

Ecological site R102CY063NE Loess Breaks

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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.

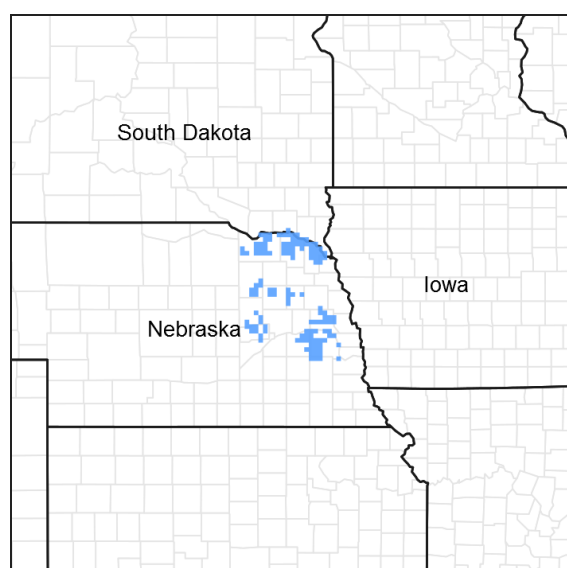


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 102C—Loess Uplands

Most of this area is in the Dissected Till Plains part of the Central Lowland Province of the Interior Plains. This MLRA has broad, undulating to rolling ridgetops and hilly to steep valley sides. The valleys are generally narrow, but broad flood plains and terraces are along the major rivers and the large tributaries. Elevation ranges from 335 to 610 meters (1,100 to 2,000 feet) increasing from southeast to northwest. Peorian age loess covers most of the area with depths ranging from 2 to 20 meters (6 to 70 feet). Glacial till underlies the loess in most areas. Bedrock can be found at or near the surface predominantly along the Missouri River valley found on the eastern side of the MLRA, but some bedrock can also be found in the northern part of 102C in Minnesota and South Dakota. The soils are predominantly Mollisols but Entisols are prominent in the floodplains of the area. Nearly all the area is farmed with 70% of the area being used as cropland for corn and soybeans. Feed grains and hay crops are also grown. The major resource concerns are wind erosion, water erosion, maintenance of organic matter and soil tilth, and soil moisture management. (USDA/NRCS 2006)

Classification relationships

"Thin Loess" range sites for NE NRCS Vegetation Zones 3 & 4

NE Natural Heritage Program/NE Game & Parks Commission: "Northern Loess/Shale Bluff Prairie"

General information for MLRA 102C:

Fenneman (1916) Physiographic Regions

Division - Interior Plains

East:

Province - Central Lowland

Section - Till Plains

West:

Province - Great Plains

Section - High Plains

USFS (2007) Ecoregions

Domain - Humid Temperate

Division - Prairie

Province - Prairie Parkland (Temperate)

Section - North-Central Glaciated Plains (251B)

EPA Ecoregions (Omernik 1997)

I - Great Plains (9)

II - Temperate Prairies (9.2)

III - Western Corn Belt Plains (9.2.3) IV - Loess Prairies (47a)

IV - Northeastern Nebraska Loess Hills (47k)

IV - Transitional Sandy Plain (47l)

Ecological site concept

The >30% slopes associated with this site cause a high proportion of natural precipitation to run off resulting in relatively high natural erosion rates, low organic matter, and limited soil development with carbonates remaining at or near the surface. These conditions are expressed as a site with the lowest production of all areas in the MLRA that do not include bedrock (or some other restrictive layer) within 51 centimeters (20 inches) of the surface, although outcrops and shallow solums may be encountered locally.

Associated sites

R102CY059NE	Limy Upland Found on areas with <30% slope and carbonates within 10
R102CY058NE	Loamy Upland May be encountered in upland drainageways as linear units between Loess Breaks areas depending on site-specific factors such as slope, surrounding topography, and size of the contributing watershed. Carbonates are leached beyond 10

Similar sites

R102CY059NE	Limy Upland Slopes are <30%, the A horizon is typically deeper (although still not mollic), and infiltration is relatively higher supporting increased vegetative production.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Andropogon gerardii</i>

Physiographic features

This site predominantly occurs on very steep loess hills and side slopes on dissected till plains, (>30% slopes) that have been dissected by geologic erosion. The slope shape is predominantly convex, generates runoff, has a water table greater than 203 centimeters (80 inches) deep, and does not flood or pond.

Table 2. Representative physiographic features

Landforms	(1) Loess hill (2) Upland > Hillslope
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	1,200–1,800 ft
Slope	20–60%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Peak precipitation occurs from the middle of spring to early in autumn. Winter precipitation occurs as snow (USDA/NRCS 2006).

The average annual temperature gradient trends higher from north (7°C / 45°F) to south (11°C / 51°F).

The average annual precipitation gradient trends higher from northwest (64 centimeters / 25 inches) to southeast (79 centimeters / 31 inches).

The annual snowfall ranges from about 60 centimeters (24 inches) in the southern part of the area to 85 centimeters (34 inches) in the northern part.

The following data summary includes weather stations representing the full geographic extent of the MLRA, and is based on 70% probabilities (NOAA/UNL) meaning that actual observed climate conditions may fall outside these ranges 30% of the time. Furthermore, climatic events can manifest many different ways. For example, abnormally dry periods could occur as 3 consecutive drought years out of 10, 3 individual years separated by “normal” years, or some combination. Tree-ring records indicate that portions of the Great Plains have also historically experienced droughts lasting several decades, so plant community response will largely depend on the manner in which climatic variability is realized in interaction with past and current land management.

Table 3. Representative climatic features

Frost-free period (characteristic range)	124-132 days
Freeze-free period (characteristic range)	143-156 days
Precipitation total (characteristic range)	27-29 in
Frost-free period (actual range)	119-138 days
Freeze-free period (actual range)	138-166 days
Precipitation total (actual range)	27-31 in
Frost-free period (average)	128 days
Freeze-free period (average)	149 days
Precipitation total (average)	28 in

Climate stations used

- (1) ALBION [USC00250070], Albion, NE
- (2) CREIGHTON [USC00251990], Creighton, NE
- (3) VERMILLION 2 SE [USC00398622], Vermillion, SD
- (4) WEST POINT [USC00259200], West Point, NE
- (5) FREMONT [USC00253050], Fremont, NE
- (6) ROCK RAPIDS [USC00137147], Rock Rapids, IA
- (7) FLANDREAU [USC00392984], Flandreau, SD
- (8) SIOUX FALLS [USW00014944], Sioux Falls, SD

Influencing water features

No riparian or wetland features are associated with this site.

Soil features

These are predominantly very deep, well drained soils and have >20% slopes. The surface texture is predominantly silt loam or silty clay loam from 0 to 15 centimeters (0 to 6 inches) and the subsurface texture group is loamy from 15 to 203 centimeters (6 to 80 inches).

Rills and gullies are not inherent to this site. Water flow patterns should be irregular and disconnected, and pedestalling none to slight; although, both of these indicators may become more apparent as slope approaches the upper limit for the site. Soil aggregate stability should be high.

Major soils assigned to this site include Crofton and Ida

Table 4. Representative soil features

Parent material	(1) Calcareous loess (2) Till
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Fine-silty
Drainage class	Well drained
Permeability class	Moderate
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	7.2–8.4 in
Calcium carbonate equivalent (0-40in)	0–30%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The vast majority of this site's spatial extent presently supports bur oak woodlands which includes other tree and shrub species with overall diversity increasing downriver along the Missouri. However, it's assumed that most of these areas pre-settlement were tall/midgrass prairie with woody species occupying only a minor portion of the landscape largely restricted to pockets, protected draws, or open savannahs.

Soil texture often tends towards the coarse end of this site's texture range with increasing proximity to the Missouri river due to eolian redistribution of alluvial material to the uplands (Hanna and Bidwell, 1955). This can affect overall plant composition with a noticeable increase in species adapted to coarser and/or droughtier conditions, particularly prairie sandreed.

This site developed with fire as an integral part of the ecological processes and grassland maintenance. It is presumed that the historic fires generally occurred every 3-4 years, were randomly distributed, and ignited by lightning at various times throughout the summer when thunderstorms were likely to occur. Furthermore, it is also believed that pre-European inhabitants often used fire as a management tool for attracting herds of large migratory herbivores (bison, elk, and/or deer) as well as for warfare. However, the impact of fire over the past 100 years has been diminished due to human prevention and suppression of wildfire and the pervasive lack of cultural acceptance of prescribed fire as a surrogate (Helzer 2010).

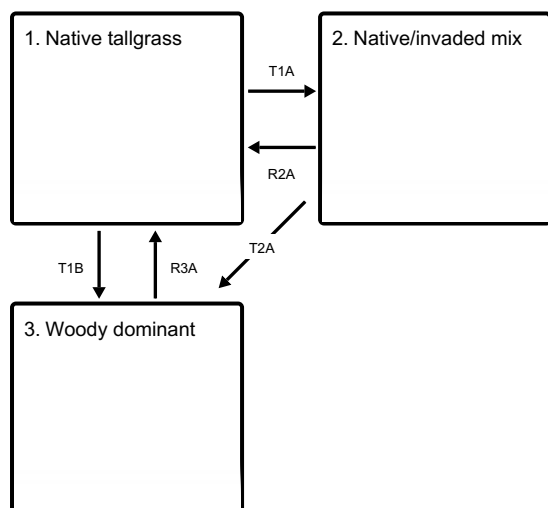
The degree of herbivory (feeding on herbaceous plants) can have a significant impact on the dynamics of the site. Historically, periodic grazing by herds of large migratory herbivores was a major influence albeit herbivore use on this site was probably somewhat less relative to flatter areas due to landscape complexity, energy required to climb steeper slopes, and reduced forage production. For example, as a general rule, cattle use of this site and its 30-60% slope range mean can be assumed to be ~60% less than nearby sites with <10% slope. However, herbivory by species such as insects, rodents, and root feeding organisms also impacted the vegetation historically and continue to this day (Helzer 2010). Human control of large herbivore impacts through grazing of domestic livestock and/or manipulation of wildlife populations has been a major contemporary influence on the ecological dynamics of the site (USDA/SCS 1977.) Management coupled with climate largely dictates the plant communities observed.

The reference state characterizes the historic natural condition, and has been determined by the study of rangeland relic areas, areas protected from excessive disturbance, and/or areas under compatible grazing regimes. Trends in plant community dynamics ranging from heavily grazed to unused areas, seasonal use pastures, and historical accounts have also been considered.

The following is a diagram illustrating predictable and recurring plant communities inherent to this site, and the pathways of change between them (Bestelmeyer 2010). The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Ecosystem states



T1A - Reduced native grass competitiveness due to excessive defoliation intensity and frequency or drought

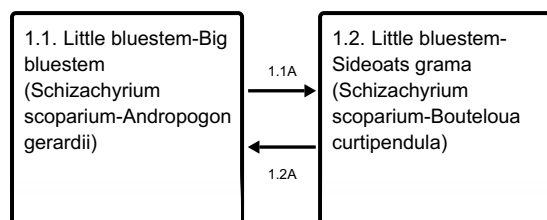
T1B - Oak and cedar encroachment leading to woody plant dominance

R2A - Restoration inputs; reduced invasive grass competitiveness allows for natives to dominant site

T2A - Oak and cedar encroachment leading to woody plant dominance

R3A - Woody species removal; restoration of warm season native grasses

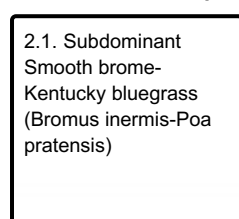
State 1 submodel, plant communities



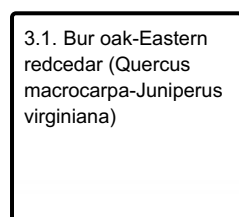
1.1A - Reduced native grass competitiveness due to excessive defoliation intensity and frequency or drought

1.2A - Reduced invasive grass competitiveness allows for natives to dominant site

State 2 submodel, plant communities



State 3 submodel, plant communities



State 1 Native tallgrass

This state comprises the communities within the range of natural variability under historic conditions and disturbance regimes. Patterns created by wildlife use and fire would have created a mosaic of communities across the landscape; however, tall and/or mid warm-season grasses would remain dominant, with a subdominant contribution from native cool-season grasses, forbs, and shrubs. The cool-season contribution increases with latitude, with species such as needleandthread and green needlegrass becoming more prevalent northward. Fire and bison herbivory were the dominant disturbance regimes that historically maintained the tallgrass dominance with a diverse forb component. Furthermore, bison grazing was closely linked to fire patterns as the animals preferred grazing burned areas offering lush regrowth devoid of decadence and of higher nutritive quality. Thus, historic plant communities were subjected to occasional burning and grazing, with substantial rest/recovery periods as the fuel load rebuilt to eventually start the process again. Fire return intervals of 3-4 years served to suppress woody species, particularly non-sprouting eastern redcedar. The degree to which observed conditions represent this state largely depends on how closely the management has mimicked these past disturbance effects.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- big bluestem (*Andropogon gerardii*), grass

Community 1.1

Little bluestem-Big bluestem (*Schizachyrium scoparium-Andropogon gerardii*)



Figure 8. Loess Breaks 1.1

This is the reference plant community and can be found on areas that are managed to allow for adequate recovery periods following defoliation or drought stress. In addition to tallgrass vigor, suppression of woody species either through natural (e.g. fire) or artificial (e.g. chainsaw) methods is necessary to maintain herbaceous dominance. The plant community consists of 75-90% grasses and grass-like, 5-10% forbs and 1-5% shrubs. Dominant grasses include little bluestem, big bluestem, sideoats grama, and plains muhly. Other grasses and grass-like are indiagrass, blue grama, prairie junegrass, and switchgrass. Forb species are diverse and include prairieclovers, and goldenrods, and black samson. Common shrubs include leadplant and New Jersey tea (Kaul 2006, Steinauer 2010, USDA/NRCS 2012). This plant community is diverse, stable, and productive with nutrient and water cycles, and energy flow functioning near full potential considering the slope limitations. Plant litter is properly distributed with negligible movement off-site, and natural plant mortality is very low. This community is resistant to many disturbances except continuous season-long heavy grazing, tillage, or non-use. Broadcast herbicide application will dramatically reduce non-target forb diversity and abundance. Total annual production, during an average year, ranges from 2400 to 4300 pounds per acre air-dry weight and will average 3500 pounds.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- big bluestem (*Andropogon gerardii*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1398	2040	2378
Shrub/Vine	105	180	275
Forb	105	180	275
Total	1608	2400	2928

Figure 10. Plant community growth curve (percent production by month). NE1021, 102C Warm-season. Warm-season grass, MLRA 102C.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	7	18	23	26	16	6	2	0	0

Community 1.2
 Little bluestem-Sideoats grama (*Schizachyrium scoparium*-*Bouteloua curtipendula*)



Figure 11. Loess Breaks 1.2

This community largely resembles central Great Plains mixed-grass prairies where rainfall is more limiting and overall conditions are relatively drier. Tallgrasses are a minor component with midgrasses - typically sideoats grama and little bluestem - dominating site structure and function. While still within the range of natural variability, energy capture, nutrient cycling, and hydrology are not functioning at their full potential relative to the reference condition. Reduced photosynthetic biomass does not capture as much light energy, less lignified plant material produces lower quality litter (e.g. less persistent, more easily transported), and reduced soil protection impairs the site's ability to capture and retain moisture.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Figure 12. Plant community growth curve (percent production by month). NE1021, 102C Warm-season. Warm-season grass, MLRA 102C.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	7	18	23	26	16	6	2	0	0

**Pathway 1.1A
Community 1.1 to 1.2**



Little bluestem-Big bluestem
(*Schizachyrium scoparium*-*Andropogon gerardii*)



Little bluestem-Sideoats grama
(*Schizachyrium scoparium*-*Bouteloua curtipendula*)

Events which remove tallgrass growing points and photosynthetic tissues without adequate recovery periods will shift community composition towards shorter statured species, particularly little bluestem and sideoats grama. Likewise, shortgrasses such as hairy and/or blue grama may also proliferate. As cattle grazing pressure increases/persists, rhizomatous grasses may assume a more sodbound growth habit which can further reduce overall diversity and adversely affect both infiltration and litter. Periods of extended drought can have similar impacts on species composition and bring about a shift towards mixed/shortgrass prairie species more tolerant of drier conditions.

**Pathway 1.2A
Community 1.2 to 1.1**



Little bluestem-Sideoats grama
(*Schizachyrium scoparium*-*Bouteloua curtipendula*)



Little bluestem-Big bluestem
(*Schizachyrium scoparium*-*Andropogon gerardii*)

Management that provides adequate recovery periods and does not annually prevent tallgrass seedset or otherwise impair vigor will facilitate a return to community phase 1.1. In the case of drought, the return to more typical precipitation patterns will promote shift towards tallgrass species.

State 2
Native/invaded mix

This state can manifest three ways: 1) the appearance of introduced cool-season grasses, 2) the expansion of deciduous shrubs and/or trees, or 3) some combination of these. Kentucky bluegrass and smooth brome are the primary cool-season grass invaders in this region, commonly found in roadsides, disturbed areas, and pastures intentionally seeded for cool-season forage. Management practices and/or environmental conditions that are not favorable to native grass vigor may allow introduced grasses to invade the site thereby decreasing native diversity and abundance, particularly of forbs. In the absence of the historic fire regime, woody deciduous species may also expand to become an influential component of the community. The invasive component tends to have very high resilience, is extremely difficult to eradicate, and what might be considered a new "contemporary" range of natural variability is seen as competition between the native grasses and introduced/woody species for space and resources.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

Community 2.1
Subdominant Smooth brome-Kentucky bluegrass (*Bromus inermis*-*Poa pratensis*)

While native grasses still dominate the site, introduced cool-season species have established a foothold in the system and can be found interspersed throughout the stand. The stand may still have a native tall and midgrass appearance overall, but bluegrass and/or brome can be easily found. Deciduous shrub/tree species may also have begun to expand into areas where they did not persist historically, but the overall appearance can vary depending on the propagation method of a particular species. Seed propagated species, such as Siberian elm, tend to colonize further from the parent plant and affect larger areas, but in lower densities. In contrast, rhizomatous species such as smooth sumac tend to progress as a higher-density encroachment spreading directly from the parent plants.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

Figure 13. Plant community growth curve (percent production by month).
NE1022, Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	9	19	23	24	13	7	3	0	0

State 3

Woody dominant

Woody species have established a significantly closed canopy that influences the herbaceous understory through processes such as stemflow, litterfall, and variable understory insolation, creating more heterogenous resource distribution relative to historic grassland conditions. Also, the precipitation gradient produces changes in both overstory and understory species composition seen as increased eastern deciduous forest influence mixing with bur oak southeasterly in MLRA.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- bur oak (*Quercus macrocarpa*), tree

Community 3.1

Bur oak-Eastern redcedar (*Quercus macrocarpa*-*Juniperus virginiana*)



Figure 14. Loess Breaks - Bur oak



Figure 15. Loess Breaks - Deciduous/cedar mix

Bur oak is the most common tree species, although mulberry, ash, and black walnut can often be found in lesser numbers. A profound shift in herbaceous plants is seen as a near total loss of warm-season tallgrasses towards native and/or introduced cool-season species such as *Carex* spp., and wildryes, as well as smooth brome and Kentucky bluegrass if present. Eastern redcedar can also be prominent, either as a subdominant component of a deciduous woodland or as the dominant with few to no interspersed deciduous.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- bur oak (*Quercus macrocarpa*), tree

Transition T1A

State 1 to 2

In the presence of introduced cool-season grasses, environmental conditions and/or management that reduces native vigor and stand resilience, and frees up resources (space, sunlight, nutrients, water) will allow for colonization of Kentucky bluegrass and smooth brome. Likewise, similar processes may also allow for deciduous woody shrubs and trees such as smooth sumac, roughleaf dogwood, and Siberian elm to expand.

Constraints to recovery. Reduced native competitiveness allows for introduced grass colonization and expansion

Transition T1B

State 1 to 3

The presence of an invasion source coupled with fire exclusion allows woody species to expand and establish within the herbaceous stand. This typically begins near woody draws and accelerates outward as propagules increase. Lack of intervening action allows woody expansion to continue, and tree sizes to increase. Trees will eventually modify site function in ways that promote further encroachment such as rainfall interception and stemflow, heavy leaf litter, and shading of the herbaceous understory.

Restoration pathway R2A

State 2 to 1

Eradication of introduced cool-season grasses from this site will require long-term, targeted management efforts to create an adverse environment during the spring and late fall when bluegrass and brome are most actively growing, with favorable conditions during the summer to promote native warm-season species. Targeted practices such as prescribed burning, flash grazing, and herbicide are often employed at strategic times of the year to set back undesirable species. The combination of practices should strive to mimic the historic disturbance regimes to which the desirable native species are best adapted.

Transition T2A

State 2 to 3

The presence of an invasion source coupled with fire exclusion allows woody species to expand and establish within the herbaceous stand. This typically begins near woody draws and accelerates outward as propagules increase. Lack of intervening action allows woody expansion to continue, and tree sizes to increase. Trees will eventually modify site function in ways that promote further encroachment such as rainfall interception and stemflow, heavy leaf litter, and shading of the herbaceous understory.

Restoration pathway R3A

State 3 to 1

With deciduous dominance, taller trees, thicker bark, and reduced understory ladder fuels have created a woodland community virtually invulnerable to fire. Overstory thinning/removal will require labor-intensive mechanical and/or chemical methods on difficult terrain. Solid cedar stands may be able to carry an effective fire, but this will steep slopes largely denuded and exposed thereby requiring additional mitigative actions to preserve site stability. The outcomes of restoration activities can vary, depending heavily on both the present understory and the seedbank,

and may instead result in a rapid increase of sprouting species such as roughleaf dogwood and/or smooth sumac which will require further efforts.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall warm-season			480–1200	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	360–480	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–240	–
	composite dropseed	SPCO16	<i>Sporobolus compositus</i>	0–120	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–120	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–120	–
2	Mid warm-season			840–1560	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	480–840	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	240–480	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	120–240	–
3	Shortgrasses			24–240	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	24–120	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–120	–
4	Cool-season			24–240	
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–120	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–120	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–120	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–120	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–120	–
5	Grass-like			24–240	
	shortbeak sedge	CABR10	<i>Carex brevior</i>	0–120	–
	heavy sedge	CAGR4	<i>Carex gravida</i>	0–120	–
	sedge	CAREX	<i>Carex</i>	24–120	–
	long-stolon sedge	CAIN9	<i>Carex inops</i>	0–72	–
Forb					
6	Forbs			120–240	
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–120	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–120	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–120	–
	white prairie clover	DACA7	<i>Dalea candida</i>	0–120	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–120	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–120	–
	stiff goldenrod	OLRI	<i>Oligoneuron rigidum</i>	0–120	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–120	–
	prairie groundsel	PAPL12	<i>Packera plattensis</i>	0–120	–

	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0–120	–
	large beardtongue	PEGR7	<i>Penstemon grandiflorus</i>	0–120	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–120	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	24–120	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	0–120	–
	Baldwin's ironweed	VEBA	<i>Vernonia baldwinii</i>	0–120	–
	nineanther prairie clover	DAEN	<i>Dalea enneandra</i>	0–72	–
	field pussytoes	ANNE	<i>Antennaria neglecta</i>	0–72	–
	scarlet beebllossom	GACO5	<i>Gaura coccinea</i>	0–72	–
Shrub/Vine					
7	Shrubs			120–240	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–120	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–120	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–120	–
	prairie rose	ROAR3	<i>Rosa arkansana</i>	0–120	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–120	–

Animal community

This site is well adapted to managed grazing by domestic livestock. The predominance of herbaceous plants across all plant community phases best lends these sites to grazing by cattle but browsing livestock such as goats or sheep that will more heavily utilize invasive forbs and brush. Carrying capacity and production estimates are conservative estimates that should be used only as guidelines in initial stages of grazing lands planning.

Often, the plant community does not entirely match any particular plant community (as described in the ecological site description). Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of this inventory data will permit the establishment of a safe, initial stocking rate for the type and class of animals and level of grazing management. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide year-long forage for cattle, sheep, or horses. During the dormant period, the protein levels of the forage may be lower than the minimum needed to meet livestock (primarily cattle and sheep) requirements.

Suggested stocking rates (carrying capacity*) for cattle under continuous season-long grazing under normal growing conditions are listed below:

- 1.1 Big bluestem-Little bluestem; 2400 lbs/acre production and 0.66 AUM/acre
- 1.2 Little bluestem-Sideoats grama; 2100 lbs/acre production and 0.58 AUM/acre
- 2.1 Subdominant smooth brome-KY bluegrass; 1600 lbs/acre production and 0.44 AUM/acre

*Carrying capacity based on continuous season-long grazing by cattle under average growing conditions, 25% harvest efficiency. Air dry forage requirements based on 3% of animal body weight, or 912 lbs/AU/month.

If grazing distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. Carrying capacity and production estimates are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Utilizing a rotational grazing system that allows for adequate rest and recovery will increase plant vigor and carrying capacity. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended to document plant composition and production. More precise carrying capacity estimates can be

calculated based on actual site information along with animal preference data, particularly when livestock 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.

Inventory data references

Information presented here has been derived from RANGE-417 archives, Rangeland NRI, and other inventory data. Field observations from range-trained personnel were also used. In addition to the multitude of NRCS field office employees and private landowners that helped with site visits and local knowledge, those involved in developing this site include:

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Contributors

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Approval

Suzanne Mayne-Kinney, 12/10/2024

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	12/04/2024
Approved by	Suzanne Mayne-Kinney
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production
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Indicators

1. **Number and extent of rills:** Typically, none. When slopes exceed 30 percent, rills may occur. When they do occur, they will be shallow (less than 6 inches or 15 cm) deep, and narrow (less than 6 inches or 15 cm) wide, and spaced at intervals of at least 5 feet apart, becoming more frequent and longer as slopes increase. On extremely steep slopes (greater than 60%) rills will be more frequent, deeper, and wider.

2. **Presence of water flow patterns:** Typically, none. When slopes exceed 30 percent, water flow patterns may be present. Where they do occur, they are rare (less than 2 per 100 ft²), narrow (less than 6 in or 15 cm wide), short (less than 1 foot or 0.30 m long) and disconnected, disrupted by perennial vegetation.

3. **Number and height of erosional pedestals or terracettes:** Typically, none. When slopes exceed 30 percent, pedestals or terracettes may occur. When they occur, bunch grasses will be pedestalled, with no exposed roots. Drought, wildfire, and prescribed burns should not increase the incidence of pedestals except on the steepest slopes.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 10 percent or less. Bare ground patches should be no larger than 6 to 8 inches (15 to 20 cm) in diameter and scattered across the site. Multi-year drought can cause the amount of bare ground to increase to 15 to 20 percent. Cross-sectional viewing of this site appears to have more bare ground than vertical viewing due to exposed loess-steps. Nearly vertical slopes should not be included in the evaluation as those areas are not part of the loess hills site but are considered a non-site. Bare ground is exposed mineral soil that is not covered by vegetation (basal and/or foliar canopy), litter, standing dead vegetation, gravel/rock, and visible biological crust (e.g., lichen, mosses, algae).

5. **Number of gullies and erosion associated with gullies:** Typically, none. A few gullies may be present in areas associated with drainageways. These areas should have no active head-cutting and sides of the gully should be vegetated.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Wind-scoured and/or depositional areas should not be present.

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter movement of 1 to 3 feet (0.3 to 1 meter) is possible during intense rains. Coarse litter may move but will move shorter distances than fine litter.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability ratings will be 3 to 5 in interspaces and 4 to 6 under canopy.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon

ranges from 3 to 9 inches (8 to 23 cm) thick. The A-horizon is grayish brown to pale brown when dry (hue: 10YR, value: 4, 5 or 6, chroma: 2 or 3) and very dark grayish brown to brown when moist (hue: 10YR, value: 3, 4, or 5, chroma: 2 or 3). Structure of the A-horizon is weak fine and very fine granular or weak medium subangular blocky.

See Official Soils Descriptions for additional details; major soil series correlated to the site are Crofton and Ida.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community composition is 75 to 90 percent grasses and grass-like, 5 to 10 percent forbs, and 5 to 10 percent shrubs which optimizes infiltration on the site. The grass and grass-like portion is composed of warm-season (C4) midgrasses (35-65%), warm-season (C4) tallgrasses (20-50%); cool-season (C3) grasses (1-20%), warm-season (C4), shortgrasses (1-10%), and grass-like (1-10%). The functional/structural groups provide a combination of rooting depths and structure which positively influences infiltration.

Invasion of introduced cool-season grasses such as Kentucky bluegrass and smooth brome may have an adverse impact infiltration and runoff. Woody encroachment of native tree species may also negatively impact infiltration and runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. No compaction layers are expected for this site.
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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: Phase 1.1

1. Native, warm-season (C4), midgrass, 840-1560 #/ac, 35-65%, (3 species minimum): little bluestem, sideoats grama, plains muly
2. Native, warm-season (C4), tallgrass, 480-1200#/ac, 20-50% (1 species minimum): big bluestem, composite dropseed, Indiangrass, prairie sandreed, switchgrass.

Phase 1.2

1. Native, warm-season (C4), midgrass, 840-1560 #/ac, 35-65%, (2 species minimum): little bluestem, sideoats grama, plains muly.

Sub-dominant: Phase 1.2

1. Native, perennial, cool-season grass (2 species minimum): needleandthread, western wheatgrass, Canada wildrye, Scribner's rosettegrass, prairie Junegrass.
2. Native, perennial, warm-season (C4) short grasses (1 species minimum): blue grama, buffalograss.
3. Native, perennial, warm-season tallgrass, (1 species minimum): sand bluestem, Indiangrass, switchgrass, prairie sandreed.

Other: Minor - Phase 1.1

1. Native forb, 120-240 #/ac , 5-10%: forbs present will vary from location to location.
2. Shrubs, 120-240 #/ac, 5-10%: leadplant, Jersey tea, prairie rose, smooth sumac, western snowberry or other shrubs which will vary from location to location.
3. Native, warm-season (C4), shortgrass, 24-240#/ac, 1-10%: blue grama, hairy grama.
4. Native, cool-season (C3) grass, 24-240#/ac, 1-10%: Canada wildrye, needle and thread, porcupinegrass, prairie Junegrass, Scribner's rosette grass.
5. Grass-like, 24-240#/ac, 1-10%: shortbeak sedge, heavy sedge, long-stolon sedge, and other sedges.

Minor - Phase 1.2

1. Native forb: forbs present vary from location to location.
2. Native shrub: leadplant, Jersey tea, prairie rose, smooth sumac, western snowberry.
3. Grass-likes: heavy sedge, Mead's sedge, other sedges.

Additional: The Little Bluestem – Big Bluestem or Reference Community (1.1) includes seven F/S groups which include in order of relative abundance, native, perennial, warm-season midgrass; native, perennial, warm-season tallgrass; native forb = native shrub; native, perennial, warm-season shortgrass = native, perennial, cool-season grass = grass-like.

The Little Bluestem – Sideoats Community (1.2) includes seven F/S groups which include in order of relative abundance, native, perennial, warm-season midgrass; native, perennial, cool-season grass; native, perennial, warm-season shortgrass; native, perennial, warm-season tallgrass; native forb = shrub = grass-like.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Bunchgrasses have strong, healthy centers with few (less than 3 percent) dead centers. Shrubs may show some dead branches (less than 5 percent) as plants age.
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14. **Average percent litter cover (%) and depth (in):** Plant litter cover is evenly distributed throughout the site and is expected to be 40 to 60 percent and at a depth of approximately 0.25 inch (0.65 cm).
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** The representative value (RV) for annual production is 2,400 pounds per acre in a year with normal precipitation and temperatures. Low and High production years should yield 1,600 and 2930 pounds per acre respectively.
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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:** No non-native invasive species are present. Woody species including roughleaf dogwood, smooth sumac, eastern redcedar, Siberian elm, and snowberry are known invasives that have the potential to become dominant or co-dominant on the site. Garlic mustard may invade the tree understory following woody encroachment. Once trees have invaded, Kentucky bluegrass will be significant in the understory. Note: species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants.
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17. **Perennial plant reproductive capability:** All perennial species exhibit high vigor relative to climatic conditions. Perennial grasses should have vigorous rhizomes or tillers; vegetative and reproductive structures are not stunted. All perennial species should be capable of reproducing annually.
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