United States Department of Agriculture
Natural Resources Conservation Service

Ecological Site Description

Site Stage: Provisional

Provisional: an ecological site description (ESD) at the provisional status represents the lowest tier of documentation that is releasable to the public. It contains a grouping of soil units that respond similarly to ecological processes. The ESD contains 1) enough information to distinguish it from similar and associated ecological sites and 2) a draft state and transition model capturing the ecological processes and vegetative states and community phases as they are currently conceptualized. The provisional ESD has undergone both quality control and quality assurance protocols. It is expected that the provisional ESD will continue refinement towards an approved status.

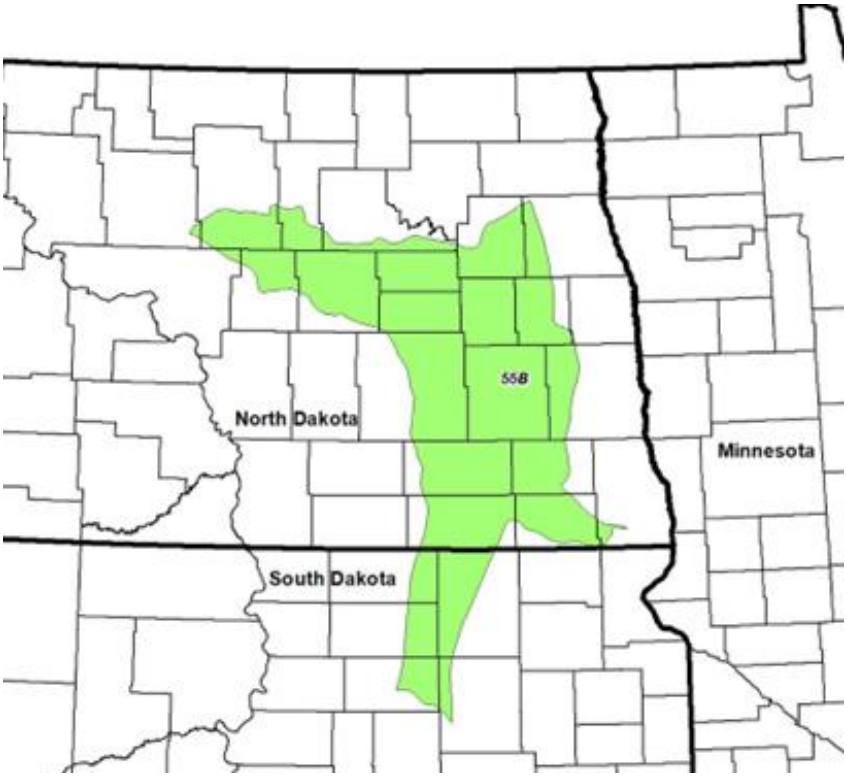
Site Name: Sands

Site Type: Rangeland

Site ID: R055BY061ND

Major Land Resource Area: 55B – Central Black Glaciated Plains

For more information on MLRAs, refer to the following web site:
https://www.nrcs.usda.gov/resources/data-and-reports/major-land-resource-area-mlra



Location of MLRA 55B - Central Black Glaciated Plains in North Dakota and South Dakota

Central Black Glaciated Plains MLRA is an expansive and agriculturally important region consisting of more than 10,000,000 acres and including all or a portion of 27 counties in east-central and southeastern North Dakota and northeastern South Dakota.

Most of MLRA 55B is covered by till: material that was moved and redeposited by the glaciers. Pre-glaciated bedrock (shale) is exposed on the breaks to some of the valleys and incised drainageways; but what covers the bedrock is glacial sediment, known as drift. These areas have the Late Wisconsin age till plain integrated drainage system in contrast to the closed drainage of much of the till plain and moraines. Some soils, particularly along the Elm, James and Sheyenne rivers, have weathered shale beds in the substratum.

The Drift Prairie Region consists of nearly level to gently rolling glacial till plains dissected by glacial outwash channels. MLRA 55B is located within the boundaries of the Prairie Pothole Region with numerous wetlands in areas without integrated drainage systems. Seven rivers flow through parts of the MLRA. The James and Sheyenne Rivers both have their headwaters in the northern part of the MLRA. A relatively narrow, low range of hills separates these rivers creating a continental watershed divide. The James River flows generally southward through the MLRA and empties into the Missouri River beyond the MLRA border. The Sheyenne River flows to the south and to the east; it empties into the Red River of the North in MLRA 56A. Major tributaries to the James River are the Pipestem and Elm Rivers. The Sheyenne River receives additional water from Devils Lake (during periods of high lake levels) via two outlet pumping stations. Other important rivers in the MLRA are the Goose, Maple, and Wild Rice rivers which are also tributaries to the Red River of the North. The Wild Rice River begins in northeastern South Dakota and flows northward and eastward. In Sargent County, North Dakota, major ditch construction has served to straighten this river and more quickly drain water off adjacent farmland.

Surface and subsurface (tile) drainage systems have been constructed/installed in many areas to manage excess water and/or salinity on cropland. Soils that were poorly drained prior to wide-spread drainage may now function as somewhat poorly drained or moderately well drained soils. Restoration of hydrology to the natural conditions of the reference state may not be possible.

This region is utilized mostly by farms and ranches; about 75 percent is non-irrigated cropland. Cash-grain, bean and oil production crops are the principal enterprise on many farms, but other feed grains and hay are also grown. The vegetation on the steeper slopes, very stony areas, and thinner (or sandy) soils is still native rangeland. About 1 percent of this area is forested. Most forested areas occur along rivers, particularly the Sheyenne River Valley.

Ecological Site Concept

The Sands ecological site is located on uplands – typically on eolian sand sheets, sandy lake plains, and outwash plains; it also occurs on eolian mantled till plains. It is on back slopes, shoulder slopes, and summits of rises and hills. The soils are very deep. Surface and subsoil textures (to depth of more than 20 inches) typically range from loamy fine sand to coarse sand; however, fine sandy loam or sandy loam surface layers are allowable if <10 inches thick. The subsoil may form a ball, but it does not ribbon. Some soils have loamy or silty material at a depth below 20 inches. Soil on this site is well drained to excessively drained. Slopes range from 0 to 25 percent. On the landscape, this site is above the Subirrigated Sands and Sandy Claypan ecological sites. The Sandy ecological site occurs on similar landscape positions; it is fine sandy loam or sandy loam to a depth >10 inches. The Choppy Sands site occurs on areas with >15% slopes. Many Choppy Sands sites (but not all) are wind-worked; in wind-worked area, the topsoil has been eroded. Where Thin Loamy ecological sites are associated, they are above the Sands site on the landscape.

Physiographic Features

This site occurs on uplands – typically on eolian sand sheets, sandy lake plains, and outwash plains. Some areas are on till plains mantled with eolian sands. Typically, it is on back slopes, shoulder slopes, and summits of rises and hills. The parent materials are coarse textured to a depth of 20 inches or more. Slopes range from 0 to 15 percent.

Landform: sand sheet, lake plain, outwash plain

	Minimum	**Maximum**
Elevation (feet):	980	2135
Slope (percent):	0	15
Water Table Depth (inches):	48	>80
Flooding:		
Frequency:	None	None
Ponding:		
Frequency:	None	None
Runoff Class:	Negligible	Low
Aspect:	No influence on this site	

Climatic Features

MLRA 55B is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are characteristic of the MLRA. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains. The air masses move unobstructed across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 18 to 23 inches per year. The normal average annual temperature is about 41.5° F. January is the coldest month with average low temperature ranging from about -4.3° F (Petersburg, ND) to about 2.5° F (Mellette, SD). July is the warmest month with temperatures averaging from about 79° F (Petersburg, ND) to about 84° F (Mellette, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 64° F. This large annual range attests to the continental nature of this MLRA's climate. Winds average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

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

Climate Station(s) 1981-2010

Station	Name	Location	Elevation	Lat	Long
USC00321225	BUTTE 5SE	Butte	1720.1	47.7947	-100.5847
USC00321360	CARRINGTON	Carrington	1586	47.4494	-99.1294
USC00323117	FORMAN 5 SSE	Forman	1250	46.0333	-97.595
USC00324013	HARVEY 4NE	Harvey	1610.9	47.8083	-99.8758
USC00324937	LA MOURE	Lamoure	1315.9	46.3547	-98.2928
USC00395456	MELLETTE 4 W	Northville	1301.8	45.155	-98.5825
USC00327027	PETERSBURG 2 N	Petersburg	1529.9	48.0356	-98.01
USC00391873	COLUMBIA 8 N	Columbia	1299.9	45.725	-98.3

Climate Normals

	Representative		Actual		
	High	Low	High	Low	Average
Mean annual precipitation (in):	22	19	23	18	21
Frost free period (days):	117	111	119	105	114
Freeze free period (days):	134	128	135	124	131

Normal Monthly Precipitation (in)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Representative high:	0.7	0.6	1.2	1.8	3.1	3.7	3.5	2.8	2.4	2.0	0.9	0.7
Representative low:	0.5	0.4	0.8	1.1	2.5	3.3	3.0	2.2	1.6	1.6	0.7	0.4
Actual high:	0.8	0.6	1.4	2.0	3.2	3.9	3.6	2.8	2.5	2.1	1.0	0.7
Actual low:	0.4	0.4	0.7	0.9	2.4	3.2	2.8	1.9	1.5	1.5	0.7	0.3

Normal monthly minimum temperature (°F)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Representative high:	0.8	5.7	18.7	31.9	44.6	54.7	59.8	56.5	45.7	32.9	19.6	6.0
Representative low:	-1.2	3.5	16.2	29.7	42.3	52.2	56.9	54.3	44.1	31.2	16.8	3.6
Actual high:	2.0	6.9	19.1	32.2	45.2	55.1	59.8	56.9	46.4	33.6	20.0	6.5
Actual low:	-3.4	1.3	14.7	29.4	41.9	52.0	56.6	54.1	43.9	30.9	16.0	2.0
Average:	-0.3	4.6	17.4	30.8	43.4	53.5	58.3	55.5	45.1	32.3	18.2	4.8

Normal monthly maximum temperature (°F)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Representative high:	21.4	27.1	39.4	57.0	69.1	77.9	83.8	82.8	72.4	58.0	39.6	25.3
Representative low:	17.5	22.5	34.6	53.1	66.2	74.7	80.4	79.5	69.1	54.1	35.0	20.7
Actual high:	22.7	28.3	40.3	57.6	69.7	78.4	84.3	83.1	73.1	58.8	40.6	26.2
Actual low:	15.5	20.7	32.6	51.9	65.5	74.1	79.5	78.8	68.3	53.2	34.1	19.3
Average:	19.5	24.8	37.0	55.2	67.8	76.3	82.3	81.3	70.9	56.2	37.4	23.1

30 Year Annual Rainfall (inches): D-Dry; N-Normal; W-Wet

1981 N	1982 N	1983 D	1984 N	1985 D	1986 W	1987 D	1988 D	1989 D	1990 D	1991 W	1992 D	1993 W	1994 N	1995 N
19.7	20.9	18.2	19.1	18.0	25.0	15.9	14.2	17.2	16.5	24.7	17.3	24.0	21.1	21.7

1996 N	1997 N	1998 W	1999 W	2000 W	2001 D	2002 D	2003 N	2004 W	2005 N	2006 D	2007 W	2008 W	2009 W	2010 W
21.2	19.1	25.8	23.4	25.2	18.6	16.7	20.9	24.4	21.2	14.8	24.7	22.8	23.3	24.8

Influencing Water Features

This site does not receive significant additional water, either as runoff from adjacent slopes or from a seasonal high water table. Depth to the water table typically exceeds 6 feet throughout the growing season; however, in the early spring of some years, the water table may be as shallow as 4 feet in some soils. Surface infiltration is moderately rapid to very rapid. Permeability through the profile is rapid in the sandy materials; where a contrasting texture is present below a depth 20 inches, it is moderately slow to moderate in that layer. Water loss is through percolation below the root zone and through evapotranspiration.

Representative Soil Features

Soils associated with Sands ES are in the Mollisol and Entisol orders. The Mollisols are classified further as Calcic Hapludolls and Entic Hapludolls. The Entisols are classified further as Typic Udipsamments. These soils were developed under prairie vegetation. They formed in glaciolacustrine deposits, glaciofluvial deposits, eolian sands, or eolian sands over till.

The common features of soils in this site are coarse, non-gravelly textures within a depth of 10 inches (soil may form a ball, but it does not form a ribbon) that extend to a depth exceeding 20 inches and limited available water capacity. The soils are very deep; some have medium or moderately fine textured soil materials below a depth of 20 inches and within a depth of 40 inches. They are well drained to excessively drained. The surface layer is most commonly loamy fine sand, fine sand, or coarse sandy loam; but loamy sand and loamy coarse sand also occur. A few soils included in this site have a fine sandy loam surface layer that is <10 inches thick.

Salinity is none or very slight (E.C. <2 dS/m) in the sandy materials; where a loamy or silty substratum occurs, it may increase to slight (E.C. <4 ds/m). Sodicity is none. Soil reaction is slightly acid to moderately alkaline (pH 6.1 to 8.4). Calcium carbonate content is none to moderately low in the sandy materials; but where contrasting materials occur deep in the profile, it can be as high as 30 percent.

The soil surface is stable and intact. These soils are susceptible to wind erosion. Loss of the soil surface layer can result in a shift in species composition and/or production.

Major soil series correlated to the Sands site are Claire, Dickey, Lohnes, Maddock, and Serden.

Access Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx) for specific local soils information.

Parent Material Kind: glaciofluvial deposits, eolian deposits, glaciolacustrine deposits
Parent Material Origin: lacustrine, outwash
Surface Texture: loamy fine sand, loamy sand, loamy coarse sand, fine sand, coarse sand, coarse sandy loam
Surface Texture Modifier: none
Subsurface Texture Group: sandy
Surface Fragments <3" (% Cover): 0-5
Surface Fragments ≥3" (%Cover): 0-1
Subsurface Fragments <3" (% Volume): 0-10
Subsurface Fragments ≥3" (% Volume): 0-2

	Minimum	Maximum
Drainage Class:	well	excessively
Permeability Class*:	rapid	rapid
Depth to first restrictive layer (inches):	80	>80
Electrical Conductivity (dS/m)*:	0	2
Sodium Absorption Ratio*:	0	0
Soil Reaction (1:1 Water)*:	6.1	8.4
Soil Reaction (0.1M CaCl2):	NA	NA
Available Water Capacity (inches):**	2	5
Calcium Carbonate Equivalent (percent)*:	0	10

*These attributes represent from 0 to >20 inches (sandy materials). Electrical Conductivity (E.C.) values are based on Saturated Paste method; the commonly used 1:1 field method will likely have E.C. values ≤1.
**This attribute represents from 0-40 inches.

Plant Communities

Ecological Dynamics of the Site:
This ecological site description is based on nonequilibrium ecology and resilience theory and utilizes a State-and-Transition Model (STM) diagram to organize and communicate information about ecosystem change as a basis for management. The ecological dynamics characterized by the STM diagram reflect how changes in ecological drivers, feedback mechanisms, and controlling variables can maintain or induce changes in plant community composition (phases and/or states). The application of various management actions, combined

with weather variables, impact the ecological processes which influence the competitive interactions, thereby maintaining or altering plant community structure.

Prior to European influence, the historical disturbance regime for MLRA 55B included frequent fires, both anthropogenic and natural in origin. Most fires, however, were anthropogenic fires set by Native Americans. Native Americans set fires in all months except perhaps January. These fires occurred in two peak periods, one from March-May with the peak in April and another from July-November with the peak occurring in October. Most of these fires were scattered and of small extent and duration. The grazing history would have involved grazing and browsing by large herbivores (such as American bison, elk, and whitetail deer). Herbivory by small mammals, insects, nematodes, and other invertebrates are also important factors influencing the production and composition of the communities. Grazing and fire interaction, particularly when coupled with drought events, influenced the dynamics discussed and displayed in the following state and transition diagram and descriptions.

Following European influence, this ecological site generally has had a history of grazing by domestic livestock, particularly cattle, which along with other related activities (e.g. fencing, water development, fire suppression) has changed the disturbance regime of the site. Changes will occur in the plant communities due to these and other factors.

Weather fluctuations coupled with managerial factors may lead to changes in the plant communities and may, under adverse impacts, result in a slow decline in vegetative vigor and composition. However, under favorable conditions the botanical composition may resemble that prior to European influence.

Four vegetative states have been identified for the site (Reference, Native/Invaded, Invaded, and Go-Back). Within each state, one or more community phases have been identified. These community phases are named based on the more dominant and visually conspicuous species; they have been determined by study of historical documents, relict areas, scientific studies, and ecological aspects of plant species and plant communities. Transitional pathways and thresholds have been determined through similar methods.

State 1: Reference State represents the natural range of variability that dominated the dynamics of this ecological site prior to European influence. Dynamics of the state were largely determined by variations in climate and weather (e.g., drought), as well as that of fire (e.g., timing, frequency) and grazing by native herbivores (e.g., frequency, intensity, selectivity). Due to those variations, the Reference State is thought to have shifted temporally and spatially between two plant community phases.

Currently the primary disturbances include widespread introduction of exotic plants, concentrated livestock grazing, lack of fire, and perhaps long-term non-use and no fire. Because of these changes, particularly the widespread occurrence of exotic plants, as well as other environmental changes, the Reference State is considered to no longer exist. Thus, the presence of exotic plants on the site precludes it from being placed in the Reference State. It must then be placed in one of the other states, commonly State 2: Native/Invaded State (T1A).

State 2: Native/Invaded State. Colonization of the site by exotic plants results in a transition from State 1: Reference State to State 2: Native/Invaded State (T1A). This transition was inevitable; it often resulted from colonization by exotic cool-season grasses (commonly Kentucky bluegrass, smooth brome, and/or crested wheatgrass) which have been particularly and consistently invasive under extended periods of non-use and no fire. Other exotic plants, such as Canada thistle and leafy spurge, are also known to invade the site.

Three community phases have been identified for this state; they are similar to the community phases in the Reference State but have now been invaded by exotic cool-season grasses. These exotic cool-season grasses can be expected to increase. As that increase occurs, plants more desirable to wildlife and livestock may decline. A decline in forb diversity can also be expected. Under non-use or minimal use management,

mulch increases and may become a physical barrier to plant growth. This also changes the micro-climate near the soil surface and may alter infiltration, nutrient cycling, and biological activity near the soil surface. As a result, these factors coupled with shading cause desirable native plants to have increasing difficulty remaining viable and recruitment declines.

To slow or limit the invasion of these exotic grasses or other exotic plants, it is imperative that managerial techniques (e.g., prescribed grazing, prescribed burning) be carefully constructed, monitored, and evaluated with respect to that objective. If management does not include measures to control or reduce these exotic plants, the transition to State 3: Invaded State should be expected (T2A).

State 3: Invaded State. The threshold for this state is reached when the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass) exceed 30% of the plant community and native grasses represent less than 40% of the community. One community phase has been identified for this state.

The exotic cool-season grasses can be quite invasive and often form monotypic stands. As they increase, both forage quantity and quality of the annual production becomes increasingly restricted to late spring and early summer, even though annual production may increase. Forb diversity often declines. Under non-use or minimal use management, mulch can increase and become a physical barrier to plant growth which alters nutrient cycling, infiltration, and soil biological activity. As such, desirable native plants become increasingly displaced.

Once the state is well established, prescribed burning and prescribed grazing techniques have been largely ineffective in suppressing or eliminating the exotic cool-season grasses, even though some short-term reductions may appear successful. However, assuming there is an adequate component of native grasses to respond to treatments, a restoration pathway to State 2: Native/Invaded State may be accomplished with the implementation of long-term prescribed grazing in conjunction with prescribed burning (R3A).

State 4: Go-Back State often results cessation of annual cropping and consists of only one community phase. This weedy assemblage may include noxious weeds that need control. Over time, the exotic cool-season grasses (Kentucky bluegrass, smooth brome, and/or crested wheatgrass) will likely predominate.

Initially, due to extensive bare ground and a preponderance of shallow rooted annual plants the potential for soil erosion is high. Plant species richness may be high, but overall diversity (i.e., equitability) is typically low, with the site dominated by a relatively small assemblage of species. Due to the lack of native perennials and other factors, restoring the site with the associated ecological processes is difficult. However, a successful range planting may result in something approaching State 2: Native/Invaded State (R4A). Following seeding, prescribed grazing, prescribed burning, haying, and the use of herbicides will generally be necessary to achieve the desired result and control weeds, some of which may be noxious weeds. A failed range planting and/or secondary succession will lead to State 3: Invaded State (R4B).

Woody Invasion. Historically, individual (or small patches of) shrubs and/or trees were scattered across the site. However, a marked increase in fire suppression, climate change, increase in non-use, and other factors enabled woody species to colonize, form patches (resistant to fire), and begin to or encroach on the site. These changes have enabled these patches to expand and become more widespread. Encroachment of both native and exotic woody species (e.g., Rocky Mountain juniper, Russian olive, Siberian elm, western snowberry, silverberry, ponderosa. pine, eastern red cedar, etc.) are examples of woody vegetation increasing in extent and impinging on the ecological integrity of the grassland biome. Windbreaks and other tree plantings can contain problematic and invasive species (such as eastern redcedar, Rocky Mountain juniper, ponderosa pine, Russian olive, etc.) which can contaminate surrounding grasslands. This results in increased long-term costs to maintain or restore this ecological site in native grasses and forbs.

Figure 1. Regardless of specific ecological site, eastern red cedar and Russian olive invasion on native rangeland in a formerly treeless grassland biome in MLRA 55B. Eastern red cedar and Russian olive seed source likely translocated by birds from planted shelterbelts.

The following state and transition model diagram illustrates the common states, community phases, community pathways, and transition and restoration pathways that can occur on the site. These are the most common plant community phases and states based on current knowledge and experience; changes may be made as more data are collected. Pathway narratives describing the site's ecological dynamics reference various management practices (e.g. prescribed grazing, prescribed fire, brush management, herbaceous weed treatment) which, if properly designed and implemented, will positively influence plant community competitive interactions. The design of these management practices will be site specific and should be developed by knowledgeable individuals; based upon management goals and a resource inventory; and supported by an ongoing monitoring protocol.

When the management goal is to maintain an existing plant community phase or restore to another phase within the same state, modification of existing management to ensure native species have the competitive advantage may be required. To restore a previous state, the application of two or more management practices in an ongoing manner will be required. Whether using prescribed grazing, prescribed burning, or a combination of both with or without additional practices (e.g., brush management), the timing and method of application needs to favor the native species over the exotic species. Adjustments to account for variations in annual growing conditions and implementing an ongoing monitoring protocol to track changes and adjust management inputs to ensure desired outcome will be necessary.

The plant community phase composition table(s) has been developed from the best available knowledge including research, historical records, clipping studies, and inventory records. As more data are collected, plant community species composition and production information may be revised.

Plant Communities and Transitional Pathways

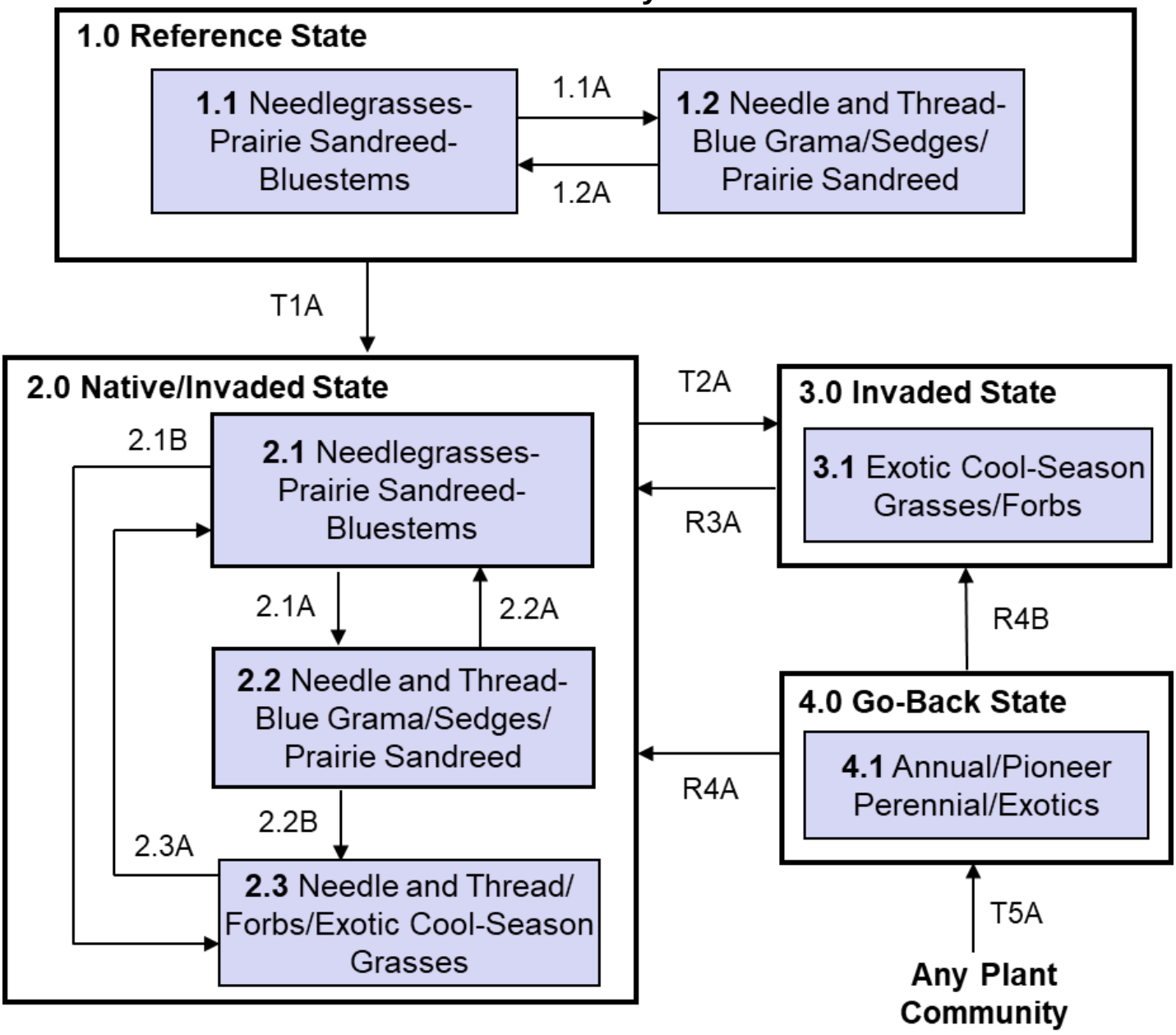


Diagram Legend MLRA 55B-Sands

T1A	Introduction of exotic cool-season grasses
T2A	Long-term non-use, or very light grazing, no fire
T5A	Cessation of annual cropping
R3A	Long-term prescribed grazing and prescribed burning
R4A	Successful range planting
R4B	Failed range planting and/or secondary succession
CP 1.1 - 1.2 (1.1A)	Multiyear drought with or without heavy grazing
CP 1.2 - 1.1 (1.2A)	Return to average precipitation with light to moderate grazing
CP 2.1 - 2.2 (2.1A)	Multiyear drought with or without heavy grazing
CP 2.1 - 2.3 (2.1B)	Long-term non-use, or very light grazing, no fire
CP 2.2 - 2.1 (2.2A)	Return to average precipitation and long-term prescribed grazing and prescribed burning
CP 2.2 - 2.3 (2.2B)	Long-term non-use, or very light grazing, no fire
CP 2.3 - 2.2 (2.3A)	Long-term prescribed grazing and prescribed burning

State 1: Reference State

This state represented the natural range of variability that dominated the dynamics of this ecological site prior to European influence. The primary disturbance mechanisms for this site in the reference condition included frequent fire and grazing by large herding ungulates. Timing of fires and grazing, coupled with weather events, dictated the dynamics that occurred within the natural range of variability. These factors likely caused the community to shift both spatially and temporally between two community phases.

Characteristics and indicators (i.e., characteristics and indicators that can be used to distinguish this state from others). Because of changes in disturbances and other environmental factors (particularly the widespread occurrence of exotic species), the Reference State is considered to no longer exist.

Resilience management (i.e., management strategies that will sustain a state and prevent a transition). If intact, the reference state should probably be managed with current disturbance regimes which has permitted the site to remain in reference condition as well as maintaining the quality and integrity of associated ecological sites. Maintenance of the reference condition is contingent upon a monitoring protocol to guide management.

Community Phase: 1.1: Needlegrasses-Prairie Sandreed-Bluestems (*Hesperostipa* spp.-*Calamovilfa longifolia-Andropogon* spp., *Schizachyrium scoparium*)

This community phase was the most dominant both temporally and spatially. Mid statured cool-season bunchgrasses, such as needle and thread and porcupinegrass, would have been co-dominants with tall warm-season grasses (such as prairie sandreed, big bluestem, sand bluestem, and little bluestem). Other grass and grass-like species included sand dropseed, sideoats grama, prairie Junegrass, western wheatgrass, Canada wildrye, blue grama, and sedges. Common leguminous and non-leguminous perennial forbs included field sagewort, white sagebrush, stiff sunflower, purple prairie clover, and goldenrod. Prairie sagewort, leadplant, prairie rose, and western snowberry are common shrubs.

Annual production would have been roughly 1800-3200 pounds per acre with the grasses and grass-likes contributing about 85%, forbs 10%, and shrubs 5%, respectively. This represents the plant community phase upon which interpretations are primarily based and is described in the “Plant Community Composition and Group Annual Production” portion of this ecological site description. Both warm-season and cool-season grasses were well represented in the community. As a result, production would have been spread across the entire growing season.

Plant Community Composition and Group Annual Production

		1.1 Needlegrasses-Prairie Sandreed-Bluestems		
COMMON/GROUP NAME	**SYMBOL**	**Group**	**lbs./acre**	**% Comp**
GRASSES & GRASS-LIKES			*1950 - 2210*	*75 - 85*
NEEDLEGRASSES		**1**	**390 - 910**	**15 - 35**
porcupinegrass	HESP11	1	390 - 650	15 - 25
needle and thread	HECOC8	1	130 - 260	5 - 10
TALL WARM-SEASON GRASSES		**2**	**390 - 780**	**15 - 30**
prairie sandreed	CALO	2	260 - 650	10 - 25
sand bluestem	ANHA	2	52 - 390	2 - 15
big bluestem	ANGE	2	52 - 390	2 - 15
SHORT WARM-SEASON GRASSES		**3**	**130 - 260**	**5 - 10**
sand dropseed	SPCR	3	52 - 208	2 - 8
blue grama	BOGR2	3	26 - 130	1 - 5
MID WARM-SEASON GRASSES		**4**	**26 - 260**	**1 - 10**
little bluestem	SCSC	4	26 - 130	1 - 5
sideoats grama	BOCU	4	0 - 78	0 - 3
plains muhly	MUCU3	4	0 - 78	0 - 3
OTHER NATIVE GRASSES		**5**	**26 - 130**	**1 - 5**
prairie Junegrass	KOMA	5	26 - 130	1 - 5
Canada wildrye	ELCA4	5	0 - 78	0 - 3
western wheatgrass	PASM	5	0 - 78	0 - 3
Scribner rosette grass	DIOLS	5	0 - 78	0 - 3
other perennial grasses	2GP	5	0 - 130	0 - 5
GRASS-LIKES		**6**	**52 - 260**	**2 - 10**
sedge	CAREX	6	52 - 208	2 - 8
other grass-likes	2GL	6	0 - 130	0 - 5
FORBS		*7*	*130 - 260*	*5 - 10*
field sagewort	ARCA12	7	26 - 78	1 - 3
white sagebrush	ARLU	7	26 - 78	1 - 3
stiff sunflower	HEPA19	7	26 - 78	1 - 3
common yarrow	ACMI2	7	26 - 52	1 - 2
Cuman ragweed	AMPS	7	26 - 52	1 - 2
wavyleaf thistle	CIUN	7	26 - 52	1 - 2
purple prairie clover	DAPU5	7	26 - 52	1 - 2
hairy false goldenaster	HEVIV	7	26 - 52	1 - 2
dotted blazing star	LIPU	7	26 - 52	1 - 2
stoneseed	LITHO3	7	26 - 52	1 - 2
scarlet beeblossom	OESU3	7	26 - 52	1 - 2
western marbleseed	ONBEO	7	26 - 52	1 - 2
scurfpea	PSORA2	7	26 - 52	1 - 2
upright prairie coneflower	RACO3	7	26 - 52	1 - 2
goldenrod	SOLID	7	26 - 52	1 - 2
white heath aster	SYER	7	26 - 52	1 - 2
longbract spiderwort	TRBR	7	26 - 52	1 - 2
American vetch	VIAM	7	26 - 52	1 - 2
smooth horsetail	EQLA	7	0 - 26	0 - 1
rush skeletonplant	LYJU	7	0 - 26	0 - 1
purple locoweed	OXLA3	7	0 - 26	0 - 1
native forbs	2FN	7	26 - 130	1 - 5
SHRUBS		*8*	*26 - 130*	*1 - 5*
leadplant	AMCA6	8	26 - 78	1 - 3
western snowberry	SYOC	8	26 - 78	1 - 3
prairie sagewort	ARFR4	8	26 - 52	1 - 2
rose	ROSA5	8	26 - 52	1 - 2
white meadowsweet	SPAL2	8	26 - 52	1 - 2
prairie willow	SAHU2	8	0 - 52	0 - 2
other shrubs	2SHRUB	8	0 - 78	0 - 3

Annual Production lbs./acre	LOW	RV	HIGH
GRASSES & GRASS-LIKES	1650 -	2327 -	2790
FORBS	125 -	195 -	275
SHRUBS	25 -	78 -	135
TOTAL	1800 -	2600 -	3200

This list of plants and their relative proportions are based on near normal years. Fluctuations in species composition and relative production may change from year to year dependent upon precipitation or other climatic factors. RV = Representative Value.

Community Phase Pathway 1.1A
Community Phase Pathway 1.1 to 1.2 occurred during multiyear drought with or without heavy grazing. This resulted in increases in blue grama and sedges with corresponding decreases in prairie sandreed and bluestems (i.e., big bluestem, little bluestem).

Community Phase 1.2: Needle and Thread-Blue Grama/Sedges/Prairie Sandreed (*Hesperostipa comata-Bouteloua gracilis*/*Carex* spp./*Calamovilfa longifolia*)
This plant community resulted from long-term drought with or without heavy grazing. Compared to Community Phase 1.1, blue grama, sand dropseed, and sedges would have increased while prairie sandreed and the bluestems would have decreased. Forb species (such as field sagewort, goldenrod, Cuman ragweed, common yarrow, and upright prairie coneflower) would have increased.

Community Phase Pathway 1.2A
Community Phase Pathway 1.2 to 1.1 occurred with return to average precipitation with light to moderate grazing. This led to increases in the bluestems and prairie sandreed with corresponding decreases in blue grama and sedges.

Transition T1A
This is the transition from the State 1: Reference State to the State 2: Native/Invaded State due to the introduction and establishment of exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass). This transition was inevitable and corresponded to a decline in native warm-season and cool-season grasses; it may have been exacerbated by chronic season-long or heavy late season grazing. Complete rest from grazing and suppression of fire could also have hastened the transition. The threshold between states was crossed when Kentucky bluegrass, smooth brome, crested wheatgrass, or other exotic species became established on the site.

Constraints to recovery (i.e., variables or processes that preclude recovery of the former state). Current knowledge and technology will not facilitate a successful restoration to Reference State.

State 2: Native/Invaded State
This State is similar to the State 1: Reference State but has now been colonized by the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass) which are now present in small amounts. Although the state is still dominated by native grasses, an increase in the exotic cool-season grasses can be expected.

These exotic cool-season grasses can be quite invasive on the site and are particularly well adapted to heavy grazing. They also often form monotypic stands. As these exotic cool-season grasses increase, both forage quantity and quality become increasingly restricted to late spring and early summer due to the monotypic nature of the stand, even though annual production may increase. Native forbs generally decrease in production, abundance, diversity, and richness compared to that of State 1: Reference State.

These exotic cool-season grasses have been particularly and consistently invasive under extended periods of non-use and no fire. To slow or limit the invasion of these exotic grasses, it is imperative that managerial techniques (e.g., prescribed grazing, prescribed burning) be carefully constructed, monitored, and evaluated with respect to that objective. If management does not include measures to control or reduce these exotic cool-season grasses, the transition to State 3: Invaded State should be expected.

Annual production of this state can be quite variable, in large part due to the amount of exotic cool-season grasses. However, as the exotic cool-season grasses increase, peak production will shift to earlier in the growing season.

Characteristics and indicators (i.e., characteristics and indicators that can be used to distinguish this state from others). The presence of trace amounts of exotic cool-season grasses indicates a transition from State 1 to State 2. The presence of exotic biennial or perennial leguminous forbs (i.e., sweet clover, black medic) may not, on their own, indicate a transition from State 1 to State 2 but may facilitate that transition.

Resilience management (i.e., management strategies that will sustain a state and prevent a transition). To slow or limit the invasion of these exotic grasses, it is imperative that managerial techniques (e.g., prescribed grazing, prescribed burning) be carefully constructed, monitored, and evaluated with respect to that objective.

Grazing management should be applied that enhances the competitive advantage of native grass and forb species. This may include: (1) grazing when exotic cool-season grasses are actively growing and native cool-season grasses are dormant; (2) applying proper deferment periods allowing native grasses to recover and maintain or improve vigor; (3) adjusting overall grazing intensity to reduce excessive plant litter (above that needed for rangeland health indicator #14 – see Rangeland Health Reference Worksheet); (4) incorporating early heavy spring utilization which focuses grazing pressure on exotic cool-season grasses and reduces plant litter, provided that livestock are moved when grazing selection shifts from exotic cool-season grasses to native grasses.

Prescribed burning should be applied in a manner that maintains or enhances the competitive advantage of native grass and forb species. Prescribed burns should be applied as needed to adequately reduce/remove excessive plant litter and maintain the competitive advantage for native species. Timing of prescribed burns (spring vs. summer vs. fall) should be adjusted to account for differences in annual growing conditions and applied during windows of opportunity to best shift the competitive advantage to the native species.

Community Phase 2.1: Needlegrasses-Prairie Sandreed-Bluestems (*Hesperostipa* spp.-*Calamovilfa longifolia-Andropogon* spp., *Schizachyrium scoparium*)

This community phase is similar to Community Phase 1.1 but has now been colonized by exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass). However, these exotics are present in smaller amounts with the community still dominated by native grasses.

Community Phase Pathway 2.1A

Community Phase Pathway 2.1 to 2.2 occurs with multiyear drought with or without heavy grazing. This results in increases in blue grama and sedges with corresponding decreases in prairie sandreed and bluestems.

Community Phase Pathway 2.1B

Community Phase Pathway 2.1 to 2.3 occurs during long-term non-use or very light grazing, and no fire. This results in the buildup of excessive mulch and a marked increase in the exotic cool-season grasses with a corresponding decline in native grasses, particularly the warm-season species. There are also noticeable increases in forbs and shrubs (such as white sagebrush, goldenrod, white heath aster, rose, and western snowberry).

Community Phase 2.2: Needle and Thread-Blue Grama/Sedges/Prairie Sandreed (*Hesperostipa comata-Bouteloua gracilis*/*Carex* spp./*Calamovilfa longifolia*)

This community phase is similar to Community Phase 1.2 but has now been colonized by exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass). However, these exotics are present in smaller amounts with the community still dominated by native grasses.

This community phase is often dispersed throughout a pasture in an overgrazed/undergrazed pattern, typically referred to as patch grazing. Some overgrazed areas will exhibit the impacts of heavy use, while the ungrazed areas will have a build-up of litter and increased plant decadence. This is a typical pattern found in properly

stocked pastures grazed season long. As a result, Kentucky bluegrass tends to increase more in the undergrazed areas while the more grazing tolerant short statured species, such as blue grama and sedges, increase in the heavily grazed areas. If present, Kentucky bluegrass may increase under heavy grazing.

Community Phase Pathway 2.2A
Community Phase Pathway 2.2 to 2.1 occurs with return to average precipitation with the implementation of long-term prescribed burning and prescribed grazing. This results in noticeable increases in prairie sandreed and the bluestems along with corresponding decreases in blue grama and sedges.

Community Phase Pathway 2.2B
Community Phase Pathway 2.2 to 2.3 occurs with long-term non-use or very light grazing, and no fire. This results in the buildup of excessive mulch along with marked increases in the exotic cool-season grasses and corresponding decreases in native grasses, particularly the warm-season species. There are also noticeable increases in forbs and shrubs (such as white sagebrush, goldenrod, white heath aster, rose, and western snowberry).

Community Phase 2.3: Needle and Thread/Forbs/Exotic Cool-Season Grasses (*Hesperostipa comata*/Forbs/Exotic Cool-Season Grasses)
This community phase occurs with extended periods of non-use or very light grazing, and no fire. As a result, there is a buildup of excessive mulch along with marked increases in the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass) and corresponding decreases in native grasses, particularly the warm-season species. White heath aster, goldenrod, and white sagebrush are among the common forbs in this community. Western snowberry and rose are often the more common shrubs.

This community phase is approaching the threshold leading to a transition to State 3: Invaded State. As a result, it is an “at risk” community. If management does not include measures to control or reduce these exotic cool-season grasses, the transition to State 3: Invaded State should be expected.

Community Phase Pathway 2.3A
Community Phase Pathway 2.3 to 2.1 occurs with the implementation of long-term prescribed grazing and prescribed burning which results in marked decreases in the exotic cool-season grasses along with corresponding increases in the warm-season grasses (particularly prairie sandreed, big bluestem, and little bluestem).

Transition T2A
This transition from the State 2: Native/Invaded State to State 3: Invaded State generally occurs with long-term non-use or very light grazing, and no fire. Exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass) become the dominant graminoids.

Studies indicate that a threshold may exist in this transition when the exotic cool-season grasses exceed 30% of the plant community and native grasses represent less than 40% of the plant community composition. This transition may occur under other managerial conditions, for example heavy season-long grazing (primarily Kentucky bluegrass).

Constraints to recovery (i.e., variables or processes that preclude recovery of the former state). Variations in growing conditions (e.g., cool, wet spring) will influence effects of various management activities on exotic cool-season grass populations.

State 3: Invaded State
This state is the result of invasion and dominance by the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass). Other exotic plants (e.g., leafy spurge) may also invade the site. These

exotic cool-season grasses can be quite invasive on the site and are particularly well adapted to heavy grazing. They also often form monotypic stands. As these exotic cool-season grasses increase, both forage quantity and quality become increasingly restricted to late spring and early summer due to the monotypic nature of the stand, even though annual production may increase. Native forbs generally decrease in production, abundance, diversity, and richness compared to that of State 1: Reference State. Common forbs often include white heath aster, goldenrod, common yarrow, and white sagebrush. Shrubs, such as western snowberry and rose, may show marked increases. Once the state is well established, prescribed burning and grazing techniques have been largely ineffective in suppressing or eliminating these species, even though some short-term reductions may appear successful.

Annual production of this state may vary widely, in part due to variations in the extent of invasion by exotic cool-season grasses. However, as the exotic cool-season grasses increase, peak production will shift to earlier in the growing season.

Characteristics and indicators (i.e., characteristics that can be used to distinguish this state from others). This site is characterized by exotic cool-season grasses constituting greater than 30 percent of the annual production and native grasses constituting less than 40 percent of the annual production.

Resilience management (i.e., management strategies that will sustain a state and prevent a transition). Light or moderately stocked continuous, season-long grazing or a prescribed grazing system which incorporates adequate deferment periods between grazing events and proper stocking rate levels will maintain this State. Application of herbaceous weed treatment, occasional prescribed burning and/or brush management may be needed to manage noxious weeds and increasing shrub (e.g., western snowberry) populations.

Community Phase 3.1: Exotic Cool-Season Grasses/Forbs

This community phase is dominated by exotic cool-season grasses (such as Kentucky bluegrass, smooth brome, and/or crested wheatgrass) often with a much-reduced forb and shrub component. Other exotic plants (e.g., leafy spurge) may also invade the site. Excessive accumulation of mulch may also be present, particularly when dominated by Kentucky bluegrass. Common forbs and shrubs often include blue lettuce, wavyleaf thistle, and western snowberry. The longer this community phase exists, the more resilient it becomes. Once the state is well established, prescribed burning and grazing techniques have been largely ineffective in suppressing or eliminating exotic species, even though some short-term reductions may appear successful.

Restoration R3A

This restoration pathway from State 3: Invaded State to State 2: Native/Invaded State may be accomplished with the implementation of long-term prescribed grazing and prescribed burning, assuming there is an adequate component of native grasses to respond to the treatments.

Both prescribed grazing and prescribed burning are likely necessary to successfully initiate this restoration pathway, the success of which depends upon the presence of a remnant population of native grasses in Community Phase 3.1. That remnant population, however, may not be readily apparent without close inspection. The application of several prescribed burns may be needed at relatively short intervals in the early phases of this restoration process, in part because many of the shrubs (e.g. western snowberry) sprout profusely following one burn. Early season prescribed burns have been successful; however, fall burning may also be an effective technique.

The prescribed grazing should include adequate recovery periods following each grazing event and stocking levels which match the available resources. If properly implemented, this will shift the competitive advantage from the exotic cool-season grasses to the native cool-season grasses.

Context dependence (i.e., factors that cause variations in plant community shifts, restoration likelihood, and contribute to uncertainty). Grazing management should be applied in a manner that enhances/maximizes the competitive advantage of native grass and forb species over the exotic species. This may include the use of prescribed grazing to reduce excessive plant litter accumulations above that needed for rangeland health indicator #14 (see Rangeland Health Reference Worksheet). Increasing livestock densities may facilitate the reduction in plant litter provided length and timing of grazing periods are adjusted to favor native species.

Grazing prescriptions designed to address exotic grass invasion and favor native species may involve earlier, short, intense grazing periods with proper deferment to improve native species health and vigor. Fall (e.g., September, October) prescribed burning followed by an intensive, early spring graze period with adequate deferment for native grass recovery may shift the competitive advantage to the native species, facilitating the restoration to State 2: Native/Invaded.

Prescribed burning should be applied in a manner that enhances the competitive advantage of native grass and forb species over the exotic species. Prescribed burns should be applied at a frequency which mimics the natural disturbance regime, or more frequently as is ecologically (e.g., available fuel load) and economically feasible. Burn prescriptions may need adjustment to: (1) account for change in fine fuel orientation (e.g., “flopped” Kentucky bluegrass); (2) fire intensity and duration by adjusting ignition pattern (e.g., backing fires vs head fires); (3) account for plant phenological stages to maximize stress on exotic species while favoring native species (both cool- and warm-season grasses).

State 4: Go-Back State

This state is highly variable depending on the level and duration of disturbance related to the T5A transitional pathway. In this MLRA, it often results from cessation of annual cropping or perhaps other uses, such as over-use with extended drought or human disturbance (e.g., off-road vehicle use). This plant community will initially include a variety of annual forbs and grasses, some of which may be noxious weeds and need control. Over time, the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass) will likely predominate.

Characteristics and indicators (i.e., characteristics and indicators that can be used to distinguish this state from others). Tillage has destroyed the native plant community, altered soil structure and biology, reduced soil organic matter, and resulted in the formation of a tillage induced compacted layer which is restrictive to root growth. Removal of perennial grasses and forbs results in decreased infiltration and increased runoff.

Resilience management (i.e., management strategies that will sustain a state and prevent a transition). Continued tillage will maintain the state. Control of noxious weeds will be required.

Community Phase 4.1: Annual/Pioneer Perennial /Exotics

This community phase is highly variable depending on the level and duration of disturbance related to the T5A transitional pathway. This plant community will initially include a variety of annual forbs and grasses, including noxious weeds (e.g., Canada thistle) which may need control. Over time, the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass) will likely predominate.

Restoration R4A

This Restoration Pathway from State 4: Go-Back State to the State 2: Native/Invaded State can be accomplished with a successful range planting. Following seeding, prescribed grazing, prescribed burning, haying, or use of herbicides will generally be necessary to achieve the desired result and control any noxious weeds.

It may be possible using selected plant materials and agronomic practices to approach something very near the functioning of State 2: Native/Invaded State. Application of chemical herbicides and the use of mechanical

planting methods using adapted varieties of the dominant native grasses are possible and can be successful. After establishment of the native plant species, prescribed grazing should include adequate recovery periods following each grazing event and stocking levels which match the available resources; management objectives must include the maintenance of those species, the associated reference state functions, and continued treatment of exotic grasses.

Context dependence (i.e., factors that cause variations in plant community shifts, restoration likelihood, and contribute to uncertainty). A successful range planting will include proper seedbed preparation, weed control (both prior to and after the planting), selection of adapted native species representing functional/structural groups inherent to the State 1, and proper planting technique. Management (e.g., prescribed grazing, prescribed burning) during and after establishment must be applied in a manner that maintains the competitive advantage for the seeded native species. Adding non-native species can impact the above and below ground biota. Elevated soil nitrogen levels have been shown to benefit smooth brome and Kentucky bluegrass more than some native grasses. As a result, fertilization, exotic legumes in the seeding mix, and other techniques that increase soil nitrogen may promote smooth brome and Kentucky bluegrass invasion.

The method or methods of herbaceous weed treatment will be site specific to each situation; but generally, the goal would be to apply the pesticide, mechanical control, or biological control (either singularly or in combination) in a manner that shifts the competitive advantage from the targeted species to the native grasses and forbs. The control method(s) should be as specific to the targeted species as possible to minimize impacts to non-target species.

Restoration R4B

A failed range planting and/or secondary succession will lead to State 3: Invaded State.

Context dependence (i.e., factors that cause variations in plant community shifts, restoration likelihood, and contribute to uncertainty). Failed range plantings can result from many causes (both singularly and in combination) including drought, poor seedbed preparation, improper planting methods, seeded species not adapted to the site, insufficient weed control, herbicide carryover, poor seed quality (purity & germination), and/or improper management.

Transition T5A

This transition from any plant community to State 4: Go-Back State. It is commonly associated cessation of annual cropping or perhaps over-use with extended drought or human disturbance (e.g., off-road vehicle use) without the benefit of range planting, resulting in a “go-back” situation. Soil conditions can be quite variable on the site, in part due to variations in the management/cropping history (e.g., development of a tillage induced compacted layer (plow pan), erosion, fertility, and/or herbicide/pesticide carryover). Thus, soil conditions should be assessed when considering restoration techniques.

Ecological Site Interpretations

Animal Community – Wildlife Interpretations

Landscape

The MLRA 55B landscape is characterized by mostly nearly level to gently rolling till plains with some steep slopes adjacent to streams and many poorly defined drainage channels. The continental drainage divide occurs in the east central part of the MLRA. The MLRA is located within the Prairie Pothole Region with temporary, seasonal, and semi-permanent wetlands throughout the MLRA. The MLRA includes areas of eskers, kames, and ground moraines. MLRA 55B is considered to have a continental climate with cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are common and characteristic of the MLRA.

This area supports mid- to tall-grass prairie vegetation with American elm, bur oak, green ash, and willow species growing along the riparian zones of river systems found throughout the MLRA. Complex intermingled ecological sites create diverse grass/shrub land habitats interspersed with varying densities of linear, slope, depressional, and in-stream wetlands associated with headwater streams and tributaries of the James, Pipestem, Maple, Goose, Sheyenne, Wild Rice, and Elm Rivers. MLRA 55B is located within North and South Dakota and within the boundaries of the Prairie Pothole Region.

Three Hydrologic Unit Areas make up this MLRA. Approximately 6% drains into the Mouse River into MLRA 55A, with the balance split between the James and Sheyenne Rivers.

By the mid-19th century, over 76% of the MLRA had been converted from mid- to tall-grass prairie to annual crop production. To alleviate crop production loss from wetlands and overland flow, a system of shallow surface ditches, judicial ditches, and road ditches removes surface water in spring and during high rainfall events. Tile drainage systems have been or are being installed extensively throughout MLRA 55B for sub-surface field drainage to enhance annual crop production.

Historic Communities/Conditions within MLRA 55B:

The northern tall- and mixed-grass prairie were disturbance-driven ecosystems with fire, herbivory, and climate functions as the primary ecological drivers (either singly or often in combination). American bison roamed MLRA 55B, wintering along the Mouse River in MLRA 55A and migrating through MLRA 55B and into MLRA 56A. Many species of grassland birds, small mammals, insects, reptiles, amphibians, elk, moose, pronghorn, white-tailed deer, and large herds of American bison were historically among the inhabitants adapted to this region. Roaming herbivores, as well as several small mammals and insect species, were the primary consumers linking the grassland resources to large predators (such as the wolf, American black bear, grizzly bear) and smaller carnivores (such as the coyote, bobcat, red fox, and raptors). Extirpated species include free-ranging American bison and gray wolf (breeding). Extinct is the Rocky Mountain locust.

Present Communities/Conditions within MLRA 55B:

This area supports natural prairie vegetation characterized by western wheatgrass, green needlegrass, needle and thread, and blue grama. Little bluestem is an important species on the more sloping and shallower soils. Prairie cordgrass, northern reedgrass, big bluestem, and wheat sedge (aka slough sedge) are important species on wet soils. Western snowberry, leadplant, and prairie rose are commonly interspersed throughout the area.

Over 80% of MLRA 55B has been converted to annual crop production. These influences fragmented the landscape, reduced, or eliminated ecological drivers (fire), and introduced exotic plant species including smooth brome, crested wheatgrass, Kentucky bluegrass, and leafy spurge; this further impacted plant and animal communities. The loss of the bison and fire as primary ecological drivers greatly influenced the character of the remaining native plant communities and the associated wildlife, moving towards a less diverse and more homogeneous landscape. Annual cropping is the main factor contributing to habitat fragmentation, reducing habitat quality for area-sensitive species.

Hydrological manipulation is extensive throughout the MLRA. Extensive wetland and subsurface tile drainage have taken place. Straightened segments of ephemeral and intermittent tributary streams of the James, Wild Rice, and Sheyenne River have reduced sinuosity, created oxbows, and enabled the conversion of riparian ecological sites to annual crop production. These anthropogenic impacts

have reduced flood water detention and retention on the landscape. The results have been increasing storm water runoff sediment and nutrient loading to the James and Sheyenne Rivers and their tributaries (along with lakes and reservoirs within the MLRA). Large dams on the James, Pipestem and Sheyenne rivers, along with installation of instream structures have reduced aquatic species movement within the MLRA.

National wildlife refuges, waterfowl production areas, state wildlife management areas, and North and South Dakota Department of Trust Lands provide herbaceous and woody cover for wildlife. In addition, the United States Army Corps of Engineers and the United States Bureau of Reclamation manage three man-made reservoirs - Jamestown Reservoir, Pipestem Reservoir, and Lake Ashtabula for flood control, also providing fish habitat and adjacent uplands for wildlife cover. Lonetree Wildlife Management Area (WMA) is the largest state managed wildlife area covering 32,800 acres. Arrowwood National Wildlife Refuge is the largest refuge consisting of 16,000 acres.

Characteristic wildlife species in this area are:

Birds: Common goldeye, bufflehead, broad-winged hawk, alder flycatcher, mourning warbler, mallard, blue-winged teal, red-tailed hawk, American kestrel, killdeer, eastern and western kingbird, western meadowlark, American crow, common yellowthroat, clay-colored sparrow, vesper sparrow, red-necked grebe, Savannah sparrow, downy and hairy woodpeckers, black-capped chickadee, white-breasted nuthatch, and brown-headed cowbird.

Mammals: Northern short-tailed shrew, white-tailed jackrabbit, Franklin's ground squirrel, thirteen-lined ground squirrel, northern pocket gopher, plains pocket gopher, western harvest mouse, deer mouse, meadow vole, meadow jumping mouse, western jumping mouse, coyote, red fox, racoon, American badger, striped skunk, white-tailed deer, elk, moose, beaver, muskrat, mink, weasel, woodchuck, and red, eastern gray and fox squirrels.

Reptiles/Amphibians: American toad, Great Plains toad, northern leopard frog, chorus frog, tiger salamander, plains garter snake, smooth green snake, wood frog, and common garter snake.

Presence of wildlife species is often determined by ecological site characteristics including grass and forb species, tree and shrub species, hydrology, aspect, and other associated ecological sites. The home ranges of a majority of species are usually larger than one ecological site or are dependent upon more than one ecological site for annual life requisites. Ecological sites offer different habitat elements as the annual life requisites change. Habitat improvement and creation must be conducted within the mobility limits of a known population for the species.

Insects play an important role in providing ecological services for plant community development. Insects that are scavengers or aid in decomposition provide the food chain baseline sustaining the carnivorous insects feeding upon them. Many insects provide the ecological services necessary for pollination, keeping plant communities healthy and productive. Insects provide a protein food source for numerous species including grassland-nesting birds, woodpeckers, woodland edge and interior species, and their young. Extensive use of insecticides for specialty crops such as soybeans, corn, and other crops has greatly reduced insects within this MLRA.

Species of Concern within MLRA 55B:

The following is a list of species considered "species of conservation priority" in the North Dakota State Wildlife Action Plan (2015) and South Dakota State Wildlife Action Plan (2014); and species listed as "threatened, endangered, or petitioned" under the Endangered Species Act within MLRA 55B at the time this section was developed:

Invertebrates: Dakota skipper, Iowa skipper, monarch butterfly, northern sandy tiger beetle, Ottoe skipper, Poweshiek skipperling, regal fritillary, yellow-banded bumble bee, and western bumble bee.

Birds: America avocet, American bittern, American kestrel, American white pelican, Baird's sparrow, bald eagle, black-billed cuckoo, black tern, bobolink, burrowing owl, canvasback, chestnut-collared longspur, Dickcissel, ferruginous hawk, Franklin's gull, grasshopper sparrow, horned grebe, lark bunting, LeConte's sparrow, lesser scaup, marbled godwit, Nelson's sparrow, northern goshawk, northern harrier, northern pintail, osprey (migration), peregrine falcon (migration), piping plover (migration), red knot (migration), sharp-tailed grouse, short-eared owl, Swainson's hawk, upland sandpiper, western meadowlark, willet, Wilson's phalarope, whooping crane (migration), and yellow rail.

Mammals: Arctic shrew, big and little brown bats, Franklin's ground squirrel, northern river otter, plains pocket mouse, pygmy shrew, Richardson's ground squirrel, and silver-haired bat.

Amphibians and Reptiles: Canadian toad, plains hognose snake, smooth green snake, and snapping turtle.

Fish and Mussels: Black sandshell, blacknose shiner, Carmine shiner, creek heelsplitter, creeper, deertoe, fragile papershell, mapleleaf, northern pearl dace, northern redbelly dace, pink heelsplitter, threeridge, trout-perch, yellow sandshell, and Wabash pigtoe.

Grassland Management for Wildlife in MLRA 55B

Management activities within the community phase pathways impact wildlife but are essential for maintenance of healthy grassland ecosystems. Community phase, transitional, and restoration pathways are keys to long-term management within each State and between States. Timing, intensity, and frequency of these inputs can have dramatic positive or negative effects on local wildlife species. Ranchers and other land managers must always consider the long-term beneficial management effects of grassland and woodland resources in comparison to typically short-term negative effects to the habitats of individual species.

Ecological sites occur as intermingled complexes on the landscape with gradual or sometimes abrupt transitions. Rarely do ecological sites exist in large enough acreage to manage independently. Ecological sites supporting a dominance of herbaceous vegetation (Loamy/Sandy) can be located adjacent to ecological sites that support medium to tall shrubs (Loamy Overflow or Loamy- Invaded Wooded State). Conversely, ecological sites that are dominated by short- to mid-statured grasses (Claypan) can be adjacent to sites with bare soil only supporting a minor amount of short grasses and forbs (Thin Claypan).

Management of these complex ecological sites can provide a heterogeneous or a homogenous landscape. Grassland bird use reduces as the plant community transitions to a homogenous state. Managers must recognize ecological sites and the complexes in which they occur to properly manage the landscape. A management regime for one ecological site may negatively impact an adjacent site; for example, alteration of a grazing regime within the Invaded Wooded State of a Loamy ecological site to encourage understory growth may encourage exotic, cool-season grasses to increase or dominate an adjacent ecological site.

Life requisites and habitat deficiencies are determined for targeted species. Deficiencies need to be addressed along community phase, transitional, and restoration pathways as presented in specific state-and-transition models. Ecological sites should be managed and restored within the site's capabilities to provide sustainable habitat for targeted species or species guilds. Managers also need to consider vegetative associations provided by adjacent/intermingled ecological sites for species with home ranges or life requisites that may not be provided by one ecological site.

Grassland-nesting birds use various grass heights for breeding, nesting, foraging, or winter habitat. While most species use varying heights, many have a preferred vegetative stature height or sensitivity to woody vegetation. Understanding the sensitivity of grassland species to woody vegetation and preferred vegetative structure enables managers to determine which grassland-nesting bird species avoid grassland habitats adjacent to woody dominated plant community. The following chart provides sensitivity to woody vegetation and preferred vegetative stature heights.

Grassland-nesting Bird Species	Preferred Vegetative Stature			Avoids woody vegetation*
	Short < 6 inches	Medium 6 - 12 inches	Tall >12 inches	
Baird's sparrow	x	x		x
Bobolink		x	x	x
Brewer's sparrow	x	x		
Burrowing owl	x			x
Chestnut-collared longspur	x	x		x
Common yellowthroat			x	
Dickcissel		x	x	
Ferruginous hawk	x	x		
Grasshopper sparrow	x	x		x
Horned lark	x			x
Killdeer	x			x
Lark bunting	x	x		
Lark sparrow	x			
Le Conte's sparrow			x	x
Long-bill curlew	x			x
Marbled godwit	x	x		x
McCown's longspur	x	x		x
Mountain plover	x			x
Nelson's sparrow			x	x
Nesting waterfowl		x	x	
Northern harrier		x	x	x
Savannah sparrow		x	x	x
Short-eared owl		x	x	x
Sprague's pipit	x	x		x
Upland sandpiper	x	x		x
Western meadowlark	x	x		
Willet	x	x		x

*Many of the listed species avoid nesting in grassland areas with large amounts of woody vegetation within a grassland or avoid nesting near woody vegetation in adjacent habitats. Although these species avoid areas with woody vegetation, most can tolerate a small amount of woody vegetation within areas dominated by grassland habitat, including short-statured shrubs (e.g., wild rose, western snowberry) in this MLRA.

Sands Wildlife Habitat Interpretation:

Sands ecological sites are very deep, coarse textured (non-gravelly), well to excessively drained soils. They are usually found on eolian sand sheets, sandy lake plains, and outwash plains but can also occur on till plains mantled with eolian sands. No significant water table or surface run-on influences vegetation production on this site. These soils are susceptible to wind erosion. Associated ecological sites include Sandy, Choppy Sands, Sandy Claypan, Subirrigated Sands, and Thin Loamy. This complex of ecological sites provides habitat for many edge-sensitive, grassland bird species preferring medium- to tall-statured vegetation.

This site is very similar to the Sandy ecological site in plant community structure and wildlife interpretations. Sands ecological sites may be found in three plant community states (1.0 Reference State, 2.0 Native/Invaded State, 3.0 Invaded State) within a local landscape. Multiple plant community phases exist within all States. Today, these states occur primarily in response to drought, fire, grazing, non-use, and other anthropogenic disturbances.

Because there is no known restoration pathway from State 2.0 to State 1.0, it is important to intensively manage using tools in State 1.0 and State 2.0 Community Phase Pathways to prevent further plant community degradation along the Transitional Pathway T2A to Community Phase 3.1. Native wildlife generally benefits from the heterogeneous grasslands found in Community Phases found in States 1.0 and 2.0 that include diverse grass and forb species of varying stature and density. As plant communities degrade within State 2.0, Kentucky bluegrass increases while native forbs are reduced. When Kentucky bluegrass exceeds 30%, the site transitions to 3.0 Invaded State. This transition results in reduced stature and increased plant community homogeneity. When adjacent and/or intermingled ecological sites undergo the same transition, the result can be an expansive, homogenous landscape.

Success along Restoration Pathways R3A from State 3.0 to State 2.0 is very difficult and is dependent upon presence of a remnant native grass population. This concept also applies to wildlife as the target species must either be present on adjacent State 1.0 or State 2.0 plant communities or on other ecological sites within the mobility limits of the species. Species with limited mobility, such as Dakota skippers, must exist near the plant community to utilize restored sites. Mobile species (such as grassland-nesting birds) can easily locate isolated, restored plant communities.

Plant Community Phases 3.1 shows dramatic increased homogeneity of exotic cool-season grasses and further reduction in native forbs. Reduced forb diversity limits insect populations, negatively affecting foraging opportunities for grassland-nesting birds. Increased exotic grass litter can limit access to bare ground by nesting insects and can limit mobility by small chicks. A homogenous grassland landscape does not provide quality escape or winter cover. As a result, many species are not able to meet life requisites, especially non-migrating bird species.

Management along community phase, transition, or restoration pathways should focus upon attainable changes. Short- and long-term monetary costs must be evaluated against short- and long-term ecological services in creating and maintaining habitat of sufficient quality to support a sustainable population density.

1.0 Reference State

Community Phase 1.1 Needlegrasses-Prairie Sandreed-Bluestems: This plant community offers quality vegetative cover for wildlife; every effort should be made to maintain this ecological site within this community phase. This phase retains high functionality through continued grassland management including prescribed grazing with adequate recovery period as well as prescribed fire. Predominance of grass species in this community favors grazers and mixed-feeders (animals selecting grasses as well as forbs and shrubs). The structural diversity provides habitat for a wide array of migratory and resident birds.

Invertebrates: Insects play a role in maintaining the forb community and provide a forage base for grassland birds, reptiles, and rodents. Ecological services, historically provided by bison, are simulated by domestic livestock. These services include putting plant material and dung in contact with mineral soil to be used by lower trophic level consumers (such as invertebrate decomposers, scavengers, shredders, predators, herbivores, dung beetles, and fungal-feeders).

Dakota skippers do not prefer this site due to unavailability of host plants (such as blacksamson echinacea, wood lily, harebell, and mountain deathcamas). Similarly, host plants for the Ottoe skipper (such as blacksamson echinacea) are absent on this ecological site. Violet species are not common on this site, not supporting the needed habitat for the regal fritillary. Monarch butterfly may use flowering forbs. The ecological site may provide habitat for the northern sandy tiger beetle which prefers dry, sandy dunes and sandy areas away from water. Bumblebees and other native bees utilize forbs as a nectar source; bare ground and nesting sites are available due to the co-dominance of bunch grasses.

Birds: This plant community provides quality nesting, foraging, and escape habitats favored by mid- to tall-grass nesting birds. Prescribed fire maintains a grass-dominated plant community providing habitat for bird species sensitive to woody vegetation. In years with reduced precipitation or drought, nesting recruitment may be compromised. This plant community is too tall and dense to provide suitable lek sites for sharp-tailed grouse but does provide nesting, brood-rearing, and escape habitat. This site provides good hunting opportunities for grassland raptors.

Mammals: The diversity of grasses and forbs provide high nutrition levels for small and large herbivores. Tall- to mid-statured vegetation provides suitable food and thermal, protective, and escape cover for small and large mammals.

Amphibians and Reptiles: This ecological site is not typically found adjacent to Wet Meadow or Shallow Marsh ecological sites. Habitat for the northern leopard frog and Canadian toad is dependent upon distance to water features such as wetlands, lakes, or streams. This site provides habitat for the northern prairie skink (secondary range in MLRA 55B) and plains hog-nosed snake.

Fish and Mussels: This ecological site is not typically adjacent to streams, rivers, or water bodies. This site receives limited run-on hydrology from adjacent ecological sites; it provides hydrology to Subirrigated Sands ecological sites. Management on Sands sites, in conjunction with neighboring run-on sites, will have an indirect effect on aquatic species in streams and/or tributaries receiving water from Sands and adjacent sites. Optimum hydrological function and nutrient cycling limit potential for sediment yield and nutrient loading to the nearby aquatic ecosystems from Community Phase 1.1.

Community Phase 1.2 Needle and Thread-Blue Grama/Sedges/Prairie Sandreed: Short- to mid-statured grasses dominate this plant community phase due to multiyear drought with or without heavy

grazing (via Community Phase Pathway 1.1A). Facilitated by periods of below normal precipitation the tall, warm-season grass component has decreased with increases in shorter statured blue grama and sedges along with field sagewort, goldenrod, Cuman ragweed, common yarrow, and upright prairie coneflower.

Invertebrates: An increase in wind-pollinated field sagewort and Cuman ragweed reduces season-long pollen production. Goldenrod provide last-season pollen, while common yarrow is favored by flies and small bees. Increases in sedges and blue grama also increase bare ground availability for ground nesting bee species.

Birds: An increase in short- to mid-grass species favors grassland-nesting birds that prefer short- to mid-statured vegetation. The forb component provides pollinator habitat and a food source for grassland-nesting birds.

Mammals: Overall plant stature is reduced in this phase, reducing cover for large ungulates. This plant community phase continues to provide life requisites for small mammals.

Amphibians and Reptiles: Provides similar life requisites as Community Phase 1.1.

Fish and Mussels: Provides similar life requisites as Community Phase 1.1.

2.0 Native/Invaded State

Community Phase 2.1 Needlegrasses-Prairie Sandreed-Bluestems: This plant community develops through Transition Pathway T1A due to changes in management (reduction in fire frequency) and the presence of exotic, cool-season grasses. This historic grazing/fire sequence has largely been replaced by chronic season-long or heavy late-season grazing. Complete rest from grazing and suppression of fire can also lead to this transition. The threshold between States 1.0 and 2.0 is crossed when Kentucky bluegrass or smooth brome become established. This plant community phase has a very similar appearance and function to the Plant Community 1.1, except that it has a minor amount of cool-season exotic grasses and forbs. This phase functions at a high level for native wildlife; therefore, managers can maintain this community phase with grazing systems that allow for adequate recovery periods following grazing events and, potentially, the combination of grazing and prescribed burning which closely mimics the natural disturbance regime. Managers need to consider management within the State 2.0 Community Phase Pathways to avoid transitioning to State 3.0.

Invertebrates: Provides similar life requisites as Community Phase 1.1.

Birds: Provides similar life requisites as Community Phase 1.1.

Mammals: Provides similar life requisites as Community Phase 1.1.

Amphibians and Reptiles: Provides similar life requisites as Community Phase 1.1.

Fish and Mussels: Provides similar life requisites as Community Phase 1.1.

Community Phase 2.2 Needle and Thread-Blue Grama/Sedges/Prairie Sandreed: Multiyear drought with or without heavy continuous grazing increases grazing tolerant needle and thread while decreasing porcupine grass. Shorter, sod-forming grasses increase while bunch grasses decrease. The forb component is still diverse; however, leguminous native forbs are decreasing and less desirable, native pollinator forb species (such as common yarrow, field sagewort, and white sagebrush) and shrubs (such as prairie sagewort) are increasing. Every effort should be made by

managers to avoid implementing a grazing system that may favor Kentucky bluegrass (via Community Phase Pathway 2.2B or Transitional Pathway T2A). Continuous, heavy season-long grazing or complete rest could cause this plant community to reach the 30 percent threshold of Kentucky bluegrass, crossing over to State 3.0 with little chance of restoration back to State 2.0.

Invertebrates: Provides similar life requisites as Community Phase 1.2. However, the forb community is shifting toward less desirable forb species (such as wind-pollinated field sagewort and white sagebrush) and wind-pollinated shrubs, such as prairie sagewort.

Birds: Provides similar life requisites as Community Phase 1.2.

Mammals: Provides similar life requisites as Community Phase 1.2.

Amphibians and Reptiles: Provides similar life requisites as Community Phase 1.1.

Fish and Mussels: Provides similar life requisites as Community Phase 1.1.

Community Phase 2.3 Needle and Thread/Forbs/Exotic Cool-Season Grasses: Extended periods of non-use or very light grazing, and no fire (along Community Pathway 2.1B or 2.2B) leads to community phase characterized by shorter-statured grasses, including the increase of cool-season exotic grass and the reduction of prairie sandreed. This is an “at risk” plant community with high amounts of Kentucky bluegrass out-completing native grasses. Every effort should be made by managers to avoid implementing a grazing system that may favor reaching the 30 percent threshold for Kentucky bluegrass via Transitional Pathways T2A and T2B. When this plant community transitions over to State 3.0, it has little chance of restoration back to State 2.0 by implementing a prescribed grazing system and introducing prescribed fire.

Invertebrates: An increase in exotic cool-season grasses and a reduction in forbs reduces pollen and nectar sources, limiting use by pollination insect species. White heath aster, goldenrod, and white sagebrush are the main pollinator species. Increased litter may begin to limit ground nesting insect opportunities.

Birds: Grassland-nesting birds that favor short-statured vegetative cover will use this site. However, continuous non-use and no fire increases exotic cool-season exotic grasses, reducing use by grassland nesting birds.

Mammals: As exotic cool-season grasses increase, thermal, protective or escape cover becomes limited.

Amphibians and Reptiles: Provides similar life requisites as Community Phase 1.1.

Fish and Mussels: Although, this ecological site is not typically adjacent to streams, rivers, or water bodies, runoff from Community Phase 2.3 increases due to management that increases short-statured grass and reduces bunch grasses. Management of this community phase, in conjunction with neighboring run-on sites, will have an indirect negative effect on aquatic species in streams and/or tributaries receiving water from Sands and adjacent sites.

3.0 Invaded State

Community Phase 3.1 Exotic Cool-Season Grasses/Forbs: Community Phase Pathway T2A is characterized by non-use and elimination of fire when exotic cool-season grasses are present (as in Community Phase 2.0). This plant community phase is characterized by a dominance (>30%) of

exotic cool-season grasses, such as smooth brome; native grasses represent less than 40% of the plant community. Restoration Pathway R3A, through prescribed burning and high levels of grazing management, requires remnant amounts of native warm- and cool-season and forbs to be successful. The remnant native community needs frequent prescribed burns and high levels of grazing management targeting the exotic, cool-season grasses to improve competitiveness and increase vigor and density. Without intensive management, the remnant native plants will not increase adequately to transition back to State 2.0. Intensified management along the R3A Pathway will have significant short-term negative impacts on wildlife habitat; however, this is necessary to restore long-term native habitat functions.

Restoration Pathway R3A, through prescribed burning and high levels of grazing management, requires remnant amounts of native warm- and cool-season and forbs to be successful. The remnant native community needs frequent prescribed burns and high levels of grazing management targeting the exotic cool-season grasses to improve competitiveness and increase vigor and density. Without intensive management, the remnant native plants will not increase adequately to transition back to State 2.0. Intensified management along the R3A Pathway will have significant short-term negative impacts on wildlife habitat; however, this is necessary to restore long-term native habitat functions.

Invertebrates: Exotic grasses limit use by beneficial insects provided in States 1.0 and 2.0. Increased litter and lack of grazing leads to limited contact between plant material and mineral soil resulting in a cooler micro-climate, which is unfavorable to most insects. Lack of bare soil limits ground-nesting sites for native bees and other ground-nesting insects. The lack of nectar-producing plants limits forage opportunities for bumblebees, regal fritillary, monarch butterfly, and other pollinating species. This Community Phase does not provide life requisites for any species of concern within MLRA 55B.

Birds: The homogeneous community phase, dominated by exotic plant species, provides limited habitat and life requisites for most obligate grassland-nesting birds. Lack of plant diversity and stature, along with increased litter and the tendency of Kentucky bluegrass and smooth brome to lay down, limits use by many grassland-nesting birds. Sharp-tailed grouse may use this plant community for lek sites and nesting cover; however, winter cover must be provided by adjacent ecological sites or plant communities.

Mammals: Litter accumulation and exotic grass cover favors thermal, protective, and escape cover for small rodents.

Amphibians and Reptiles: Provides similar life requisites as Community Phase 1.1.

Fish and Mussels: Provides similar life requisites as Community Phase 1.1.

4.0 Go-Back State

Community Phase 4.1 Annual/Pioneer Perennial/Exotics: These plant communities are the result of severe soil disturbance (such as cropping, recreational activity, or concentrated livestock activity for a prolonged period). Following cessation of disturbances, the resulting plant community is dominated by early pioneer annual and perennial plant species. Plant species composition and production are highly variable. Weedy plants can provide pollinator habitat along with spring and summer cover for many mammals and birds and their young. Dense weed cover can keep soils moist, increasing insect presence. Tall stature provided by some weeds such as marsh elder and ragweed offer thermal cover and seeds throughout winter. The response by wildlife species will be dependent upon plant community composition, vegetative stature, patch size, and management activities (such as prescribed grazing, burning, inter-seeding, haying, or noxious weed control). Successful restoration of native species along Transition Pathway R4A can result in a native grass and forb community in

State 2.0. Hydrological and nutrient cycling can be greatly reduced depending upon vegetation composition. Sites with poor species diversity and density have high potential for erosion and low nutrient cycling

Animal Community – Grazing Interpretations

This site is well adapted to managed grazing by domestic livestock. The predominance of herbaceous plants across all plant community phases best lends these sites to grazing by cattle, but other domestic grazers with differing diet preferences may also be a consideration depending upon management objectives. Often, the current plant community does not match any particular plant community (as described in the ecological site description). Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of this inventory data will permit the establishment of a safe, initial stocking rate for the type and class of animals and level of grazing management. More accurate stocking rate estimates should eventually be calculated using actual stocking rate information and monitoring data.

NRCS defines prescribed grazing as “managing the harvest of vegetation with grazing and/or browsing animals with the intent to achieve specific ecological, economic, and management objectives”. As used in this site description, the term ‘prescribed grazing’ is intended to include multiple grazing management systems (e.g., rotational grazing, twice-over grazing, conservation grazing, targeted grazing, etc.) provided that, whatever management system is implemented, it meets the intent of prescribed grazing definition.

The basic grazing prescription addresses balancing forage demand (quality and quantity) with available forage, varying grazing and deferment periods from year-to-year, matching recovery/deferment periods to growing conditions when pastures are grazed more than once in a growing season, implementation of a contingency (e.g., drought) plan, and a monitoring plan. When the management goal is to facilitate change from one plant community phase or state to another, then the prescription needs to be designed to shift the competitive advantage to favor the native grass and forb species.

Grazing levels are noted within the plant community narratives and pathways in reference to grazing/prescribed grazing management. “Degree of utilization” is defined as the proportion of the current years forage production that is consumed and/or destroyed by grazing animals (may refer to a single plant species or a portion or all the vegetation). “Grazing utilization” is classified as slight, moderate, full, close, and severe (see the following table for description of each grazing use category). The following utilization levels are also described in the Ranchers Guide to Grassland Management IV. Utilization levels are determined by using the landscape appearance method as outlined in the Interagency Technical Reference “Utilization Studies and Residual Measurements” 1734-3.

Utilization Level	%	Use Description
Slight (Light)	0-20	Appears practically undisturbed when viewed obliquely. Only choice areas and forage utilized.
Moderate	20-40	Almost all of accessable range shows grazing. Little or no use of poor forage. Little evidence of trailing to grazing.
Full	40-60	All fully accessable areas are grazed. The major sites have key forage species properly utilized (about half taken, half left). Points of concentration with overuse limited to 5 to 10 percent of accessible area.
Close (Heavy)	60-80	All accessible range plainly shows use and major sections closely cropped. Livestock forced to use less desirable forage, considering seasonal preference.
Severe	> 80	Key forage species completely used. Low-value forages are dominant.

Hydrology Functions

Available water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic group A, but some soils in group B are included. Infiltration varies from moderately rapid to rapid; runoff potential varies from negligible to low for this site depending on soil hydrologic group, surface texture, slope percent, and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where short-grasses form a dense sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational Uses

Hunting and Bird Watching: National wildlife refuges, waterfowl production areas, state wildlife management areas (WMA), and North Dakota and South Dakota Department of Trust Lands provide herbaceous and woody cover for wildlife. National Wildlife Refuges and waterfowl production areas are owned and managed by the United States Fish and Wildlife Service and are available for public hunting, hiking, and bird watching. In addition, the United States Army Corps of Engineers and the United States Bureau of Reclamation manage three man-made reservoirs - Jamestown Reservoir (2,036 acres), Pipestem Reservoir (1,027 acres), and Lake Ashtabula (5,174 acres) for flood control, also providing fish habitat and adjacent uplands for wildlife cover. Lonetree WMA is the largest state managed wildlife area covering 32,800 acres. Numerous WMAs in North Dakota and Game Production Areas in South Dakota are found within this MLRA. The largest refuges

managed by the United States Fish and Wildlife service are Arrowwood National Wildlife Refuge (NWR) Complex consists of 75,000 acres and Tewaukon National NWR covers 8,363 acres.

Fishing: Approximately 100 lakes are managed for public fishing within MLRA 55B. Most of these lakes offer boat docks and ramps. These lakes contain various sport fish including walleye, northern pike, yellow perch, catfish, trout, crappie, and bluegill. Many of these lakes are known for excellent round-around walleye and yellow perch fishery.

Camping: Fort Ramson State Park, Pipestem Reservoir, Jamestown Reservoir, Spiritwood Lake, Clausen Springs, Little Yellowstone, Richmond Lake State Recreation Area, Mina Lake State Recreation Area, and other public and private campgrounds are found within the MLRA. Limited, primitive camping is available on wildlife management areas. Ft. Ransom State Park (North Dakota), located along the Sheyenne River has a designated horse park with 15 miles of trails.

Hiking/Biking/Horseback Riding: Horseback riders, hikers, and biker can enjoy over 15 miles of multi-use trails at Fort Ransom State Park. The Jamestown Reservoir (5 miles), Pipestem Reservoir (8 miles) and Arrowwood National Wildlife Refuge (9.4 miles) maintain hiking trails. The Lonetree Wildlife Management Area has a 32-mile segment of the North Country Trail. It is designed for hiking and non-motorized travel including mountain bikes or horseback riding.

Canoeing/Kayaking: The Sheyenne River offers 278 miles of canoeing/kayaking from May-July. A kayak kiosk is located at Valley City and canoe/kayak rentals are available at Fort Ransom State Park. The James River has a canoe trail starting in Grand Rapids and canoeing down to the James River Dam site in LaMoure; no rentals are available.

Auto Tour: A 63-mile scenic drive starts north of Valley City and heading south through Sheyenne River Valley. Audubon National Wildlife Refuge offers a 5.5-mile auto-tour route winding through both prairie grassland and wetland habitats of the lower portion of the James River Valley.

Wood Products

There are no applicable wood products found on this site.

Other Products

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

Site Development and Testing Plan

- Investigation is needed on the slope break of 15% between Sands and Choppy Sands. It is currently thought that the plant community and production on stable landscapes (not dunes) with slopes >15% is similar to that of dune areas. There is also uncertainty about the plant community and productivity of Serden soils (dunes) with slope <15% as compared to other soils in the Sands ecological site. The plant communities and production levels need more documentation to verify the current slope break.
- Further evaluation and refinement of the State-and-Transition model is needed to identify disturbance driven dynamics. Additional states and/or phases may be required to address grazing response.
- Further documentation may be needed for plant communities in all states. Plant data has been collected in previous range-site investigations, including clipping data; however, this data needs review.

If geo-referenced sites meeting Tier 3 standards for either vegetative or soil data are not available, representative sites will be selected for further investigation.

- Site concepts will be refined as the above noted investigations are completed.
- The long-term goal is to complete an approved, correlated Ecological Site Description as defined by the National Ecological Site Handbook.

This ESD is the best available knowledge. The site concept and species composition table have been used in the field and tested for more than five years. It is expected that as additional information becomes available revisions may be required.

Supporting Information

Associated Sites

Ecological Site Name	Site ID	Narrative
Sandy	R055BY062ND	This site occurs on similar landscape positions. It has fine sandy loam or sandy loam textures (forms a ribbon <1 inch long) to a depth >10 inches.
Choppy Sands	R055BY067ND	This site occurs on dunes with slopes >15 percent. The surface and subsoil layers do not form a ribbon.
Sandy Claypan	R055BY072ND	This site occurs lower on the landscape. It has a root-restrictive claypan (forms a ribbon <1 inch long) starting at a depth between 6 to 20 inches.
Subirrigated Sands	R055BY074ND	This site occurs lower on the landscape. It has redoximorphic features at a depth of 30 to 40 inches. The subsoil does not form a ribbon.
Thin Loamy	R055BY068ND	This site occurs on higher, convex slopes on till plains and lake plains – a run-off landscape position. The surface and subsoil layers form a ribbon 1 to 2 inches long. It is highly calcareous (strong or violent effervescence) within a depth of 8 inches.

Similar Sites

Ecological Site Name	Site ID	Narrative
Sandy	R055BY062ND	This site occurs on similar landscape positions. It has fine sandy loam or sandy loam textures (forms a ribbon <1 inch long) to a depth >10 inches.
Subirrigated Sands	R055BY074ND	This site occurs lower on the landscape. It has redoximorphic features within a depth of 40 inches. The subsoil does not form a ribbon.
Choppy Sands	R055BY067ND	This site occurs on dunes with slopes >15 percent. The surface and subsoil layers do not form a ribbon.

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Inventory Data References

Information presented here has been derived from NRCS and other federal/state agency clipping and inventory data. Also, field knowledge of range-trained personnel was used. All descriptions were peer reviewed and/or field-tested by various private, state and federal agency specialists.

State Correlation

This site has been correlated with North Dakota and South Dakota.

Relationship to Other Established Classifications

Level IV Ecoregions of the Conterminous United States: 46c - Glacial Lake Basins; 46d - Glacial Lake Deltas; 46e - Tewaukon Dead ice Moraine; 46f - End Moraine Complex; 46i - Drift Plains; and 46j - Glacial Outwash.

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Site Description Approval

ND, State Rangeland Management Specialist	Date	SD, State Rangeland Management Specialist	Date

INTERPRETING INDICATORS OF RANGELAND HEALTH, Version 5, REFERENCE SHEET

Ecological site name: _Sands_____ Ecological site code: _RO55BY061ND_____
Author(s)/participant(s): __USDA-NRCS North Dakota_____
Contact for lead author: __NRCS State Rangeland Management Specialist_____
Date: _Dec. 2021_____ **MLRA:** _55B_____ **LRU:** _____
Composition based on (check one): ☐ Cover ☒ Annual Production

Indicators. For each indicator, describe the potential for the site using the reference sheet checklist. Where possible, (1) use quantitative measurements; (2) include expected range of values for above- and below-average years and natural disturbance regimes for each community phase within the reference state, when appropriate; and (3) cite data sources used. Continue descriptions on separate sheet.
1. Rills: Rills are not expected on this site.
2. Water flow patterns: Water flow patterns are not visible.
3. Pedestals and/or terracettes: Neither pedestals nor terracettes are expected.
4. Bare ground: Bare ground ranges from 10 to 15%. Bare ground patches should be small (less than 4 inches in diameter) and not connected. Animal activity (burrows and ant mounds) may occasionally result in isolated bare patches of up to 24 inches in diameter.
5. Gullies: Active gullies are not expected on this site.
6. Wind-scoured and/or depositional areas: Active blowouts are not expected. If present, previously active blowouts and depositional areas should be well vegetated with no active erosion/deposition visible.
7. Litter movement: Plant litter movement not expected on this site.
8. Soil surface resistance to erosion: Stability class anticipated to average 5 or greater.
9. Soil surface loss and degradation: Use soil series description for depth, color, and structure of A-horizon.
10. Effects of plant community composition and distribution on infiltration: Tall-statured rhizomatous grasses and mid- and short-statured bunchgrasses are dominant and well distributed across the site. A diverse forb component is subdominant.
11. Compaction layer: No compaction layers occur naturally on this site.
12. Functional/structural groups: Due to differences in phenology, root morphology, soil biology relationships, and nutrient cycling Kentucky bluegrass, smooth brome, and crested wheatgrass are included in a new Functional/structural group, mid- and short-statured early cool-season grasses (MSeC3), **not expected for this site**.

Dominance Category[1]	**Relative dominance of F/S groups for community phases in the *Reference State*** *Minimum expected number of species for dominant and subdominant groups is included in parentheses.*

	Dominance based on[1]: Annual Production _X_ or Foliar Cover __		
	Phase 1.1_	**Phase 1. __**	**Phase 1. __**
Dominant	**Tall C4 rhizomatous grasses (3); Mid & short C3 bunch grasses (4)**		
Subdominant	**Mid & short C4 bunch grasses (4); Forbs (18)**		
Minor	**Grass-likes; Shrub; Mid & short C3 rhizomatous grasses; Mid & short C4 rhizomatous grasses**		
Trace			

[1]Biological soil crust dominance is determined based on cover, rather than production. If biological soil crusts are an expected dominant or subdominant group, the number of expected life forms (e.g., lichen, moss) is listed, rather than number of individual species.

13. Dead or dying plants or plant parts: Rare or not occurring on this site.

14. Litter cover and depth: Plant litter cover is 50 to 70% with a depth of 0.25 to 0.50 inches. Litter is in contact with the soil surface.

15. Annual production: Annual air-dry production is 2600 lbs./ac (reference value) with normal precipitation and temperatures. Low and high production years should yield 1800 lbs./ac to 3200 lbs./ac, respectively.

16. Invasive plants: State and local noxious species, Kentucky bluegrass, smooth bromegrass, crested wheatgrass, quackgrass, Eastern red cedar/juniper and Siberian elm.

17. Vigor with an emphasis on reproductive capability of perennial plants: Noninvasive species in all functional/structural groups are vigorous and capable of reproducing annually under normal weather conditions.

Functional/Structural Groups Sheet

State ND **Office** _____ **Ecological site** Sands **Ecol. site code** RO55BY061ND

Observers _____ **Date** _____

Evaluation site ID and/or name: _____
Dominance in ESD based on: Foliar Cover Annual Production Biomass

Species list of functional/structural groups in the **Reference State**	
Functional/Structural Group	Species List
Tall C4 rhizomatous grasses	prairie sandreed, sand bluestem, big bluestem
Mid & short C3 bunch grasses	porcupinegrass, needle and thread, prairie Junegrass, Canada wildrye
Mid & short C4 bunch grasses	sand dropseed, blue grama, little bluestem, plains muhly*, Scribner panicum
Forbs	please see plant community table 1.1
Grass-likes	sedge
Shrub	fringed sagewort, leadplant, prairie willow*, rose, spirea, western snowberry
Mid & short C3 rhizomatous grasses	western wheatgrass
Mid & short C4 rhizomatous grasses	sideoats grama*
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.	
Biological soil crust[1]	

Reference State - Relative dominance of functional/structural groups for each community phase

Relative dominance annotations: *Use the following annotations in the narrow columns to describe the relative dominance of the listed functional/structural groups: = "equal"; > "greater than"; >> "much greater than"*

Phase	Dominant **	>> > =	Subdominant **	>> > =	Minor **	>> > =	Trace **
1.1	Tall C4 rhizomatous grasses > Mid & short C3 bunch grasses	>>	Mid & short C4 bunch grasses > Forbs	>	Grass-likes > Shrub > Mid & short C3 rhizomatous grasses = Mid & short C4 rhizomatous grasses	.	
		.		.		.	
		.		.		.	

* Indicates species that may or may not be present on the site. Absence of these species may not constitute a departure.
** See IIRH Version 5 page 70.

Circle the community phase that most closely matches the evaluation area. *Revise functional/structural groups relative dominance for the community phase circled to represent changes in dominance given the time since disturbance(s) (see page 1 of site evaluation sheet).

Species list of functional/structural groups in the **Evaluation Area**	
Functional/Structural Group	Species List
Tall C4 rhizomatous grasses	
Mid & short C3 bunch grasses	
Mid & short C4 bunch grasses	
Forbs	
Grass-likes	
Shrub	
Mid & short C3 rhizomatous grasses	
Mid & short C4 rhizomatous grasses	
Groups not expected:	
Mid & short early C3 grasses	
Biological soil crust[1]	

Evaluation Area - Relative dominance of functional/structural groups

Dominant **	>> > =	Subdominant **	>> > =	Minor **	>> > =	Trace **

Biological soil crust [1] - dominance is evaluated solely on cover, not composition by weight

** See IIRH Version 5 page 70.

Notes: