

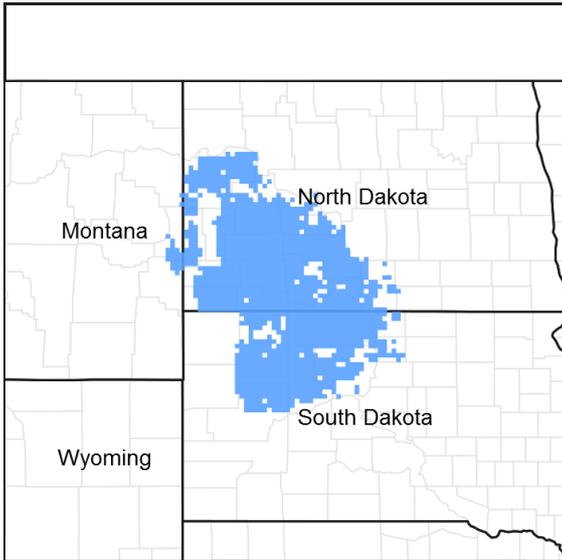
# Ecological site R054XY028ND

## Shallow Clayey

Accessed: 04/24/2024

### 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

R054XY020ND	<b>Clayey</b>
R054XY035ND	<b>Very Shallow</b>

### Similar sites

R054XY043ND	<p><b>Shallow Sandy</b></p> <p>[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 similar species but more little bluestem, sand bluestem, prairie sandreed and sedges, less plains muhly, green needlegrass, western wheatgrass, restrictive layer above twenty inches is sandstone or gravels, slightly more production.]</p>
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R054XY030ND	<p><b>Shallow Loamy</b> [Somewhat excessively well-drained soils more than 10 less than 20 inches to sedimentary bedrock that restricts root penetration. Surface layer will ribbon less than 2 inches and greater than 1 inch. Upslope from thin loamy or loamy sites and some times down slope form very shallow ecological sites. Indicator species: little bluestem, plains muhly, needle grasses and sideoats grama, with dotted gayfeather, pasqueflower, purple coneflower and purple prairie clover, and shrubs like broom snakeweed. This site has similar species but more little bluestem, and sideoats, less plains muhly, green needlegrass, western wheatgrass, restrictive layer above twenty inches is sedimentary bedrock, slightly more production.]</p>
R054XY020ND	<p><b>Clayey</b> [Does not receive additional moisture. Found on dry uplands, upslope from loamy or clayey terraces or loamy overflow sites, down slope from thin loamy, shallow loamy or shallow clayey sites. Similar landscape position as sandy, sands, and loamy sites. Will ribbon greater than 2 inches. Indicator species: dominated by of western wheatgrass and green needlegrass. This site has more production, different landscape position, no restrictive shales above twenty inches, no little bluestem, plains muhly, and sideoats grama, more western wheatgrass and green needlegrass.]</p>
R054XY035ND	<p><b>Very Shallow</b> [Excessively well drained soils less than 10 inches to scoria, gravels, shales, siltstone or sandstone bedrock that restricts root penetration, upslope of shallow clayey, shallow loamy or shallow sandy ecological sites. Indicator species are little bluestem, sideoats grama, blue grama, purple coneflower, pasqueflower and creeping juniper. This site has similar species but more needleandthread, blue grama and little bluestem, less plains muhly, green needlegrass, western wheatgrass, restrictive layer above 10 inches is scoria or gravels, less production.]</p>
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 no little bluestem, plains muhly, sideoats grama, less green needlegrass, more blue grama and needleandthread, similar production, different restrictive layer.]</p>
R054XY033ND	<p><b>Thin Claypan</b> [Well drained soils on uplands or terraces that don't receive extra moisture with a dense sodic subsoil above 6 inches and with salts above 16 inches that restricts root penetration. Usually found in micro relief within Claypan sites, indicator species are western wheatgrass, Sandberg's bluegrass with an understory of blue grama and buffalograss, heath aster, cudweed sagewort and western yarrow along with a few shrubs of fringed sagewort, cactus and Nuttall's Saltbush. This site has no little bluestem, plains muhly, sideoats grama, less green needlegrass, more blue grama and needleandthread, less production, different restrictive layer at less than 6 inches and salts above 16 inches.]</p>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i>

## Physiographic features

This site occurs on gently sloping to very 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	2–35%
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 silty clay to clay-textured substratum and slopes of 2 to 35 percent. The soils in this site are well drained and formed in shale. The surface layer is 1 to 6 inches thick. The soils have a slow to very slow 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.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 5 percent. Low available water capacity and very slow permeability strongly influences the soil-water-plant relationship. 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) Silty clay loam (2) Silty clay (3) Clay
Family particle size	(1) Clayey
Drainage class	Well drained

Permeability class	Very slow to moderately slow
Soil depth	10–20 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1–3 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	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 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 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 considered. 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 and blue grama will initially increase. Little bluestem, green needlegrass, plains muhly and sideoats grama will decrease in frequency and production. Heavy continuous grazing causes blue grama to increase and eventually dominates 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.

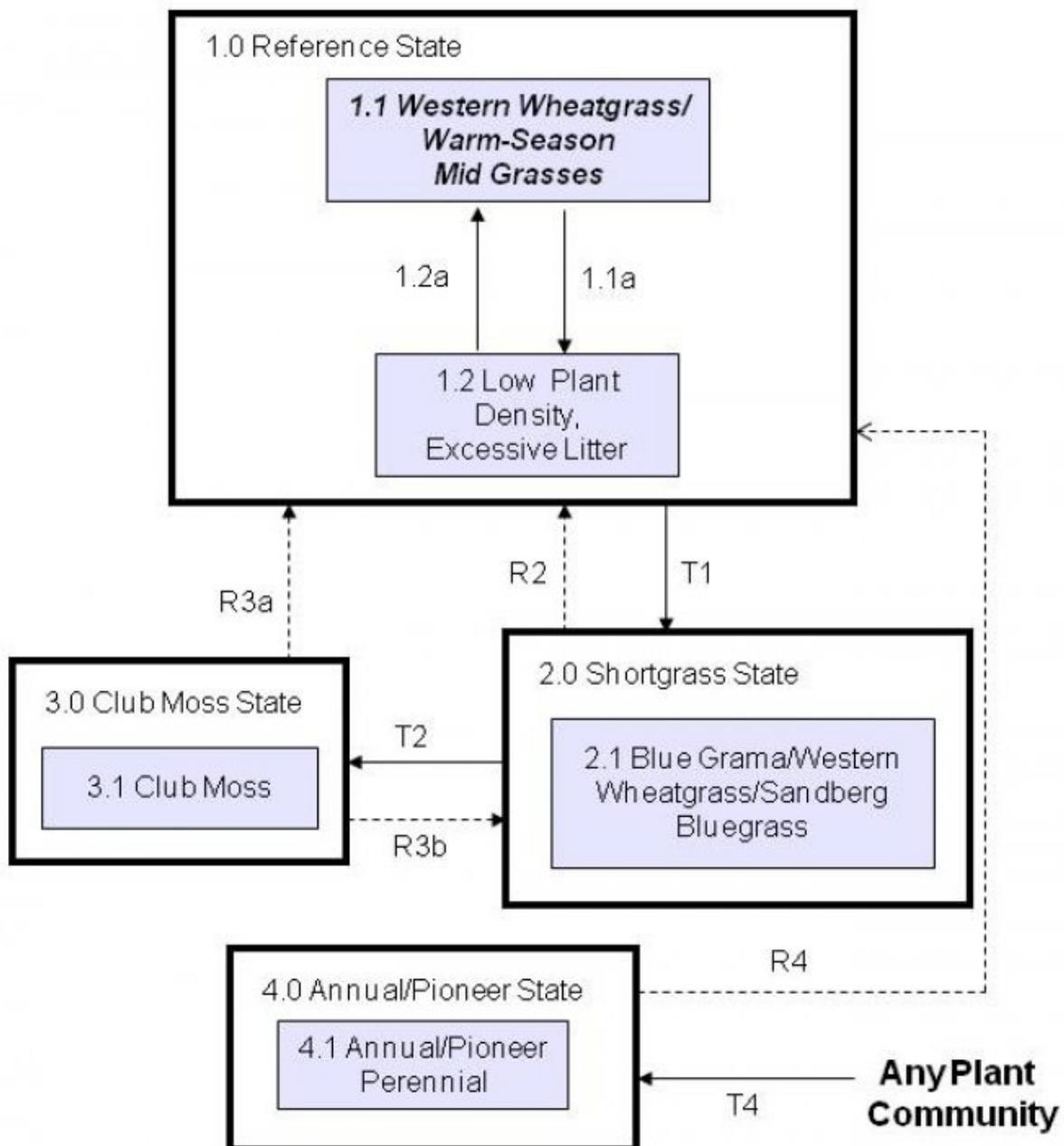
Extended periods of non-use and no fire will result in a plant community having high litter levels, which favors an increase in Sandberg bluegrass and the invasion of Kentucky bluegrass and/or smooth brome grass. In time, shrubs such as silver sagebrush and rubber rabbitbrush will increase.

Due to a general invasion of exotic species (such as Kentucky bluegrass and smooth brome grass) across the MLRA within this site, returning to the 1.1 Western Wheatgrass/Warm-Season Mid Grasses Plant Community Phase may not be possible. Today, the 2.1 Blue Grama/Western Wheatgrass/Sandberg Bluegrass Plant Community Phases 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 Western Wheatgrass/Warm-Season Mid Grasses

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 79% grasses or grass-like plants, 10% forbs, 10% shrubs and 1% cryptogams. The plant community is dominated by both cool season and mid warm-season grasses. The co-dominant grasses include western wheatgrass, green needlegrass, plains muhly, little bluestem and sideoats grama. Other grasses and grass-like plants present include needleandthread, thickspike wheatgrass, blue grama, buffalograss, inland salt, Sandberg bluegrass, prairie junegrass, plains reedgrass, and sedges. Significant forbs include prairie coneflower, dotted gayfeather, Missouri goldenrod, silverleaf scurfpea, eriogonum, wild parsley and cudweed sagewort, silverleaf scurfpea and Missouri goldenrod. Rubber rabbitbrush, Gardner's saltbush, winterfat and silver sagebrush are the principal shrub and occur randomly throughout the site. Other shrubs include plains pricklypear, purple pincushion, broom snakeweed 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	490	1014	1135
Forb	55	90	125
Shrub/Vine	55	90	125
Moss	0	6	15
<b>Total</b>	<b>600</b>	<b>1200</b>	<b>1400</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 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 properly stocked 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 sweetclover tend to invade and may dominate this plant community. Other grasses present include western wheatgrass, needleandthread, green needlegrass, prairie junegrass, Sandberg bluegrass and sedges with lesser amounts of plains muhly, little bluestem, blue grama, sideoats grama, and inland saltgrass. The common forbs include dotted gayfeather, Missouri goldenrod, prairie coneflower, silverleaf scurfpea, western yarrow and heath aster. Fringed sagewort, silver

sagebrush, rubber rabbitbrush, Gardner's saltbush, broom snakeweed and winterfat are the principal shrubs. 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 favor early cool season plant species which are moisture loving and usually tends to utilize the spring moisture quickly causing the forage base to become dry and not very palatable early in the summer. 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	475	716	1055
Forb	85	112	140
Shrub/Vine	40	68	95
Moss	0	4	10
<b>Total</b>	<b>600</b>	<b>900</b>	<b>1300</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 Low Plant Density, Excessive Litter Plant Community.

### Pathway 1.2a Community 1.2 to 1.1

Prescribed grazing or prescribed burning followed by prescribed grazing, will move this plant community toward the Western Wheatgrass/Warm-Season Mid Grasses 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/ Western Wheatgrass/Sandberg Bluegrass

This plant community can quickly result from 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, low vigor western wheatgrass and unpalatable 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 early cool season species like Sandberg bluegrass a competitive advantage over both the cool and warm 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, western wheatgrass and Sandberg bluegrass are the dominant species with the balance being a few species of cool-season grasses and warm-season grasses including inland saltgrass, little bluestem, plains muhly, buffalograss, prairie junegrass, plains reedgrass, needleandthread, and annual grasses. Forbs such as hairy golden aster, heath aster, Lambert’s crazyweed, prairie coneflower, scarlet globemallow, scurfpea, curlycup gumweed, goldenpea and western yarrow will also be present. There is usually less than 15% 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	225	294	465
Forb	35	50	65
Shrub/Vine	35	46	55
Moss	5	10	15
<b>Total</b>	<b>300</b>	<b>400</b>	<b>600</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 Clubmoss

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. Blue grama, western wheatgrass and Sandberg bluegrass are the dominant grass species with the balance being a few species of cool-season grasses and warm-season grasses including, inland saltgrass, buffalograss, prairie junegrass and annual grasses. Sedges are typically not found. Forbs such as hairy goldaster, heath aster, Lambert’s crazyweed, scarlet globemallow, scurfpea, curlycup gumweed, goldenpea and western yarrow will also be present. There is usually less than 10% bare ground. This plant community is very resistant to change. The thick sod and 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 to the Reference Plant Community. Soil erosion will be minimal.

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

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	140	204	275
Forb	25	38	50
Shrub/Vine	25	38	50
Moss	10	20	25
<b>Total</b>	<b>200</b>	<b>300</b>	<b>400</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, sixweeks fescue, smooth brome, crested wheatgrass, annual brome, needleandthread, prairie junegrass, western wheatgrass and little bluestem.. The dominant forbs include curlycup gumweed, maretail, 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 other non-native species due to severe soil disturbances and relatively high percent of bare ground. Compared to the Reference Plant Community, western wheatgrass and blue grama have decreased drastically or even disappeared while green needlegrass, plains muhly, sideoats grama, little bluestem have completely disappeared. 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 plant community. 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/Western Wheatgrass/Sandberg Bluegrass 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 the mid grasses may eventually moves this plant community through the successional stages leading toward the Western Wheatgrass/Warm-Season Mid Grasses Plant Community.

#### **Conservation practices**

Prescribed Grazing
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#### **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 R3a**

##### **State 3 to 1**

Fertilization combined with prescribed grazing will move this plant community subsequently through the successional stages leading toward the Western Wheatgrass/Warm-Season Mid Grasses 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/Warm-Season Mid Grasses Plant Community.

#### **Conservation practices**

Prescribed Grazing
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#### **Restoration pathway R3b**

##### **State 3 to 2**

Prescribed burning followed by prescribed grazing may eventually convert this plant community back to the Blue Grama/Western Wheatgrass/Sandberg Bluegrass Plant Community. Long-term prescribed grazing may eventually move this plant community through the successional stages leading toward the Blue Grama/Western Wheatgrass/Sandberg Bluegrass Plant Community.

#### **Conservation practices**

Prescribed Burning
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Prescribed Grazing
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#### **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 a plant community resembling the Western Wheatgrass/ Warm-Season Mid 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 prescribed grazing can convert this to a plant community resembling the Western Wheatgrass/Warm-Season Mid Grasses Plant Community.

#### **Conservation practices**

## 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>Cool-Season Mid Grasses</b>			420–540	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	360–480	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–120	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	60–120	–
2	<b>Warm-Season Mid Grasses</b>			120–180	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	60–120	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	60–120	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	60–120	–
3	<b>Other Warm-Season Grasses</b>			60–120	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	36–96	–
	saltgrass	DISP	<i>Distichlis spicata</i>	24–36	–
	dropseed	SPORO	<i>Sporobolus</i>	0–12	–
4	<b>Other Native Grasses</b>			60–96	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	36–60	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	24–36	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	24–36	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	24–36	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	12–24	–
	Grass, annual	2GA	<i>Grass, annual</i>	0–12	–
5	<b>Grass-Likes</b>			12	
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–12	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	12	–
<b>Forb</b>					
7	<b>Forbs</b>			60–120	
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	12–24	–
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	0–24	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	12–24	–
	blazing star	LIATR	<i>Liatris</i>	12–24	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	12–24	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	12–24	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	12	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	12	–
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	0–12	–
	Nuttall's violet	VINU2	<i>Viola nuttallii</i>	12	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	12	–

	leafy wildparsley	MUDI	<i>Musineon divaricatum</i>	12	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	12	–
	onion	ALLIU	<i>Allium</i>	12	–
	rosy pussytoes	ANRO2	<i>Antennaria rosea</i>	0–12	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–12	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–12	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	12	–
	buckwheat	ERIOG	<i>Eriogonum</i>	12	–
	blanketflower	GAAR	<i>Gaillardia aristata</i>	12	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	12	–
	povertyweed	IVAX	<i>Iva axillaris</i>	0–12	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–12	–
	sticky cinquefoil	POGL9	<i>Potentilla glandulosa</i>	12	–
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			60–120	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	24–36	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	12–24	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–24	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	12–24	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	12–24	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–24	–
	Nuttall's saltbush	ATNU2	<i>Atriplex nuttallii</i>	0–12	–
	spinystar	ESVIV	<i>Escobaria vivipara var. vivipara</i>	0–12	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	12	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–12	–
<b>Moss</b>					
9	<b>Cryptogams</b>			0–12	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	0–12	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Cool-Season Mid Grasses</b>			180–270	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	180–270	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–45	–
2	<b>Warm-Season Mid Grasses</b>			9–45	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	9–45	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	9–45	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	9	–
3	<b>Other Warm-Season Grasses</b>			18–45	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	18–45	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–9	–
	tumblegrass	SCDA	<i>Schedoneardus paniculatus</i>	0–9	–

	timbergrass	SOFA	<i>Scribnerianthus paniculatus</i>	0-9	-
	dropseed	SPORO	<i>Sporobolus</i>	0-9	-
4	<b>Other Native Grasses</b>			90-135	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	90-135	-
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	36-45	-
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	18-36	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	9-18	-
	Grass, annual	2GA	<i>Grass, annual</i>	0-9	-
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-9	-
5	<b>Grass-Likes</b>			18-27	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	18-27	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-9	-
6	<b>Non-Native Grasses</b>			90-144	
	bluegrass	POA	<i>Poa</i>	81-135	-
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0-45	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-45	-
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-18	-
<b>Forb</b>					
7	<b>Forbs</b>			90-135	
	sweetclover	MELIL	<i>Melilotus</i>	0-90	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	27-45	-
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	9-27	-
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	18-27	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	18-27	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	18-27	-
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	9-18	-
	leafy wildparsley	MUDI	<i>Musineon divaricatum</i>	9-18	-
	povertyweed	IVAX	<i>Iva axillaris</i>	9-18	-
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	9-18	-
	common yarrow	ACMI2	<i>Achillea millefolium</i>	9-18	-
	onion	ALLIU	<i>Allium</i>	0-9	-
	rosy pussytoes	ANRO2	<i>Antennaria rosea</i>	9	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	9	-
	buckwheat	ERIOG	<i>Eriogonum</i>	9	-
	blanketflower	GAAR	<i>Gaillardia aristata</i>	0-9	-
	old man's whiskers	GETR	<i>Geum triflorum</i>	9	-
	blazing star	LIATR	<i>Liatris</i>	9	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	9	-
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	9	-
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0-9	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	9	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	9	-
	sticky cinquefoil	POGL9	<i>Potentilla glandulosa</i>	9	-

	Nuttall's violet	VINU2	<i>Viola nuttallii</i>	0–9	–
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	9	–
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			45–90	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	27–45	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	36–45	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	36–45	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	27–36	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	18–27	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–27	–
	Nuttall's saltbush	ATNU2	<i>Atriplex nuttallii</i>	18–27	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	18–27	–
	spiny star	ESVIV	<i>Escobaria vivipara var. vivipara</i>	9–18	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	9–18	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	9–18	–
<b>Moss</b>					
9	<b>Cryptogams</b>			0–9	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	0–9	–

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Cool-Season Mid Grasses</b>			28–40	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	28–40	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–8	–
2	<b>Warm-Season Mid Grasses</b>			12–20	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	8–20	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	4–8	–
3	<b>Other Warm-Season Grasses</b>			100–120	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	80–120	–
	saltgrass	DISP	<i>Distichlis spicata</i>	8–16	–
	dropseed	SPORO	<i>Sporobolus</i>	4–12	–
	tumblegrass	SCPA	<i>Schedonnardus paniculatus</i>	4–8	–
4	<b>Other Native Grasses</b>			60–80	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	40–60	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	20–40	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	20–40	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	8–12	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	4–8	–
	Grass, annual	2GA	<i>Grass, annual</i>	4–8	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	4–8	–
5	<b>Grass-Likes</b>			4–8	

	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	4-8	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-4	-
6	<b>Non-Native Grasses</b>			4-8	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-8	-
<b>Forb</b>					
7	<b>Forbs</b>			40-60	
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	8-12	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	8-12	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	8-12	-
	common yarrow	ACMI2	<i>Achillea millefolium</i>	8-12	-
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	8-12	-
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	8-12	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	4-8	-
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	4-8	-
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	4-8	-
	sweetclover	MELIL	<i>Melilotus</i>	0-8	-
	onion	ALLIU	<i>Allium</i>	4-8	-
	rosy pussytoes	ANRO2	<i>Antennaria rosea</i>	4-8	-
	povertyweed	IVAX	<i>Iva axillaris</i>	4-8	-
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	4-8	-
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	4-8	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	4-8	-
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	0-4	-
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	0-4	-
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	0-4	-
	Nuttall's violet	VINU2	<i>Viola nuttallii</i>	0-4	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0-4	-
	buckwheat	ERIOG	<i>Eriogonum</i>	4	-
	blanketflower	GAAR	<i>Gaillardia aristata</i>	0-4	-
	old man's whiskers	GETR	<i>Geum triflorum</i>	0-4	-
	blazing star	LIATR	<i>Liatris</i>	4	-
	leafy wildparsley	MUDI	<i>Musineon divaricatum</i>	0-4	-
	sticky cinquefoil	POGL9	<i>Potentilla glandulosa</i>	4	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			40-52	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	20-40	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	12-16	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	8-12	-
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0-12	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	8-12	-
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	4-8	-
	Nuttall's saltbush	ATNU2	<i>Atriplex nuttallii</i>	0-8	-
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	4-8	-

	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–4	–
	spiny star	ESVIV	<i>Escobaria vivipara</i> var. <i>vivipara</i>	0–4	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–4	–
<b>Moss</b>					
9	<b>Cryptogams</b>			8–12	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	8–12	–

Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Cool-Season Mid Grasses</b>			15–24	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	12–24	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–3	–
2	<b>Warm-Season Mid Grasses</b>			0–3	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–3	–
3	<b>Other Warm-Season Grasses</b>			90–105	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	75–105	–
	saltgrass	DISP	<i>Distichlis spicata</i>	12–30	–
	dropseed	SPORO	<i>Sporobolus</i>	6–15	–
4	<b>Other Native Grasses</b>			30–45	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	15–30	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	12–24	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	12–24	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	9–15	–
	Grass, annual	2GA	<i>Grass, annual</i>	3–6	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	3–6	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0–3	–
5	<b>Grass-Likes</b>			0–3	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	0–3	–
6	<b>Non-Native Grasses</b>			3–6	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–6	–
<b>Forb</b>					
7	<b>Forbs</b>			30–45	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	12–15	–
	povertyweed	IVAX	<i>Iva axillaris</i>	9–12	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	9–12	–
	sweetclover	MELIL	<i>Melilotus</i>	0–12	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	9–12	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	9–12	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	9–12	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	9–12	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	6–9	–

	woolly plantain	PLPA2	<i>Plantago patagonica</i>	6–9	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	6–9	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	6–9	–
	rosy pussytoes	ANRO2	<i>Antennaria rosea</i>	6–9	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	6–9	–
	sticky cinquefoil	POGL9	<i>Potentilla glandulosa</i>	3–6	–
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	3–6	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	3–6	–
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	0–3	–
	onion	ALLIU	<i>Allium</i>	0–3	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–3	–
	blazing star	LIATR	<i>Liatris</i>	0–3	–
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			30–45	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	15–30	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–18	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	12–18	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	12–15	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	9–12	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	9–12	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	6–9	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–3	–
	spiny star	ESVIV	<i>Escobaria vivipara var. vivipara</i>	0–3	–
<b>Moss</b>					
9	<b>Cryptogams</b>			15–24	
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	15–24	–

## Hydrological functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups B and C, with localized areas in hydrologic group D. Infiltration and runoff potential for this site varies from moderate 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; Stan Boltz, NRCS Range Management Specialist; Darrell Vanderbusch, NRCS Resource Soil Scientist; L. Michael Stirling, NRCS Range Management Specialist; David Dewald, NRCS State Biologist; and Brad Podoll, NRCS Biologist.

Data Source Number of Records Sample Period State County  
SCS-RANGE-417 5 1984 – 1989 ND, SD Bowman, Dewey  
Ocular Estimates 2 1998 ND Bowman

## Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728.  
(<http://hprcc.unl.edu>)

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224.  
(<http://www.wcc.nrcs.usda.gov>)

USDA, NRCS. National Range and Pasture Handbook, September 1997

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (<http://nasis.nrcs.usda.gov>)

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

USDA, NRCS, Various Published Soil Surveys.

## Contributors

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Jeff Printz/Stan Boltz

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	05/13/2011
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** Due to the wide slope range associated with this site, the number and extent of rills will vary from none on sites with slopes of < 9% to common on slopes > 25%.

- 
2. **Presence of water flow patterns:** Due to the wide slope range associated with this site, water flow patterns will vary from barely observable on sites with slopes of < 9% from broken and irregular in appearance to continuous on slopes > 25%.
- 
3. **Number and height of erosional pedestals or terracettes:** Not evident on slopes < 9%. Erosional pedestals will be present with terracettes present at debris dams on slopes > 9%.
- 
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 40%.
- 
5. **Number of gullies and erosion associated with gullies:** Active gullies restricted to concentrated water flow patterns.
- 
6. **Extent of wind scoured, blowouts and/or depositional areas:** None.
- 
7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement occurs on slopes < 9%. Litter movement does occur within plant interspaces on slopes > 25%.
- 
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 60% or greater of soil surface and maintains soil surface integrity. Stability class anticipated to be 5 or greater.
- 
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:** Plant canopy (60% maximum), very slow to slow infiltration rates, the amount of bare ground, and steepness of slopes results in a naturally high runoff rate on slopes > 25%, even in the reference state.
- 
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 rooting restriction (bedrock or decomposing shale) at 10 to 20 inches.
- 
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: cool-season bunchgrasses >

Other: mid, warm-season bunchgrass > forbs = shrubs > short, warm-season grasses > grass-likes

Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth brome grass 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 = 1200 lbs/ac with a range of 600 lbs/ac to 1400 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 brome grass
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17. **Perennial plant reproductive capability:** No limitations.
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