USDA Natural Resources Conservation Service

Ecological site R066XY058NE
Loamy 22-25 P.Z.

Accessed: 04/25/2024

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.

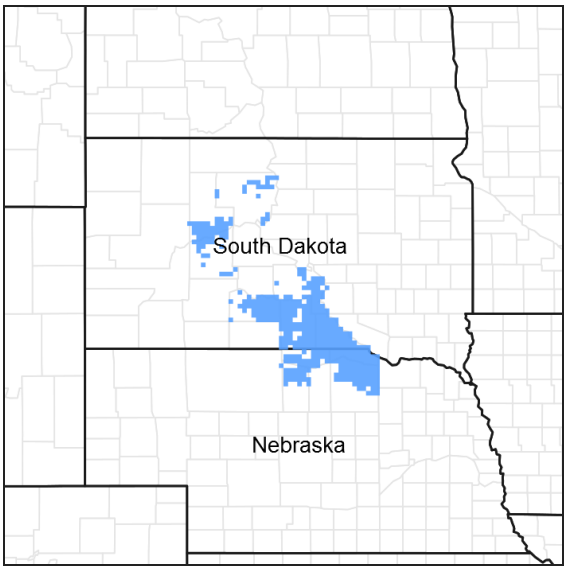


Figure 1. Mapped extent

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

This site has been correlated with South Dakota and Nebraska in MLRA 66.

Associated sites

R066XY026NE	**Loamy Overflow** Loamy Overflow
R066XY054NE	**Sandy 22-25 P.Z.** Sandy 22-25” P.Z.
R066XY062NE	**Shallow To Gravel** Shallow to Gravel
R066XY066NE	**Loamy Terrace** Thin Upland

Similar sites

R066XY026NE	**Loamy Overflow** Loamy Overflow [big bluestem dominant; occurs in concave positions; more productive]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Hesperostipa comata ssp. comata*

Physiographic features

This site occurs on gently undulating to moderately steep rolling plains and low hills.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Terrace (3) Hill
Elevation	1,900–3,000 ft
Slope	0–30%
Water table depth	80 in
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)	25 in

Influencing water features

No significant water features influence this site.

Soil features

The features common to soils of this site are the silt loam to fine sandy loam textured surface layers and slopes of 0

to 30 percent. These well drained soils formed primarily in eolian deposits. The surface layer is 7 to 20 inches thick. The texture of the soil subsurface generally ranges from clay loam to fine sandy loam. This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are broken should not be distinguishable, and litter should fall and mainly remain in place. 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) Loam (2) Fine sandy loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	40–80 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6–8 in
Calcium carbonate equivalent (0-40in)	0–20%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–55%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

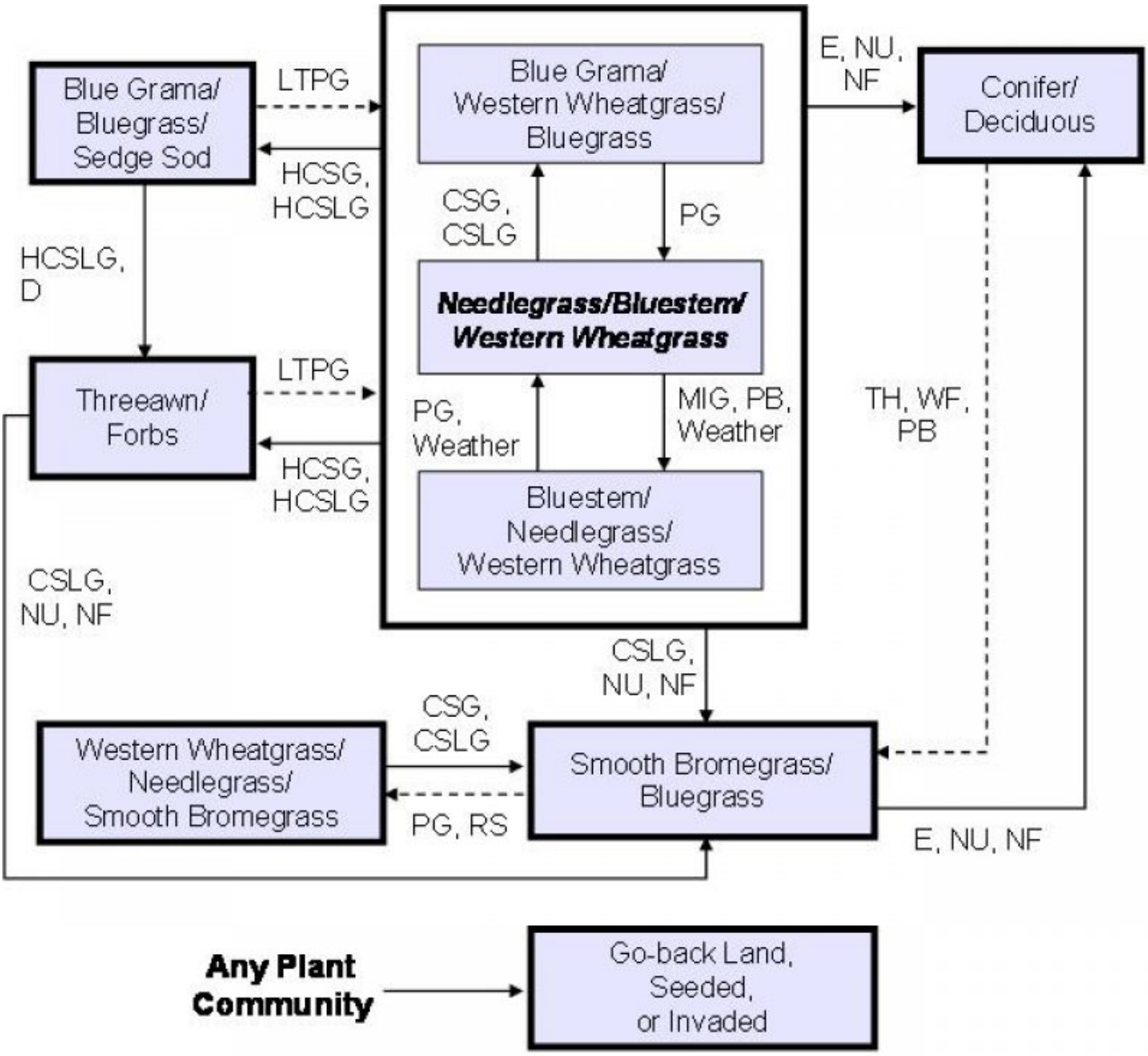
This plant community developed under Northern Great Plains climatic conditions, and included natural influence of large herbivores and occasional fire. Changes will occur in the plant communities due to management actions and/or climatic conditions.

Natural fire played a significant role in the maintenance of this site by limiting conifer establishment. The recent control of fire and the increased seed source from shelterbelts results in occasional encroachment by Juniperus species and/or ponderosa pine.

The plant community upon which interpretations are primarily based is the Needlegrass/Bluestem/Western Wheatgrass Plant Community. This plant community has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas managed 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.

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



CSG – Continuous seasonal grazing; **CSLG** – Continuous season-long grazing; **D** – Defoliation (rodents, insects, etc.); **E** – Encroachment or escaped; **HCSG** – Heavy continuous seasonal grazing; **HCSLG** – Heavy continuous season-long grazing; **LTPG** – Long-term prescribed grazing; **MIG** – Management intensive grazing; **NF** – No fire; **NU** – Non-use; **PB** – Prescribed burning; **PG** – Prescribed grazing; **RS** – Range seeding; **TH** – Timber harvest; **WF** – Wildfire; **- - - - - -** Denotes long term or use of accelerating practices.

State 1
Needlegrass/Bluestem/Western Wheatgrass Plant Community

Community 1.1
Needlegrass/Bluestem/Western Wheatgrass Plant Community

Interpretations are primarily based on the Needlegrass/Bluestem/Western Wheatgrass Plant Community, which is also considered climax. The site evolved with grazing by large herbivores and occasional fire. The potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% shrubs. This plant community is dominated by mid and tall cool-season grasses. Warm season mid and tall grasses are sub-dominant. Principal grasses are green needlegrass, big bluestem, needleandthread, western wheatgrass, little bluestem, porcupine grass and sideoats grama. Grama grasses and sedges occur as an understory. Common forbs include cudweed sagewort, dotted gayfeather, prairie coneflower, goldenrod and green sagewort. Leadplant and rose are common shrubs, with western snowberry occurring in patches across the site. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle and energy flow are functioning at the sites potential. Plant litter is evenly distributed with little movement and plant mortality is low. This plant community is highly drought tolerant due to factors such as high species diversity, varied root structures, and high soil quality. Transitional pathways and/or community pathways leading to other plant communities are as follows: - Continuous season-long grazing or continuous seasonal grazing (grazing at the same time of year every year) will convert the plant community to the Blue Grama/Western Wheatgrass/Bluegrass Plant Community. - Management intensive grazing, prescribed spring burning with managed grazing, or favorable weather patterns (above average summer precipitation) will shift this plant community to the Bluestem/Needlegrass/Western Wheatgrass Plant Community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1600	2635	3550
Shrub/Vine	150	233	325
Forb	150	233	325
Total	**1900**	**3101**	**4200**

Figure 5. Plant community growth curve (percent production by month). NE6635, Eroded Tableland, cool-season dominant, warm-season subdominant.

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

State 2
Conifer/Deciduous Plant Community

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrasses**			465–2790	
	green needlegrass	NAVI4	*Nassella viridula*	310–930	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	155–465	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	62–310	–
2	**Tall Warm-Season Grasses**			310–620	
	big bluestem	ANGE	*Andropogon gerardii*	155–620	–

	switchgrass	PAVI2	*Panicum virgatum*	0–310	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–310	–
3	**Rhizomatous Wheatgrass**			155–465	
	western wheatgrass	PASM	*Pascopyrum smithii*	155–465	–
4	**Mid Warm-Season Grasses**			155–465	
	little bluestem	SCSC	*Schizachyrium scoparium*	155–465	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	62–310	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–155	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–155	–
5	**Short Warm-Season Grasses**			62–217	
	blue grama	BOGR2	*Bouteloua gracilis*	62–217	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–155	–
6	**Other Native Grasses**			31–155	
	Grass, perennial	2GP	*Grass, perennial*	0–93	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	31–93	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–62	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–62	–
7	**Grass-Likes**			62–248	
	threadleaf sedge	CAFI	*Carex filifolia*	62–248	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–155	–
Forb					
9	**Forbs**			155–310	
	Forb, native	2FN	*Forb, native*	0–155	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	31–93	–
	tarragon	ARDR4	*Artemisia dracunculus*	31–93	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	31–93	–
	goldenrod	SOLID	*Solidago*	31–93	–
	dotted blazing star	LIPU	*Liatris punctata*	31–93	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–93	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	31–93	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–62	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	31–62	–
	white heath aster	SYER	*Symphyotrichum ericoides*	31–62	–
	large Indian breadroot	PEES	*Pediomelum esculentum*	0–62	–
	beardtongue	PENST	*Penstemon*	0–62	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	31–62	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–62	–
	false boneset	BREU	*Brickellia eupatorioides*	31–62	–
	prairie clover	DALEA	*Dalea*	31–62	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–62	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–62	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–62	–

	scarlet beeblossom	GACO5	*Gaura coccinea*	0–31	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–31	–
	prairie groundsel	PAPL12	*Packera plattensis*	0–31	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–31	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–31	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–31	–
Shrub/Vine					
10	**Shrubs**			155–310	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	31–155	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–155	–
	leadplant	AMCA6	*Amorpha canescens*	62–155	–
	prairie sagewort	ARFR4	*Artemisia frigida*	31–93	–
	rose	ROSA5	*Rosa*	31–93	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–62	–

Animal community

As this site improves in condition through proper management (from the more shortgrass dominated plant communities to the Needlegrass/Bluestem/Western Wheatgrass Plant Community), the advantage for livestock production includes: higher forage production from cool season grasses, improved early spring forage production and higher water infiltration. The disadvantage for livestock include: reduction in cool/warm season grass mix which would provides better management flexibility, less plant diversity, and a potential increase in soil erosion. The Threeawn/Forbs Plant Community is of limited value for livestock production.

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 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% 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. Areas where ground cover is less than 50% 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).

For the interpretive 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.

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 was also used. Those involved in developing this site include: Wayne Bachman, Soil Scientist, NRCS; Stan Boltz, Range Management Specialist, NRCS; Chuck Markley, Soil Scientist, 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://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)

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/technical/handbook/)

Contributors

SCB

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.

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2. **Presence of water flow patterns:** None, or barely visible and discontinuous.

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3. **Number and height of erosional pedestals or terracettes:** None.

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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 5 percent, and patches less than 2 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** None should be present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Slight amount of movement of smallest size class litter is possible, but not normal.

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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 are 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.

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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 (some soils may have subangular blocky structure parting to granular in the surface).

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool-season grasses) with fine and coarse roots positively influences infiltration.

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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.

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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: Needlegrasses (mid and tall, cool-season bunchgrasses >

    Sub-dominant: Tall, warm-season rhizomatous grasses > mid, cool-season rhizomatous grasses = mid, warm-season grasses >

    Other: Forbs = shrubs > grass-like species > short, warm-season grasses

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

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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):** Litter cover about 80 to 90 percent, with depths about 0.5 to 1 inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 1,800 pounds/acre to 3,600 pounds/acre, with the reference value being 2,600 pounds/acre (air-dry basis).

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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; also Kentucky bluegrass and smooth bromegrass.

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17. **Perennial plant reproductive capability:** Perennial grasses should have vigorous rhizomes or tillers.
