USDA Natural Resources Conservation Service

Ecological site R054XY020ND
Clayey

Accessed: 05/13/2025

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.

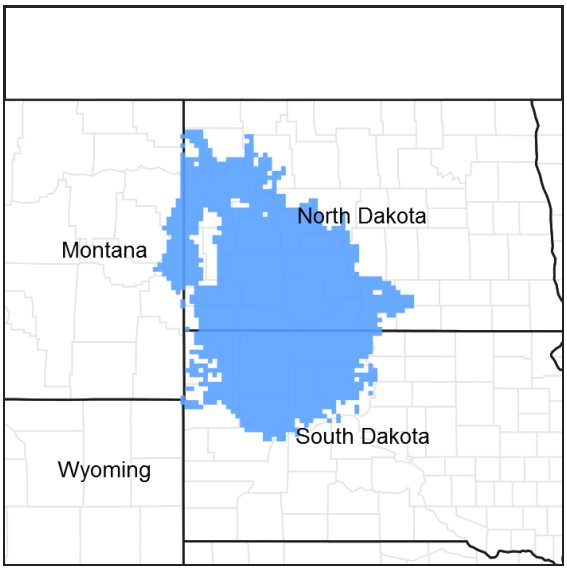


Figure 1. Mapped extent

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

R054XY021ND	**Claypan**
R054XY022ND	**Closed Depression**
R054XY023ND	**Loamy Overflow**
R054XY028ND	**Shallow Clayey**
R054XY031ND	**Loamy**
R054XY033ND	**Thin Claypan**

Similar sites

R054XY028ND	**Shallow Clayey** [Somewhat excessively well drained soils. More than 10 less than 20 inches to unweathered shales that restrict root penetration. Upslope of clayey site, surface layer will ribbon greater than 2 inches, upslope of clayey ecological sites. Indicator species: western wheatgrass dominates with little bluestem, plains muhly, sideoats grama and gayfeather. This site has less production, different landscape position, shallower soils, more little bluestem, plains muhly, and sideoats grama.]
R054XY021ND	**Claypan** [Well drained soils on uplands or terraces that don't receive extra moisture with a dense sodic subsoil below 6 inches with salts below 16 inches; indicator species are western wheatgrass with an understory of blue grama, heath aster, and western yarrow along with a few shrubs of fringed sagewort and Nuttall's Saltbush. This site has less western wheatgrass, considerably less green needlegrass and lower production.]
R054XY022ND	**Closed Depression** [Poorly drained clayey soils with sodic subsoils and with noticeable redoximorphic features within depressions. Ponds periodically with no apparent water table. Indicator species: dominated by western wheatgrass with alkaligrass and foxtail barley intermixed, forb indicator is western dock, no shrubs. This site has more western wheatgrass and less green needlegrass, no blue grama or shrubs, more production and different landscape position.]
R054XY031ND	**Loamy** [Does not receive additional moisture. Found on dry uplands upslope from loamy terraces or loamy overflow sites, down slope from thin loamy or shallow loam sites. Similar landscape position as sandy, sands, clayey sites. Will ribbon greater than 1 inch and up to 2 inches. Indicator species are western wheatgrass some green needlegrass and blue grama, with fringed sagewort and western snowberry being the dominant shrubs. This site has less green needlegrass and western wheatgrass; slightly higher production, similar landscape position, different soil type.]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Physiographic features

This site occurs on gently undulating to rolling sedimentary uplands.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Alluvial flat (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	488–1,097 m
Slope	0–15%
Water table depth	122–183 cm
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)	116 days
Freeze-free period (average)	133 days
Precipitation total (average)	432 mm

Influencing water features

No significant water features influence this site.

Soil features

The common features of soils in this site are the silty clay to clay textured subsoils and slopes of 0 to 15 percent. The soils in this site are moderately well to well drained and formed in soft siltstone, shales or alluvium. The silty clay loam to loam surface layer is 5 to 14 inches thick. The soils have a moderately slow to slow infiltration rate. When dry these soils crack. When wet surface compaction can occur with heavy traffic. This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are non-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 5 percent. 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) Silt loam (2) Silty clay loam (3) Silty clay
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to slow
Soil depth	51–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	12.7–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–15
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.5
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0%

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 moderately resilient. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur.

The plant community upon which interpretations are primarily based is the Reference Plant Community Phase. The Reference Plant Community Phase 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 considered. Subclimax plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

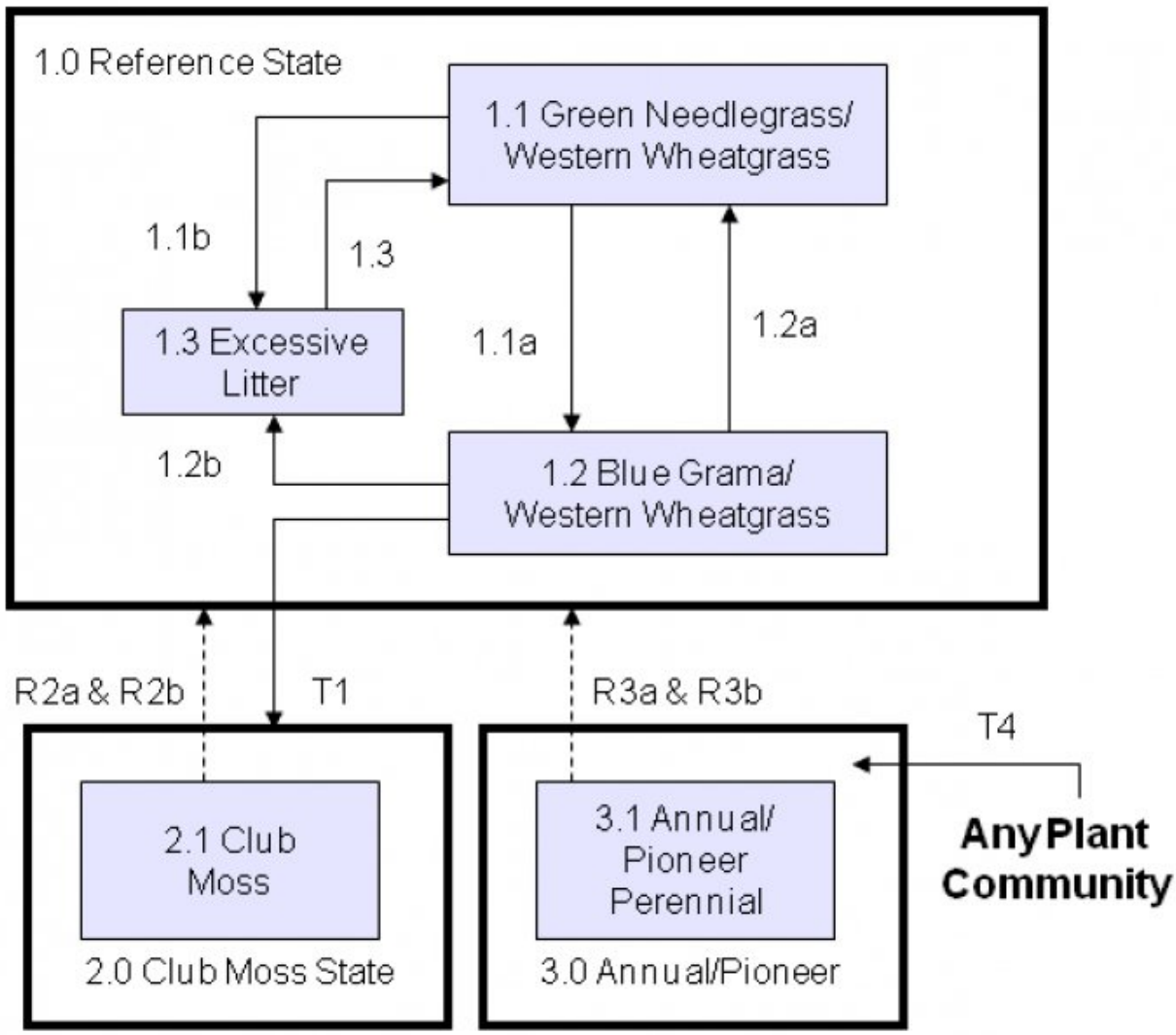
Heavy continuous grazing and/or continuous seasonal (spring) grazing, without adequate recovery periods following each grazing occurrence causes this site to depart from the Reference Plant Community. Blue grama and buffalograss will begin to increase. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass will decrease in frequency and production. In time, heavy continuous grazing will likely cause blue grama and buffalograss 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 Reference Plant Community. Runoff increases and infiltration will decrease. Soil erosion will be minimal.

Extended periods of non-use and/or lack of fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass and/or smooth bromegrass.

Due to a general invasion of exotic species (such as Kentucky bluegrass and smooth bromegrass) across the MLRA within this site, returning to the 1.1 Green Needlegrass/Western Wheatgrass Plant Community Phase may not be possible. Today, the 2.1 Blue Grama/Western Wheatgrass Plant Community Phase most resembles the 1.1 Reference Plant Community Phase in appearance and function.

Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

State and transition model



State 1
Reference

The State narrative is under development.

Community 1.1
Green Needlegrass/Western Wheatgrass

This is the interpretive plant community and is considered to be the Reference Plant Community Phase. This community evolved with grazing by large herbivores and occasional prairie fires and can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. The potential vegetation is about 90% grasses or grass-like plants, 5% forbs, and 5% shrubs. Green needlegrass and western wheatgrass dominate the plant community. Other grasses and grass-like plants include thickspike wheatgrass, needleandthread, blue grama, porcupine grass, buffalograss, prairie junegrass, and sedges. Significant forbs include scurfpea, Lambert's crazyweed, scarlet globemallow, cudweed sagewort and western yarrow. In many areas western snowberry is the principal shrub and occurs in patchy mosaics. In other areas, silver sagebrush is the dominant shrub and occurs more evenly dispersed across the site. Other shrubs include prairie rose, leadplant, winterfat, and fringed sagewort. 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.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1390	2224	3278
Forb	45	83	123
Shrub/Vine	22	47	73
Total	**1457**	**2354**	**3474**

Figure 7. Plant community growth curve (percent production by month). ND5401, Missouri Slope, Native Grasslands, Cool-season Dominant. Cool-season, mid-grass dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	8	24	45	10	3	5	2	0	0

Community 1.2
Blue Grama/Western Wheatgrass

This plant community is the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing. Repeated spring grazing depletes stored carbohydrates, resulting in weakening and eventual death of the cool season mid-grasses. Blue grama and western wheatgrass are the dominant species with the balance being a few species of cool-season grasses/grass-likes and warm-season grasses including upland sedges, needleandthread, prairie junegrass and annual grasses. Forbs such as western ragweed, scurfpea, cudweed sagewort and scarlet globemallow may also be present. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur This plant community is less productive than the 1.1 Reference Plant Community. Lack of litter and reduced plant vigor result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gives blue grama a competitive advantage over cool season mid-grasses.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	415	690	852
Forb	34	78	123
Moss	–	8	17
Shrub/Vine	–	8	17
Total	**449**	**784**	**1009**

Figure 9. 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

Community 1.3
Excessive Litter

This plant community develops after an extended period of 10 or more years of non-use by herbivores or exclusion of fire. Non-native grasses, such as Kentucky bluegrass, crested wheatgrass, and smooth bromegrass tend to invade and may dominate this plant community. Other grasses present include western wheatgrass, porcupine grass, green needlegrass and Sandberg bluegrass. The common forbs include sweetclover and cudweed sagewort. Western snowberry and/or silver sagebrush are the principal shrubs and tend to increase in density and cover. Litter buildup reduces plant vigor and density, and native seedling recruitment declines. Due to a lack of tiller stimulation

and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. 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 properly stocked pastures grazed season-long. This plant community is resistant to change without prescribed grazing or fire. The combination of both grazing and fire is most effective in moving this plant community towards the Reference Plant Community. Soil erosion is low. Runoff is similar to the Reference Plant Community. Once this plant community is reached, time and external resources will be needed to see any recovery in diversity.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1227	1885	2539
Forb	101	159	219
Shrub/Vine	17	64	112
Moss	–	21	45
Total	**1345**	**2129**	**2915**

Figure 11. 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

Pathway 1.1a
Community 1.1 to 1.2

Heavy, continuous grazing and/or continuous seasonal (i.e. spring) grazing will convert this plant community to the 1.2 Blue Grama/Western Wheatgrass Plant Community

Pathway 1.1b
Community 1.1 to 1.3

Non-use and no fire for extended periods of time will convert this plant community to the Excessive Litter Plant Community.

Pathway 1.2b
Community 1.2 to 1.1

Prescribed grazing that includes changing season of use and allowing adequate recovery periods between grazing events will lead this plant community back to the Green Needlegrass/Western Wheatgrass (Reference Plant Community).

Conservation practices

Prescribed Grazing

Pathway 1.2a
Community 1.2 to 1.3

Non-use and no fire over an extended period of time may lead this plant community to the Excessive Litter Plant Community. This shift may take considerably longer than the corresponding transition from the Reference Plant Community, depending on how much residual cool-season mid-grasses are present upon initiation of non-use or fire exclusion.

Pathway 1.3a
Community 1.3 to 1.1

Prescribed grazing or prescribed burning followed by prescribed grazing, will move this plant community toward the Western Wheatgrass/Green Needlegrass Plant Community (Reference). This would require long-term management with prescribed grazing and/or prescribed burning under controlled conditions.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Club Moss

The State narrative is under development.

Community 2.1
Club Moss

This plant community typically occurs in the western portion of MLRA 54. A dense sod of club moss dominates this plant community. Club moss occupies bare soil areas within deteriorated or disturbed higher successional plant communities due to long-term repeated disturbances. Club moss cover is often 25% or greater. Club moss creates a more arid microclimate, resulting in extreme competition for available moisture. Vigor and production of other species is reduced dramatically. Grasses and grass-like plants include western wheatgrass, needleandthread, blue grama, prairie junegrass and upland sedges. Forbs commonly found in this plant community include green sagewort and western yarrow. When compared to the Green Needlegrass/Western Wheatgrass Plant Community, blue grama and club moss have increased, while green needlegrass and western wheatgrass have decreased. This plant community is very resistant to change. The competitive advantage of both the clubmoss and the blue grama prevents other species from expanding and establishing. This plant community is far less productive than the Reference Plant Community. Initial runoff rates are low but then increase as clubmoss becomes saturated. Once clubmoss has been saturated then runoff increases and infiltration decreases as compared the Reference Plant Community. Soil erosion will be minimal due to the sod forming habit of both the clubmoss and blue grama.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	219	454	577
Forb	62	101	140
Shrub/Vine	28	67	106
Moss	28	50	73
Total	**337**	**672**	**896**

Figure 13. 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 3
Annual/Pioneer

The State narrative is under development.

Community 3.1
Annual/Pioneer Perennial Plant Community

This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock or wildlife concentration, and cropping abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include red threeawn, sixweeks fescue, smooth bromegrass, crested wheatgrass, annual brome, needleandthread, prairie junegrass and western wheatgrass. The dominant forbs include curlycup gumweed, marestail, salsify, kochia, field bindweed, thistles, western ragweed, pussytoes, prostrate verbena and other early successional species. Shrubs that may be present include prairie rose, fringed sagewort and broom snakeweed. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of other non-native species due to severe soil disturbances and relatively high percent of bare ground. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Soil erosion is potentially high in this vegetation state. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates. Significant economic inputs, management and time would be required to move this plant community toward a higher successional stage and a more productive plant community. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. This plant community can be renovated to improve the production capability, but management changes would be needed to maintain the new plant community.

Transition T1
State 1 to 2

Heavy, continuous grazing may cause further deterioration resulting in a shift to the Club Moss Plant Community.

Transition T4
State 1 to 3

Excessive defoliation (i.e., areas of heavy animal concentration) will convert the plant community to the Annual/Pioneer Perennial Plant Community. Cropped go-back land with continuous grazing will convert this plant community to the Annual/Pioneer Perennial Plant Community.

Transition T4
State 1 to 3

Heavy, continuous grazing and/or excessive defoliation may shift this plant community to the Annual/Pioneer Perennial Plant Community. Cropped go-back land with continuous grazing will convert this plant community to the Annual/Pioneer Perennial Plant Community.

Restoration pathway R2a
State 2 to 1

Fertilization combined with prescribed grazing may move this plant community through the successional stages leading toward the Green Needlegrass/Western Wheatgrass Plant Community. Mechanical renovation followed by prescribed grazing will reduce club moss, increase western wheatgrass, and eventually shift this plant community back toward the Green Needlegrass/Western Wheatgrass Plant Community. Prescribed burning may reduce club moss, and eventually convert this plant community back to the Green Needlegrass/Western Wheatgrass Plant Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Restoration pathway R2b
State 2 to 1

Long-term prescribed grazing with adequate recovery periods following each grazing event and proper stocking over long periods of time move this plant community toward the Blue Grama/Western Wheatgrass Plant Community. It may eventually return to the Reference Plant Community or associated successional plant community stages assuming an adequate seed/vegetative source is available. This process may take greater than 20 years.

Conservation practices

Prescribed Grazing

Restoration pathway R3a
State 3 to 1

Under long-term prescribed grazing and/or removal of disturbance, including adequate rest periods, this plant community will move through the successional stages, and may eventually lead to a plant community resembling the Reference Plant Community. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly. This process will likely take a long period of time (50+ years).

Restoration pathway R3b
State 3 to 1

Range seeding followed with prescribed grazing can be used to convert this plant community to one that may resemble the Reference Plant Community.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			588–942	
	western wheatgrass	PASM	*Pascopyrum smithii*	588–942	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–235	–
2	**Needlegrasses**			471–706	
	green needlegrass	NAVI4	*Nassella viridula*	353–588	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–71	–
3	**Short Warm-Season**			118–235	
	blue grama	BOGR2	*Bouteloua gracilis*	118–235	–
4	**Native Cool-Season**			24–141	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	24–118	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	24–71	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	24–71	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	24–71	–
	sedge	CAREX	*Carex*	24–47	–
	Sandberg bluegrass	POSE	*Poa secunda*	24–47	–
5	**Other Native Grasses**			24–141	
	Grass, perennial	2GP	*Grass, perennial*	24–118	–
	big bluestem	ANGE	*Andropogon gerardii*	0–118	–

	big bluestem	ANGE	*Andropogon gerardii*	0–118	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–118	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–47	–
	saltgrass	DISP	*Distichlis spicata*	0–24	–
Forb					
7	**Forbs**			47–118	
	leafy wildparsley	MUDI	*Musineon divaricatum*	24–47	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	24–47	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	24–47	–
	Forb, perennial	2FP	*Forb, perennial*	0–47	–
	common yarrow	ACMI2	*Achillea millefolium*	24–47	–
	tarragon	ARDR4	*Artemisia dracunculus*	24–47	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	24–47	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	24–47	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	24–47	–
	blazing star	LIATR	*Liatris*	24–47	–
	scurfpea	PSORA2	*Psoralidium*	24–47	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	24–47	–
	goldenrod	SOLID	*Solidago*	24–47	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	24–47	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	24–47	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–24	–
	desertparsley	LOMAT	*Lomatium*	24	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–24	–
	old man's whiskers	GETR	*Geum triflorum*	24	–
	false boneset	BREU	*Brickellia eupatorioides*	24	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	24	–
	larkspur	DELPH	*Delphinium*	0–24	–
	autumn onion	ALST	*Allium stellatum*	24	–
	pussytoes	ANTEN	*Antennaria*	0–24	–
	American vetch	VIAM	*Vicia americana*	24	–
	spiny phlox	PHHO	*Phlox hoodii*	0–24	–
	Forb, annual	2FA	*Forb, annual*	0–24	–
Shrub/Vine					
8	**Shrubs**			24–71	
	prairie sagewort	ARFR4	*Artemisia frigida*	24–47	–
	prairie rose	ROAR3	*Rosa arkansana*	24–47	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	24–47	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–24	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–24	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–24	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–24	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			39–157	
	western wheatgrass	PASM	*Pascopyrum smithii*	39–157	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–39	–
2	**Needlegrasses**			0–63	
	green needlegrass	NAVI4	*Nassella viridula*	0–63	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–16	–
3	**Short Warm-Season**			235–337	
	blue grama	BOGR2	*Bouteloua gracilis*	275–314	–
4	**Native Cool-Season**			16–31	
	sedge	CAREX	*Carex*	8–31	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	8–24	–
	Sandberg bluegrass	POSE	*Poa secunda*	8–24	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–8	–
5	**Other Native Grasses**			8–31	
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–24	–
	Grass, perennial	2GP	*Grass, perennial*	0–16	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–8	–
	saltgrass	DISP	*Distichlis spicata*	0–8	–
6	**Introduced Grasses**			0–16	
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–16	–
	smooth brome	BRIN2	*Bromus inermis*	0–16	–
	cheatgrass	BRTE	*Bromus tectorum*	0–16	–
	bluegrass	POA	*Poa*	0–16	–
Forb					
7	**Forbs**			39–118	
	tarragon	ARDR4	*Artemisia dracunculus*	8–47	–
	common yarrow	ACMI2	*Achillea millefolium*	8–39	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	8–31	–
	yellow salsify	TRDU	*Tragopogon dubius*	8–24	–
	Forb, annual	2FA	*Forb, annual*	0–24	–
	Forb, perennial	2FP	*Forb, perennial*	0–24	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	8–24	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	8–24	–
	scurfpea	PSORA2	*Psoralidium*	8–24	–
	goldenrod	SOLID	*Solidago*	8–24	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	8–16	–
	spiny phlox	PHHO	*Phlox hoodii*	8–16	–
	blazing star	LIATR	*Liatris*	0–16	–
	pussytoes	ANTEN	*Antennaria*	8–16	

	pussytoes	ANTEN	*Antennaria*	8–16	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–16	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	8–16	–
	larkspur	DELPH	*Delphinium*	0–16	–
	sweetclover	MELIL	*Melilotus*	8–16	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–16	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	8	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–8	–
Shrub/Vine					
8	**Shrubs**			0–16	
	prairie sagewort	ARFR4	*Artemisia frigida*	8–16	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	8–16	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0–16	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–16	–
	prairie rose	ROAR3	*Rosa arkansana*	0–16	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–16	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–8	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–8	–
Moss					
9	**Crytogams**			0–16	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–16	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			21–213	
	western wheatgrass	PASM	*Pascopyrum smithii*	21–149	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–106	–
2	**Needlegrasses**			21–149	
	green needlegrass	NAVI4	*Nassella viridula*	21–149	–
3	**Short Warm-Season**			0–85	
	blue grama	BOGR2	*Bouteloua gracilis*	0–64	–
4	**Native Cool-Season**			106–213	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	21–149	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	43–106	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	21–85	–
	sedge	CAREX	*Carex*	21–85	–
	Sandberg bluegrass	POSE	*Poa secunda*	21–43	–
5	**Other Native Grasses**			0–43	
	Grass, perennial	2GP	*Grass, perennial*	0–43	–
	saltgrass	DISP	*Distichlis spicata*	0–21	–
6	**Introduced Grasses**			426–1065	
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–1065	–

	crested wheatgrass	AGCR	*Agropyron cristatum*	0–1065	
	smooth brome	BRIN2	*Bromus inermis*	0–1065	–
	bluegrass	POA	*Poa*	426–1065	–
	cheatgrass	BRTE	*Bromus tectorum*	0–319	–
Forb					
7	**Forbs**			106–213	
	sweetclover	MELIL	*Melilotus*	0–213	–
	tarragon	ARDR4	*Artemisia dracunculus*	21–85	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	21–64	–
	Forb, annual	2FA	*Forb, annual*	0–64	–
	common yarrow	ACMI2	*Achillea millefolium*	21–64	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–64	–
	yellow salsify	TRDU	*Tragopogon dubius*	21–64	–
	scurfpea	PSORA2	*Psoralidium*	21–43	–
	goldenrod	SOLID	*Solidago*	0–43	–
	Forb, perennial	2FP	*Forb, perennial*	0–43	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–43	–
	larkspur	DELPH	*Delphinium*	0–43	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–43	–
	blazing star	LIATR	*Liatris*	0–43	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	21	–
	autumn onion	ALST	*Allium stellatum*	21	–
Shrub/Vine					
8	**Shrubs**			21–106	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	21–106	–
	prairie rose	ROAR3	*Rosa arkansana*	0–43	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–43	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–43	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0–21	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–21	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–21	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–21	–
Moss					
9	**Crytogams**			0–43	
	lesser spikemoss	SEDE2	*Selaginella densa*	0–43	–

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			34–135	
	western wheatgrass	PASM	*Pascopyrum smithii*	34–135	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–34	–
3	**Short Warm-Season**			101–135	

	blue grama	BOGR2	*Bouteloua gracilis*	67–135	–
4	**Native Cool-Season**			13–54	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	7–27	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	7–27	–
	Sandberg bluegrass	POSE	*Poa secunda*	7–20	–
	sedge	CAREX	*Carex*	7–20	–
5	**Other Native Grasses**			0–13	
	Grass, perennial	2GP	*Grass, perennial*	0–7	–
	saltgrass	DISP	*Distichlis spicata*	0–7	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–7	–
6	**Introduced Grasses**			7–34	
	cheatgrass	BRTE	*Bromus tectorum*	7–27	–
	bluegrass	POA	*Poa*	7–27	–
Forb					
7	**Forbs**			67–135	
	tarragon	ARDR4	*Artemisia dracunculus*	7–47	–
	common yarrow	ACMI2	*Achillea millefolium*	7–34	–
	sweetclover	MELIL	*Melilotus*	0–27	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–20	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	7–13	–
	spiny phlox	PHHO	*Phlox hoodii*	7–13	–
	scurfpea	PSORA2	*Psoralidium*	7–13	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–13	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–13	–
	pussytoes	ANTEN	*Antennaria*	7–13	–
	Forb, annual	2FA	*Forb, annual*	0–13	–
	Forb, perennial	2FP	*Forb, perennial*	0–13	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–13	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–13	–
	larkspur	DELPH	*Delphinium*	0–7	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–7	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–7	–
Shrub/Vine					
8	**Shrubs**			34–101	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	7–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	7–27	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–13	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	7–13	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	7–13	–
	prairie rose	ROAR3	*Rosa arkansana*	0–13	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–13	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–7	–
Moss					

9	**Cryptogams**			34–67	
	lesser spikemoss	SEDE2	*Selaginella densa*	34–67	–

Animal community

The following table lists suggested initial stocking rates for cattle under continuous grazing (year long grazing or growing season long grazing) under normal growing conditions; however, continuous grazing is not recommended. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process and may need to be adjusted due to diet preferences of other types or kinds of livestock and/or other factors. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community = Green Needlegrass/Western Wheatgrass (HCPC)
Average Annual Production (lbs./ac, air-dry) = 2100
Stocking Rate (AUM/ac) = 0.66

Plant Community = Excessive Litter
Average Annual Production (lbs./ac, air-dry) = 1900
Stocking Rate (AUM/ac) = 0.60 2

Plant Community = Blue Grama/Western Wheatgrass
Average Annual Production (lbs./ac, air-dry) = 700
Stocking Rate (AUM/ac) = 0.22

Plant Community = Clubmoss
Average Annual Production (lbs./ac, air-dry) = 600
Stocking Rate (AUM/ac) = 0.19

Plant Community = Annual/Pioneer Perennial
Average Annual Production (lbs./ac, air-dry) = --3
Stocking Rate (AUM/ac) = --3

1 Continuous season-long grazing by cattle under average growing conditions.
2 Stocking rates may need to be adjusted due to palatability and/or availability of forage.
3 Highly variable; stocking rate needs to be determined on site.

Hydrological functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups C with localized areas in hydrologic group D. Infiltration varies from moderately slow to slow and runoff potential varies from medium to very high for this site depending on soil surface texture 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 increase 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.

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 and other inventory data. Also, field knowledge of range-trained personnel was used. All descriptions were peer reviewed and/or field tested by various private, state and federal agency specialists.

Those involved in developing this site description include: Dennis Froemke, NRCS Range Management Specialist; Dean Chamrad, NRCS State Range Management Specialist; Jeff Printz, NRCS State Range Management Specialist; L. Michael Stirling, NRCS Range Management Specialist; Stan Boltz, NRCS Range Management Specialist; Josh Saunders, NRCS Range Management Specialist; Darrell Vanderbusch, NRCS Resource Soil Scientist; Michael D. Brand, State Land Dept. Director Surface Management; David Dewald, NRCS State Biologist; and Brad Podoll, NRCS Biologist.
Data Source Number of Records Sample Period State County
SCS-RANGE-417 15 1970 – 1985 SD Dewey, Perkins, Ziebach
Ocular estimates 5 1987 – 2000 ND Dunn, Hettinger, Morton

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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	05/09/2011
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:** Barely observable.

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3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent.

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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 is 5 to 15%. Bare ground will occur as small areas less 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:** None.

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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.

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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 80% or greater of soil surface and maintains soil surface integrity. Stability class anticipated to be 5 or greater.

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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.

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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. Infiltration rate is slow.

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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):** No compaction layer or soil surface crusting should be evident.

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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: Mid stature, cool-season rhizomatous grasses > mid stature, cool-season bunch grasses >

    Sub-dominant: short stature, warm-season rhizomatous grasses > forbs > shrub = sedges.

Other:

Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth bromegrass do not fit into reference plant community F/S groups.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very low.

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14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Representative value of 2100 lbs/ac with a range of 1300 lbs/ac to 3100 lbs/ac (air dry weight) depending upon growing conditions.

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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; Kentucky bluegrass, smooth bromegrass.

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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
