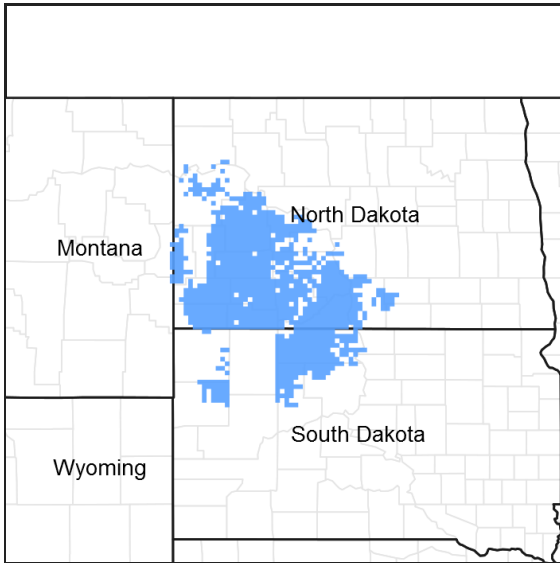


# Ecological site R054XY027ND Sandy Claypan

Accessed: 05/03/2024

## 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>
R054XY033ND	<b>Thin Claypan</b>

## Similar sites

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 doesn't have dense sodic subsoil below 6 inches with salts below 16 inches, far less western wheatgrass, blue grama, more prairie sandreed, and sand bluestem, more production.]</p>
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R054XY021ND	<p><b>Claypan</b> [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 production, no prairie sandreed and little threadleaf sedge, more blue grama and Sandberg's bluegrass, soil texture is finer but with similar sodic subsoils layer.]</p>
R054XY042ND	<p><b>Sandy Terrace</b> [Well drained soils on a river or stream terrace in a position that will flood occasionally (once in ten years) with no apparent water table. Indicator species are prairie sandreed evenly mixed with sand bluestem, some Canada wildrye, penstemon, and leadplant and/or western snowberry, and with possible trees. This site doesn't have dense sodic subsoil below 6 inches with salts below 16 inches, far less western wheatgrass, blue grama, more prairie sandreed, and sand bluestem, with more silver sagebrush and/or western snowberry and sporadic trees, more production.]</p>
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 doesn't have dense sodic subsoil below 6 inches with salts below 16 inches, far less western wheatgrass, blue grama, more prairie sandreed, and sand bluestem, more 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, a limiting layer above 20 inches without a dense sodic subsoil below 6 inches with salts below 16 inches more little bluestem, plains muhly, sideoats grama, less western wheatgrass, usually different landscape positions.]</p>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Hesperostipa comata ssp. comata</i>

## Physiographic features

This site occurs on nearly level to rolling sedimentary uplands.

**Table 2. Representative physiographic features**

Landforms	(1) Terrace (2) Alluvial fan (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	488–1,097 m
Slope	0–9%
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)	136 days
Freeze-free period (average)	157 days
Precipitation total (average)	457 mm

## Influencing water features

No significant water features influence this site.

## Soil features

The common features of soils in this site are the sandy loam to fine sandy loam textured subsoils and slopes of 0 to 9 percent. The soils in this site are moderately well to well drained and formed in soft sandstone or alluvium. The loamy fine sand to fine sandy loam surface layer is 5 to 13 inches thick. The soils have a moderate infiltration rate. 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 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 6 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) Fine sandy loam (2) Loamy fine sand (3) Sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately slow
Soil depth	15–51 cm

Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	8–12 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	4–25
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

## 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 climatic conditions and/or management actions. 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 Reference Plant Community.

The plant community upon which interpretations are primarily based is the Reference Plant Community. The Reference Plant Community 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 Reference Plant Community. Species such as western wheatgrass, blue grama, sedges, cudweed sagewort, hairy golden aster, prairie coneflower, scurfpea and fringed sagewort will initially increase. Prairie sandreed, sand bluestem green needlegrass, false gromwell, vetch, penstemon and leadplant will decrease in frequency and production. 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 Reference Plant Community. Runoff increases and infiltration will decrease. Soil erosion will be minimal.

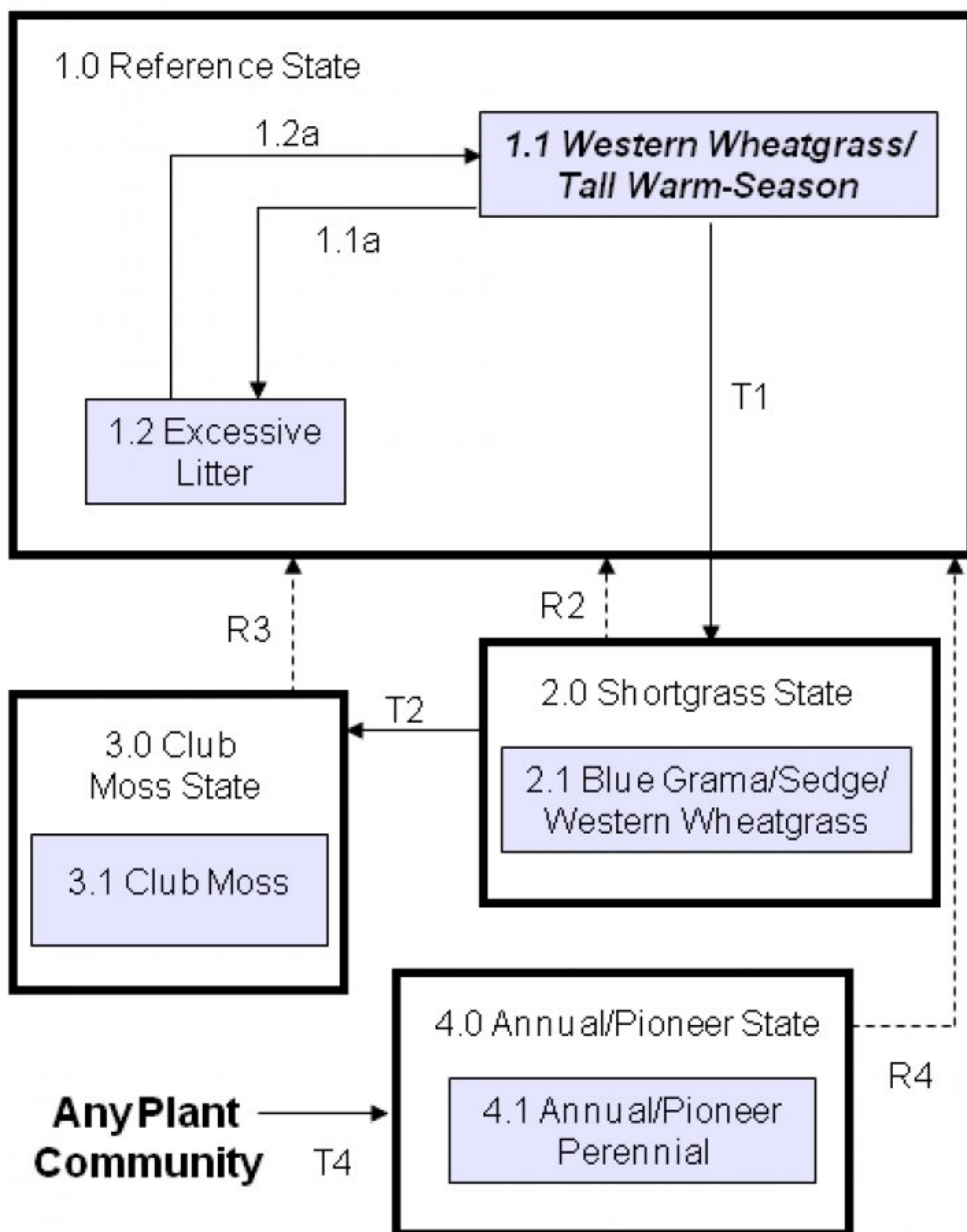
Extended periods of non-use and/or lack of fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass and/or smooth bromegrass, and in time, shrubs such as western snowberry and silver sagebrush will increase.

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 Western Wheatgrass/Tall Warm-Season Plant Community Phase may not be possible. Today, the 2.1 Blue Grama/Sedge/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



## Reference

The State narrative is under development.

### Community 1.1

#### Western Wheatgrass/Tall Warm-Season

This is the interpretive plant community and is considered to be the Reference Plant Community. 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 82% grasses or grass-like plants, 10% forbs, and 8% shrubs. Cool-season and tall warm-season grasses dominate the plant community. The co-dominant grasses include western wheatgrass and prairie sandreed. Other grasses and grass-like plants occurring on the site include needleandthread, green needlegrass, blue grama, prairie junegrass and sedges. Significant forbs include stiff sunflower, false gromwell, silverleaf scurfpea, western yarrow and goldenrod. In many areas western snowberry is the principle shrub and occurs in patchy mosaic. In other areas, silver sagebrush is the dominant shrub and occurs more evenly dispersed across the site. Other shrubs include prairie rose, leadplant 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. Low available water capacity coupled with high accumulations of sodium and slow permeability strongly influences the 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	1446	1995	2539
Forb	106	168	230
Shrub/Vine	17	67	118
Moss	–	11	28
<b>Total</b>	<b>1569</b>	<b>2241</b>	<b>2915</b>

Figure 5. Plant community growth curve (percent production by month). ND5402, Missouri Slope, Native Grasslands, Cool/Warm-season Mix. Cool-season/warm-season dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	6	21	40	20	6	4	1	0	0

### Community 1.2

#### 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 properly stocked pastures grazed season-long. Plant litter accumulates in large amounts as this community develops. Litter buildup reduces plant vigor and density, and seedling recruitment declines. Eventually litter levels become abundant enough to crowd out living plants and reduce plant density. Annual and/or biennial forbs, annual grasses, and cryptogams commonly fill these interspaces. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. Heavy 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. Non-native grasses, such as Kentucky bluegrass, crested wheatgrass, smooth brome grass and cheatgrass tend to dominant this plant community. Other grasses that may be present include western wheatgrass, needleandthread, green needlegrass and Sandberg bluegrass. The common forbs include sweetclover, green sagewort, cudweed sagewort and heath aster. Fringed sagewort, snowberry and/or silver

sagebrush are the principal shrubs and tend to increase in density and cover. 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. Compared to the Reference Plant Community, infiltration is reduced to the lower root zone. Runoff is similar to the Reference Plant Community. This plant community tends to be moisture loving and usually tends to utilize the spring moisture quickly causing forage base to become dry and not very palatable early in the summer. Once this plant community is reached, time and external resources will be needed to see any immediate recovery in the diversity of the site.

**Table 6. Annual production by plant type**

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1054	1610	2163
Forb	90	143	196
Shrub/Vine	90	143	196
Moss	–	9	22
<b>Total</b>	<b>1234</b>	<b>1905</b>	<b>2577</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

### **Pathway 1.1a Community 1.1 to 1.2**

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

### **Pathway 1.2a Community 1.2 to 1.1**

With prescribed grazing and/or prescribed burning, this plant community will move toward the Western Wheatgrass/Tall Warm-Season Plant Community. This would require long-term management with prescribed grazing and/or prescribed burning under controlled conditions.

#### **Conservation practices**

Prescribed Burning
Prescribed Grazing

## **State 2 Shortgrass**

The State narrative is under development.

### **Community 2.1 Blue Grama/ Sedge/Western Wheatgrass**

This plant community can quickly develop from the adverse effects of heavy, continuous grazing and/or annual, early spring seasonal grazing. Annual grazing too early in the spring depletes stored carbohydrates, resulting in weakening and eventual death of the cool season mid-grasses. Short grasses and grass-likes and forbs increase to dominate the site and annual production decreases dramatically. Lack of litter and reduced plant vigor result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gives blue grama and

sedges a competitive advantage over 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. Blue grama, sedges and western wheatgrass are the dominant species. Other grasses that may be present include Sandberg bluegrass, red threeawn, needleandthread, prairie junegrass and annual grasses. Forbs such as hairy goldaster, cudweed sagewort, heath aster, Lambert crazyweed, prairie coneflower, scurfpea and western yarrow may also be present. There is usually less than 10% bare ground. This plant community is relatively stable. The thick sod and 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 due to the sod forming habit of blue grama.

**Table 7. Annual production by plant type**

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	370	753	796
Forb	39	67	95
Shrub/Vine	34	63	95
Moss	6	13	22
<b>Total</b>	<b>449</b>	<b>896</b>	<b>1008</b>

**Figure 9. Plant community growth curve (percent production by month).  
ND5404, Missouri Slope, Warm-season Dominant, Cool-season  
Subdominant. Short warm-season dominant, mid cool-season subdominant  
& club moss..**

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 Club Moss

The State narrative is under development.

#### Community 3.1 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. 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 Reference Plant Community. Vigor and production of other species are reduced dramatically. Grasses and grass-like plants include western wheatgrass, blue grama, Sandberg bluegrass and upland sedges. Forbs commonly found in this plant community include cudweed sagewort, hairy goldenaster, heath aster, prairie coneflower, scurfpea, annual deervetch and western yarrow. When compared to the Western Wheatgrass/Tall Warm-Season Plant Community, blue grama and club moss have increased, while western wheatgrass has decreased and the tall warm-season grasses have disappeared.

**Table 8. Annual production by plant type**



Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	477	510
Forb	62	84	106
Shrub/Vine	22	61	95
Moss	28	50	73
<b>Total</b>	<b>224</b>	<b>672</b>	<b>784</b>

Figure 11. Plant community growth curve (percent production by month).  
 ND5404, Missouri Slope, Warm-season Dominant, Cool-season  
 Subdominant. Short warm-season dominant, mid cool-season subdominant  
 & club moss..

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 4 Annual/Pioneer

The State narrative is under development.

### Community 4.1 Annual/Pioneer Perennial

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, smooth brome, crested wheatgrass, annual brome, needleandthread, prairie junegrass and western wheatgrass. The dominant forbs include curlycup gumweed, marehail, 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 also is susceptible to invasion of non-native species due to severe soil disturbances and relatively high percent of bare ground. Many annual and perennial forbs, including non-native species, have invaded the site. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persist, 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. The total annual production ranges from 300 to 1100 lbs./ac. (air-dry weight) depending upon growing conditions.

### Transition T1 State 1 to 2

Heavy, continuous grazing or continuous seasonal grazing will convert the plant community to the Blue Grama/Sedge/Western Wheatgrass Plant Community.

### Restoration pathway R2 State 2 to 1

Long-term prescribed grazing that includes changing season of use and allowing adequate recovery periods to enhance cool season grasses will lead this plant community back to the Western Wheatgrass/Tall Warm-Season Plant Community.

### Conservation practices

Prescribed Grazing

### Transition T2 State 2 to 3

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

### Restoration pathway R3 State 3 to 1

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

### Conservation practices

Prescribed Burning

Prescribed Grazing

### Transition T4 State 3 to 4

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

### Restoration pathway R4 State 4 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 the Western Wheatgrass/Tall Warm-Season 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). Range seeding with deferment and long term prescribed grazing can convert this to a plant community resembling the Western Wheatgrass/Tall Warm-Season Plant Community.

### Conservation practices

Prescribed Grazing

### Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Western Wheatgrass</b>			336–560	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	336–560	–
2	<b>Tall Warm-Season Grasses</b>			224–336	

	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	112–224	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	22–112	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–67	–
3	<b>Needlegrass</b>			224–336	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	224–336	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	45–112	–
4	<b>Gramma</b>			112–224	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	112–224	–
5	<b>Other Native Grasses</b>			112–202	
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	45–67	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–67	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–45	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22–45	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	22–45	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–22	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–22	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–22	–
6	<b>Grass-Likes</b>			112–224	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	112–179	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	45–112	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–22	–
<b>Forb</b>					
8	<b>Forbs</b>			112–224	
	scurfpea	PSORA2	<i>Psoraleidium</i>	22–45	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	22–45	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–22	–
	beardtongue	PENST	<i>Penstemon</i>	0–22	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–22	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–22	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–22	–
	blazing star	LIATR	<i>Liatris</i>	0–22	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–22	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–22	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–22	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–22	–
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaarpus</i>	0–22	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–22	–
	prairie clover	DALEA	<i>Dalea</i>	0–22	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–22	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum var. capitatum</i>	0–22	–
	blanketflower	GAAR	<i>Gaillardia aristata</i>	0–22	–

	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–22	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–22	–
	goldenrod	SOLID	<i>Solidago</i>	0–22	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–22	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0–22	–
	longbract spiderwort	TRBR	<i>Tradescantia bracteata</i>	0–22	–
	American vetch	VIAM	<i>Vicia americana</i>	0–22	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			22–112	
	rose	ROSA5	<i>Rosa</i>	22–45	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	22–45	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–45	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	22–45	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	22–45	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	22–45	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–22	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–22	–
<b>Moss</b>					
10	<b>Cryptogams</b>			0–22	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	0–22	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Western Wheatgrass</b>			95–191	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	95–191	–
2	<b>Tall Warm-Season Grasses</b>			57–95	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	57–95	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–19	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–19	–
3	<b>Needlegrass</b>			95–191	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	95–191	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	38–95	–
4	<b>Gramma</b>			19–76	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	19–76	–
5	<b>Other Native Grasses</b>			95–191	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	95–191	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	38–57	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	19–57	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	19–38	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	19–38	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–19	–

	Grass, perennial	2GP	<i>Grass, perennial</i>	0–19	–
6	<b>Grass-Likes</b>			76–191	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	57–152	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	38–95	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–19	–
7	<b>Non-Native Grasses</b>			381–572	
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–572	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	191–572	–
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–381	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–191	–
<b>Forb</b>					
8	<b>Forbs</b>			95–191	
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	0–286	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	57–95	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	38–57	–
	scurfpea	PSORA2	<i>Psoraleidum</i>	38–57	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–57	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	19–38	–
	goldenrod	SOLID	<i>Solidago</i>	19–38	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	19–38	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	19–38	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	19–38	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–38	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	19–38	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum var. capitatum</i>	19–38	–
	American bird's-foot trefoil	LOUNU	<i>Lotus unifoliolatus var. unifoliolatus</i>	19–38	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–19	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–19	–
	beardtongue	PENST	<i>Penstemon</i>	0–19	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–19	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–19	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–19	–
	blanketflower	GAAR	<i>Gaillardia aristata</i>	0–19	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–19	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–19	–
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaarpus</i>	0–19	–
	American vetch	VIAM	<i>Vicia americana</i>	0–19	–
	longbract spiderwort	TRBR	<i>Tradescantia bracteata</i>	0–19	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–19	–
	blazing star	LIATR	<i>Liatris</i>	0–19	–
	prairie clover	DALEA	<i>Dalea</i>	0–19	–
	blacksamson echinacea	ECAN2	<i>Echinacea anaustifolia</i>	0–19	–

	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–19	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			95–191	
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	38–133	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	38–133	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	38–76	–
	rose	ROSA5	<i>Rosa</i>	19–57	–
	pricklypear	OPUNT	<i>Opuntia</i>	19–38	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–38	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–38	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–19	–
<b>Moss</b>					
10	<b>Cryptogams</b>			0–19	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	0–19	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Western Wheatgrass</b>			90–135	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	90–135	–
2	<b>Tall Warm-Season Grasses</b>			18–45	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	18–45	–
3	<b>Needlegrass</b>			36–45	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	36–45	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–9	–
4	<b>Grama</b>			269–314	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	269–314	–
5	<b>Other Native Grasses</b>			36–72	
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	18–45	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	9–45	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	27–45	–
	Scribner's rosette grass	DIOLS	<i>Dichantherium oligosanthes var. scribnerianum</i>	9–27	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	9–27	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–18	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–18	–
6	<b>Grass-Likes</b>			45–90	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	45–90	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	18–45	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–9	–
<b>Forb</b>					
8	<b>Forbs</b>			45–90	
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	0–72	–

	scurfpea	PSORA2	<i>Psoralidium</i>	27–72	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	27–45	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	27–45	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	27–45	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	18–45	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	18–45	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	9–27	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	9–27	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	9–27	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	9–27	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	9–27	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	9–18	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	9–18	–
	American bird's-foot trefoil	LOUNU	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	9–18	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	9–18	–
	blanketflower	GAAR	<i>Gaillardia aristata</i>	0–18	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–18	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–9	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	9	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			36–90	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	36–72	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–36	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	18–27	–
	pricklypear	OPUNT	<i>Opuntia</i>	9–27	–
	rose	ROSA5	<i>Rosa</i>	9–18	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–9	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–9	–
<b>Moss</b>					
10	<b>Cryptogams</b>			9–18	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	9–18	–

Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Western Wheatgrass</b>			34–67	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	34–67	–
3	<b>Needlegrass</b>			13–27	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	13–27	–
4	<b>Gramma</b>			168–202	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	168–202	–
5	<b>Other Native Grasses</b>			27–54	

	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–34	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	7–20	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	7–13	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	7–13	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	7–13	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–7	–
6	<b>Grass-Likes</b>			27–54	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	27–54	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0–7	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–7	–
7	<b>Non-Native Grasses</b>			0–7	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–7	–
<b>Forb</b>					
8	<b>Forbs</b>			67–101	
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	27–54	–
	scurfpea	PSORA2	<i>Psoralidium</i>	27–54	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	27–54	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	27–54	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	13–34	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	13–27	–
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	0–27	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	13–27	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	7–20	–
	American bird's-foot trefoil	LOUNU	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	13–20	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	7–20	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	13–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	7–13	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	7–13	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	7–13	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	7–13	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–13	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	7–13	–
	blanketflower	GAAR	<i>Gaillardia aristata</i>	0–7	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			27–94	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	34–67	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–27	–
	pricklypear	OPUNT	<i>Opuntia</i>	13–20	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–13	–
	rose	ROSA5	<i>Rosa</i>	0–7	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–7	–



<b>Moss</b>				
10	<b>Cryptogams</b>			34–67
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	34–67
				–

## Hydrological functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic group D. Infiltration varies from moderate to slow and runoff potential varies from medium to high 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

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 specialist.

Those involved in developing this site description include: Dennis Froemke, NRCS Range Management Specialist; Jeff Printz, NRCS State Range Management Specialist; L. Michael Stirling, NRCS Range Management Specialist; Stan Boltz, NRCS Range Management Specialist; Darrell Vanderbusch, NRCS Resource Soil Scientist; David Dewald, NRCS State Biologist; and Brad Podoll, NRCS Biologist.

Data Source Number of Records Sample Period State County

SCS-RANGE-417 4 1979 – 1982 ND Grant

ND-Cons-20 4 1997 – 2001 ND Bowman, Morton

## Other references

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USDA, NRCS, Various Published Soil Surveys.

## Contributors

Jeff Printz

## 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	
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:** Not evident on slopes < 8%. Erosional pedestals may be present with small terracettes present at debris dams on slopes 9%.  

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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 25 to 45%.  

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- 5. Number of gullies and erosion associated with gullies:** Active gullies should not be present.  

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

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- 7. Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. If litter movement occurs, it is only for a short distance.  

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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 45% 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.
- 
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Moderate plant canopy (50 to 70% maximum), deeper surface layer and a healthy plant community contribute to reduced runoff. Infiltration rates are slow to moderately slow.
- 
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 would be expected except for the naturally occurring pan below the surface layer.
- 
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, cool-season rhizomatous grasses >
- Sub-dominant: tall, warm-season rhizomatous grasses = mid, cool-season bunchgrasses >
- Other: short, warm-season grasses = grass-likes = forbs > shrubs
- 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):** Some plant mortality and decadence (less than 5%) is expected on this site.
- 
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 = 2000 lbs/ac with a range of 1400 lbs/ac to 2600 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/local noxious, Kentucky bluegrass, smooth brome grass
- 
17. **Perennial plant reproductive capability:** No limitations.
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