USDA Natural Resources Conservation Service

Ecological site R071XY055NE
Sands

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.

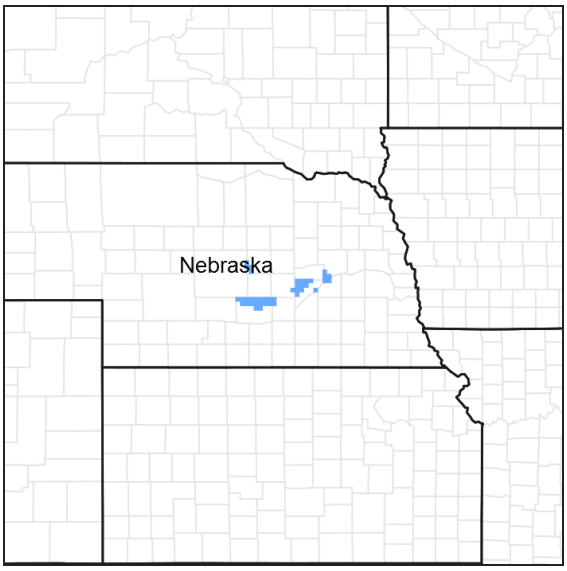


Figure 1. Mapped extent

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 (MLRA) 71. (USDA-Natural Resources Conservation Service, 2006)

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.

Level IV Ecoregions of the Conterminous United States; 44a – Nebraska Sand Hills.

Ecological site concept

The Sands site is positioned in a run-off position on a dune or hill, with a slope of greater than 3 percent. Soil textures are non-effervescing LFS,SL,LS or S, and have a dark colored surface horizon less than 10 inches thick. Catsteps are not evident on this site.

Associated sites

R071XY024NE	**Subirrigated** Sub-irrigated-Lower on the landscape.
R071XY054NE	**Sandy** Sandy-Lower on the landscape, often adjacent to the Sands site.

Similar sites

R071XY036NE	**Loamy Upland** Loamy Upland-Differentiated by soil texture, not LFS,SL,LS or S.
R071XY054NE	**Sandy** Occupies a lower landscape position,slope not as steep, higher vegetative production.
R071XY037NE	**Limy Upland** Limy Upland-Differentiated by soil texture other than LFS,SL,LS or S, and has an effervescing soil.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon hallii* (2) *Panicum virgatum*

Physiographic features

This site occurs on nearly level to steep uplands of less than 24 percent. Surface slope slips known as “catsteps” are not characteristic of this site. This site produces runoff to areas lower on the landscape. This site is subject to erosion by water if the vegetative cover is reduced or absent by such things as overgrazing and fire events. Livestock trailing on this site often leads to the formation of blowouts.

Table 2. Representative physiographic features

Landforms	(1) Dune
Flooding frequency	None
Ponding frequency	None
Elevation	497–937 m
Slope	3–24%
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 13 miles per hour annually. Peak wind gusts range from 46 to 80 miles per hour. Daytime winds are generally stronger than nighttime winds. 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) BROKEN BOW 2 W [USC00251200], Broken Bow, NE
- (2) BURWELL [USC00251345], Burwell, NE
- (3) NORTH LOUP [USC00256040], North Loup, NE
- (4) RAVENNA [USC00257040], Ravenna, NE
- (5) STAPLETON 5W [USC00258133], Stapleton, NE
- (6) KEARNEY 4 NE [USC00254335], Kearney, NE
- (7) ANSELMO 2 SE [USC00250245], Anselmo, NE
- (8) CANADAY STEAM PLT [USC00251450], Lexington, NE
- (9) COMSTOCK [USC00251835], Comstock, NE
- (10) LOUP CITY [USC00254985], Loup City, NE
- (11) MASON CITY [USC00255250], Mason City, NE
- (12) GRAND ISLAND AP [USW00014935], Grand Island, NE
- (13) ARNOLD [USC00250355], Arnold, NE
- (14) CENTRAL CITY [USC00251560], Central City, NE
- (15) GOTHENBURG [USC00253365], Gothenburg, NE
- (16) OCONTO [USC00256167], Oconto, NE
- (17) OVERTON 3 W [USC00256439], Overton, NE
- (18) SAINT PAUL [USC00257515], Saint Paul, NE
- (19) TAYLOR [USC00258455], Taylor, NE

Influencing water features

This site is an upland site and functions independently from ground and surface water features.

Soil features

The features common to all soils in this site are the sandy textured surface soils and slopes of 3 to 24 percent. The soils in this site are excessively drained and formed in eolian sand. The surface layer is 2 to 9 inches thick. The subsurface texture ranges from loamy fine sand to fine sand. Runoff as evidenced by patterns of rill, gully or other water flow is low to very low due to the very high intake rate of these soils. Some pedestalling of plants occurs, but it is not very evident on casual observation and occurs on less than 5 percent of the plants.
The major soil series associated with this site is Valentine.

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

Table 4. Representative soil features

Surface texture	(1) Fine sand (2) Loamy fine sand (3) Sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Rapid
Soil depth	206–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	7.62 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Historically, large areas of blowing sand resulted in the active movement of the sand dunes. Evaporation from the soil surface was extremely high due to the large areas of bare ground, lack of litter and sparse plant populations. The transpiration rate of these sparse plant populations was also high due to the harsh soil environment. Occasional wild fires, severe grazing by transient bison herds and drought contributed to the lack of stability of the sand dunes. This lack of stability caused the dunes to go back and forth through multiple stages of plant succession over the course of time. Early perennial plants such as sandhill muhly, blowout grass and blowout penstemon were common due to their ability to tolerate the movement of the sand and droughty conditions. As these plants began to colonize and stabilize the sand movement, other perennials such as prairie sandreed, sand bluestem, hairy grama, lemon scurfpea and rose slowly became evident on the site. Annual native plants such as sandbur, woolly Indianwheat, annual eriogonum and annual sunflower eventually colonized the areas between the perennials.

As this site deteriorates, prairie sandreed, sand dropseed, and blue grama will increase. Species such as sand bluestem and switchgrass will decrease in frequency and production. The site is extremely resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought resistance.

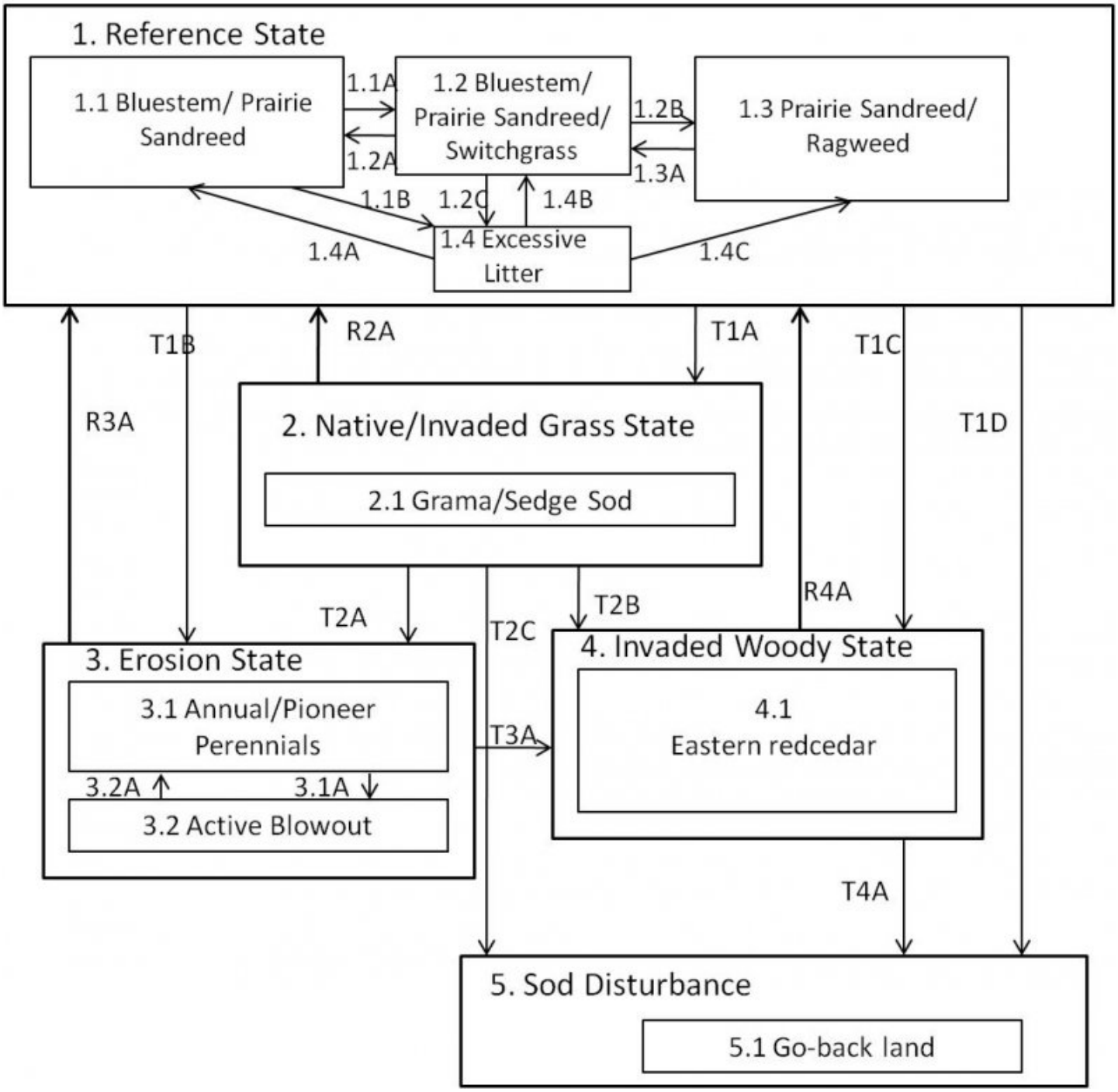
Interpretations are primarily based on the Bluestem/Prairie Sandreed Plant Community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Sub-climax 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 discussed 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. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

State and transition model

MLRA-Sands R071XY055NE



	State and Transition Diagram Legend for Sands MLRA 71
CP 1.1A CP 1.2B CP 1.4C CP 3.1A	Continuous season-long grazing, growing season haying, overstocking, prolonged drought
CP 1.1B CP 1.2C	Lack of natural disturbance processes, i.e fire and grazing.
CP 1.2A CP 1.3A R 3A	Managed grazing, reduced stocking rate, appropriately timed prescribed fire.
CP 1.4A CP 1.4B	Introduction/allowance of natural disturbance regimes, i.e. grazing and fire.
CP 3.2A	Prescribed grazing, haying blowouts, reseeding/ temporary cover crop
T 1A T 1B T 2A	Continuous season-long grazing, growing season haying, overstocking, prolonged drought.
T 1C T 2B T 3A	Lack of fire allows the encroachment of eastern red cedar. Once the canopy cover reaches 15 percent with an average tree height exceeding 5 feet, the threshold is crossed to the Invaded Woody State.
T 1D T 2C T 4A	Tillage followed by abandonment causes a transition to the sod disturbance state.
R 2A	A combination of prescribed fire and grazing timed to impact the invading cool-season grasses followed by rest during the optimal growth period for the warm-season grasses will move this community back towards the reference state.
R 4A	This state can be converted back to the previous state with a combination of mechanical treatment and prescribed fire. In the case of dense canopies of mature trees, a combination of the mechanical operation of "cutting and stuffing' and specialized ignition techniques may be required. Maintenance burns will be needed to prevent re-invasion.

Figure 6. STM Legend for Sands MLRA 71

State 1
Reference State

This state contains four community phases historically maintained by frequent fire and herbivory (grazing) with

adequate recovery periods. High perrennial grass cover and production facilitates increased soil moisture retention, high infiltrates rates, plant vigor, and overall soil quality.

Community 1.1
Bluestem/ Prairie Sandreed

Interpretations are primarily based on the Bluestem/Prairie Sandreed Plant Community. This site evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. This plant community can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional periods of rest. This plant community consists chiefly of tall and mid warm season grasses. Principle dominants are sand bluestem, prairie sandreed, and little bluestem. Grasses of secondary importance are Indiangrass, needlegrasses, switchgrass, sand lovegrass, and hairy or blue grama. Sedges occur in the understory. Forbs and shrubs such as dotted blazing star, leadplant, rose and sandcherry are significant. This plant community is about 85 percent grasses, 10 percent forbs, and 5 percent shrubs by weight. This plant community is extremely resilient and well adapted to the Northern Great Plains climatic conditions. This is a sustainable plant community in terms of site/soil stability, watershed function, and biologic integrity. Plant litter is properly distributed with some movement off-site and natural plant mortality is low. The diversity in plant species allows for high drought tolerance. Moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2292	2709	3094
Forb	146	228	336
Shrub/Vine	28	91	157
Total	**2466**	**3028**	**3587**

Figure 8. 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
Bluestem/ Prairie Sandreed/ Switchgrass

Plants resistant to grazing are maintaining themselves in this plant community which developed under grazing by domestic livestock. Most of the palatable plants from the Bluestem/Prairie Sandreed Plant Community are present but occur in lesser amounts. Warm season grasses still comprise a significant component of this plant community. Dominant grasses include sand bluestem, little bluestem, switchgrass and prairie sandreed. Grasses of secondary importance include blue or hairy grama, and Scribner’s panicum. Forbs commonly found in this plant community include blazingstar, white heath aster and goldenrod. Indiangrass, sand bluestem, and perennial forbs are present in lesser amounts. This plant community has higher overall production of shrubs as compared to the Bluestem/Prairie Sandreed Plant Community. Excessive removal of forage will cause shrubs to increase further. Strong healthy root systems allow production on this plant community to increase with favorable precipitation. This plant community contributes to optimum soil health. This plant community is drought resistant due to its tall and mid grass diversity. These warm-season grasses cure well for winter forage stockpiling. This plant community has slightly less litter than the Bluestem/Prairie Sandreed Plant Community. This plant community is somewhat resistant to change; however, either improved management or increased disturbance can move the plant community. The resiliency of this plant community is dependent on the type of management system implemented, and the intensity and duration of the disturbance. The following growth curve shows the estimated monthly percentages of total annual growth of the dominant species expected during a normal year:

Figure 9. 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 1.3
Prairie Sandreed/ Ragweed

This plant community occurs under historic heavy grazing with continued seasonal grazing starting early in the growing season. The plant community is a mix of warm season and short cool season grasses, with an increase of forbs and shrubs. The percent ground cover and plant density increases from the Bluestem/Prairie Sandreed/Switchgrass Plant Community due to considerable encroachment by the sod-forming bluegrasses. The potential vegetation is about 60 percent grasses or grass-like plants, 25 percent forbs, and 15 percent shrubs. The dominant grasses include prairie sandreed, bluegrass, blue grama and sand dropseed. Other grasses present include little bluestem, switchgrass and Scribner's panicum. Major forbs include Cuman ragweed, with lesser amounts of green sagewort and blazingstar. The dominant shrub is rose. There can be an increase in shrubs, especially snowberry and plum. There is a significant increase in cool-season plants such as ragweed and bluegrass. With the exception of an increase in prairie sandreed, a decrease can occur in the mid and tall warm-season grasses such as sand bluestem, switchgrass, little bluestem. The soil surface has remained intact. Compared to the Bluestem/Prairie Sandreed Plant Community, the total annual production is reduced by 25-35 percent, and plant diversity and amount of litter is lower. This plant community is considered stable, but is at risk if a major shift in climatic conditions or overgrazing occurs. The resiliency of this plant community is moderate depending on the intensity and duration of disturbance. Infiltration and runoff are not greatly affected because of the sandy nature of the soil.

Figure 10. Plant community growth curve (percent production by month). NE7136, Central NE Loess Hills, cool season/warm season co-dominant. Cool-season grass and warm-season grass co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	25	20	10	5	5	0	0

Community 1.4
Excessive Litter

This plant community occurs after an extended period (10-30 years) of non-use by domestic livestock (periodic fire may extend the amount of time it will take to reach this plant community). Livestock grazing and fire has been eliminated. Litter amount has clearly increased and few or no sedges or understory plants (shortgrass) are present. There is reduced plant basal cover which is replaced by litter. Bunch grass plants tend to colonize by individual species and are very mature. These mature plants tend to have dead centers, and pedestalling is usually evident. These plants have very few tillers for vegetative reproduction. The potential vegetation is about 90 percent grasses or grass-like plants, 5 percent forbs, and 5 percent shrubs. The dominant grasses include sand bluestem, prairie sandreed, little bluestem and needlegrasses. Other grasses present include sand dropseed, switchgrass and prairie junegrass. The dominant forbs include Cuman ragweed and green sagewort, with less dominant forbs including blazingstar and spiny phlox. The shrubs present on this plant community include rose, leadplant and western sandcherry. Plant diversity has decreased and native plants tend to occur in individual colonies. This plant community has a high amount of litter covering the soil between widely dispersed mature plants. This plant community will change rapidly if plant manipulation is allowed to occur (grazing by domestic livestock or periodic fire). Soil erosion is low, and infiltration and runoff are not significantly different than the Bluestem/Prairie Sandreed Plant Community.

Figure 11. 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

Pathway 1.1A
Community 1.1 to 1.2

Heavy grazing (usually including improper rest periods) will convert this plant community to the Bluestem/Prairie Sandreed/Switchgrass Plant Community. Continuous heavy grazing tends to accelerate this movement.

Pathway 1.1B
Community 1.1 to 1.4

No use and no fire causes Bluestem/ Prairie Sandreed to shift to the Excessive Litter community phase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing can convert the plant community to the Bluestem/Prairie Sandreed Plant Community.

Pathway 1.2B
Community 1.2 to 1.3

Heavy grazing (usually including improper rest periods) or excessive disturbance (e.g., defoliation by rodents) can convert this plant community to the Prairie Sandreed/Ragweed Plant Community. Continuous heavy grazing tends to accelerate this movement to the Prairie Sandreed/Ragweed Plant Community.

Pathway 1.2C
Community 1.2 to 1.4

Non-use and no fire can convert this plant community to the Excessive Litter Plant Community.

Pathway 1.3A
Community 1.3 to 1.2

Prescribed grazing can convert the plant community to the Bluestem/Prairie Sandreed Switchgrass Plant Community.

Pathway 1.4A
Community 1.4 to 1.1

Prescribed grazing and/or prescribed fire will convert the plant community to the Bluestem/Prairie Sandreed Plant Community. (Depending on the length of time non-use occurred and the composition of the plant species prior to removal of use and/or fire, these practices will move this plant community to the Bluestem/Prairie Sandreed Plant Community or the Bluestem/Prairie Sandreed/Switchgrass Plant Community).

Pathway 1.4B
Community 1.4 to 1.2

Prescribed grazing and/or prescribed fire will convert the plant community to the Bluestem/Prairie Sandreed/Switchgrass Plant Community. (Depending on the length of time non-use occurred and the composition of the plant species prior to removal of use and/or fire, these practices will move this plant community to the Bluestem/Prairie Sandreed Plant Community or the Bluestem/Prairie Sandreed/Switchgrass Plant Community). Prescribed grazing and/or fire will eventually shift Excessive Litter back to the Bluestem/ Prairie Sandreed/ Switchgrass community phase.

Pathway 1.4C
Community 1.4 to 1.3

Heavy grazing (usually including improper rest periods) can convert this plant community to the Prairie

Sandreed/Ragweed Plant Community. This change will be accelerated if coupled with several years of below average precipitation.

State 2
Native/Invaded Grass State

This state consists of one community phase that has deteriorated from the reference state and consists of warm season short grasses and cool season grasses. It may be invaded by introduced species such as smooth bromegrass and Kentucky bluegrass. The loss of native warm season grasses/functional groups and increased bare soil will reduce forage productivity, soil moisture retention, organic matter, and plant vigor.

Community 2.1
Grama/ Sedge Sod

This plant community occurs under heavy grazing and inadequate recovery periods. This may occur where too little time is allowed before areas are re-grazed, or in large pastures where animals graze individual plants repeatedly. It is made up of warm-season short grasses, and cool-season grasses and grass-likes. The dominant grass is blue grama. Other grasses or grass-likes include hairy grama, sedges, sand dropseed, prairie sandreed and needleandthread. The dominant forbs include Cuman ragweed and annual sunflower. The dominant shrubs include rose and cactus. Compared to the Bluestem/Prairie Sandreed Plant Community, blue grama, hairy grama, sedges, ragweed and rose have increased, while prairie sandreed, sand bluestem and switchgrass have decreased or are absent. The plant diversity has decreased from that of the Bluestem/Prairie Sandreed Plant Community. This plant community is resistant to change due to a lower percentage of bare ground. Under disturbance, this plant community is also highly resilient. The soil erosion is low. The water cycle is impaired because of the high density of short-rooted grasses which decreases infiltration.

Figure 12. Plant community growth curve (percent production by month). NE7138, Central NE Loess Hills, warm-season dominant. Warm-season grass dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	15	20	30	15	5	5	0	0

State 3
Erosion State

This state includes two community phases that have very little plant cover, few native warm or cool season grasses and few perennial forbs. The vegetation that is present consists of pioneer species. The majority of the plants are annual forbs with a lesser amount of short-lived perennial species. Erosion has occurred and may still be occurring. There is very little plant cover, little forage production and poor soil quality.

Community 3.1
Annual/ Pioneer Perennials

As succession progresses, sandhill muhly, blowout grass and sand bluestem begin to colonize. Sandbur, lemon scurfpea and annual sunflower begin to come in with prairie sandreed, hairy grama, and rose slowly becoming evident on this plant community.

Community 3.2
Active Blowout

This plant community can be reached from any other plant community with significant disturbances such as heavy grazing. Large areas of blowing sand result in movement and possible enlargement of the blowout. Evaporation and transpiration of existing plants are extremely high due to bare ground, lack of litter,and few plants. This plant community is in a low successional stage from poor soil development, fire occurrence and sporadic herbivore use. Sandhill muhly and blowout grass are present due to their drought tolerance.

Pathway 3.1A
Community 3.1 to 3.2

Heavy grazing or overgrazing will eventually shift Annual/Pioneer Perennials to the Active Blowout community phase.

Pathway 3.2A
Community 3.2 to 3.1

With prescribed grazing, this plant community may move to the Annual/Pioneer Perennial Plant Community. Establishment of vegetation may be accelerated with concentrated short-term animal impact (such as feeding hay on the blowout), followed by broadcast seeding of a temporary cover crop prior to removal of animal impact.

State 4
Invaded Woody State

This state includes one plant community that has been invaded by Eastern red cedar. The woody species are present due to lack of prescribed fire and/or brush management measures. The sites typically have a loss of native warm season grasses, reduced forage production and reduced soil quality.

Community 4.1
Eastern Redcedar

This plant community can develop whenever eastern redcedar is adjacent to the originating plant community, and encroachment occurs. This can occur in areas adjacent to a seed source, such as near windbreaks or adjacent to ponderosa pine woodlands. With prescribed burning, encroachment can be controlled. This plant community has a canopy cover of 15% or more mature trees. Total tree canopy cover can exceed 40%. The herbaceous component decreases proportionately in relation to the increase in canopy cover. This plant community is resistant to change. In higher canopy cover situations, the soil erosion will increase. The water cycle is also significantly altered under higher canopy cover. Infiltration is reduced because of interception of rainfall by the canopy. Runoff is not greatly increased, as the soil is still capable of absorbing the rainfall that reaches the soil surface.

State 5
Sod Disturbance

State influenced by some sort of sod disturbance, mainly tillage.

Community 5.1
Go Back Land

This plant community can be reached whenever severe mechanical disturbance occurs (e.g., abandoned farmland). The vegetation on this plant community varies greatly, sometimes being dominated by little bluestem, threeawn, sand dropseed, prairie sandreed, marestail, annual sunflower, green sagewort, and/or ragweed. Other plants that occur on this plant community include rose, yucca, sand bluestem, switchgrass, and needleandthread. Compared to the Bluestem/Prairie Sandreed Plant Community, warm-season natives have decreased. Annual forbs and grasses have become established in the plant community. This plant community may not return to a higher successional plant community because of the long-term effects of the soil disturbance by tillage equipment. This plant community is variable in its resistance to change depending on past management practices. Soil erosion is typically evident in low successional stages. The water cycle is not greatly affected.

Transition T1A
State 1 to 2

Heavy grazing and improper rest periods can convert this plant state to the Native/Invaded Grass State. Continuous heavy grazing tends to accelerate this movement.

Transition T1B
State 1 to 3

Heavy grazing, prolonged drought, and soil disturbance can all cause the transition from the reference state to erosion state.

Transition T1C
State 1 to 4

Encroachment from lack of chemical or mechanical removal, of Eastern redcedar, as well as abscense of prescribed burning causes a transition from the reference state to the invaded woody state.

Transition T1D
State 1 to 5

Tillage followed by abandonment of soil causes a transition from the reference state to sod disturbance state.

Restoration pathway R2A
State 2 to 1

With long-term prescribed grazing, including adequate recovery periods, this plant community will move through the successional stages leading to the Bluestem/Prairie Sandreed Plant Community. This change will require a long period of time, and may be difficult to attain if the grama sod is extensive.

Transition T2A
State 2 to 3

Heavy grazing, wildfires, and other disturbance causes transition from Native/Invaded Grass State to Erosion State.

Transition T2B
State 2 to 4

Encroachment of Eastern redcedar due to lack of chemical or mechanical removal as well as abscence of prescribed burning causes transition from Native/Invaded Grass State to Invaded Woody State.

Transition T2C
State 2 to 5

Tillage and abandonment of farmland causes transition from Native/Invaded Grass State to Sod Disturbance State

Restoration pathway R3A
State 3 to 1

Under long-term prescribed grazing (10+ years), including adequate rest periods, succession will progress leading to the Bluestem/Prairie Sandreed Plant Community. The slope, aspect, size and relative abundance of perennial plants will influence the rate that change will occur.

Transition T3A
State 3 to 4

Encroachment of Eastern redcedar due to lack of chemical or mechanical removal or the abscence of prescribed burning causes transition from Erosion State to Invaded Woody State.

Restoration pathway R4A
State 4 to 1

With brush management, or prescribed burning, followed by prescribed grazing, succession will progress leading to

the Bluestem/Prairie Sandreed/Needlegrass Plant Community.

Transition T4A
State 4 to 5

Tillage followed by abandonment of farmland causes a transition from Invaded Woody State to the Sod Disturbance State

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm Season**			1059–1513	
	sand bluestem	ANHA	*Andropogon hallii*	605–1059	20–35
	prairie sandreed	CALO	*Calamovilfa longifolia*	605–908	20–30
	switchgrass	PAVI2	*Panicum virgatum*	303–605	10–20
	Indiangrass	SONU2	*Sorghastrum nutans*	151–303	5–10
2	**Mid Warm Season**			605–908	
	little bluestem	SCSC	*Schizachyrium scoparium*	454–757	15–25
	sand lovegrass	ERTR3	*Eragrostis trichodes*	151–303	5–10
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–151	0–5
3	**Native Cool Season**			30–303	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	151–303	5–10
	porcupinegrass	HESP11	*Hesperostipa spartea*	151–303	5–10
	prairie Junegrass	KOMA	*Koeleria macrantha*	30–91	1–3
	western wheatgrass	PASM	*Pascopyrum smithii*	30–91	1–3
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	30–91	1–3
4	**Short Warm Season**			151–303	
	blue grama	BOGR2	*Bouteloua gracilis*	30–151	1–5
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–151	0–5
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–91	0–3
5	**Other native**			0–61	
	sedge	CAREX	*Carex*	30–91	1–3
	Grass, perennial	2GP	*Grass, perennial*	0–61	0–2
Forb					
6	**Forbs**			151–303	
	Forb, perennial	2FP	*Forb, perennial*	30–61	1–2
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–61	0–2
	white heath aster	SYER	*Symphyotrichum ericoides*	0–61	0–2
	spiderwort	TRADE	*Tradescantia*	0–61	0–2
	purple prairie clover	DAPUA	*Dalea purpurea var. arenicola*	0–61	0–2
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–61	0–2
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–61	0–2
	dotted blazing star	LIPU	*Liatris punctata*	0–61	0–2

	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–61	0–2
	evening primrose	OENOT	*Oenothera*	0–61	0–2
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–61	0–2
	beardtongue	PENST	*Penstemon*	0–61	0–2
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–61	0–2
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–61	0–2
	ragwort	SENEC	*Senecio*	0–30	0–1
	goldenrod	SOLID	*Solidago*	0–30	0–1
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–30	0–1
Shrub/Vine					
7	**Shrubs**			30–151	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	30–91	1–3
	leadplant	AMCA6	*Amorpha canescens*	0–91	0–3
	pricklypear	OPUNT	*Opuntia*	0–61	0–2
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–30	0–1
	rose	ROSA5	*Rosa*	0–30	0–1

Animal community

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

Hydrological functions

Water is the principal factor limiting forage production on this site. Normal rainfall is 18-25 inches per year. Valentine soils on this site are in Hydrologic Soil Group A (low runoff and high infiltration even when thoroughly wetted). Water transmission through Group A soils is normally greater than 0.30 inches per hour. Runoff is expected to occur only during the most intense storms (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).
For the Bluestem/Prairie Sandreed Plant Community, rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses such as little bluestem. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Overall this site has the appearance of being very stable and productive.

Recreational uses

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

Wood products

No appreciable wood products are present on the site.

Other products

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

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.

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Dana Larsen, State Rangeland Management Specialist, NRCS; Chuck Markley, Resource Soil Scientist, NRCS., Neil Dominy, Resource Soil Scientist, NRCS.

Other references

Other references used include: USDA NRCS Water & Climate Center, USDA NRCS National Range and Pasture Handbook, USDA NRCS Soil Surveys from various counties, Atlas of the Sandhills.

Contributors

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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 R071XY055NE - 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:**