785	–
4	**Needlegrass**			157–314	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	157–314	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	157–314	–
5	**Grama**			31–314	
	blue grama	BOGR2	*Bouteloua gracilis*	31–314	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	31–157	–
6	**Other Warm-Season Grasses**			471–942	

	switchgrass	PAVI2	*Panicum virgatum*	157–628	–
	Indiangrass	SONU2	*Sorghastrum nutans*	157–471	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	157–471	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–126	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–94	–
7	**Native Grass/Grass-Likes**			94–251	
	sedge	CAREX	*Carex*	31–157	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	31–157	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	31–157	–
	Grass, perennial	2GP	*Grass, perennial*	0–63	–
Forb					
9	**Forbs**			157–314	
	scurfpea	PSORA2	*Psoralidium*	0–94	–
	goldenrod	SOLID	*Solidago*	0–63	–
	Forb, perennial	2FP	*Forb, perennial*	0–63	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–63	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–63	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–63	–
	blazing star	LIATR	*Liatris*	0–63	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–31	–
	beardtongue	PENST	*Penstemon*	0–31	–
	thistle	CIRSI	*Cirsium*	0–31	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–31	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–31	–
	spiderwort	TRADE	*Tradescantia*	0–31	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–31	–
Shrub/Vine					
10	**Shrubs**			31–157	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	31–94	–
	leadplant	AMCA6	*Amorpha canescens*	31–94	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	31–94	–
	rose	ROSA5	*Rosa*	31–94	–
	American plum	PRAM	*Prunus americana*	0–63	–
	soapweed yucca	YUGL	*Yucca glauca*	0–31	–
	pricklypear	OPUNT	*Opuntia*	0–31	–

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 this site. Normal rainfall is 18-25 inches per year. Valentine soils on this site are in Hydrologic Soil Group A (low runoff and high infiltration even when thoroughly wetted). Water transmission through Group A soils is normally greater than 0.30 inches per hour. Runoff is expected to occur only during the most intense storms (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

For the Bluestem/Prairie Sandreed Plant Community, rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. 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 very 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.

Wood products

No appreciable wood products are present on the 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.

There are 14 SCS-RANGE-417 records from Cherry, Garden, Keith, Lincoln, Sheridan, and Thomas counties in Nebraska. The sample period was from 1968 to 1983.

Other references

Other references used include: USDA NRCS Water & Climate Center, USDA NRCS National Range and Pasture Handbook, USDA NRCS Soil Surveys from various counties, Atlas of the Sandhills.

Contributors

Dana Larsen

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	Stan Boltz, stanley.boltz@sd.usda.gov, 605-352-1236
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.

3. **Number and height of erosional pedestals or terracettes:** Bunchgrasses may be pedestalled, but 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):** Bare ground typically less than 15 percent. Occasional small blowouts may occur immediately adjacent to areas receiving repeated disturbance, but areas should be few and typically not greater than a few feet 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:** Occasional areas associated with increased animal activity (e.g., rodent burrows, animal trailing) may exhibit small wind scoured areas, typically less than 10 feet in diameter.

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):** Some series on this site typically have little organic matter in the surface horizon, and the structure is single grain sand. Soil aggregate stability will be difficult to measure on these soils. Surface organic matter should still adhere to the soil surface. Surface erosion by water rarely occurs due to rapid infiltration, but surface is susceptible to wind erosion if vegetative cover is reduced due to drought or heavy grazing. Biological crusts are often present (up to 10% of the surface) and serve to provide resistance to erosion. The dominant rhizomatous warm-season species are adapted to these coarse soils and when vigorous are vital in preventing erosion by wind.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 2 to 8 inches thick. Some soils have little organic matter in the A-horizon and dark grayish brown colors when moist, but possibly not mollic. Structure can be single grain to fine granular parting to single grain in the 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. Infiltration is typically high due to the coarse nature of these soils.

---

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 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: Tall, warm-season grasses >>

    Sub-dominant: Mid, warm-season grasses >

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

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

---

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.

---

14. **Average percent litter cover (%) and depth (in):** 40-60 percent plant litter cover, roughly 0.25 to 0.5 inches in depth. Litter cover is in contact with the soil surface.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 1,900 to 3,400 pounds/acre, with the reference value being 2,800 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:** Refer to State and local Noxious Weed List.

---

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.
