

Ecological site R054XY038ND **Thin Loamy**

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General information

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

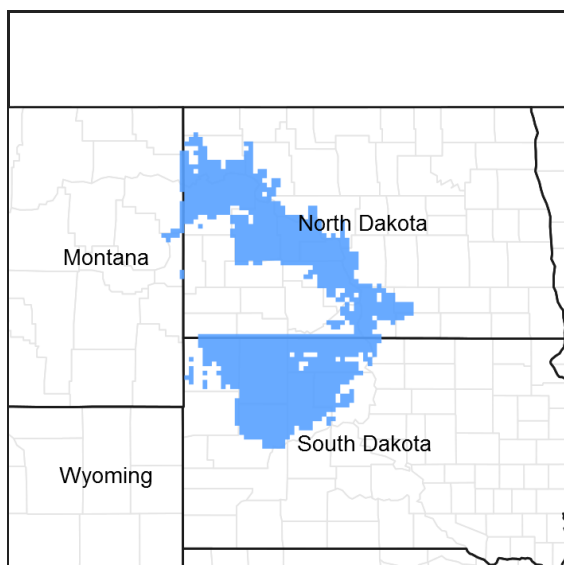


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Classification relationships

Level IV Ecoregions of the Conterminous United States: 43a – Missouri Plateau.

Associated sites

R054XY030ND	Shallow Loamy
R054XY031ND	Loamy
R054XY035ND	Very Shallow

Similar sites

R054XY045ND	Limy Sands [Moderately deep entisol, usually calcareous within 4 inches to the surface, found on knobs and/or sideslopes of hills and buttes; will not form a ribbon; up slope of sands or sandy and down slope from shallow sandy ecological sites. Indicator species: Little bluestem, sand bluestem, and prairie sandreed, along with penstemon, silverleaf scurfpea, purple coneflower, yucca, creeping juniper, and leadplant. This site has less western wheatgrass, plains muhly, green needlegrass and sideoats grama, more little bluestem, sedges, prairie sandreed and sand bluestem, similar production, soil depths.]
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R054XY028ND	Shallow Clayey [Some what excessively well drained soils more than 10 less than 20 inches to unweathered shales that restricts root penetration. Upslope of clayey site, surface layer will ribbon greater than 2 inches, upslope of clayey ecological site. Indicator species: western wheatgrass dominates with little bluestem, plains muhly and sideoats grama, gayfeather. This site has similar species but no porcupinegrass, similar little bluestem, less sideoats, more western wheatgrass, plains muhly, green needlegrass, restrictive layer above twenty inches is shale, less production.]
R054XY030ND	Shallow Loamy [Somewhat excessively 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 and purple coneflower, and shrubs like broom snakeweed. This site has similar species but more little bluestem and plains muhly, less sideoats grama, green needlegrass, western wheatgrass, has a restrictive layer above twenty inches is sedimentary bedrock, less production.]
R054XY043ND	Shallow Sandy [Somewhat excessively drained soils > 10 and < 20 inches to sedimentary sandstone bedrock or gravel restricting root penetration. Surface layer ribbons < 1 inch unless above gravel, than > 1 but < 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 needlegrasses, with dotted gayfeather, pasqueflower and purple coneflower, 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, porcupinegrass, western wheatgrass, restrictive layer above twenty inches is sandstone or gravels, less production.]
R054XY031ND	Loamy Found on dry uplands, upslope from loamy terraces or loamy overflow sites, down slope from thin loamy or shallow loam sites; similar landscape position as sandy, sands, clayey sites. Will ribbon greater than 1 inch and up to 2 inches. Indicator species are western wheatgrass some green needlegrass and blue grama, with fringed sagewort and western snowberry being the dominant shrubs. This site has more production, different landscape position, no restrictive layers above twenty inches, no little bluestem, plains muhly, and sideoats grama, more western wheatgrass and green needlegrass.]

Table 1. Dominant plant species

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

Physiographic features

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

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Knoll (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	488–1,097 m
Slope	6–35%
Aspect	Aspect is not a significant factor

Climatic features

MLRA 54 is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are characteristic. The climate is the result of this MLRA's location in

the geographic center of North America. There are few natural barriers on the northern Great Plains. The air masses move unobstructed across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 14 to 18 inches per year. The normal average annual temperature is about 42° F. January is the coldest month with average temperatures ranging from about 13° F (Beach, ND) to about 16° F (Bison, SD). July is the warmest month with temperatures averaging from about 69° F (Beach, ND) to about 72° F (Timber Lake, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 57° F. This large annual range attests to the continental nature of this MLRA's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of native cool-season plants begins in late March and continues to early to mid July. Native warm-season plants begin growth in mid May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	136 days
Freeze-free period (average)	157 days
Precipitation total (average)	457 mm

Influencing water features

No significant water features influence this site.

Soil features

The common features of soils in this site are the calcareous silt loam to calcareous fine sandy loam textured subsoils and slopes of typically greater than 6 to 35 percent. The soils in this site are well drained and formed in soft siltstone, loess deposits or glacial till deposits. The loam to silt loam surface layer is 4 to 7 inches thick. The soils have a moderate to moderately slow infiltration rate. It is not uncommon to have some pedestalling of plants due to the inherent instability of the soils. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers, and there is a risk of rills and eventually gullies if vegetative cover is not adequate. The soil surface is unstable and slumping, erosion and deposition is common to the site. Cryptobiotic crusts are present. Sub-surface soil layers are slightly restrictive to water movement and root penetration.

These soils are highly susceptible to water erosion and to a lesser degree wind erosion. The hazard of water erosion increases where vegetative cover is not adequate. 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) Loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate

Soil depth	51–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herbivores and occasional fire. Changes will occur in the plant communities due to management actions and/or climatic conditions. Due to the nature of the soils, the site is considered quite fragile. Under continued adverse impacts, a rapid decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments the site can slowly return to the Historic Climax Plant Community (HCPC).

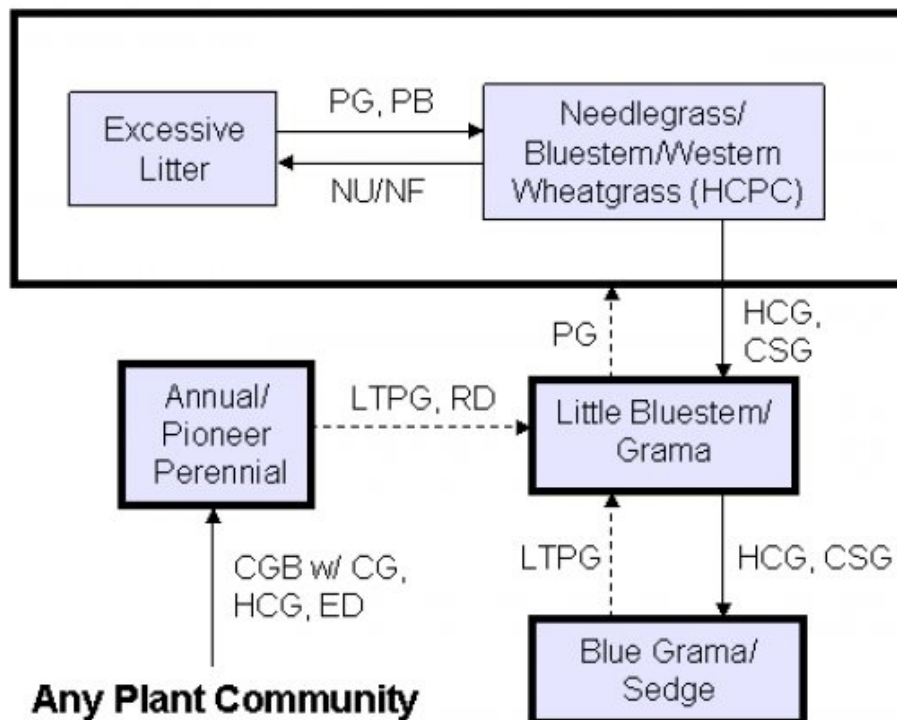
The plant community upon which interpretations are primarily based is the Historic Climax Plant Community. The HCPC has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered. Subclimax plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

Several years of continuous grazing without adequate recovery periods, following each grazing occurrence will likely cause this site to depart from the HCPC. Species such as western wheatgrass and blue grama will initially increase while little bluestem will sustain. Porcupine grass and/or green needlegrass, plains muhly and sideoats grama will decrease in frequency and production. Heavy continuous grazing causes blue grama to increase and eventually dominates with eroded gaps between while little bluestem stays in wolf plant colonies. In time, heavy continuous grazing will likely cause upland sedges and blue grama to dominate and pioneer perennials, and annuals to increase.

This plant community is relatively stable and the competitive advantage prevents other species from establishing. This plant community is less productive than the HCPC. Runoff increases and infiltration will decrease. Soil erosion will be critical. Extended periods of non-use and/or lack of fire will result in excessive litter, which favors an increase in Kentucky bluegrass and/or smooth brome grass and/or Crested Wheatgrass. In many areas shrubs such as western snowberry and fringed sagewort will also increase. In other areas, silver sagebrush will be the dominant shrub that will increase.

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model



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

Community 1.1

Needlegrass/Bluestem/Western Wheatgrass (HCPC)

This is the interpretive plant community for this site and is considered to be the Historic Climax Plant Community (HCPC). This community evolved with grazing by large herbivores and occasional prairie fire. It is well suited for grazing by domestic livestock and can be found on areas that are properly managed with prescribed grazing that allows for proper utilization, changes in season of use and adequate recovery periods following each grazing event. The potential vegetation is about 85% grasses or grass-like plants, 10% forbs, and 5% shrubs. The site is dominated by a mixture of cool and warm-season grasses. The major grasses include the needlegrasses, western wheatgrass, little bluestem, and sideoats grama. Other grasses occurring on the site include blue grama, plains muhly, and red threeawn. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle and energy flow are functioning properly. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Run-off from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	998	1695	2393
Forb	90	143	196
Shrub/Vine	34	67	101
Total	1122	1905	2690

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

State 2

Little Bluestem/ Grama

Community 2.1

Little Bluestem/ Grama

Historically, this plant community evolved under heavy grazing and a low fire frequency. Little bluestem, blue grama and needleandthread are the significant species in this plant community. Warm-season grass such as blue grama make up the majority of the understory with the balance made up of the sedges. Forbs and shrubs commonly found in this plant community include cudweed sagewort and fringed sagewort. Shrub canopy ranges from 2% to 4%. When compared to the HCPC, little bluestem, blue grama and needleandthread have increased. The green needlegrass and/or porcupine grass have decreased. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	684	925	1278
Forb	50	112	174
Shrub/Vine	50	84	118
Total	784	1121	1570

Figure 7. 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

Blue Grama/Sedge

Community 3.1

Blue Grama/Sedge

This plant community evolves from heavy grazing over several years of time. Diversity is lost as the short grasses become dominant in the plant community. Big bluestem, little bluestem, western wheatgrass and the needlegrasses are replaced by the grazing tolerant blue grama, and sedges. Sideoats grama remains in the plant community, but is less productive because of the mid-summer grazing pressure. Because they are less palatable, cudweed sagewort, and green sagewort become more prevalent in the plant community. This plant community is resistant to change. The herbaceous species present are not suitable to grazing.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	353	655	953
Shrub/Vine	73	99	123
Forb	22	31	45
Total	448	785	1121

Figure 9. Plant community growth curve (percent production by month).
ND5405, Missouri Slope, Warm-season Short Grass. Warm-season, short
grass dominant, and some sedge.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	7	18	33	26	10	4	1	0	0

State 4

Excessive Litter

Community 4.1

Excessive Litter

This plant community develops after an extended period of 10 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. shortgrasses 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, and smooth brome grass tend to invade and may dominate this plant community. Other grasses present include western wheatgrass, porcupine grass, green needlegrass and bearded wheatgrass. The common forbs include sweetclover, green sage, cudweed sage, and American vetch. Western snowberry is the principal shrub and tends to increase in density and cover. This plant community is resistant to change without prescribed grazing and/or fire. The combination of both grazing and fire is most effective in moving this plant community towards the HCPC. Soil erosion is low. Compared to the HCPC, infiltration is reduced to the lower root zone. Runoff is similar to the HCPC. 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 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	768	1302	1816
Forb	163	252	364
Shrub/Vine	78	127	174
Total	1009	1681	2354

Figure 11. Plant community growth curve (percent production by month). ND5406, Missouri Slope, Introduced Cool-season Grasses. Introduced cool-season grasses.

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

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Western Wheatgrass			191–286	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	191–286	–
2	Little Bluestem			95–191	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	95–191	–
3	Plains Muhly			95–191	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	95–191	–
4	Needlegrass			191–381	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	95–191	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	95–191	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	95–191	–
5	Grama			191–286	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	95–286	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	38–95	–
6	Other Native Grasses			95–191	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–95	–
	Fendler threeawn	ARPI11	<i>Aristida purpurea</i> var. <i>longiseta</i>	10–38	–

	prairie threadawn	ANTR	<i>Arnica purpurea</i> var. <i>longicula</i>	10–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	19–38	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	19–38	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–38	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–19	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–19	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	0–19	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–19	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–19	–
7	Grass-Likes			57–95	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	57–95	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	19–38	–
Forb					
9	Forbs			95–191	
	blazing star	LIATR	<i>Liatris</i>	19–38	–
	goldenrod	SOLID	<i>Solidago</i>	19–38	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	19–38	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	19	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	19	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	19	–
	American vetch	VIAM	<i>Vicia americana</i>	19	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–19	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	19	–
	large Indian breadroot	PEES	<i>Pedimelum esculentum</i>	0–19	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–19	–
	scurfpea	PSORA2	<i>Psoralegium</i>	19	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–19	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–19	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	19	–
	onion	ALLIU	<i>Allium</i>	0–19	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–19	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–19	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	19	–
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaupus</i>	19	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–19	–
	prairie clover	DALEA	<i>Dalea</i>	19	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	19	–
	buckwheat	ERIOG	<i>Eriogonum</i>	19	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	0–19	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	19	–
Shrub/Vine					
10	Shrubs			38–95	
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–38	–

	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	19–38	–
	rose	ROSA5	<i>Rosa</i>	19–38	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–38	–
	western poison ivy	TORY	<i>Toxicodendron rydbergii</i>	0–19	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–19	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–19	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–19	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	19	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	19	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	0–19	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (<.5m)</i>	0–19	–
	dwarf false indigo	AMNA	<i>Amorpha nana</i>	19	–

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Western Wheatgrass			34–67	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	34–67	–
2	Little Bluestem			168–224	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	168–224	–
3	Plains Muhly			0–34	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–34	–
4	Needlegrass			112–168	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	112–168	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–11	–
5	Grama			112–157	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	112–157	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–22	–
6	Other Native Grasses			56–78	
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	45–78	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–67	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	11–34	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–22	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–22	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	11–22	–
7	Grass-Likes			56–112	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	56–112	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	11–22	–
Forb					
9	Forbs			56–168	
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	34–67	–

	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–45	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	22–34	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	22–34	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	22–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22–34	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	22–34	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	22–34	–
	onion	ALLIU	<i>Allium</i>	11–22	–
	pussytoes	ANTEN	<i>Antennaria</i>	11–22	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	11–22	–
	sweetclover	MELIL	<i>Melilotus</i>	0–22	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	11–22	–
	large Indian breadroot	PEES	<i>Pedimelum esculentum</i>	0–11	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	11	–
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaupus</i>	0–11	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–11	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–11	–
	old man's whiskers	GETR	<i>Geum triflorum</i>	11	–
	blazing star	LIATR	<i>Liatris</i>	0–11	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	11	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–11	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–11	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	0–11	–
	American vetch	VIAM	<i>Vicia americana</i>	0–11	–
	goldenrod	SOLID	<i>Solidago</i>	0–11	–
Shrub/Vine					
10	Shrubs			56–112	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	56–90	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–34	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	11–22	–
	pricklypear	OPUNT	<i>Opuntia</i>	11–22	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–11	–
	rose	ROSA5	<i>Rosa</i>	11	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–11	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–11	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–11	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (<.5m)</i>	0–11	–

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Western Wheatgrass			16–31	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	16–31	–

2	Little Bluestem			0–39	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–39	–
3	Plains Muhly			0–8	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–8	–
4	Needlegrass			24–39	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	24–39	–
5	Grama			196–235	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	196–235	–
6	Other Native Grasses			63–118	
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	24–78	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	8–31	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	8–24	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–8	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–8	–
7	Grass-Likes			118–157	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	110–157	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	8–39	–
Forb					
9	Forbs			24–39	
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	24–31	–
	sweetclover	MELIL	<i>Melilotus</i>	8–31	–
	pussytoes	ANTEN	<i>Antennaria</i>	16–24	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	16–24	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	16–24	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	8–24	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	8–16	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	8–16	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	8–16	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	8–16	–
	onion	ALLIU	<i>Allium</i>	8	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–8	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–8	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	8	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	8	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–8	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	8	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	8	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	8	–
Shrub/Vine					
10	Shrubs			78–118	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	55–94	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	8–31	–

	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	8–24	–
	pricklypear	OPUNT	<i>Opuntia</i>	8–24	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–16	–
	rose	ROSA5	<i>Rosa</i>	0–8	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–8	–

Table 12. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Western Wheatgrass			50–84	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	50–84	–
2	Little Bluestem			34–84	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	34–84	–
3	Plains Muhly			0–17	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–17	–
4	Needlegrass			34–67	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	34–67	–
6	Other Native Grasses			84–168	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	50–84	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	17–50	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	17–34	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–17	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–17	–
7	Grass-Likes			34–67	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	34–67	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–17	–
8	Non-Native Grasses			504–689	
	bluegrass	POA	<i>Poa</i>	336–689	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–504	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–168	–
Forb					
9	Forbs			168–336	
	sweetclover	MELIL	<i>Melilotus</i>	34–118	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	17–50	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	17–34	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	17–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	17–34	–
	scurfpea	PSORA2	<i>Psoralegium</i>	17–34	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	17–34	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	17–34	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	17–34	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	17	–

	American vetch	VIAM	<i>Vicia americana</i>	0–17	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–17	–
	goldenrod	SOLID	<i>Solidago</i>	0–17	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–17	–
	onion	ALLIU	<i>Allium</i>	0–17	–
	pussytoes	ANTEN	<i>Antennaria</i>	17	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–17	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–17	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	17	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–17	–
	blazing star	LIATR	<i>Liatris</i>	0–17	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	17	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–17	–
Shrub/Vine					
10	Shrubs			84–168	
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	34–67	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–67	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	34–50	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–50	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–34	–
	rose	ROSA5	<i>Rosa</i>	0–17	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	17	–
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	0–17	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–17	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–17	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (<.5m)</i>	0–17	–

Hydrological functions

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

None noted.

Other references

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

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

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USDA, NRCS. 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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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	05/24/2011
Approved by	Jeff Printz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** Short and broken, irregular in appearance or discontinuous, with debris dams.

3. **Number and height of erosional pedestals or terracettes:** Some terracettes may be associated with debris dams. Some slumping may occur on steeper slopes.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground 20 to 25% consisting of randomly scattered small patches no greater than 2 inches in diameter.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present. Existing gullies should be “healed” with a good vegetative cover.
-
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. Plant litter remains in place and is not moved by erosional forces.
-
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Plant cover and litter is at 75% or greater of soil surface and maintains soil surface integrity. Stability class anticipated to be 5 – 6.
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth, color and structure of A-horizon.
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High grass canopy and basal cover and small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. Healthy, deep rooted native grasses enhance infiltration and reduce runoff. Infiltration rates are moderate 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):** None.
-
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: mid, cool-season bunchgrasses >
- Sub-dominant: mid, warm-season grasses = mid, cool-season rhizomatous grasses >
- Other: forbs > grass-likes = shrubs > short, cool-season grasses = short, warm-season grasses
- Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth brome grass do not fit into reference plant community F/S groups.
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very low.
-
14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Representative value = 1700 lbs/ac with a range of 1000 lbs/ac to 2400 lbs/ac (air dry weight) depending upon growing conditions
-

16. **Potential invasive (including noxious) species (native and non-native).** List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: State and local noxious, smooth brome, Kentucky bluegrass
-

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