USDA Natural Resources Conservation Service

Ecological site R066XY036NE
Loamy 18-22 P.Z.

Accessed: 05/17/2024

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

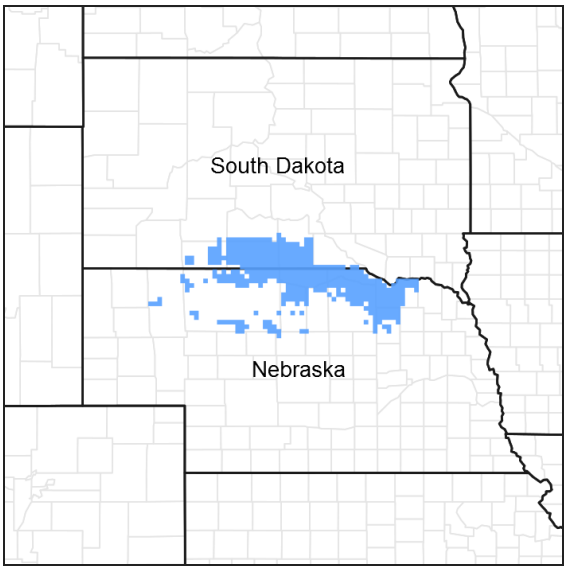


Figure 1. Mapped extent

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: 43i – Keya Paha Tablelands.

Associated sites

R066XY026NE	**Loamy Overflow** Loamy Overflow
R066XY032NE	**Sandy 18-22" P.Z.** Sandy 18-22" P.Z.
R066XY059NE	**Thin Upland** Thin Upland
R066XY062NE	**Shallow To Gravel** Shallow to Gravel

Similar sites

R066XY026NE	**Loamy Overflow** Loamy Overflow [big bluestem dominant; occurs in concave positions; more productive]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on gently undulating to moderately steep rolling plains and low hills.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Terrace (3) Hill
Elevation	579–914 m
Slope	0–20%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 66 is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA’s location near the geographic center of North America. There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 18 to 22 inches per year. The normal average annual temperature is about 47° F. January is the coldest month with average temperatures ranging from about 20° F (Valentine, NE) to about 23° F (Ainsworth, NE). July is the warmest month with temperatures averaging from about 73° F (Harrington, SD) to about 75° F (Ainsworth, NE). The range of normal average monthly temperatures between the coldest and warmest months is about 53° F. This large annual range attests to the continental nature of this area's climate. Hourly winds average about 10 miles per hour annually, ranging from about 11 miles per hour during the spring to about 9 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 mid to late March and continues to late June. Native warm season plants begin growth in early May and continue to late August. Green up of cool season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	154 days
Freeze-free period (average)	172 days
Precipitation total (average)	559 mm

Influencing water features

Soil features

The features common to soils of this site are the loam to fine sandy loam textured surface layers and slopes of 0 to 20 percent. These well drained soils formed primarily in eolian depostis. The surface layer is 6 to 17 inches thick. The texture of the soil subsurface generally ranges from clay loam to fine sandy loam. This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are broken should not be

distinguishable, and litter should fall and mainly remain in place. The soil surface is stable and intact. Sub-surface soil layers are not 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 10 percent.

More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Fine sandy loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to rapid
Soil depth	102–203 cm
Available water capacity (0-101.6cm)	15.24–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–55%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

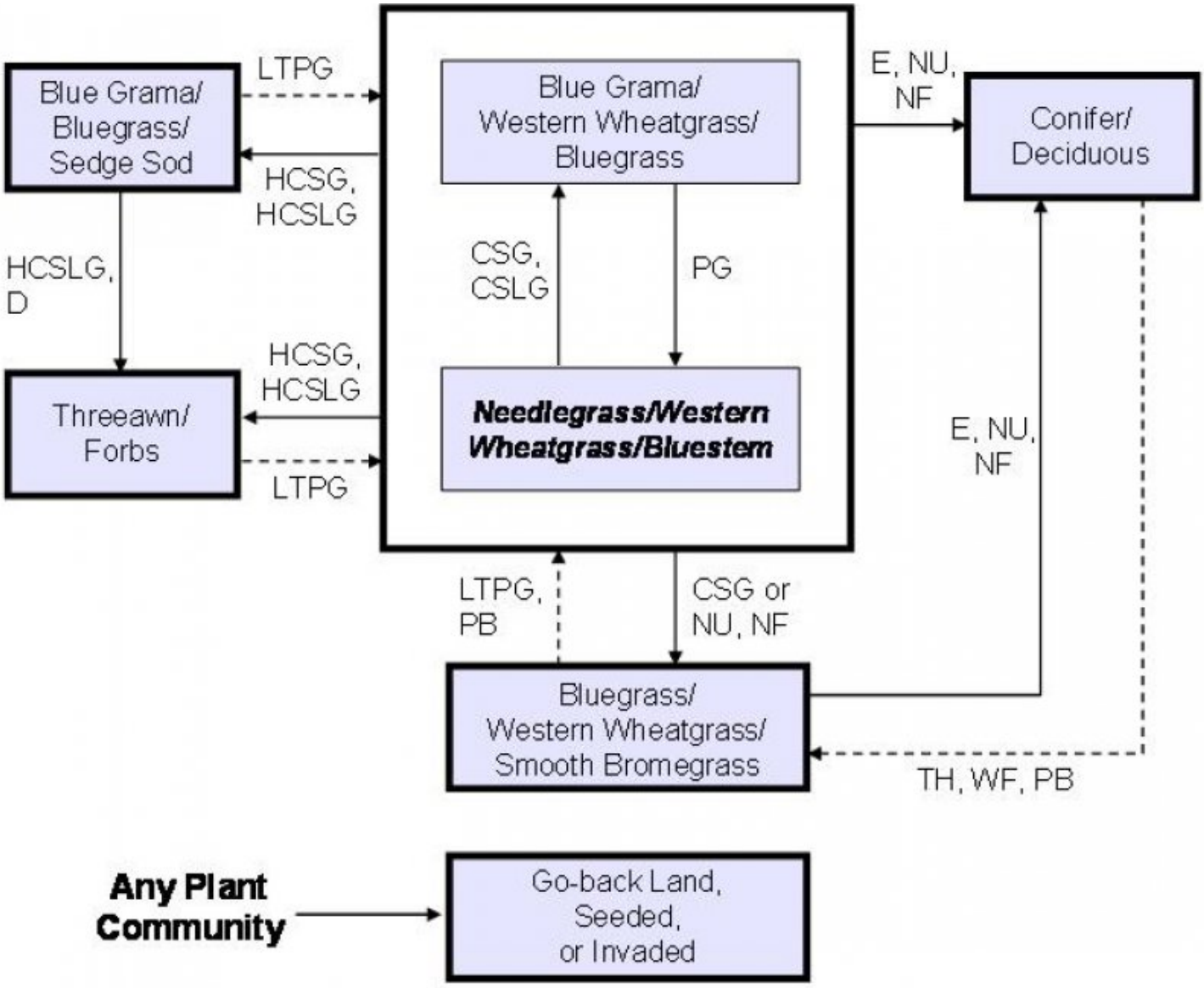
This plant community developed under Northern Great Plains climatic conditions, and included natural influence of large herbivores and occasional fire. Changes will occur in the plant communities due to management actions and/or climatic conditions.

Natural fire played a significant role in the maintenance of this site by limiting conifer establishment. The recent control of fire and the increased seed source from shelterbelts results in occasional encroachment by Juniperus species and/or ponderosa pine.

The plant community upon which interpretations are primarily based is the Needlegrass/Western Wheatgrass/Bluestem Plant Community. This plant community has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas managed 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.

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



CSG – Continuous seasonal grazing; **CSLG** – Continuous season-long grazing; **D** – Defoliation (rodents, insects, etc.); **E** – Encroachment or escaped; **HCSG** – Heavy continuous seasonal grazing; **HCSLG** – Heavy continuous season-long grazing; **LTPG** – Long-term prescribed grazing; **NF** – No fire; **NU** – Non-use; **PB** – Prescribed burning; **PG** – Prescribed grazing; **TH** – Timber harvest; **WF** – Wildfire; **- - - - - -** Denotes long term or use of accelerating practices.

State 1
Needlegrass/Western Wheatgrass/Bluestem Plant Community

Community 1.1
Needlegrass/Western Wheatgrass/Bluestem Plant Community

Interpretations are primarily based on the Needlegrass/Western Wheatgrass/Bluestem Plant Community, which is

also considered climax. The site evolved with grazing by large herbivores and occasional fire. The potential vegetation is about 80% grasses or grass-like plants, 10% forbs, and 10% shrubs. This plant community is dominated by mid and tall cool-season grasses. Warm season mid and tall grasses are sub-dominant. Principal grasses are green needlegrass, needleandthread, western wheatgrass, big bluestem, and little bluestem. Grama grasses and sedges occur as an understory. Common forbs include cudweed sagewort, dotted gayfeather, prairie coneflower, goldenrod and scurfpea. Leadplant and rose are common shrubs, with western snowberry occurring in patches across the site. 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 at the sites potential. Plant litter is properly distributed with some movement off-site and natural plant mortality is low. This plant community is highly drought tolerant due to factors such as high species diversity, varied root structures, and high soil quality. Transitional pathways and/or community pathways leading to other plant communities are as follows: - Continuous season-long grazing or continuous seasonal grazing (grazing at the same time of year every year) will convert the plant community to the Blue Grama/Western Wheatgrass/Bluegrass Plant Community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1737	2477	3419
Shrub/Vine	140	219	308
Forb	140	219	308
Total	**2017**	**2915**	**4035**

Figure 5. Plant community growth curve (percent production by month). NE6635, Eroded Tableland, cool-season dominant, warm-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	10	25	30	15	5	5	5		

State 2
Blue Grama/Western Wheatgrass/Bluegrass Plant Community

Community 2.1
Blue Grama/Western Wheatgrass/Bluegrass Plant Community

This plant community develops under continuous seasonal grazing (i.e., grazing an area during the same season every year) or from continuous season-long grazing. The potential vegetation is made up of approximately 80% grasses and grass-like species, 10% forbs and 10% shrubs. The dominant grasses include blue grama, western wheatgrass, bluegrass, and threadleaf sedge. Other grasses may include needleandthread, smooth bromegrass, buffalograss, sideoats grama, prairie junegrass, red threeawn, and little bluestem. The dominant forbs include cudweed sagewort, goldenrod, scurfpea, western ragweed, green sagewort, scarlet globemallow, and sometimes sweetclover. Dominant shrubs in this community include western snowberry and wild rose. Fringed sagewort may also be present in significant amounts. Compared to the Needlegrass/Western Wheatgrass/Bluestem Plant Community, the shortgrass species including blue grama, bluegrass, sedge and buffalograss have increased. The cool season needlegrass species and the mid and tall warm-season grasses have decreased in composition. Annual bromes, bluegrass, smooth bromegrass and annual forbs can invade the site. While plant diversity is relatively high, the structure of the community is dominated by shortgrasses. The dominant herbaceous species are very adapted to grazing; however, mid to tall grass species and palatable forbs will decrease in the community through long-term overgrazing. Soil erosion is low. Because of the sod forming habit of the shortgrass species, water infiltration is reduced, and runoff is moderate. Typically the runoff is very clean because of the low potential for soil erosion. Transitional pathways and/or community pathways leading to other plant communities are as follows: - Continuous season-long grazing or continuous seasonal grazing without adequate rest periods will convert the plant community to the Blue Grama/Bluegrass/Sedge Sod Plant Community. If this grazing impact is extreme, this plant community could shift directly to the Threeawn/Forbs Plant Community. - Prescribed grazing will move this plant community back to the Needlegrass/Western Wheatgrass/Bluestem Plant Community.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1132	1849	2561
Shrub/Vine	106	168	230
Forb	106	168	230
Tree	–	56	118
Total	**1344**	**2241**	**3139**

State 3
Blue Grama/Bluegrass/Sedge Sod Plant Community

State 4
Bluegrass/Western Wheatgrass/Smooth Bromegrass Plant Community

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrasses**			583–874	
	green needlegrass	NAVI4	*Nassella viridula*	146–729	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	146–583	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–146	–
2	**Rhizomatous Wheatgrasses**			291–729	
	western wheatgrass	PASM	*Pascopyrum smithii*	291–729	–
3	**Mid Warm-Season Grasses**			146–437	
	little bluestem	SCSC	*Schizachyrium scoparium*	58–291	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	58–233	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–146	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–146	–
4	**Tall Warm-Season Grasses**			58–291	
	big bluestem	ANGE	*Andropogon gerardii*	58–291	–
	switchgrass	PAVI2	*Panicum virgatum*	0–146	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–146	–
5	**Short Warm-Season Grasses**			58–291	
	blue grama	BOGR2	*Bouteloua gracilis*	58–291	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–146	–
6	**Other Native Grasses**			29–146	
	Grass, perennial	2GP	*Grass, perennial*	0–146	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	29–146	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–58	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–29	–
7	**Grass-Likes**			58–291	
	threadleaf sedge	CAFI	*Carex filifolia*	58–291	–

	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–146	–
Forb					
9	**Forbs**			146–291	
	Forb, native	2FN	*Forb, native*	0–87	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	29–87	–
	scurfpea	PSORA2	*Psoralidium*	29–87	–
	goldenrod	SOLID	*Solidago*	29–87	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	29–58	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–58	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	29–58	–
	false boneset	BREU	*Brickellia eupatorioides*	29–58	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	29–58	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	29–58	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–58	–
	dotted blazing star	LIPU	*Liatris punctata*	29–58	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	29–58	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	29–58	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–58	–
	swamp verbena	VEHA2	*Verbena hastata*	0–29	–
	pussytoes	ANTEN	*Antennaria*	0–29	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–29	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–29	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–29	–
	beardtongue	PENST	*Penstemon*	0–29	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–29	–
Shrub/Vine					
10	**Shrubs**			146–291	
	leadplant	AMCA6	*Amorpha canescens*	29–146	–
	prairie sagewort	ARFR4	*Artemisia frigida*	29–87	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	29–87	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–58	–
	rose	ROSA5	*Rosa*	29–58	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–58	–

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrasses**			112–336	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	112–336	–
	green needlegrass	NAVI4	*Nassella viridula*	22–179	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–45	–

2	**Rhizomatous Wheatgrasses**			336–673	
	western wheatgrass	PASM	*Pascopyrum smithii*	336–673	–
3	**Mid Warm-Season Grasses**			22–112	
	sideoats grama	BOCU	*Bouteloua curtipendula*	22–67	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–67	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–22	–
4	**Tall Warm-Season Grasses**			0–45	
	big bluestem	ANGE	*Andropogon gerardii*	0–45	–
	switchgrass	PAVI2	*Panicum virgatum*	0–22	–
5	**Short Warm-Season Grasses**			112–448	
	blue grama	BOGR2	*Bouteloua gracilis*	112–336	–
	buffalograss	BODA2	*Bouteloua dactyloides*	45–224	–
	threeawn	ARIST	*Aristida*	22–112	–
6	**Other Native Grasses**			45–179	
	Grass, perennial	2GP	*Grass, perennial*	0–112	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	22–112	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	22–67	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	22–67	–
7	**Grass-Likes**			67–269	
	threadleaf sedge	CAFI	*Carex filifolia*	67–269	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–112	–
8	**Non-Native Grasses**			112–291	
	bluegrass	POA	*Poa*	112–224	–
	smooth brome	BRIN2	*Bromus inermis*	22–179	–
	cheatgrass	BRTE	*Bromus tectorum*	0–112	–
Forb					
9	**Forbs**			112–224	
	Forb, introduced	2FI	*Forb, introduced*	0–112	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	22–112	–
	sweetclover	MELIL	*Melilotus*	0–112	–
	scurfpea	PSORA2	*Psoralidium*	22–90	–
	goldenrod	SOLID	*Solidago*	22–90	–
	white heath aster	SYER	*Symphyotrichum ericoides*	22–67	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–67	–
	swamp verbena	VEHA2	*Verbena hastata*	0–67	–
	tarragon	ARDR4	*Artemisia dracunculus*	22–67	–
	dotted blazing star	LIPU	*Liatris punctata*	22–67	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	22–67	–
	Forb, native	2FN	*Forb, native*	0–67	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	22–67	–
	false boneset	BREU	*Brickellia eupatorioides*	0–45	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–45	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	22–45	–

	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	22–45	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–22	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–22	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–22	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–22	–
	pussytoes	ANTEN	*Antennaria*	0–22	–
Shrub/Vine					
10	**Shrubs**			112–224	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	22–112	–
	prairie sagewort	ARFR4	*Artemisia frigida*	22–112	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–67	–
	rose	ROSA5	*Rosa*	22–67	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–58	–
	leadplant	AMCA6	*Amorpha canescens*	0–45	–
Tree					
11	**Trees**			0–112	
	Tree	2TREE	*Tree*	0–67	–
	boxelder	ACNE2	*Acer negundo*	0–67	–
	common hackberry	CEOC	*Celtis occidentalis*	0–67	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–67	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–67	–
	eastern redcedar	JUVI	*Juniperus virginiana*	0–67	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0–67	–
	bur oak	QUMA2	*Quercus macrocarpa*	0–67	–

Animal community

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

As this site improves in condition through proper management (from the more shortgrass dominated plant communities to the Needlegrass/Western Wheatgrass/Bluestem Plant Community), the advantage for livestock production includes: higher forage production from cool season grasses, improved early spring forage production and higher water infiltration. The disadvantage for livestock include: reduction in cool/warm season grass mix which would provides better management flexibility, less plant diversity, and a potential increase in soil erosion. The Threeawn/Annuals Plant Community is of limited value for livestock production.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong 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).

For the interpretive plant community, rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses such as little bluestem. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present but only cover 1-2% of the soil surface. Overall this site has the appearance of being very stable and productive.

Recreational uses

This site provides hunting opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Other products

Seed harvest of native plant species can provide additional income on this site.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel was also used. Those involved in developing this site include: Wayne Bachman, Soil Scientist, NRCS; Stan Boltz, Range Management Specialist, NRCS; Chuck Markley, Soil Scientist, NRCS; Anna Ferguson, Soil Conservationist, NRCS; Roger Hammer, Soil Scientist, NRCS; Dana Larsen, Range Management Specialist, NRCS; Dave Schmidt, Rangeland Management Specialist, NRCS; Kim Stine, Rangeland Management Specialist, NRCS.

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://www.hprcc.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, 2002. National Soil Survey Handbook, title 430-VI. (http://soils.usda.gov/technical/handbook/)

Contributors

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	08/01/2006
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

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2. **Presence of water flow patterns:** None, or barely visible and discontinuous.

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3. **Number and height of erosional pedestals or terracettes:** None.

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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 typically less than 5 percent, and patches less than 2 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** None should 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):** Slight amount of movement of smallest size class litter is possible, but not normal.

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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):** Soil aggregate stability ratings are typically be 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 6 to 20 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular at least in the upper A-horizon (some soils may have subangular blocky structure parting to granular in the surface).

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff: Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool-season grasses) with fine and coarse roots positively influences infiltration.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None – when dry, B horizons can be hard and appear to be compacted, but no platy structure will be present.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Needlegrasses (mid and tall, cool-season bunchgrasses > mid, cool-season rhizomatous grasses >

    Sub-dominant: Mid, warm-season grasses > tall, warm-season grasses >

    Other: Short, warm-season grasses = grass-like species = forbs = shrubs

    Additional: Other grasses in other functional groups occur but in minor amounts.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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14. **Average percent litter cover (%) and depth (in):** Litter cover about 80 to 90 percent, with depths about 0.5 to 1 inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 1,800 pounds/acre to 3,600 pounds/acre, with the reference value being 2,600 pounds/acre (air-dry basis).

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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 weeds; also Kentucky bluegrass and smooth bromegrass.

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17. **Perennial plant reproductive capability:** Perennial grasses should have vigorous rhizomes or tillers.
