USDA Natural Resources Conservation Service

Ecological site R066XY065NE
Closed Depression

Accessed: 04/26/2024

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.

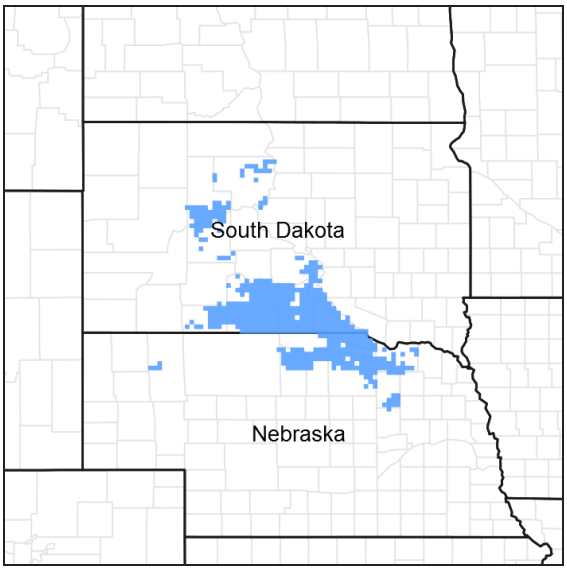


Figure 1. Mapped extent

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

R063BY011SD	**Clayey** Clayey
R066XY058NE	**Loamy 22-25 P.Z.** Loamy 22-25" P.Z.

Similar sites

R063BY021SD	**Clayey Overflow** Clayey Overflow [similar species, Clayey Overflow occurs along drainages, higher component of shrubs, fewer forbs, no water table]
R063BY007SD	**Saline Lowland** Saline Lowland [similar species and production, less western wheatgrass, more prairie cordgrass, and a water table]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii*

Physiographic features

This site occurs on depressional areas of uplands which are closed (without natural drainage). This site receives run-in water from areas higher on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat
Flooding frequency	None
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	1,900–3,000 ft
Slope	0–1%
Ponding depth	0–36 in
Water table depth	18–36 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 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)	25 in

Influencing water features

Soil features

The features common to soils of this site are the poorly drained soils with silty clay textured surface layers underlain by a very clayey subsoil layer. This layer restricts internal drainage and has a slow to very slow infiltration rate. Water perches on this layer and may even pond over the soil surface following large precipitation events and/or run-in events during spring thaw. The soils crack when dry and heavy traffic can cause surface compaction when wet. This site should show no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are typically non-existent, or if present, appear broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

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) Silty clay
Family particle size	(1) Clayey
Drainage class	Poorly drained
Permeability class	Very slow to rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, 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 between communities that will occur, severe disturbances, such as periods of well-below average precipitation, can cause significant shifts in plant communities and/or species composition.

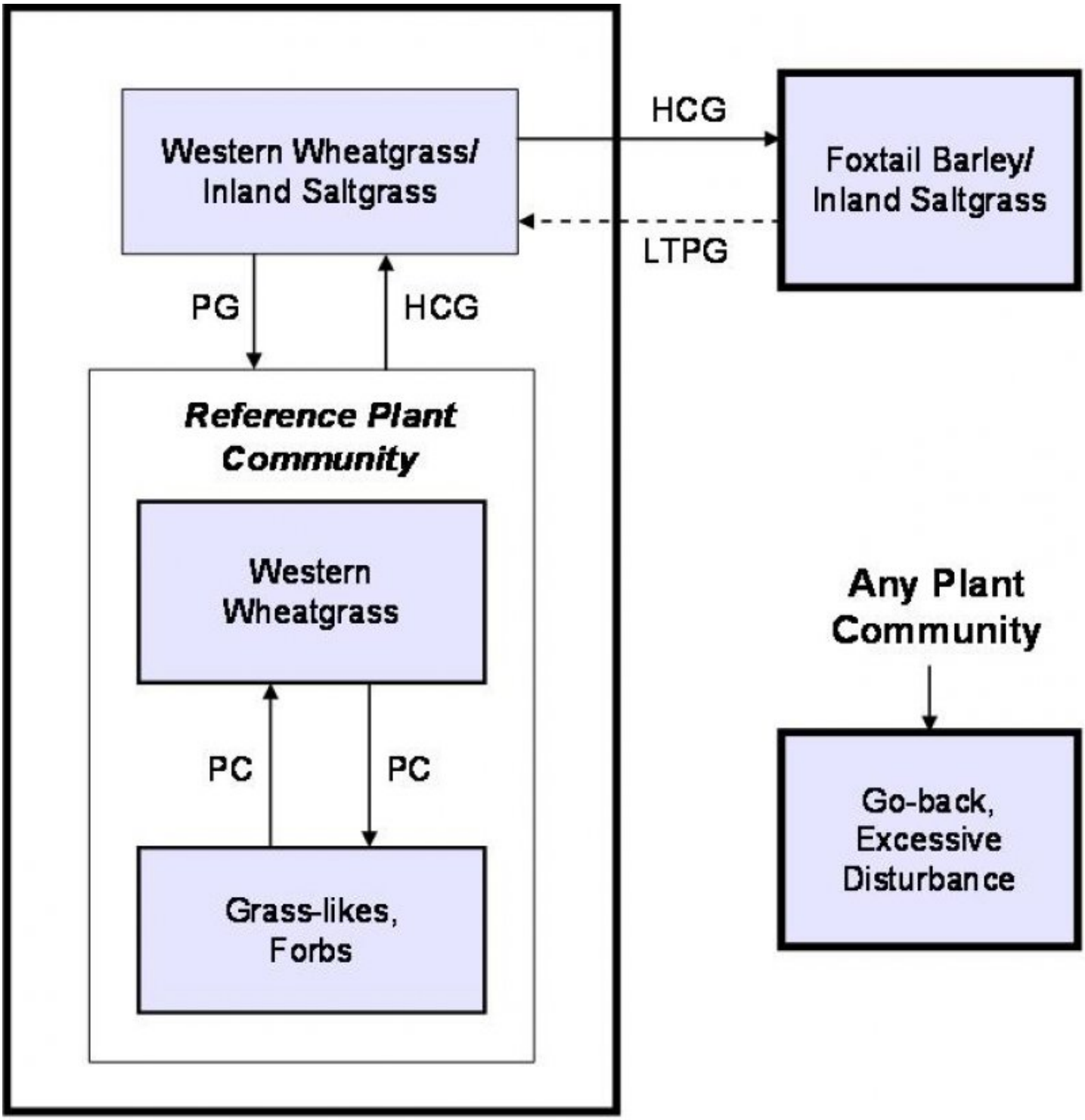
This site is very sensitive to precipitation fluctuations from year to year. With above average precipitation, the site becomes very wet, leading to a much different plant community than what would be present with average to below average precipitation. In dry years, plant density becomes very low. The two plant communities influenced strongly by precipitation alone (Western Wheatgrass; and Grass-likes, Forbs) make up the natural fluctuation of what could be considered the historic climax plant community.

The plant community upon which interpretations are primarily based is the Reference Plant Community. The Reference Plant Community has been determined by studying 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 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 are discussed in more detail in the plant community descriptions following the diagram.

State and transition model



HCG – Heavy continuous grazing; **LTPG** – Long-term prescribed grazing; **PC** – Precipitation cycles; **PG** – Prescribed grazing.

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

Interpretations are based primarily on the Western Wheatgrass and Grass-likes, Forb Plant Communities, which are also considered to be reference. This plant community evolved with grazing by large herbivores and occasional fire, and can be maintained with prescribed grazing, prescribed burning, or areas receiving occasional short periods of rest or deferment. Western Wheatgrass Plant Community: Following several years of relatively normal to above average precipitation, the plant community stabilizes and becomes dominated with perennial grasses such as western wheatgrass. Other grasses and grass-likes present include Nuttall's alkaligrass, sedge, rush, slender wheatgrass. The occurrence of forbs will be considerably lower, including some species such as American licorice, curlycup knotweed, Pennsylvannia smartweed, Pursh seepweed, and western dock. The plant community is made up of about 80-90% grasses and grass-likes, and about 10-20% forbs. The total annual production (air-dry weight) of this plant community is typically about 3500 lbs./acre. Grass-likes, Forbs Plant Community: This plant community often occurs after a period of higher precipitation that follows an extended dry cycle. Grasses and grass-likes commonly occurring include sedge, spikerush, rush, foxtail barley, western wheatgrass and bluegrasses. The forbs commonly found include western dock, mint, Pursh seepweed, lambsquarters, knotweed, evening-primrose, buttercup and New England aster. The plant community is made up of about 5-10% grasses, 30-40% grass-likes, and about 50-60% forbs. The total annual production (air-dry weight) is about 2200 lbs./acre. Transitions or pathways leading to other plant communities are as follows: - Precipitation cycles will shift this community between the Western Wheatgrass and Grass-likes, Forbs Plant Communities. After several years of normal to above average precipitation, the plant community stabilizes and perennial grasses/western wheatgrass will dominate the site with few grass-likes and forbs; and in the instance of higher precipitation received after extended years of drought, there will be an increase in the grass-likes and forbs components. - Heavy continuous grazing will shift this community to the Western Wheatgrass/Inland Saltgrass Plant Community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1845	2363	3050
Forb	155	1138	1450
Total	**2000**	**3501**	**4500**

Figure 5. Plant community growth curve (percent production by month). NE6634, Eroded Tableland, cool-season dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	28	30	10	2	5	5	0	0

State 2
Western Wheatgrass/Inland Saltgrass 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	**Wheatgrasses**			700–2975	
	western wheatgrass	PASM	*Pascopyrum smithii*	700–2975	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–175	–
2	**Cool-Season Bunchgrasses**			175–1400	
	foxtail barley	HOJU	*Hordeum jubatum*	70–1225	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	70–525	–
3	**Short Warm-Season Grasses**			35–350	
	saltgrass	DISP	*Distichlis spicata*	35–350	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–175	–

4	**Other Native Grasses**			70–350	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–350	–
	plains bluegrass	POAR3	*Poa arida*	35–175	–
	fowl bluegrass	POPA2	*Poa palustris*	35–175	–
5	**Grass-Likes**			350–1575	
	common spikerush	ELPA3	*Eleocharis palustris*	175–1400	–
	needle spikerush	ELAC	*Eleocharis acicularis*	35–525	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–350	–
	sedge	CAREX	*Carex*	70–350	–
	rush	JUNCU	*Juncus*	0–175	–
Forb					
7	**Forbs**			175–2100	
	Forb, native	2FN	*Forb, native*	0–700	–
	curlytop knotweed	POLA4	*Polygonum lapathifolium*	0–525	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–525	–
	pale dock	RUAL4	*Rumex altissimus*	0–525	–
	western dock	RUAQ	*Rumex aquaticus*	0–350	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–350	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	0–350	–
	lambsquarters	CHAL7	*Chenopodium album*	0–350	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–175	–
	golden tickseed	COTI3	*Coreopsis tinctoria*	0–175	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–175	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–175	–
	povertyweed	IVAX	*Iva axillaris*	0–175	–
	bushy knotweed	PORA3	*Polygonum ramosissimum*	0–175	–
	cinquefoil	POTEN	*Potentilla*	0–175	–
	plantain	PLANT	*Plantago*	0–175	–
	mint	MENTH	*Mentha*	0–175	–
	evening primrose	OENOT	*Oenothera*	0–175	–
	creeping woodsorrel	OXCO	*Oxalis corniculata*	0–105	–
	tall fringed bluebells	MECI3	*Mertensia ciliata*	0–105	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–105	–

Animal community

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

D. Infiltration is very slow to slow and runoff potential is very high depending on 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).

Rills, gullies and water flow patterns are not present. Pedestals are only slightly present. Litter falls in place, and signs of movement are not common. Chemical and physical crusts are rare, and not significant for hydrologic considerations. Cryptogamic crusts may be present but are not significant for hydrologic considerations. Overall this site has the appearance of being stable and productive except areas of white crust (salts) may be present.

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.

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

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	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:** Rills should not be present.

2. **Presence of water flow patterns:** Barely observable or not present.

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):** Normally bare ground is less than 5 percent and patches less than two inches in diameter. Following well-above average or well-below average precipitation periods, bare ground can be very high for brief periods of time.

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 present.

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):** Soil aggregate stability normally a 4 to 6 rating. Typically high root content and organic matter in the soil surface. Soil surface is very resistant to erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface soils typically have an E-horizon (leached) at the surface which is platy structure, and typically will not have mollic colors at the surface.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep-rooted native grass and grass-like species 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 present. Surface horizon may be platy and appear to be compacted and should not be confused with compaction.

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: Drier precipitation cycles: Wheatgrasses (mid, cool-season bunchgrasses) >> mid, cool-season bunchgrasses >
    Wetter precipitation cycles: Grass-like species = forbs >

    Sub-dominant: Drier precipitation cycles: Short, warm-season grasses >
    Wetter precipitation cycles: Wheatgrasses (mid, cool-season rhizomatous) > short, warm-season grasses >

    Other: Drier precipitation cycles: Forbs > grass-like species
    Wetter precipitation cycles: Mid, cool-season bunchgrasses

    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 to no evidence of decadence or mortality.

14. **Average percent litter cover (%) and depth (in):** 55-80 percent plant litter cover, roughly 0.5 to 1 inch 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 2,000 to 4,500 pounds/acre, with the reference value being 3,500 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:** Perennial grass and grass-like species have vigorous rhizomes and/or tillers.