USDA Natural Resources Conservation Service

Ecological site R066XY051NE
Sandy Lowland

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.

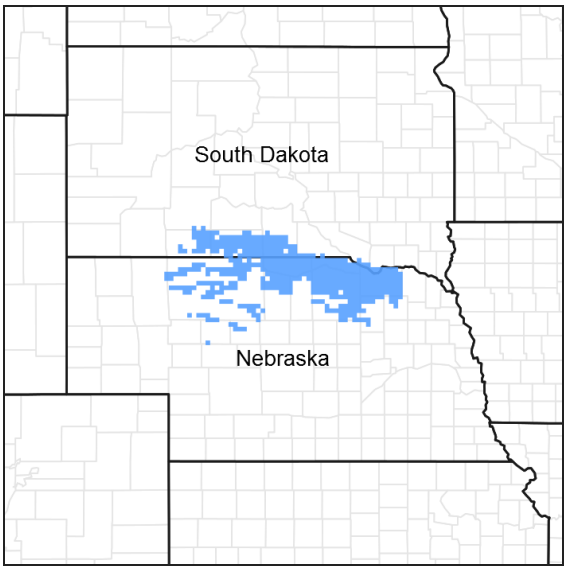


Figure 1. Mapped extent

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; 44a - Nebraska Sand Hills.

Associated sites

R066XY032NE	**Sandy 18-22" P.Z.** Sandy 18-22" P.Z.
R066XY033NE	**Sands 18-22 P.Z.** Sands 18-22" P.Z.
R066XY036NE	**Loamy 18-22 P.Z.** Loamy 18-22" P.Z.
R066XY054NE	**Sandy 22-25 P.Z.** Sandy 22-26" P.Z.
R066XY055NE	**Sands 22-25 P.Z.** Sands 22-26" P.Z.

Similar sites

R066XY032NE	**Sandy 18-22" P.Z.** Sandy 18-22" P.Z. (higher productions; sand bluestem dominant; less blue grama)

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on stream terraces and uplands where gravelly sediments are deposited.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Terrace (3) Alluvial fan
Elevation	579–914 m
Slope	0–30%
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 18 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 73° F (Harrington, SD) 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 sand to sandy loam textured surface soils and slopes of 0 to 30 percent. The soils in this site are from somewhat excessively to excessively drained and formed in alluvium. The surface layer is 4 to 16 inches thick. The texture of the subsurface generally ranges from sand to gravelly coarse sand. Runoff as evidenced by patterns of rill, gully, or other water flow is negligible to low, in spite of the steep slopes, 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) Sand (2) Loamy sand (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Rapid to very rapid
Soil depth	203 cm
Surface fragment cover <=3"	0–40%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	5.08–12.7 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)	5.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–55%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

This site includes depressional areas, which allow for deep-rooted native warm season grasses to utilize subsurface moisture. It is often a transitional area between Sandy and Subirrigated sites. If management common to Subirrigated sites extends onto Sandy Lowland sites, the plant community can quickly shift due to the limited availability of subsoil moisture.

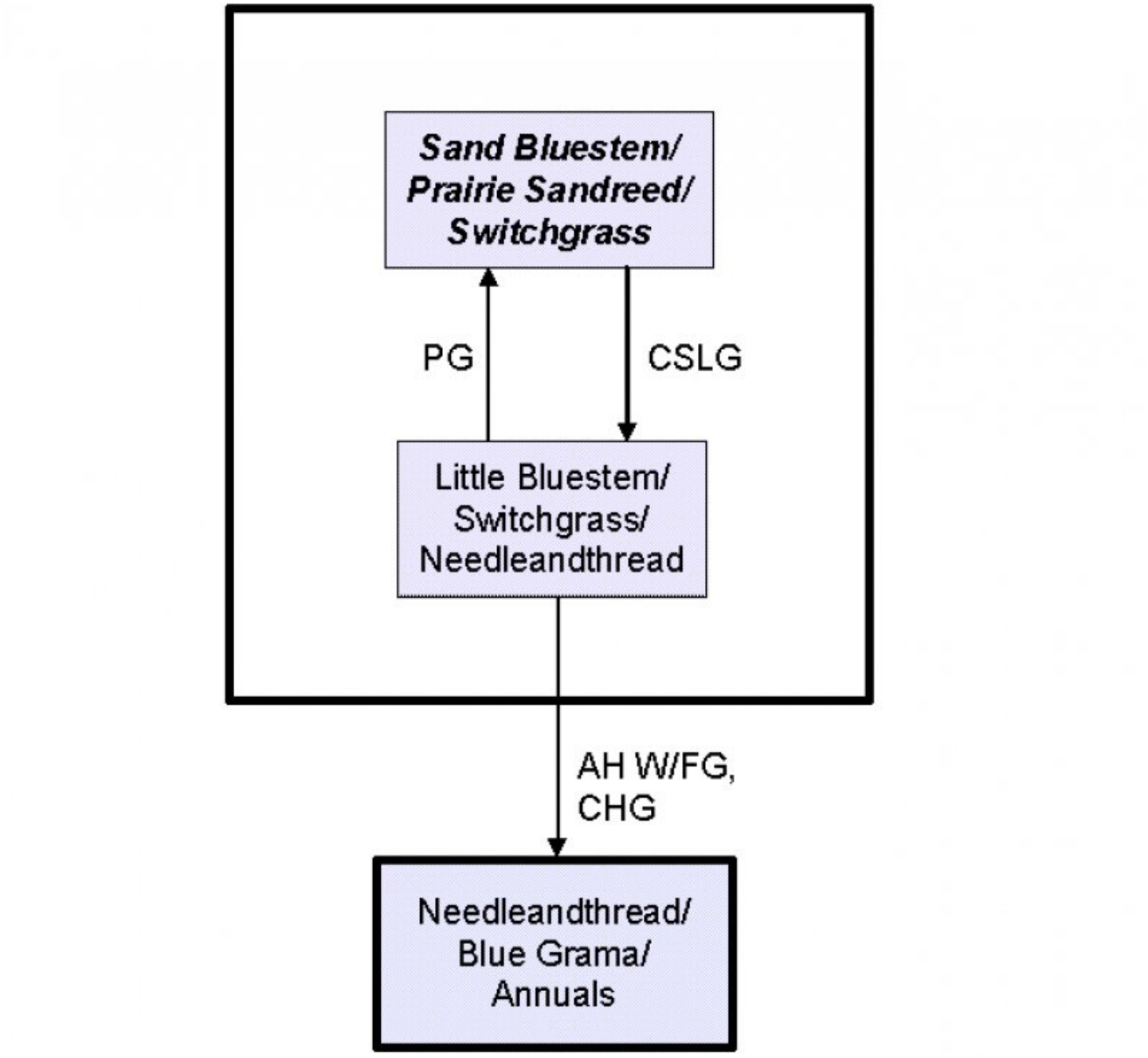
The site is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought resistance. As this site deteriorates, species such as prairie sandreed, little bluestem, sand dropseed and blue grama will increase initially. Species such as sand bluestem and switchgrass will decrease in frequency and production. With continued improper management, prairie sandreed and little bluestem will also decrease with a significant increase in cool season grasses and forbs.

Interpretations are primarily based on the Sand Bluestem/Prairie Sandreed/Switchgrass Plant Community. It has

been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational haying or 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 though 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



AH W/FG - Annual haying with fall grazing; **CHG** - Continuous heavy grazing; **CSLG** - Continuous season-long grazing; **HCPC** - Historical Climax Plant Community; **PG** - Prescribed grazing.

State 1
Sand Bluestem/Prairie Sandreed/Switchgrass

Community 1.1
Sand Bluestem/Prairie Sandreed/Switchgrass

Interpretations are primarily based on this community (it is also considered climax). This site evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. This plant community is found on areas that are properly managed with grazing and or prescribed burning. Harvesting hay biennially at a different time during the growing season will allow this plant community to persist. The potential vegetation is about 90% grasses, 5% forbs and 5% woody plants. Tall, warm-season grasses predominate. The major grasses include Sand bluestem, prairie sandreed, switchgrass, and little bluestem. Other grasses occurring in this plant community include needleandthread, indiangrass, hairy and blue grama, and grass-likes including sedges. This plant community is extremely resilient and well adapted to the Northern Great Plains climatic conditions. 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: NE6534 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: Continuous season-long grazing will convert the plant community to the Little Bluestem/Switchgrass/Needleandthread Plant Community. Continuous heavy grazing tends to accelerate this movement.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2533	2925	3278
Forb	157	244	364
Shrub/Vine	–	82	168
Total	**2690**	**3251**	**3810**

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		

State 2
Little Bluestem/Prairie Sandreed/Needleandthread

State 3
Needleandthread/Blue Grama/Annuals

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	**Warm-Season Grasses**			1300–2600	
	sand bluestem	ANHA	*Andropogon hallii*	650–1300	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	488–975	–
	little bluestem	SCSC	*Schizachyrium scoparium*	488–975	–

	switchgrass	PAVI2	*Panicum virgatum*	325–650	–
2	**Other Native Grasses**			488–1300	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	163–488	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–325	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–163	–
	sedge	CAREX	*Carex*	33–163	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	0–163	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–163	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–163	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–163	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–163	–
	Grass, perennial	2GP	*Grass, perennial*	0–163	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–65	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–65	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–65	–
Forb					
4	**Forbs**			163–325	
	beardtongue	PENST	*Penstemon*	0–65	–
	goldenrod	SOLID	*Solidago*	0–65	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–65	–
	Forb, perennial	2FP	*Forb, perennial*	0–65	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–65	–
	dotted blazing star	LIPU	*Liatris punctata*	0–65	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–33	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0–33	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–33	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–33	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–33	–
	false boneset	BREU	*Brickellia eupatorioides*	0–33	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–33	–
	vervain	VERBE	*Verbena*	0–33	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–33	–
	Forb, annual	2FA	*Forb, annual*	0–33	–
Shrub/Vine					
5	**Shrubs**			0–163	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–98	–
	leadplant	AMCA6	*Amorpha canescens*	0–65	–
	rose	ROSA5	*Rosa*	0–65	–

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. Meadin and Simeon soils on this site are in Hydrologic Soil Group A. 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).

The high infiltration rate of these sands results in few rills and gullies or water flow patterns even though steep slopes may be included. Pedestals are only slightly present in association with bunchgrasses such as needleandthread. Litter typically falls in place on flat slopes. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present but only cover 1-2% of the soil surface. This crusting is not significant for hydrologic considerations. Overall this site has the appearance of being 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

None noted.

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: Dave Cook, Rangeland Management Specialist, NRCS; Dwight Hale, Engineer, NRCS; Sheila Luoma, Resource Conservationist, NRCS; Marla Shelbourn, Rangeland Management Specialist, NRCS; Dave Steffen, Rangeland Management Specialist, NRCS.

There are 5 SCS-RANGE-417 records available that were collected in Boyd, Holt, Brown, and Knox counties in Nebraska. The sample period was from 1968 to 1982.

There are also 4 Ocular Estimate records available from Keya Paha county, Nebraska and Todd county, South Dakota. The sample period was 2002.

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)

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.

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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.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground normally less than 10 percent.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter falls in place.

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.

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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 8 to 20 inches thick with black to very dark gray colors when moist. Structure typically is medium to fine granular in the upper A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Deep rooted species (mid and tall rhizomatous cool- and warm-season grasses and grass-likes) 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.

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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: Tall, warm-season rhizomatous grasses >>

    Sub-dominant: Mid, warm-season bunchgrasses >

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

    Additional: Other grasses in other functional groups occur 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.

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14. **Average percent litter cover (%) and depth (in):** About 50 to 70 percent litter cover, litter in contact with soil surface. Depth of litter is about 0.25 to 0.5 inches.

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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 2,400 pounds/acre to 3,400 pounds/acre, with the reference value 2,900 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; Kentucky bluegrass may be prevalent during dry cycles, but will typically not dominate the site.

17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses and grass-likes should have vigorous rhizomes or tillers.