USDA Natural Resources Conservation Service

Ecological site R071XY028NE
Loamy Lowland

Accessed: 05/03/2024

General information

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

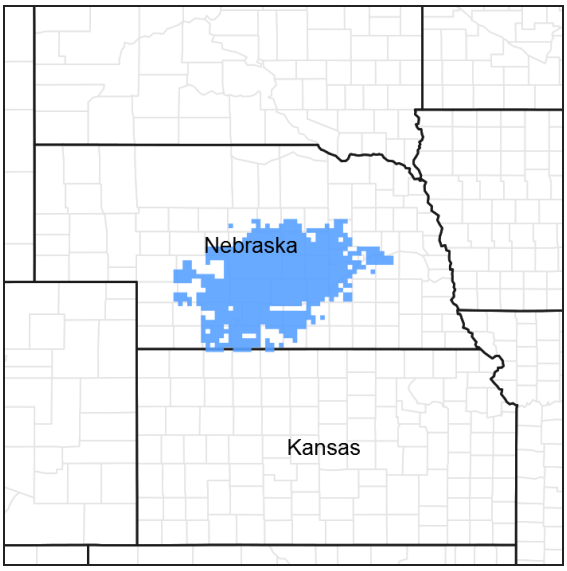


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 071X–Central Nebraska Loess Hills

This PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the Approved Ecological Site Description Standard, but it has been through a Quality Control and Quality Assurance processes to assure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an Approved Ecological Site Description.

MLRA 71 is named “The Central Nebraska Loess Hills”, and is located exclusively in Nebraska. The approximately 5.3 million acre landscape covers all or parts of 21 counties, primarily Custer, Dawson, Buffalo, Sherman, Howard, Valley, Greeley and Hall. The physical appearance of the landscape is dominated by loess hills dissected by the North, Middle and South Loup Rivers and their tributaries. The Platte River defines the southern border.
The elevation in MLRA 71 ranges from over 3,000 to less than 1,700 feet above sea level, with average local relief stretching from 20 to 200 feet. The predominate soil orders are mesic, udic Mollisols and Entisols, commonly represented by the Coly, Uly, Cozad, Hord, Hall and Holdredge soil series.
Loess overlays the surface of almost all of the uplands in this MLRA. Alluvial clay, silt, sand, and gravel are deposited in the stream and river valleys, and can be extensive in the major drainages. Terraces are common in the valleys along the river systems.
Average annual precipitation ranges from 21 to 26 inches, with the number of freeze-free days averaging around 200.

The matrix vegetation type is mixed-grass prairie, with big and little bluestem, switchgrass, Indiangrass, and sideoats and blue grama making up the bulk of the warm-season species, while western wheatgrass is the dominant cool season species.
The primary large-patch vegetative component of the landscape is dominated by Needle-and-thread, prairie sandreed, sand and little bluestem, and blue grama grass.
The majority of the small-patch communities are associated with upland playas and the wetter sites found along the floodplains.
Forty four percent of the land in this MLRA has been broken out of native prairie and farmed; mostly corn, alfalfa and some soybeans, while 48 percent of the grasslands remain intact. Livestock grazing, primarily cattle, is a major industry here.
Wildlife flourishes in this combination of crop and grassland environment, with both mule and white-tailed deer being the most abundant wild ungulate. A variety of smaller species, including coyote, raccoon, opossum, porcupines, muskrat, beaver, squirrel and mink thrive in the region, as well as a suite of grassland and upland birds. The rivers, streams and lakes harbor excellent fisheries.
This landscape developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores and repeated natural or man-caused wildfire. Other biotic and abiotic factors also typically influence soil/site development. This is a disturbance driven ecosystem, evolving under the influences of herbivory, fire, and variable climate. Historically, these processes created a heterogenous mosaic of plant communities and structure heights across the region. Any given site in this landscape experienced fire every 7 to 9 years. The fires were caused both by lightning strikes, and were set by native Americans, who used fire for warfare, signaling, and to refresh the native grasses. These people understood the value of fire as a tool, and that the highly palatable growth following a fire provided both excellent forage for their horses, and attracted grazing game animals such as bison and elk.
Even as post European settlement's alteration of the fire regime allows the expansion of the woody component of the native prairie, introduction of eastern red cedar as a windbreak component further facilitates invasion by this species.
While eastern red cedar is native to Nebraska, the historic population in MLRA 71 was limited to isolated pockets in rugged river drainages that were subsequently insulated from fire, or non-existent. Widespread plantings of windbreaks with eastern red cedar as a primary component has provided a seed source for the aggressive woody plant. The ensuing encroachment into the native grasslands degrades the native wildlife habit and causes significant forage loss for domestic livestock. However, since it is not a root sprouter, eastern red cedar is very susceptible to fire when under six feet tall. Management with prescribed fire is exceedingly effective if applied before this stage. Larger cedars can also be controlled with fire, but requires the use of specially designed ignition and suppression techniques.
Fragmentation of the native grasslands by conversion to cropland, transportation corridors and other development by European man has effectively disrupted the natural fire regime of this ecosystem. This has allowed encroachment by native and introduced shrubs and trees into the remnants of the native prairie throughout the MLRA. Aggressive fire suppression policies have exacerbated this process to the point that shrub and tree encroachment is a major ecological issue in the majority of both native and re-seeded grasslands.

Classification relationships

Major Land Resource Area (MLRA: Major Land Resource Area 71. (USDA-Natural Resources Conservation Service, 2006)
Level IV Ecoregions of the Conterminous United States

Revision Notes:
A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise group during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

Ecological site concept

This ecological site occupies a run-on position on the landscape, but is not influenced by the water table. There are no visible salts on the site, and the soil texture is other than Sandy Loam, Loamy Sand or Sand.

Associated sites

R071XY036NE	**Loamy Upland** Loamy Upland- Positioned upslope and adjacent to Loamy Lowland.
R071XY037NE	**Limy Upland** Limy Upland- Positioned upslope and adjacent to Loamy Lowland.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Schizachyrium scoparium*

Physiographic features

This site occurs on lowland areas that receives runoff from areas higher on the landscape. Flooding is none to rare.

Table 2. Representative physiographic features

Landforms	(1) Terrace
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	None to very rare
Ponding frequency	None
Elevation	497–937 m
Slope	0–6%
Ponding depth	0 cm
Water table depth	122 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 22 to 26 inches per year. Hourly winds are estimated to average about 14 miles per hour annually. Occasional strong storms may bring brief periods of high winds with gusts to more than 60 miles per hour.

Growth of native cool season plants begins in early April and continues to about mid June. Native warm season plants begin growth in early June, and continue to early August. Green up of cool season plants may occur in September and October.

Table 3. Representative climatic features

Frost-free period (average)	137 days
Freeze-free period (average)	156 days
Precipitation total (average)	660 mm

Climate stations used

- (1) ANSELMO 2 SE [USC00250245], Anselmo, NE
- (2) BROKEN BOW 2 W [USC00251200], Broken Bow, NE
- (3) CENTRAL CITY [USC00251560], Central City, NE
- (4) GOTHENBURG [USC00253365], Gothenburg, NE
- (5) KEARNEY 4 NE [USC00254335], Kearney, NE
- (6) NORTH LOUP [USC00256040], North Loup, NE
- (7) RAVENNA [USC00257040], Ravenna, NE
- (8) BURWELL [USC00251345], Burwell, NE
- (9) CANADAY STEAM PLT [USC00251450], Lexington, NE
- (10) COMSTOCK [USC00251835], Comstock, NE
- (11) MASON CITY [USC00255250], Mason City, NE
- (12) OVERTON 3 W [USC00256439], Overton, NE
- (13) STAPLETON 5W [USC00258133], Stapleton, NE
- (14) GRAND ISLAND AP [USW00014935], Grand Island, NE
- (15) ARNOLD [USC00250355], Arnold, NE
- (16) LOUP CITY [USC00254985], Loup City, NE
- (17) OCONTO [USC00256167], Oconto, NE
- (18) SAINT PAUL [USC00257515], Saint Paul, NE
- (19) TAYLOR [USC00258455], Taylor, NE

Influencing water features

There are no water features of the ecological site or adjacent wetland/riparian regimes that influence the vegetation and/or management of the site that make it distinctive from other ecological sites.

Soil features

These very deep soils are terraces or high flood plains. They receive extra water from runoff from adjoining uplands. They may be rarely flooded. Textures are primarily loamy and silty, but sandy textures may occur in the lower part of the root zone. Free water is usually very deep but may be present in the lower part of some profiles during part of the growing season. Organic matter is generally moderate in the surface layer.
The major soil series correlated to this site are: Cozad, Gosper, Hall, Hord and Detroit
The Reference Plant Community should exhibit slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths, if any, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration.

These soils are susceptible to wind erosion where vegetative cover is inadequate. Silt deltas may form in areas adjacent to higher lying soils.

Table 4. Representative soil features

Surface texture	(1) Silty clay loam (2) Sandy clay loam (3) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderate
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	18.54–23.37 cm

Calcium carbonate equivalent (0-101.6cm)	0–3%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Loamy Lowland sites developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire, and other biotic and abiotic factors that typically influence soil/site development. This continues to be a disturbance driven site, with the disturbances being herbivory, fire, and variable climate. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions.
The State and Transition Model (STM) is depicted below, and is made up of a Reference State, a Native/Invaded State, a Sod-busted State and an Invaded Woody State. Each state represents the crossing of a major ecological threshold due to alteration of the functional dynamic properties of the ecosystem. The main properties observed to determine this change are the soil and vegetative communities, and the hydrological cycle.
Each state may have one or more vegetative communities that fluctuate in species composition and abundance within the normal parameters of the state. Within each state, communities may degrade or recover in response to natural and man caused disturbances such as variation in the degree and timing of herbivory, presence or absence of fire, and climatic and local fluctuations in the precipitation regime.

Continuous season-long grazing (during the typical growing season of May through October), repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence, and/or continuous heavy grazing causes this site to depart from the Mixed Native Grass Plant Community. Western wheatgrass increases initially and will eventually decrease with continuous grazing. Grasses such as big bluestem and little bluestem will decrease in frequency and production. Introduced species such as Kentucky bluegrass, cheatgrass and smooth bromegrass invade the site as a result of inadequate recovery periods between grazing events and overstocking. If trees dominate the site, woody regeneration will decline and cool season grasses and forbs will become dominant in the understory. The Reference plant community is interpreted as an herbaceous dominated site on the higher reaches of the landscape position where trees encroach from adjacent sites, and flooding events are infrequent. Loamy Lowland sites occupying the lower reaches in the landscape position or plant communities adjacent to riparian areas will typically have a stronger mixed hardwood component.

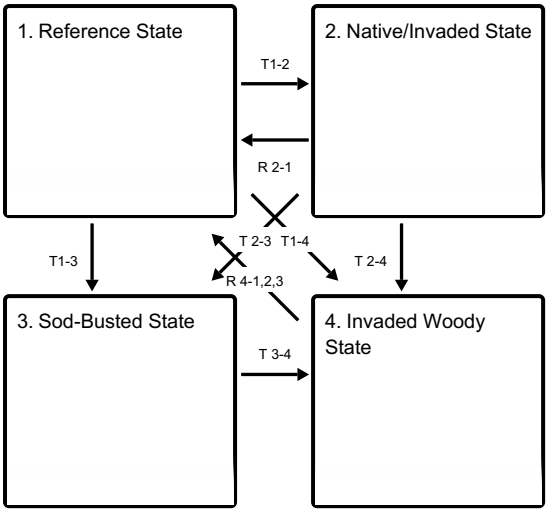
Interpretations are primarily based on the Mixed Native Grass Plant Community. This has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics have been interpreted from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

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 described in more detail in the plant community descriptions following the diagram.

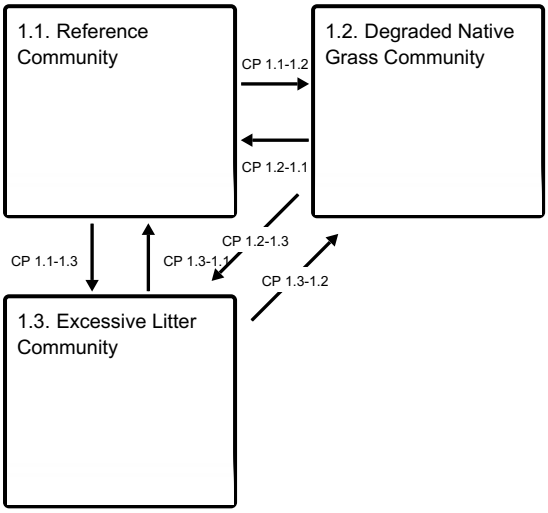
Plant Community and Vegetation State Narratives:
Following the diagram are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable plant communities.

State and transition model

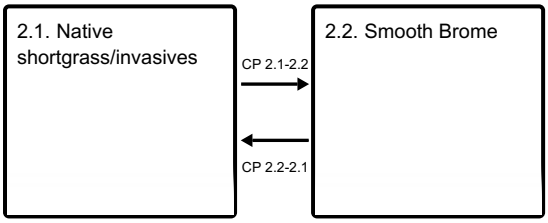
Ecosystem states



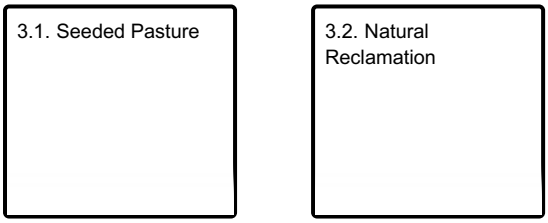
State 1 submodel, plant communities



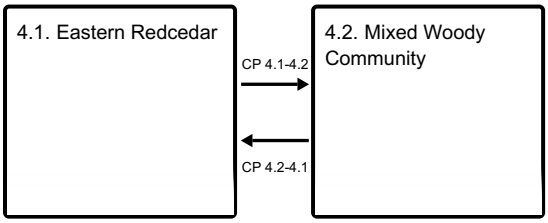
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Reference State

This state describes the range of vegetative community phases that occur on the Loamy Lowland site where the natural processes are mostly intact. The Reference Community is a representation of the native plant community phase that occupies a site that has been minimally altered by management. The Degraded Native Grass Community and the Excessive Litter Community are the phases that result from management decisions that are unfavorable to a healthy Reference Community. High perennial grass cover and production allows for increased soil moisture retention, vegetative production and overall soil quality.

Community 1.1
Reference Community

The Reference Community Phase serves as a description of the native plant community that naturally occurs on the site when the natural disturbance regimes are intact, or closely mimicked by management practices. This phase is dynamic, with fluid relative abundance and spatial boundaries between the dominant structural vegetative groups. These fluctuations are primarily driven by different responses of the species to changes in precipitation timing and abundance, and fire and grazing events. This community averages 90 percent grasses and grass-like plants, 5 percent forbs, and 5 percent shrubs. The plant community is dominated by both warm season grasses with a lesser component of cool season grasses. The major grasses include big bluestem, little bluestem, and western wheatgrass. Other grasses and grass-likes include switchgrass and sedges. Forbs are diverse and include sunflowers, goldenrods, and native legume species. Woody species included in the plant community are western snowberry and rose. The potential for tree encroachment is high. This plant community is productive and diverse. The total annual production ranges from 3000 to 4500 pounds of air dry vegetation per acre and may produce 3750 pounds during an average year. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regard to site/soil stability, watershed function, and biologic integrity. The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3155	3783	4383
Forb	207	315	448
Shrub/Vine	–	105	213
Total	**3362**	**4203**	**5044**

Figure 7. Plant community growth curve (percent production by month). NE7137, Central NE Loess Hills, warm-season dominant, cool-season sub-dominant. Warm-season grass dominant with cool-season plants sub-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	8	15	24	23	15	5	5	0	0

Community 1.2
Degraded Native Grass Community

The Degraded Native Grass Community Phase describes a significant shift in the vegetative community. Western wheatgrass increases, while we see a loss in the composition and production of big bluestem and little bluestem. Other grasses and grass-likes in this phase include sideoats grama, blue grama and sedges. The forb composition remains diverse and includes both annual and perennial sunflowers, cudweed sagewort, and goldenrod. Woody species included in the plant community are western snowberry and rose. The potential is high for tree encroachment or regeneration. This plant community is less productive and the diversity of grasses is lower than the representative plant community. This site remains a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity. The total annual production ranges from 2200 to 3200 pounds of air dry vegetation per acre and may produce 2700 pounds during an average year. The following growth curve is an

estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2320	2724	3094
Forb	146	228	336
Shrub/Vine	–	76	157
Total	**2466**	**3028**	**3587**

Figure 9. Plant community growth curve (percent production by month). NE7141, Central NE Loess Hills, lowland cool season/warm season co-dominant. Cool-season and warm-season grasses co-dominant, lowland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	12	20	25	19	11	5	3	0	0

Community 1.3
Excessive Litter Community

The Excessive Litter Community Phase describes the response of the community to the removal of the natural disturbances of herbivory and fire. As the duff layer deepens, infiltration of the precipitation is interrupted and evaporation increases significantly, simulating drouth-like conditions.

Pathway CP 1.1-1.2
Community 1.1 to 1.2

Long-term excessive livestock grazing without adequate growing season rest will cause this community to shift to the Degraded Native Grass Community. Prolonged periods of drought will have the same affect.

Pathway CP 1.1-1.3
Community 1.1 to 1.3

Interruption of the natural disturbances of herbivory and fire will result in conversion from this community to the Excessive Litter Community.

Pathway CP 1.2-1.1
Community 1.2 to 1.1

Management practices that include an appropriate stocking rate, and alteration of the grazing/haying regime to provide adequate growing season rest will allow recovery to the Reference Community. In the case of prolonged drought, return to the normal precipitation cycle will allow return of the reference community.

Pathway CP 1.2-1.3
Community 1.2 to 1.3

Interruption of the natural disturbances of herbivory and fire will result in conversion from this community to the Excessive Litter Community.

Pathway CP 1.3-1.1
Community 1.3 to 1.1

Re-introduction of the natural processes of herbivory and fire will allow the vegetation to return to the previous community.

Pathway CP 1.3-1.2
Community 1.3 to 1.2

Re-introduction of the natural processes of herbivory and fire will allow the vegetation to return to the previous community.

State 2
Native/Invaded State

This state has been degraded from the reference state and much of the native warm season grass community has been replaced by less desirable plants. The loss of tall and mid warm season grasses has negatively impacted energy flow and nutrient cycling. Water infiltration is reduced due to the shallow root system and rapid runoff characteristics of invaded grazing-evasive plant communities.

Community 2.1
Native shortgrass/invasives

This plant community develops as a result of continuous heavy grazing without adequate recovery periods. Western wheatgrass and big bluestem have decreased. There is an increase in the sod forming grasses, blue grama and Kentucky bluegrass. The potential is high for woody plant encroachment. Kentucky bluegrass and ragweed will begin to dominate the plant community with continued heavy grazing use. Production and diversity have declined compared to the Reference Plant Community. Dominant forbs include ragweed, scurfpeas, cudweed sagewort, and verbenas. The loss of tall and mid warm season grasses have negatively impacted energy flow and nutrient cycling. Water infiltration will be reduced due to the shallow root system and rapid runoff characteristics of sod-forming communities. The total annual production ranges from 1500 to 2500 pounds of air dry vegetation per acre and may produce 1650 pounds during an average year. The following growth curve is an estimate of the monthly percentages of total annual growth of the dominant species expected during an average year:

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1295	1513	1659
Forb	185	280	465
Shrub/Vine	–	56	95
Total	**1480**	**1849**	**2219**

Figure 11. Plant community growth curve (percent production by month). NE7140, Central NE Loess Hills, cool-season dominant, warm-season sub-dominant. Cool-season grasses dominant, warm-season grasses subdominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	8	25	30	15	10	2	5	0	0

Community 2.2
Smooth Brome

This plant community contains predominately smooth bromegrass but also contains native warm season grass remnants. Production on smooth bromegrass dominated plant communities are highly variable depending on the percent composition present and outside inputs such as fertilizer and weed control. Production can range from 2500 lbs/acre to 3000 pounds/acre with an average of 2750 lbs/acre in normal years on rangelands with a smooth bromegrass component of 50 percent or more. Clipping or ocular estimates of production should be conducted to verify current annual production. Prescribed grazing, prescribed burning, or the use of herbicide treatments at critical time periods can reduce the smooth bromegrass component in the plant community.

Pathway CP 2.1-2.2
Community 2.1 to 2.2

Transition to the Smooth Bromegrass Community includes the following environmental factors - Triggers: Introduced grass seeding, excessive summer grazing, inadequate rest during the summer, multi season haying and nitrogen fertilizing in spring and/or fall that promote cool season grasses such as smooth bromegrass and reduce the amount of native grasses. Threshold: Smooth bromegrass and/or other non-native native plants are predominant and there is limited plant species diversity.

Pathway CP 2.2-2.1
Community 2.2 to 2.1

Restoration can be achieved by herbicide treatment and reseeding. If native remnants are present, appropriately timed prescribed fire and a follow up prescribed grazing program may achieve the desired results.

State 3
Sod-Busted State

This threshold is crossed as a result of mechanical disturbance to facilitate production agriculture. If farming operations are suspended, the site can: be abandoned, which will result in the Naturally Reclaimed Community, or; be re-seeded to a desired perennial forage mixture, which is described as the Re-seeded Community. Permanent alterations of the soil community and the hydrological cycle make restoration to the original native Reference Community extremely difficult, if not impossible.

Community 3.1
Seeded Pasture

This plant community does not contain native remnants, and will vary considerably depending on what type of grasses/legumes were planted, how eroded the soil is, how long ago the stand was planted, nitrogen fertilizer use, and past grazing management. Prescribed grazing with adequate recovery periods will be needed to maintain productivity and desirable species. There are several factors that make seeded pasture a different grazing resource than native rangeland. Factors such as species selected, stand density, improved varieties and harvest efficiency all impact the production level and palatability. Species diversity on seeded pasture is often limited to a few species. When seeded pasture and native rangelands are in the same grazing unit, uneven forage utilization will occur. Improve forage utilization by managing this community separately from native rangelands. Total annual production during an average year varies significantly depending on the level of management and grass species seeded. Improved varieties of warm season or cool season grasses are recommended for forage purposes. Single species stands of Big bluestem, Indiangrass or Switchgrass or well managed cool season grasses/legume plantings with improved varieties will yield 4000-5000 lbs/acre/year with an average of 4500 lbs/acre/year.

Community 3.2
Natural Reclamation

This plant community consists of annual and perennial weeds and less desirable grasses. These sites have been farmed (all previous plant communities were destroyed) and abandoned without being reseeded. Soil organic matter/carbon reserves are reduced, soil structure is changed, and a plow-pan or compacted layer can be formed which decreases water infiltration. Residual synthetic chemicals may remain from farming operations. In early successional stages, this community is not stable. Erosion is a concern. Total annual production during an average year varies significantly depending on the succession stage of the plant community and any management applied to the system.

State 4
Invaded Woody State

This State is a result of the disruption of the natural fire regime, and lack of management in response to an increase in woody species. The native component of woody species increases, as do invading introduced exotic species. Once the canopy cover reaches 15 percent with an average tree height exceeding 5 feet, the threshold is crossed to

the Invaded Woody State.

Community 4.1
Eastern Redcedar

This community will develop when brush management, harvest, prescribed burning, grazing by browsing animals, or wildfire is absent from the site over an extended period of time. Generally, this site is susceptible to cedar seedling encroachment. Eastern red cedar typically occupies hillsides and slopes where wildfire or prescribed fire treatments did not carry. The percent composition of eastern red cedar normally does not exceed 5 percent of the plant community when fire is regularly present in the ecosystem. With the absence of fire, harvesting, and browsing by animals, the steady encroachment of eastern red cedar will occur with the resulting loss of the herbaceous plant community as tree density and canopy cover increases. Soil erosion underneath a closed tree canopy can be high. Honey locust encroachment may occur as you move south and east within the MLRA. Eastern red cedar control can usually be effectively accomplished with a prescribed burn while the trees are six foot tall or less and fine fuel production is over 1500 pounds per acre. Mechanical removal followed by a chemical treatment on stumps is effective on honey locust.

Community 4.2
Mixed Woody Community

This plant community can occur whenever this site is near a seed source for eastern red cedar. This plant community typically develops after some amount of deciduous canopy exists, which provides a suitable microclimate for the establishment of eastern red cedar. If no fire occurs, the eastern red cedar will continue to increase in size, and in the process, change the microclimate (soil moisture) so that it becomes less suitable for the deciduous trees. This plant community is the beginning stage of this transformation, and typically will have numerous immature cedar under the deciduous tree canopy. The herbaceous/shrub understory will begin to decline rapidly.

Pathway CP 4.1-4.2
Community 4.1 to 4.2

Advance of green ash growth will lead to a shift from the Eastern redcedar community phase to the Mixed Woody community phase.

Pathway CP 4.2-4.1
Community 4.2 to 4.1

Timber harvest and tree thinning can cause the Green ash-Eastern redcedar community phase to shift to the Eastern redcedar community phase.

Transition T1-2
State 1 to 2

Continuous heavy grazing without adequate recovery periods will cause this plant community to lose a significant proportion of tall and mid warm season grass species and cross a threshold to the Native/Invaded State. Once this occurs it will require considerable time (more than 40 years) and expense to return this site to a more productive plant community. Water infiltration and other hydrologic functions will be reduced due to the root matting presence of sod-forming grasses.

Transition T1-3
State 1 to 3

The Reference State is significantly altered by mechanical tillage to allow the site to be placed into production agriculture. The disruption to the plant community, the soil and the hydrology of the system make restoration to a true reference state unlikely.

Transition T1-4
State 1 to 4

Disruption of the natural fire regime, and the introduction of exotic species such as Russian olive trees causes a major shift in the vegetative community. The resulting impacts to the system cross the threshold into the Invaded Woody State.

Restoration pathway R 2-1
State 2 to 1

Development of a long-term management plan that includes an appropriate level of livestock grazing with adequate growing season rest, and strategically timed prescribed fire will return this state to the Reference State.

Transition T 2-3
State 2 to 3

The State is significantly altered by mechanical tillage to allow the site to be placed into production agriculture. The disruption to the plant community, the soil and the hydrology of the system make restoration unlikely.

Transition T 2-4
State 2 to 4

Disruption of the natural fire regime and the introduction of exotic species can cause this state to shift to the Invaded Woody State.

Transition T 3-4
State 3 to 4

Encroachment of woody species, no grazing, and no fire will cause the Invaded Grass-Seeded State to transition to the Invaded Woody State.

Restoration pathway R 4-1,2,3
State 4 to 1

Prescribed burning, wildfire, harvest,and brush management will move this plant community toward one of the herbaceous plant dominated plant communities. The forb component of a site with heavy tree density or canopy cover will initially increase following tree removal through mechanical brush management treatments and prescribed fire.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall warm season grasses**			1261–1889	
	big bluestem	ANGE	*Andropogon gerardii*	1051–1472	25–35
	switchgrass	PAVI2	*Panicum virgatum*	211–420	5–10
	Indiangrass	SONU2	*Sorghastrum nutans*	0–420	0–10
2	**Mid warm season grasses**			841–1472	
	little bluestem	SCSC	*Schizachyrium scoparium*	631–1051	15–25
	sideoats grama	BOCU	*Bouteloua curtipendula*	211–420	5–10
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–211	0–5
3	**Native cool season grasses**			420–1051	

	western wheatgrass	PASM	*Pascopyrum smithii*	420–841	10–20
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–211	0–5
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–211	0–5
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–211	0–5
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–211	0–5
4	**Short Warm Season**			0–211	
	blue grama	BOGR2	*Bouteloua gracilis*	0–211	0–5
5	**Other Native**			0–211	
	sedge	CAREX	*Carex*	0–211	0–5
	Grass, perennial	2GP	*Grass, perennial*	0–84	–
Forb					
7	**Forbs**			211–420	
	Forb, annual	2FA	*Forb, annual*	0–84	0–2
	Forb, perennial	2FP	*Forb, perennial*	0–84	0–2
	yarrow	ACHIL	*Achillea*	0–84	0–2
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–84	0–2
	pussytoes	ANTEN	*Antennaria*	0–84	0–2
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–84	0–2
	false boneset	BREU	*Brickellia eupatorioides*	0–84	0–2
	purple prairie clover	DAPU5	*Dalea purpurea*	0–84	0–2
	common sunflower	HEAN3	*Helianthus annuus*	0–84	0–2
	smooth sunflower	HELA2	*Helianthus laevigatus*	0–84	0–2
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–84	0–2
	blazing star	LIATR	*Liatris*	0–84	0–2
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–84	0–2
	scurfpea	PSORA2	*Psoralidium*	0–84	0–2
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–84	0–2
	goldenrod	SOLID	*Solidago*	0–84	0–2
	white heath aster	SYER	*Symphyotrichum ericoides*	0–84	0–2
	vervain	VERBE	*Verbena*	0–84	0–2
Shrub/Vine					
8	**Shrubs**			0–211	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–84	0–2
	leadplant	AMCA6	*Amorpha canescens*	0–84	0–2
	rose	ROSA5	*Rosa*	0–84	0–2
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–84	0–2
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–84	0–2

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season Grasses**			151–454	

	big bluestem	ANGE	*Andropogon gerardii*	151–303	5–10
	switchgrass	PAVI2	*Panicum virgatum*	0–151	0–5
	Indiangrass	SONU2	*Sorghastrum nutans*	0–61	0–2
2	**Mid Warm Season Grasses**			303–908	
	little bluestem	SCSC	*Schizachyrium scoparium*	151–454	5–15
	sideoats grama	BOCU	*Bouteloua curtipendula*	151–303	5–10
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–151	0–5
3	**Native Cool Season Grasses**			303–757	
	western wheatgrass	PASM	*Pascopyrum smithii*	303–757	10–25
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–61	0–2
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–61	0–2
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–61	0–2
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–61	0–2
4	**Short Warm Season Grasses**			30–605	
	blue grama	BOGR2	*Bouteloua gracilis*	303–454	10–15
5	**Other Native**			0–151	
	sedge	CAREX	*Carex*	0–151	0–5
6	**Non-Native Grasses**			0–303	
	woolly brickellbush	BRIN	*Brickellia incana*	0–303	0–10
	Kentucky bluegrass	POPR	*Poa pratensis*	0–303	0–10
	cheatgrass	BRTE	*Bromus tectorum*	0–61	0–2
Forb					
7	**Forbs**			151–303	
	yarrow	ACHIL	*Achillea*	0–61	0–2
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–61	0–2
	pussytoes	ANTEN	*Antennaria*	0–61	0–2
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–61	0–2
	false boneset	BREU	*Brickellia eupatorioides*	0–61	0–2
	purple prairie clover	DAPU5	*Dalea purpurea*	0–61	0–2
	common sunflower	HEAN3	*Helianthus annuus*	0–61	0–2
	smooth sunflower	HELA2	*Helianthus laevigatus*	0–61	0–2
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–61	0–2
	blazing star	LIATR	*Liatris*	0–61	0–2
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–61	0–2
	scurfpea	PSORA2	*Psoralidium*	0–61	0–2
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–61	0–2
	goldenrod	SOLID	*Solidago*	0–61	0–2
	white heath aster	SYER	*Symphyotrichum ericoides*	0–61	0–2
	vervain	VERBE	*Verbena*	0–61	0–2
Shrub/Vine					
8	**Shrubs**			0–151	
	leadplant	AMCA6	*Amorpha canescens*	0–61	0–2
	rose	ROSA5	*Rosa*	0–61	0–2

	rose	ROSA5	*Rosa*	0–61	0–2
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–61	0–2
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–61	0–2

Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season Grasses**			0–93	
	big bluestem	ANGE	*Andropogon gerardii*	0–56	0–3
	switchgrass	PAVI2	*Panicum virgatum*	0–37	0–2
2	**Mid Warm Season Grasses**			0–278	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–93	0–5
	little bluestem	SCSC	*Schizachyrium scoparium*	0–93	0–5
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–93	0–5
3	**Native Cool Season Grasses**			93–185	
	western wheatgrass	PASM	*Pascopyrum smithii*	93–185	5–10
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–93	0–5
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–37	0–2
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–37	0–2
4	**Short Warm Season Grasses**			370–555	
	blue grama	BOGR2	*Bouteloua gracilis*	370–555	20–30
5	**Other Native**			0–93	
	sedge	CAREX	*Carex*	0–93	0–5
6	**Non-Native Grasses**			463–833	
	woolly brickellbush	BRIN	*Brickellia incana*	0–833	0–45
	Kentucky bluegrass	POPR	*Poa pratensis*	463–833	25–45
	cheatgrass	BRTE	*Bromus tectorum*	0–93	0–5
Forb					
7	**Forbs**			185–463	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	185–370	10–20
	pussytoes	ANTEN	*Antennaria*	0–37	0–2
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–37	0–2
	false boneset	BREU	*Brickellia eupatorioides*	0–37	0–2
	purple prairie clover	DAPU5	*Dalea purpurea*	0–37	0–2
	common sunflower	HEAN3	*Helianthus annuus*	0–37	0–2
	smooth sunflower	HELA2	*Helianthus laevigatus*	0–37	0–2
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–37	0–2
	blazing star	LIATR	*Liatris*	0–37	0–2
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–37	0–2
	scurfpea	PSORA2	*Psoralidium*	0–37	0–2
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–37	0–2
	goldenrod	SOLID	*Solidago*	0–37	0–2
	white heath aster	SYER	*Symphyotrichum ericoides*	0–37	0–2

	white heath aster	SYER	*Symphyotrichum ericoides*	0–37	0–2
	vervain	VERBE	*Verbena*	0–37	0–2
	yarrow	ACHIL	*Achillea*	0–37	0–2
Shrub/Vine					
8	**Shrubs**			0–93	
	rose	ROSA5	*Rosa*	0–37	0–2
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–37	0–2
	coralberry	SYOR	*Symphoricarpos orbiculatus*	0–37	0–2

Animal community

Grazing Interpretations:
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, goats, and horses. 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.
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 field visit is recommended in all cases to document plant composition and production. More precise 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.

Average Annual Stocking
Production Rate*
Plant Community (lbs./acre, air-dry) (AUM/acre)
Reference Community 3750 1.03
Degraded Native Community 2700 0.74
Native Shortgrass/Invaded 1650 0.45
Smooth brome (dryland, unfertilized, >50% of plant composition) 2700 0.74
* Based upon the following conditions: continuous season-long grazing by cattle under average growing conditions, 25 percent harvest efficiency. Air dry forage requirements based on 3 percent of animal body weight, or 912 lbs/AU/month. (refer to USDA NRCS, National Range and Pasture Handbook).

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B, with localized areas in hydrologic group C. Infiltration rate is moderate to slow. 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 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where rhizomatous grasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent 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, hiking, photography, bird watching and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

Local or individual fire wood can be utilized from this site.

Other products

None noted.

Other information

Revision Notes: “This PROVISIONAL ecological site concept has been QC’d and QA’d to ensure that the site meets the NESH standards for a provisional ecological site that provides basic compiled information in one location. This site should not be considered an Approved ESD until further data entry and editing is completed.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used.
Data Source Number of Records Sample Period State County
SCS-RANGE-417 2 2007 NE Valley

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)
USDA, NRCS. National Range and Pasture Handbook, September 1997
USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (http://nasis.nrcs.usda.gov)
USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
USDA, NRCS, Various Published Soil Surveys.

Contributors

Dana Larsen
Nadine Bishop
Doug Whisenhunt

Acknowledgments

Site Development and Testing Plan:
Future work is needed to validate the information in this Provisional Ecological Site Description. Additional data collection and evaluation may also be needed to develop this ESD to the Approved, then Correlated level. This could include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Field reviews of the project plan should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.
The State and Transitional Model and corresponding pathways and associated vegetative communities will need to be reviewed and upgraded to adhere to the new guidelines.
Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team. The project plan is: ES R071XY028NE- MLRA 71 -

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.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

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:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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:**

17. **Perennial plant reproductive capability:**