

# Ecological site R054XY045ND Limy Sands

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## General information

**Provisional.** A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

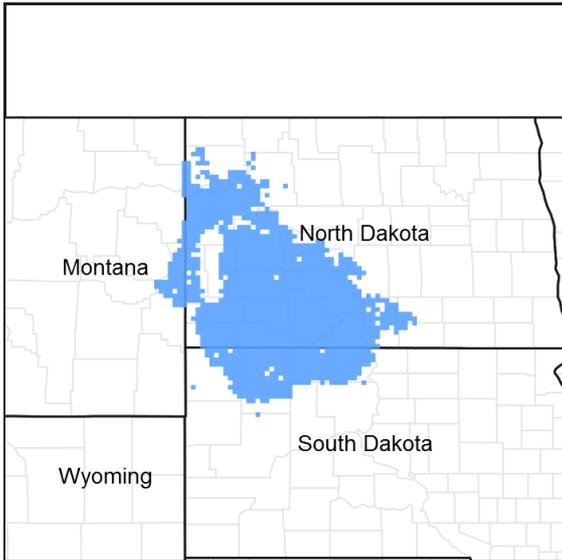


Figure 1. Mapped extent

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: 43a – Missouri Plateau.

## Associated sites

R054XY025ND	<b>Sands</b>
R054XY026ND	<b>Sandy</b>
R054XY034ND	<b>Choppy Sands</b>
R054XY035ND	<b>Very Shallow</b>
R054XY043ND	<b>Shallow Sandy</b>

## Similar sites

R054XY026ND	<p><b>Sandy</b> [Does not receive additional moisture. Found on dry uplands upslope from sandy terraces or loamy overflow sites, down slope from limy sands or shallow sandy sites. Similar landscape position as loamy, sands, clayey sites; will ribbon up to 1 inches. Indicator species are prairie sandreed with western wheatgrass and green needlegrass intermixed. This site has more production, thicker "A" horizon, a mollic epipedon, lime is deeper than 6 inches from the surface, less little bluestem, no plains muhly, sideoats grama, more prairie sandreed, different landscape positions.]</p>
R054XY030ND	<p><b>Shallow Loamy</b> Somewhat excessively drained soils &gt; 10 and &lt; 20 inches to sedimentary bedrock that restricts root penetration. Surface layer will ribbon &gt; 1 and &lt; 2 inches. Upslope from thin loamy or loamy sites and sometimes down slope from very shallow ecological sites. Indicator species: little bluestem, plains muhly, needlegrasses and sideoats grama, with dotted gayfeather, purple coneflower and pasqueflower, and shrubs like broom snakeweed. This site has similar species but less little bluestem, sand bluestem, prairie sandreed and sedges, more plains muhly, green needlegrass, western wheatgrass, restrictive layer above twenty inches is not sandstone or gravels, slightly less production.]</p>
R054XY043ND	<p><b>Shallow Sandy</b> [Some what excessively well drained soils more than 10 less than 20 inches to sedimentary sandstone bedrock and/or gravels that restricts root penetration. Surface layer will ribbon less than 1 inch unless above gravels than more than 1 but less than 2 inches. Upslope from thin loamy, limy sands, sands or sandy sites and some times down slope form very shallow ecological sites. Indicator species: little bluestem, prairie sandreed, sand bluestem, and needle grasses, with dotted gayfeather, pasqueflower, purple coneflower and purple prairie clover, and shrubs like prairie rose and yucca. This site has less production, less little bluestem, porcupinegrass, big bluestem or sand bluestem and more blue grama, plains muhly, sedges and needleandthread, has a restrictive layer within twenty inches.]</p>
R054XY025ND	<p><b>Sands</b> [Does not receive additional moisture. Found on dry uplands, upslope from sandy terraces or loamy overflow sites, down slope from limy sands or shallow sandy sites. Similar landscape position as loamy, sandy, and clayey sites. Won't form a ribbon; indicator species are sand bluestem and prairie sandreed evenly mixed, some Canada wildrye, penstemon, and leadplant and western snowberry. This site has more production, thicker "A" horizon and a mollic epipedon, lime is deeper than 6 inches from the surface, less little bluestem, no plains muhly, sideoats grama, more prairie sandreed, different landscape positions.]</p>
R054XY038ND	<p><b>Thin Loamy</b> [Deep and moderately deep entisols, usually calcareous within 4 inches to the surface, found on knobs and/or sideslopes of hills and buttes. Will form a ribbon greater than 1 inches but not more than 2 inches. Up slope of loamy and down slope of thin loamy or shallow loamy ecological sites. Indicator species: western wheatgrass, little bluestem, plains muhly, porcupinegrass and sideoats grama, with Missouri goldenrod, dotted gayfeather, pasqueflower, purple coneflower and purple prairie clover, and shrubs like winterfat and prairie rose. This site has more western wheatgrass, plains muhly, green needlegrass and sideoats grama, less little bluestem, sedges, prairie sandreed and sand bluestem, similar production and soil depth.]</p>
R054XY034ND	<p><b>Choppy Sands</b> [Deep entisol found on knobs and ridges of level to choppy sand blown plains; will not ribbon, found upslope from sands and sandy terrace sites. Indicator species: Sand bluestem, prairie sandreed and needleandthread evenly mixed, some Canada wildrye, penstemon, lemon scurp pea western ragweed, yucca, silky prairie clover and leadplant. This site has similar production with a thin "A" horizon, no mollic epipedon, but doesn't have lime within 6 inches to the surface, less little bluestem, no plains muhly, sideoats grama, more prairie sandreed and sand bluestem, different landscape positions.]</p>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon hallii</i>

### Physiographic features

This site typically occurs on moderately sloping to steep sedimentary uplands.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Knoll (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,600–3,600 ft
Slope	6–35%
Aspect	Aspect is not a significant factor

## Climatic features

MLRA 54 is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are characteristic. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains. The air masses move unobstructed across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 14 to 18 inches per year. The normal average annual temperature is about 42° F. January is the coldest month with average temperatures ranging from about 13° F (Beach, ND) to about 16° F (Bison, SD). July is the warmest month with temperatures averaging from about 69° F (Beach, ND) to about 72° F (Timber Lake, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 57° F. This large annual range attests to the continental nature of this MLRA's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 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 in late March and continues to early to mid July. Native warm-season plants begin growth in mid May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present.

**Table 3. Representative climatic features**

Frost-free period (average)	136 days
Freeze-free period (average)	157 days
Precipitation total (average)	18 in

## Influencing water features

No significant water features influence this site.

## Soil features

The common features of soils in this site are the loamy fine sand and loamy sand textured substratum and slopes of 6 to 35 percent. The soils in this site are somewhat excessively drained and formed in soft sandstone. The loamy fine sand to fine sandy loam surface layer is 4 to 6 inches thick. The soils have a rapid infiltration rate. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers, and there is a risk of rills and eventually gullies if vegetative cover is not adequate. Pedestalling of plants occurs. The soil surface is unstable and slumping, erosion and deposition is common to the site. Cryptobiotic crusts are present. These soils are susceptible to water and wind erosion. Severe loss of the soil surface layer can result in a shift in species composition and/or production.

Major soil series correlated to this ecological site can be found in Section II of the Natural Resources Conservation Service Field Office Technical Guide or the following web sites:

North Dakota <http://www.nd.nrcs.usda.gov/>

South Dakota <http://www.sd.nrcs.usda.gov/>

Montana <http://www.mt.nrcs.usda.gov/>

**Table 4. Representative soil features**

Surface texture	(1) Loamy fine sand (2) Loamy sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Rapid
Soil depth	20–72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2–3 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–10%

## Ecological dynamics

The site 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. Due to the nature of the soils, the site is considered quite fragile. Under continued adverse impacts, a rapid decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments the site can slowly return to the Historic Climax Plant Community (HCPC).

The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). The HCPC 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.

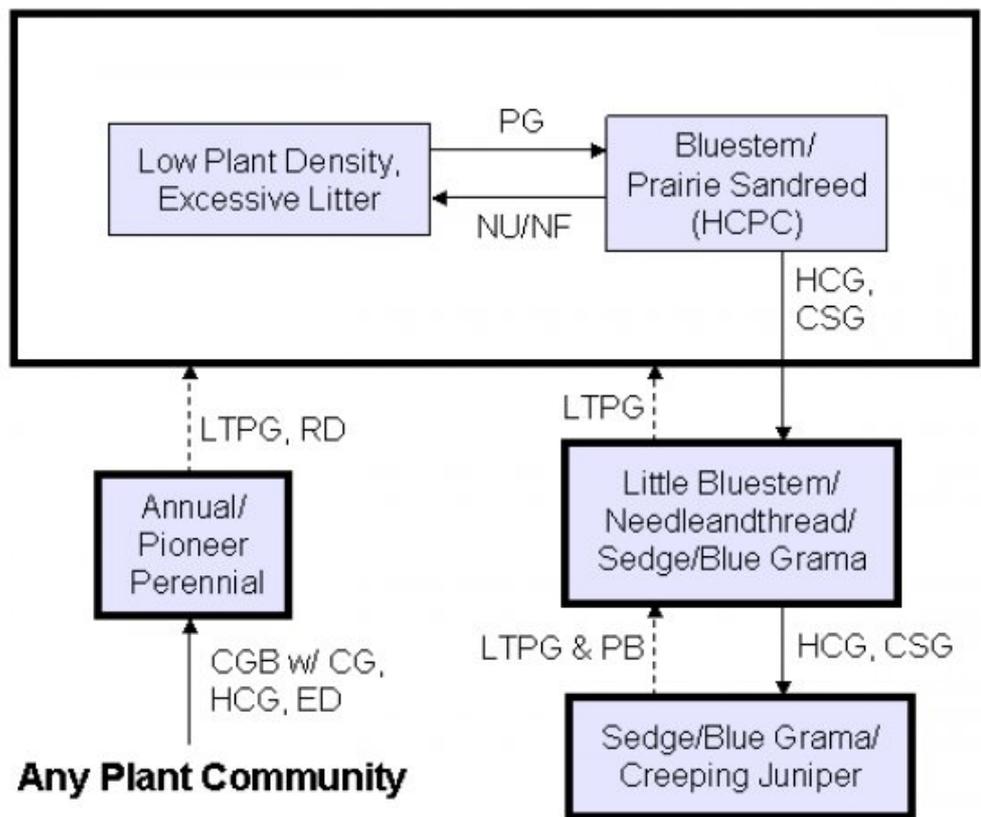
Continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the HCPC. Species such as little bluestem, blue grama and sedges will initially increase. Big bluestem, sand bluestem, porcupine grass and sideoats grama will decrease in frequency and production. Heavy continuous grazing cause sedges, blue grama and creeping juniper to increase, while little bluestem stays in wolf plant colonies.

In time, heavy continuous grazing will likely cause upland sedges and blue grama to dominate and pioneer perennials, annuals, and club moss (in its range) to increase. This plant community is relatively stable and the competitive advantage prevents other species from establishing. This plant community is less productive than the HCPC. Runoff increases and infiltration will decrease. Soil erosion could be critical.

Under extended periods of non-use and/or lack of fire will result in a plant community having low plant densities and open spaces, which favors an increase in annuals, biennials and pioneering perennials. Such species are red threeawn, sweetclover, cheatgrass, sand dropseed and Scribner's panicum. In time, shrubs such as cactus and creeping juniper will increase.

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**



**CGB w/ CG** - cropped go-back with continuous grazing; **CSG** - continuous seasonal grazing; **ED** - excessive defoliation; **HCG** - heavy continuous grazing; **HCPC** - Historical Climax Plant Community; **LTPG** - long-term prescribed grazing; **NU/NF** - extended period of non-use & no fire; **PB** - prescribed burning; **PG** - prescribed grazing; **RD** - removal of disturbance.

**State 1**  
**Bluestem/Prairie Sandreed (HCPC)**

## Community 1.1 Bluestem/Prairie Sandreed (HCPC)

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC). This community evolved with grazing by large herbivores and occasional prairie fire. It is well suited for grazing by domestic livestock and can be found on areas that are properly managed with prescribed grazing that allows for proper utilization, changes in season of use and adequate recovery periods following each grazing event. The potential vegetation is about 84% grasses or grass-like plants, 10% forbs, 5% shrubs and 1% trees. Warm season grasses dominate the plant community. The co-dominant grasses include prairie sandreed, little bluestem, big bluestem and sand bluestem. Other grasses and grass-like plants occurring on the site include needleandthread, blue grama, porcupine grass, sideoats grama and sedges. Significant forbs include penstemon, American vetch, dotted gayfeather, prairie coneflower, pasqueflower, green sagewort, silverleaf scurfpea and spiderwort. Leadplant, yucca, dwarf false indigo, rose, western sandcherry and creeping juniper are the principal shrubs. This plant community is well adapted to the Northern Great Plains climatic conditions. 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 properly. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Run-off from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship. This is a healthy and sustainable plant community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	980	1593	2200
Forb	85	135	185
Shrub/Vine	35	63	95
Tree	0	9	20
<b>Total</b>	<b>1100</b>	<b>1800</b>	<b>2500</b>

Figure 5. Plant community growth curve (percent production by month). ND5403, Missouri Slope, Native Grasslands, Warm-season dominant. Warm-season dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	5	20	38	25	8	3	0	0	0

## State 2 Low Plant Density, Excessive Litter

### Community 2.1 Low Plant Density, Excessive Litter

This plant community develops after an extended period of 15 or more years of non-use by herbivores and exclusion of fire. This plant community is dispersed throughout the pasture, encircling spot grazed areas, and areas distant from water sources. This is a typical pattern found in pastures grazed season-long. Plant litter may accumulate as this plant community first develops. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to colonies. Standing decadent plants and moderate litter covers shorter understory species (i.e. short grasses and sedges), restricting their ability to capture adequate sunlight for photosynthesis. Vigor and diversity of native plants are reduced. Annual and/or biennial forbs, annual grasses, and cryptogams commonly fill interspaces once occupied by desirable species. Kentucky bluegrass, crested wheatgrass, smooth brome grass, cheatgrass and/or sweetclover tend to invade and may dominate this plant community. Other grasses present include needleandthread, western wheatgrass, Scribner panicum, sand dropseed, red threeawn and threadleaf sedge. The common forbs include green sagewort, prairie coneflower, and hairy golden aster. Fringed sagewort, rose, yucca, cactus, creeping juniper and Rocky Mountain juniper are principal shrubs and tend to increase in density and cover. This plant community is

resistant to change without prescribed grazing or fire. Grazing is most effective in moving this plant community towards the HCPC. Soil erosion is low. Compared to the HCPC, infiltration is reduced to the lower root zone. Runoff is similar to the HCPC. Once this plant community is reached, any of the preferred treatments can readily return the diversity and production of the site.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	850	1360	1970
Forb	75	120	165
Shrub/Vine	60	96	130
Tree	15	24	35
<b>Total</b>	<b>1000</b>	<b>1600</b>	<b>2300</b>

Figure 7. Plant community growth curve (percent production by month). ND5406, Missouri Slope, Introduced Cool-season Grasses. Introduced cool-season grasses.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	35	35	5	2	8	2	0	0

### State 3 Little Bluestem/Needleandthread/Sedge/Blue Grama

#### Community 3.1 Little Bluestem/Needleandthread/Sedge/Blue Grama

This plant community is the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing. Short grasses, grass-likes, little bluestem and forbs increase to dominate the site and annual production decreases dramatically. Ungrazed little bluestem seed stalks resist grazing pressure from most grazing animals causing a “red grass” patchy appearance amongst larger areas dominated by short grasses. Lack of litter and reduced plant vigor in the short grass areas result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gives the early growth sedges and drought resistant blue grama a competitive advantage over the tall warm-season grasses and cool season mid-grasses. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. Sedges, blue grama and patches of little bluestem are the dominant species with the balance being a few species of cool-season grasses and warm-season grasses including red threeawn, sand dropseed, needleandthread and Scribner panicum. Forbs such as western ragweed, green sagewort, hairy goldaster, American pasqueflower, Lambert crazyweed, scurfpea and prairie coneflower may also be present. Dominant shrubs are cactus, yucca, fringed sagewort and creeping juniper. There is usually less than 15% bare ground. This plant community is very stable. The likelihood of this plant community to head away from the HCPC is greater than moving towards HCPC if management does not change. Runoff has increased and infiltration has decreased. Soil erosion is apparent as per many pedestalled plants and debris dams existing throughout the site, especially on the steeper slopes. This plant community is less productive than the HCPC.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	375	534	690
Forb	25	45	65
Shrub/Vine	0	18	35
Tree	0	3	10
<b>Total</b>	<b>400</b>	<b>600</b>	<b>800</b>

Figure 9. Plant community growth curve (percent production by month). ND5408, Missouri Slope, Sedge Dominant. Cool-season, short grasses and grass-likes.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	30	25	20	5	5	2	0	0

## State 4 Sedge/Blue Grama/Creeping Juniper

### Community 4.1 Sedge/Blue Grama/Creeping Juniper

This plant community can quickly develop from the adverse effects of continuous heavy grazing over several years. Diversity is lost as the short grasses become dominant in the plant community. Little bluestem and needleandthread have been reduced greatly compared to the Sedge/Blue Grama/Little Bluestem Plant Community and are replaced by the grazing tolerant blue grama and sedges. Sideoats grama remains in the plant community, but is less productive because of the mid-summer grazing pressure. Because they are less palatable, American pasqueflower and green sagewort become more prevalent in the plant community. The herbaceous species present are less suitable to grazing. There is more than 20% bare ground. Litter is usually non-existent which reduces infiltration, increasing run-off and soil erosion. The soil temperature is hot early and continues throughout the rest of the growing season. These management induced environmental factors greatly influence this plant community and is why this vegetation state is very resistant to change. Once this plant community is reached, any of the preferred treatments will very slowly return the diversity and production of the site. This will take 25+ years.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	260	380	495
Shrub/Vine	20	34	50
Forb	20	34	50
Tree	0	2	5
<b>Total</b>	<b>300</b>	<b>450</b>	<b>600</b>

Figure 11. Plant community growth curve (percent production by month). ND5408, Missouri Slope, Sedge Dominant. Cool-season, short grasses and grass-likes.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	30	25	20	5	5	2	0	0

## Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Bluestem</b>			180–270	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	180–270	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–90	–
2				270–450	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	90–360	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	90–360	–
3	<b>Needlegrass</b>			90–180	

	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	72–144	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	36–144	–
4	<b>Grama</b>			90–270	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	90–180	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	90–144	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–90	–
5	<b>Other Native Grasses</b>			54–126	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–54	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	18–36	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	18–36	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	18–36	–
	Scribner's rosette grass	DIOLS	<i>Dichantherium oligosanthes</i> var. <i>scribnerianum</i>	18–36	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	18–36	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	18–36	–
6	<b>Grass-Likes</b>			126–216	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	108–180	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	36–54	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–18	–
<b>Forb</b>					
8	<b>Forbs</b>			90–180	
	goldenrod	SOLID	<i>Solidago</i>	18–36	–
	scurfpea	PSORA2	<i>Psoralea</i>	18–36	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	18–36	–
	tarragon	ARDR4	<i>Artemisia dracunculoides</i>	18–36	–
	silky prairie clover	DAVI	<i>Dalea villosa</i>	0–36	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	18–36	–
	green hellebore	HEVI	<i>Helleborus viridis</i>	18–36	–
	blazing star	LIATR	<i>Liatris</i>	18–36	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	18–36	–
	beardtongue	PENST	<i>Penstemon</i>	18–36	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–18	–
	large Indian breadroot	PEES	<i>Pedicularis esculenta</i>	0–18	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	18	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–18	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	18	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–18	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	0–18	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	18	–
	plains milkvetch	ASGI5	<i>Astragalus gilviflorus</i>	0–18	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–18	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–18	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–18	–

	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–18	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–18	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	18	–
	longbract spiderwort	TRBR	<i>Tradescantia bracteata</i>	18	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			36–90	
	leadplant	AMCA6	<i>Amorpha canescens</i>	18–36	–
	dwarf false indigo	AMNA	<i>Amorpha nana</i>	0–18	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	18	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	0–18	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–18	–
	western sandcherry	PRPUB	<i>Prunus pumila var. besseyi</i>	0–18	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–18	–
	rose	ROSA5	<i>Rosa</i>	18	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–18	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–18	–
<b>Tree</b>					
10	<b>Trees</b>			0–18	
	juniper	JUNIP	<i>Juniperus</i>	0–18	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Bluestem</b>			80–128	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	80–128	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–16	–
2				160–240	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	80–240	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	80–160	–
3	<b>Needlegrass</b>			80–240	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	80–240	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	16–80	–
4	<b>Grama</b>			80–160	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	48–112	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	32–64	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–48	–
5	<b>Other Native Grasses</b>			80–160	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	48–96	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	48–80	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	32–64	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	32–48	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	16–32	–

	Grass, perennial	2GP	<i>Grass, perennial</i>	16–32	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–16	–
	mat sandbur	CELO3	<i>Cenchrus longispinus</i>	0–16	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–16	–
6	<b>Grass-Likes</b>			160–320	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	160–288	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	32–48	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–16	–
7	<b>Non-Native Grasses</b>			0–32	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–32	–
<b>Forb</b>					
8	<b>Forbs</b>			80–160	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	16–48	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	32–48	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	32–48	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	16–32	–
	scurfpea	PSORA2	<i>Psoralegium</i>	16–32	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	16–32	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	16–32	–
	goldenrod	SOLID	<i>Solidago</i>	0–16	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	16	–
	longbract spiderwort	TRBR	<i>Tradescantia bracteata</i>	0–16	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum var. capitatum</i>	0–16	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–16	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	0–16	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–16	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	0–16	–
	silky prairie clover	DAVI	<i>Dalea villosa</i>	0–16	–
	plains milkvetch	ASGI5	<i>Astragalus gilviflorus</i>	0–16	–
	pussytoes	ANTEN	<i>Antennaria</i>	16	–
	Forb, annual	2FA	<i>Forb, annual</i>	16	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–16	–
	blazing star	LIATR	<i>Liatris</i>	0–16	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	16	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–16	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–16	–
	large Indian breadroot	PEES	<i>Pediomelum esculentum</i>	0–16	–
	beardtongue	PENST	<i>Penstemon</i>	0–16	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–16	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			64–128	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	16–48	–
	pricklypear	OPUNT	<i>Opuntia</i>	16–48	–

	pricklypear	OPUNT	<i>Opuntia</i>	10-40	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	16-32	-
	rose	ROSA5	<i>Rosa</i>	16-32	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	16-32	-
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	16-32	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	16-32	-
	dwarf false indigo	AMNA	<i>Amorpha nana</i>	0-16	-
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0-16	-
	western sandcherry	PRPUB	<i>Prunus pumila var. besseyi</i>	16	-
<b>Tree</b>					
10	<b>Trees</b>			16-32	
	juniper	JUNIP	<i>Juniperus</i>	16-32	-

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Bluestem</b>			0-12	
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0-12	-
2				60-120	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	60-120	-
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0-12	-
3	<b>Needlegrass</b>			60-120	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	60-120	-
4	<b>Grama</b>			60-120	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	60-120	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-30	-
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-30	-
5	<b>Other Native Grasses</b>			18-42	
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	18-30	-
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	18-30	-
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	12-18	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	6-18	-
	mat sandbur	CELO3	<i>Cenchrus longispinus</i>	0-12	-
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-6	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-6	-
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0-6	-
6	<b>Grass-Likes</b>			48-84	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	30-66	-
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0-6	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-6	-
7	<b>Non-Native Grasses</b>			0-6	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-6	-

Forb

8	<b>Forbs</b>			30–60	
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	18–30	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	18–30	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	12–18	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	12–18	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	6–18	–
	scurfpea	PSORA2	<i>Psoralegium</i>	12–18	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	6–12	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	6–12	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	6–12	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	6–12	–
	goldenrod	SOLID	<i>Solidago</i>	0–6	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	6	–
	blazing star	LIATR	<i>Liatris</i>	0–6	–
	pussytoes	ANTEN	<i>Antennaria</i>	6	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–6	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–6	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	6	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–6	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum var. capitatum</i>	0–6	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–6	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			6–30	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	12–18	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	6–18	–
	pricklypear	OPUNT	<i>Opuntia</i>	6–12	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	6–12	–
	rose	ROSA5	<i>Rosa</i>	0–6	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–6	–
<b>Tree</b>					
10	<b>Trees</b>			0–6	
	juniper	JUNIP	<i>Juniperus</i>	0–6	–

Table 12. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
2				0–18	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–18	–
3	<b>Needlegrass</b>			9–23	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	9–23	–
4	<b>Grama</b>			68–126	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	68–126	–

	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–23	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–9	–
5	<b>Other Native Grasses</b>			23–45	
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	18–32	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	23–32	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	5–14	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	5–9	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–5	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–5	–
	mat sandbur	CELO3	<i>Cenchrus longispinus</i>	0–5	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–5	–
6	<b>Grass-Likes</b>			90–144	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	90–144	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0–5	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–5	–
<b>Forb</b>					
8	<b>Forbs</b>			23–45	
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	18–27	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	18–27	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	5–9	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	5–9	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	5–9	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	5–9	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	5–9	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	5–9	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	5–9	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	5	–
	pussytoes	ANTEN	<i>Antennaria</i>	5	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–5	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–5	–
	goldenrod	SOLID	<i>Solidago</i>	0–5	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	5	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			23–45	
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	23–45	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	14–23	–
	pricklypear	OPUNT	<i>Opuntia</i>	5–14	–
	rose	ROSA5	<i>Rosa</i>	0–5	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–5	–
<b>Tree</b>					
10	<b>Trees</b>			0–5	
	juniper	JUNIP	<i>Juniperus</i>	0–5	–

## **Animal community**

Animal Community – Wildlife Interpretations:  
Under development.

Animal Community – Grazing Interpretations:

This site is well adapted to managed grazing by domestic livestock. The predominance of herbaceous plants across all plant community phases best lends these sites to grazing by cattle but other domestic grazers with differing diet preferences may also be a consideration depending upon management objectives. Often, the current plant community does not entirely match any particular plant community (as described in the ecological site description). Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of this inventory data will permit the establishment of a safe, initial stocking rate for the type and class of animals and level of grazing management. More accurate stocking rate estimates should eventually be calculated using actual stocking rate information and monitoring data.

## **Hydrological functions**

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups A. Infiltration rate is rapid and runoff potential for this site varies from very low to medium depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where short grasses form a dense 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).

## **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**

Highly diversified plant community provides excellent opportunity to evaluate different types of potential plant materials.

## **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>)

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USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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## **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	05/12/2011
Approved by	Jeff Printz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

- 1. Number and extent of rills:** Rills should not be present.

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- 2. Presence of water flow patterns:** Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams.

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- 3. Number and height of erosional pedestals or terracettes:** Few and scattered.

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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 20 to 25% consisting of randomly scattered small patches no greater than 2 inches in diameter.

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- 5. Number of gullies and erosion associated with gullies:** Active gullies should not be present. Existing gullies should be "healed" with a good vegetative cover.

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- 6. Extent of wind scoured, blowouts and/or depositional areas:** Active blowouts should not be present although a few, small, scattered scour sites may be observed. Historic blowouts should be "healed" with a good vegetative cover.

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- 7. Amount of litter movement (describe size and distance expected to travel):** Little to no litter movement. Plant litter remains in place and is not moved by erosional forces.

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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):** Plant cover and litter is at 70% or greater of soil surface and maintains soil surface integrity. Stability class anticipated to be 4 - 5.

- 
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth, color and structure of A-horizon.
- 
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High grass canopy and basal cover and small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. Healthy, deep rooted native grasses 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):** 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: Mid, warm-season grasses = tall, rhizomatous warm-season grasses >
- Sub-dominant: mid, cool-season bunchgrasses >
- Other: short, warm-season grasses = grass-likes > forbs > shrubs > short, cool-season grasses
- Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth brome grass do not fit into reference plant community F/S groups.
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very low.
- 
14. **Average percent litter cover (%) and depth ( in):** Litter cover is in contact with soil surface.
- 
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Representative value = 1800 lbs/acre with a range of 1100 lbs/ac to 2500 lbs/ac (air dry weight) depending upon growing conditions
- 
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, Kentucky bluegrass, smooth brome grass
- 
17. **Perennial plant reproductive capability:** All species are capable of reproducing.

