USDA Natural Resources
Conservation Service

Ecological site R055BY066ND
Thin Claypan

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General information

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

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 055B–Central Black Glaciated Plains

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.

Classification relationships

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

Ecological site concept

The Thin Claypan ecological site typically is located on glaciated uplands – till plains, lake plains, and outwash plains; but it also occurs on side slopes of escarpments. Although these soils are moderately deep (over soft sedimentary shale bedrock) to very deep, a dense claypan layer severely limits the rooting depth of plants. The thickness of the surface layer is 6 inches or less. The texture of the claypan layer typically is clay, silty clay, or clay loam (forms a ribbon >1.5 inches long); but it is sandy loam or loam in a few soils (forms a ribbon <1.5 inches long). The texture of the surface layer is typically loam or silt loam, but silty clay loam and sandy loam also occur. Soil on this site is typically moderately well drained, but somewhat poorly drained is allowed. Salt accumulations occur within a depth of 16 inches. Slopes range from 0 to 15 percent. On the landscape, this site is below the Clayey, Loamy, and Loamy Overflow ecological sites; these sites do not have root- restrictive claypan layers. The Saline Lowland site is in shallow depressions. The Claypan ecological site occurs in a mosaic across the landscape on micro-highs associated with the Thin Claypan site. The depth to the claypan in Claypan site is 6 to 20 inches and the depth to salts is >16 inches.

To see a full copy of the ecological site description with all tables and the full version 5 rangeland health worksheet, please use the following hyperlink:
https://efotg.sc.egov.usda.gov/references/public/ND/55B_Thin_Claypan_Narrative_FINAL_Ref_FSG.pdf

Associated sites

R055BY059ND	**Loamy Overflow** This site occurs in upland swales; it does not have a root-restrictive claypan layer. The surface and subsoil layers form a ribbon 1 to 2 inches long.
R055BY060ND	**Saline Lowland** This site occurs in shallow depressions. It is poorly drained and has an accumulation of salts in the surface and subsoil layer (E.C. >8 dS/m).
R055BY056ND	**Clayey** This site occurs somewhat higher on the landscape. The subsoil forms a ribbon >2 inches long; but it is not root-restrictive. Soil salinity is none to very slight (E.C. <4 dS/m) to a depth >20 inches.
R055BY057ND	**Claypan** This site typically occurs on micro-highs. It is 6 to 20 inches to the dense, root-restrictive claypan layer. The claypan forms a ribbon >1 inch long. It is >16 inches to accumulated salts.
R055BY064ND	**Loamy** This site occurs higher on the landscape. The subsoil forms a ribbon 1-2 inches long; it is not root-restrictive. Soil salinity is none to very slight (E.C. <4 dS/m) to a depth >20 inches.

Similar sites

R055BY060ND	**Saline Lowland** This site occurs in shallow depressions. It is poorly drained and has an accumulation of salts in the surface and subsoil layer (E.C. >8 dS/m).
R055BY057ND	**Claypan** This site typically occurs on micro-highs. It is 6 to 20 inches to the dense, root-restrictive claypan layer. The claypan forms a ribbon >1 inch long. It is >16 inches to accumulated salts.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Bouteloua gracilis*

Physiographic features

This site typically occurs on glaciated uplands – till plains, lake plains, and outwash plains. It most commonly occurs in micro-lows in swales and on foot slopes; but also occurs on side slopes of escarpments. Parent materials are till, glaciolacustrine sediments, glaciofluvial deposits, or colluvium from weathered shale residuum. Slopes range from 0 to 15 percent.

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) Escarpment (3) Lake plain (4) Outwash plain
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	299–651 m
Slope	0–15%
Water table depth	91–203 cm
Aspect	Aspect is not a significant factor

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.

Table 3. Representative climatic features

Frost-free period (characteristic range)	111-117 days
Freeze-free period (characteristic range)	128-134 days
Precipitation total (characteristic range)	483-559 mm
Frost-free period (actual range)	105-119 days
Freeze-free period (actual range)	124-135 days
Precipitation total (actual range)	457-584 mm
Frost-free period (average)	114 days
Freeze-free period (average)	131 days
Precipitation total (average)	533 mm

Climate stations used

- (1) BUTTE 5SE [USC00321225], Butte, ND
- (2) CARRINGTON [USC00321360], Carrington, ND
- (3) FORMAN 5 SSE [USC00323117], Forman, ND
- (4) HARVEY 4NE [USC00324013], Harvey, ND
- (5) LA MOURE [USC00324937], Lamoure, ND
- (6) MELLETTE 4 W [USC00395456], Northville, SD
- (7) PETERSBURG 2 N [USC00327027], Petersburg, ND
- (8) COLUMBIA 8 N [USC00391873], Columbia, SD

Influencing water features

This site does not receive significant additional water, either as runoff from adjacent slopes or from a seasonal high-water table. Although the seasonal water table can be as shallow as 1.5 feet early in the growing season on some low-relief areas, the root-restrictive claypan layer and soil salinity prohibit the plants from benefiting from subirrigation. Depth to the water table typically exceeds 3 feet in during April through June and is more than 4 feet during the remainder of the year. Surface infiltration and the permeability in the claypan layer are slow to very slow. Water loss is primarily through evapotranspiration.

Soil features

Soils associated with Thin Claypan ecological site are in the Mollisol order; they are classified further as Leptic Natrudolls. These soils were developed under prairie vegetation. They formed in till, glaciolacustrine sediments, glaciofluvial deposits, or colluvium over soft sedimentary shale bedrock. Typically, the soils are moderately well drained, but somewhat poorly drained soils are included in the site.

The common features of soils in this site are the shallow depth (typically less than 6 inches) to a dense, root-restrictive, claypan layer and salt accumulations within a depth of 16 inches (typically near the surface). Although these soils are very deep to moderately deep, the dense claypan severely limits the rooting depth of plants and the salts limit plant-available water. The texture of the surface is typically loam or silt loam, but silty clay loam and sandy loam also occur. The dense claypan typically is clay, silty clay, or clay loam (forms a ribbon >1.5 inches long); but it is sandy loam or loam in a few soils (forms a ribbon <1.5 inches long).

Soil salinity may be slight or less (E.C. <8 dS/m) at the surface, but it is moderate or stronger (E.C. >8 dS/m) within a depth of 16 inches. Sodicity is low to moderate (SAR <10) in the surface layer but moderately high or high (SAR 10 to 25) in the claypan layer. Soil reaction is slightly acid to moderately alkaline (pH 5.6 to 8.4) above the claypan and slightly alkaline to strongly alkaline (pH 7.4 to 9.0) in the claypan. Calcium carbonate content is none to low in the surface layer and typically low to moderate in the upper part of the claypan; in the lower part of the claypan

there is commonly an accumulation of calcium carbonate (as much as 25 percent).

Wet surface compaction can occur with heavy traffic. These soils are mainly susceptible to water erosion. Loss of the soil surface layer can result in a shift in species composition and/or production.

Major soil series correlated to the Thin Claypan site are Exline, Ferney, Lemert, Mekinock, and Uranda.

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

Table 4. Representative soil features

Parent material	(1) Till (2) Glaciolacustrine deposits (3) Colluvium–shale (4) Glaciofluvial deposits
Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam (4) Sandy loam
Family particle size	(1) Clayey (2) Loamy (3) Coarse-loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Very slow to slow
Depth to restrictive layer	0–15 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–1%
Available water capacity (Depth not specified)	3.81–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
Electrical conductivity (0-40.6cm)	4–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	10–25
Soil reaction (1:1 water) (0-101.6cm)	5.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

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 three 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 (e.g., Kentucky bluegrass, smooth brome, quackgrass, crested wheatgrass) which have been particularly and consistently invasive under extended periods of non-use or very light grazing, and no fire. Other exotics plants (e.g., Canada thistle, leafy spurge) are also known to invade the site.

Four 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 both the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, quackgrass, 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 following cropland abandonment and consists of only one plant community phase. This weedy assemblage may include noxious weeds that need control. Over time, the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, quackgrass, 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 planting, 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.

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.

State and transition model

Figure 8. 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.

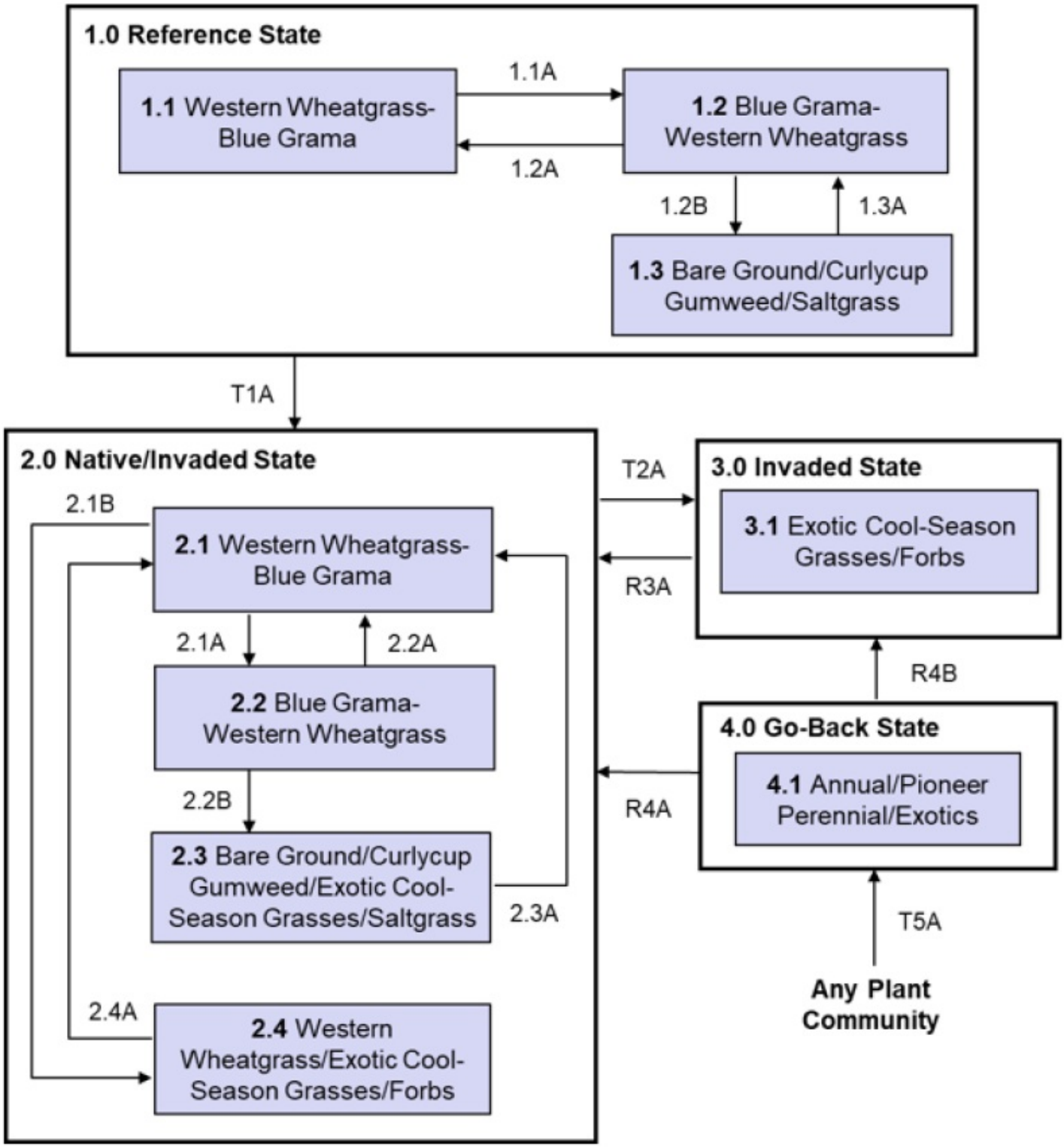
1.0 Reference State
1.1 Western Wheatgrass-Blue Grama
1.1A
1.2A
1.2 Blue Grama-Western Wheatgrass
1.2B
1.3A
1.3 Bare Ground/Curlycup Gumweed/Saltgrass
T1A
2.0 Native/Invaded State
2.1B
2.1 Western Wheatgrass-Blue Grama
2.1A
2.2A
2.2 Blue Grama-Western Wheatgrass
2.2B
2.3 Bare Ground/Curlycup Gumweed/Exotic Cool-Season Grasses/Saltgrass
2.3A
2.4A
2.4 Western Wheatgrass/Exotic Cool-Season Grasses/Forbs
T2A
R3A
3.0 Invaded State
3.1 Exotic Cool-Season Grasses/Forbs
R4B
R4A
4.0 Go-Back State
4.1 Annual/Pioneer Perennial/Exotics
T5A
Any Plant Community

Diagram Legend - MLRA 55B Thin Claypan	
T1A	Invasion by exotic cool-season grasses
T2A	Heavy season-long grazing or long-term non-use or 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)	Heavy grazing with or without drought
CP 1.2 - 1.1 (1.2A)	Reduced grazing, return to average precipitation
CP 1.2 - 1.3 (1.2B)	Heavy grazing with or without drought
CP 1.3 - 1.2 (1.3A)	Reduced grazing, return to average precipitation
CP 2.1 - 2.2 (2.1A)	Long-term heavy season-long grazing with or without drought
CP 2.1 - 2.4 (2.1B)	Long-term non-use or light grazing, no fire
CP 2.2 - 2.1 (2.2A)	Long-term prescribed grazing and prescribed burning, return to average precipitation
CP 2.2 - 2.3 (2.2B)	Long-term heavy season-long grazing with or without drought
CP 2.3 - 2.1 (2.3A)	Long-term prescribed grazing and prescribed burning
CP 2.4 - 2.1 (2.4A)	Long-term prescribed grazing and prescribed burning

State 1
Reference

This state represents 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 three community phases.

Characteristics and indicators. 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. 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 1.1
Western Wheatgrass-Blue Grama (Pascopyrum smithii-Bouteloua gracilis)

This community phase was historically the most dominant both temporally and spatially. Cool-season grasses dominated the community, but warm-season short grasses are also prevalent. The co-dominant grasses were western wheatgrass and blue grama. Other grasses included buffalograss, saltgrass, Nuttall’s alkaligrass, and prairie Junegrass. Common forb and shrub species included common yarrow, textile onion, white sagebrush, curlycup gumweed, white heath aster, scarlet globemallow, prairie sagewort, broom snakeweed, and prairie rose. Annual production likely varied from about 800-1800 pounds per acre with grasses and grass-likes, forbs, and shrubs contributing about 85%, 10% and 5%, respectively. This community 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.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	818	1305	1777
Forb	67	110	163
Shrub/Vine	11	44	78
Total	**896**	**1459**	**2018**

Figure 10. Plant community growth curve (percent production by month). ND5502, Central Black Glaciated Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	23	42	15	5	4	1	0	0

Community 1.2
Blue Grama-Western Wheatgrass (Bouteloua gracilis-Pascopyrum smithii)

This community phase formed with heavy grazing with or without drought. Compared to Community Phase 1.1, western wheatgrass decreased due to grazing pressure and/or drought with corresponding increases in blue grama, buffalograss, and saltgrass. Grasses and grass-likes still dominated the production, but forbs (such as common yarrow, curlycup gumweed, and rose pussytoes) and shrubs (such as prairie sagewort) increased. Annual production would have decreased slightly.

Community 1.3
Bare Ground/Curlycup Gumweed/Saltgrass (Bare Ground/Grindelia squarrosa/Distichlis spicata)

This community phase formed during periods of heavy grazing with or without drought. This resulted in marked increases in bare ground, curlycup gumweed, and saltgrass with corresponding decreases in western wheatgrass, blue grama. Annual production would have decreased further in comparison to community Phase 1.1 and 1.2.

Pathway 1.1a
Community 1.1 to 1.2

Community Phase Pathway 1.1 to 1.2 occurred with heavy grazing with or without drought. This led to an increase in blue grama and a corresponding decrease in western wheatgrass.

Pathway 1.2a
Community 1.2 to 1.1

Community Phase Pathway 1.2 to 1.1 occurred with reduced grazing and return to average precipitation resulting in an increase in western wheatgrass relative to blue grama.

Pathway 1.2b
Community 1.2 to 1.3

Community Phase Pathway 1.2 to 1.3 occurred with heavy grazing with or without drought. This resulted in marked increases in bare ground, curlycup gumweed, and saltgrass with corresponding decreases in western wheatgrass and blue grama.

Pathway 1.3a
Community 1.3 to 1.2

Community Phase Pathway 1.3 to 1.2 occurred with reduced grazing and return to average precipitation. This resulted in marked decreases in bare ground, curlycup gumweed, and saltgrass with corresponding increases in western wheatgrass and blue grama. Annual production would have increased.

State 2
Native/Invaded

This state is similar to State 1: Reference State but has now been colonized by the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, quackgrass, crested wheatgrass) which are now present in small amounts. Although the state is still dominated by native grasses, an increase in these exotic cool-season grasses can be expected. These exotic cool-season grasses can be quite invasive 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 no 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. 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. 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 2.1
Western Wheatgrass-Blue Grama (Pascopyrum smithii-Bouteloua gracilis)

This community phase is similar to Community Phase 1.1 but has been colonized by exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, crested wheatgrass, quackgrass). However, these exotics are present in smaller amounts with the community still dominated by native grasses. Annual production may be comparable to that of Community Phase 1.1 (800-1800 pounds per acre). However, as the exotic cool-season grasses increase, peak production will shift to earlier in the growing season.

Community 2.2
Blue Grama-Western Wheatgrass (Bouteloua gracilis-Pascopyrum smithii)

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, quackgrass). These exotics, however, 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. Increasing amounts of exotic cool-season grasses, particularly Kentucky bluegrass, can make this an “at risk” community, even though its presence may not be obvious. If management does not include measures to control or reduce Kentucky bluegrass, the transition to State 3: Invaded State should be expected.

Community 2.3
Bare Ground/ Curlycup Gumweed/ Exotic Cool-Season Grasses/ Saltgrass (Bare Ground/Grindelia squarrosa/ Exotic Cool-Season Grasses/ Distichlis spicata)

This community phase results from long-term heavy season-long grazing with or without drought. It can be characterized by increased areas of bare ground and abundance of curlycup gumweed. Grass composition is largely exotic cool-season grasses and saltgrass. Most other native grasses have decreased markedly.

Community 2.4
Western Wheatgrass/ Exotic Cool-Season Grasses/ Forbs (Pascopyrum smithii/ Exotic Cool-Season Grasses/ Forbs)

This community phase forms during long-term non-use or very light grazing, and no fire, which results in a marked increase in the exotic cool-season grasses. Western wheatgrass remains a conspicuous grass, although most of the other native grasses have decreased. Common forb and shrub species often include common yarrow, white sagebrush, white heath aster, prairie sagewort, and prairie rose. 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.

Pathway 2.1a
Community 2.1 to 2.2

Community Phase Pathway 2.1 to 2.2 occurs with long-term heavy season-long grazing with or without drought, resulting in an increase in blue grama relative to western wheatgrass.

Pathway 2.1b
Community 2.1 to 2.4

Community Phase Pathway 2.1 to 2.4 occurs with long-term non-use or very light grazing, and no fire resulting in marked increases in the exotic cool-season grasses and decreases in many native grasses, particularly blue grama.

Pathway 2.2a
Community 2.2 to 2.1

Community Phase Pathway 2.2 to 2.1 occurs with the implementation of long-term prescribed grazing and prescribed burning, and the return to average precipitation which results in an increase in western wheatgrass relative to blue grama.

Pathway 2.2b
Community 2.2 to 2.3

Community Phase Pathway 2.2 to 2.3 occurs with long-term heavy season-long grazing with or without drought. This results in the site becoming characterized by increased areas of bare ground and the abundance of curlycup gumweed, exotic cool-season grasses, and saltgrass.

Pathway 2.3a
Community 2.3 to 2.1

Community Phase Pathway 2.3 to 2.1 occurs with the implementation of long-term prescribed grazing and prescribed burning leading to marked decreases in exotic cool-season grasses and corresponding increases in

native grasses (e.g., western wheatgrass, blue grama).

Pathway 2.4a
Community 2.4 to 2.1

Community Phase Pathway 2.4 to 2.1 can occur with the implementation of long-term prescribed grazing and prescribed burning leading to marked decreases in the exotic cool-season grasses and corresponding increases in western wheatgrass, blue grama, and other native grasses.

State 3
Invaded

This state is the result of invasion and dominance by exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, quackgrass, crested wheatgrass). Other exotic plants (e.g., Canada thistle, 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. 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. 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 3.1
Exotic Cool-Season Grasses/Forbs

This community phase is dominated by exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, quackgrass, crested wheatgrass), often with a much-reduced forb and shrub component. Common forb and shrub species often include common yarrow, white sagebrush, white heath aster, prairie sagewort, and prairie rose. 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. The longer this community phase exists, the more resilient it becomes. Natural or management disturbances that reduce the cover of Kentucky bluegrass or smooth brome are typically short- lived.

State 4
Go-Back

This state is highly variable depending on the level and duration of disturbance related to the T5A transitional pathway. In this MLRA, the most probable origin of this state is plant succession following cropland abandonment. 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 (Kentucky bluegrass, smooth brome, quackgrass and/or crested wheatgrass) will likely predominate.

Characteristics and indicators. 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. Continued tillage will maintain the state. Control of noxious weeds will be required.

Community 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. In this MLRA, the most probable origin of this phase is secondary succession following cropland abandonment. This plant community will initially include a variety of annual forbs and grasses, including noxious weeds (e.g., leafy spurge) which may need control. Over time, the exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, quackgrass, crested wheatgrass) will likely predominate.

State 5
Any Plant Community

Transition T1A
State 1 to 2

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, quackgrass, 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, quackgrass, crested wheatgrass, or other exotic species became established on the site.

Constraints to recovery. Current knowledge and technology will not facilitate a successful restoration to Reference State.

Transition T2A
State 2 to 3

This transition from the State 2: Native/Invaded State to State 3: Invaded State generally occurs with heavy season-long grazing or long-term non-use or very light grazing, and no fire. Exotic cool-season grasses (e.g., Kentucky bluegrass, smooth brome, quackgrass, crested wheatgrass) become the dominant grasses. Studies indicate that a threshold may exist in this transition when both the exotic cool-season grasses exceed 30% of the plant community and native grasses represent less than 40% of the plant community composition.

Constraints to recovery. Variations in growing conditions (e.g., cool, wet spring) will influence effects of various management activities on exotic cool-season grass populations.

Restoration pathway R3A
State 3 to 2

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 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. 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).

Restoration pathway R4A
State 4 to 2

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 planting, 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. 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 pathway R4B
State 4 to 3

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

Context dependence. 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
State 5 to 4

This transition from any plant community to State 4: Go-Back State. It is most commonly associated with the cessation of cropping 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.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			364–729	
	western wheatgrass	PASM	*Pascopyrum smithii*	364–656	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–73	–
2	**Short Warm-season Grasses**			219–510	
	blue grama	BOGR2	*Bouteloua gracilis*	146–364	–
	saltgrass	DISP	*Distichlis spicata*	15–73	–
	buffalograss	BODA2	*Bouteloua dactyloides*	15–73	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–29	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–29	–
3	**Cool-season Bunchgrasses**			15–73	
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	15–73	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–44	–
4	**Other Native Grasses**			15–73	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–73	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	15–44	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–15	–
5	**Grass-likes**			15–73	
	needleleaf sedge	CADU6	*Carex duriuscula*	15–73	–
	Pennsylvania sedge	CAPE6	*Carex pensylvanica*	0–29	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–29	–
Forb					
6	**Forbs**			73–146	
	Forb, native	2FN	*Forb, native*	15–58	–
	common yarrow	ACMI2	*Achillea millefolium*	15–29	–
	textile onion	ALTE	*Allium textile*	15–29	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	15–29	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	15–29	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	15–29	–
	white heath aster	SYER	*Symphyotrichum ericoides*	15–29	–
	pussytoes	ANTEN	*Antennaria*	0–15	–
	field sagewort	ARCA12	*Artemisia campestris*	0–15	–
	bladderpod	LESQU	*Lesquerella*	0–15	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–15	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–15	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–15	–

	bushy knotweed	PORA3	*Polygonum ramosissimum*	0–15	–
	salty popcornflower	PLSA3	*Plagiobothrys salsus*	0–15	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–15	–
Shrub/Vine					
7	**Shrubs**			15–73	
	prairie sagewort	ARFR4	*Artemisia frigida*	15–44	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–29	–
	prairie rose	ROAR3	*Rosa arkansana*	0–29	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–29	–

Animal community

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 he 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-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 minor amounts 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 an Invaded Wooded State 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 phases. The following chart provides sensitivity to woody vegetation and preferred vegetative

stature heights.

To see the chart please follow the hyperlink:
https://efotg.sc.egov.usda.gov/references/public/ND/55B_Thin_Claypan_Narrative_FINAL_Ref_FSG.pdf

Thin Claypan Wildlife Habitat Interpretation:

Thin Claypan ecological sites are identified by the presence of a claypan within 6 inches of the soil surface making the site very droughty with salt accumulations within a depth of 16 inches (typically near the surface). In addition, the depth to claypan will cause a mosaic of non-vegetated (slick spots) with vegetated areas within the ecological site creating a mosaic of short- and mixed-grass habitat components that commonly support grassland nesting birds. This mosaic of slick spots and vegetated areas occurs in all states. Also, Thin Claypan sites commonly occur in a complex with Claypan ecological sites. These mosaics of ecological sites and slick spots commonly support grassland nesting birds including lek sites, nest sites, and brood rearing habitat for sharp-tailed grouse but lack sufficient vegetative stature for winter cover. Insects rely on associated forbs and grasses for survival and serve as food sources for birds and their young, and forage for small and large herbivores. Other associated ecological sites include Clayey, Claypan, Loamy, Loamy Overflow, and Saline Lowland. This complex of ecological sites provides habitat for many edge- sensitive, grassland bird species.

Thin Claypan ecological sites may be found in four plant community states (1.0 Reference State, 2.0 Native/Invaded State, 3.0 Invaded State, and 4.0 Go-back State) within a local landscape. Multiple plant communities are found in States 1.0 and 2.0. In addition, slick spots (bare ground) occur in patches of varying size scattered across the ecological site and in all plant communities. Today, these states occur primarily in response to grazing and drought. Secondary influences include anthropogenic disturbances and fire.

Because there is no known restoration pathway from State 2.0 to State 1.0, it is important to intensively manage, using tools in the community phase pathways in States 1.0 and 2.0 to prevent further plant community degradation along either the T1A Transitional Pathway to the Native/Invaded State 2.0 or T2A Transitional Pathway to the Invaded State 3.0 thresholds. Native wildlife generally benefits from grasslands that are heterogeneous in species composition and stature found in States 1.0 and 2.0 that include diverse grass and forb species with varying stature and density. As plant communities degrade within State 2.0, warm-season grasses, particularly short-statured grasses, increase along with cool-season exotic grasses while native forbs are reduced. 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.

Restoration success along pathway R3A from State 3.0 to State 2.0 is very difficult and is dependent upon range planting of native grasses and intensive management to control cool-season exotic grasses. This restoration effort will have a significant negative short-term impact on wildlife species. Target species must either be present on adjacent State 1.0 or State 2.0 plant communities or on other ecological sites within the species' mobility limits. Species with limited mobility, such as some butterflies, 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 dramatically increased homogeneity of exotic cool-season grasses and further reduction in native forbs. Reduced forb diversity limits insect populations, negatively affecting grassland-nesting bird foraging opportunities. Increased exotic grass litter can limit access to bare ground to 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.

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 Western Wheatgrass-Blue Grama: Even though this ecological site is not very productive or have a large diversity of plant species, this plant community offers quality habitat for grassland nesting birds; effort should be made to maintain this ecological site within this community phase. This phase retains high functionality through continued maintenance 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 grassland nesting birds preferring short to mid-structure vegetation and bare ground.

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 mirrored 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 shredders, predators, herbivores, dung beetles, and fungal-feeders).

Dakota skippers do not prefer this site due to limited host plants, such as little bluestem and prairie dropseed. Regal fritillary habitat is limited due to short stature of this plant community and Nuttall's and prairie violets are uncommon. Monarch butterflies may use flowering forbs on this site; however, few milkweed species are found on this site to support caterpillar food. The ecological site does not provide habitat for the northern sandy tiger beetle which prefer dry, sandy dunes and sandy areas away from water. This plant community does not provide habitat for the Ottoe Skipper preferring mid-statured grasses containing little bluestem, prairie dropseed, and sideoats grama which are lacking in this plant community. Bumblebees and other native bee utilize forbs as a nectar source and bare ground for nesting amongst bunchgrasses. Prescribed grazing with adequate recovery periods, as well as prescribed fire, to maintain Community Phase 1.1 will have long term positive effects on ground dwelling insects.

Birds: This plant community provides quality nesting, foraging, and escape habitats favored by short- to midgrass nesting birds. However, areas of slick or bare spots provide limited nesting, foraging, and winter cover. Several species of grassland birds, preferring short- to mid-grass stature, will use this site. In years with reduced precipitation or drought, nesting recruitment may be compromised. This plant community provides suitable areas for sharp-tailed lek sites, nesting, and brood-rearing habitat. Limited stature and diverse prey populations provide good hunting opportunities for grassland raptors.

Mammals: The diversity of grasses and forbs provide high nutrition levels for small and large herbivores. Short to moderate stature provides suitable food and thermal, protective, and escape cover for small herbivores.

Amphibians/Reptiles: This ecological site and associated plant communities provides habitat for smooth green snakes. This ecological site can provide habitat for the northern leopard frog and Great Plains toad if freshwater habitat such as wetlands, streams, or lakes are in the vicinity to the site.

Fish and Mussels: This ecological site is not directly associated with streams, rivers, or water bodies. It receives run-on hydrology from adjacent ecological sites and may provide hydrology to other ecological sites lower on the landscape (Saline Lowland). Management on Thin Claypan sites, in conjunction with nearby run-on sites, can have an indirect effect on aquatic species in streams and/or tributaries receiving water from Thin Claypan and nearby sites. Optimum hydrological function and nutrient cycling limit potential for sediment yield and nutrient loading to any nearby aquatic ecosystems from Community Phase 1.1.

Community Phase 1.2 Blue Grama-Western Wheatgrass: Blue grama and western wheatgrass will dominate with heavy grazing, with or without drought, via Community Pathway 1.1A; this favors a decrease of cool season, mid statured grasses and an increase of warm season, short statured grasses. The dominant forbs include common yarrow, curlycup gumweed, and rose pussytoes. Prairie sagewort is a common shrub.

Invertebrates: Provides similar life requisites as Community Phase 1.1; however, heavy, continuous seasonal grazing may negatively impact ground-nesting sites for bumble bees, other native bees, and other ground-nesting insects due to reduction of forbs, timing of forb flowering, or increased soil compaction.

Birds: A shift to shorter herbaceous plant statures and a short shrub component along Community Phase Pathway 1.1A provides nesting, foraging, and escape habitats favored by short-grass nesting birds. Species that prefer midgrass statures will be generally successful with normal to above normal precipitation and a change in management along the Community Phase Pathway 1.2A. In years with reduced precipitation and/or continued heavy grazing, nesting recruitment may be compromised even for short-grass nesting species. This plant community provides areas suitable for sharp-tailed grouse lek sites. Limited cover and diverse prey populations provide good hunting opportunities for grassland raptors.

Mammals: Provides similar life requisites as Community Phase 1.1; however, heavy season-long grazing reduces protective and thermal cover for small mammals.

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

Fish and Mussels: Provides similar secondary resource benefits as Community Phase 1.1.

1.3 *Bare Ground*/Curlycup Gumweed/Saltgrass: This plant community phase is characterized by bare ground and saltgrass. Heavy grazing with or without drought increases bare ground and grazing tolerant grasses and forbs, curlycup gumweed. Bare ground increases and litter amounts and infiltration rates decline while soil surface temperatures increase. Although, this plant community is resilient, retaining sufficient grazing sensitive native plant species to return to Community Phase 1.1 (via Community Phase Pathway 1.3A) will take long term management.

Invertebrates: A switch to mainly grazing tolerant grasses and forbs will have a significant impact to invertebrates due to the reduction of season-long nectar and pollen. Season-long nectar sources may be found on adjacent plant communities or ecological sites for mobile species. Increased bare ground provides increased nesting sites for bumble bees and other ground-nesting insects.

Birds: Dependent upon the amount of bare ground, adequate habitat for grassland nesting birds, maybe compromised. This plant community may be attractive grassland nesting birds preferring short-statured vegetation.

Mammals: Bare ground and short-statured grasses provides limited food, thermal, shelter, and escape cover for most mammals.

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

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

2.0 Native/Invaded State

Community Phase 2.1 Western Wheatgrass-Blue Grama: This plant community develops through Transitional Pathway T1A, which has been colonized by the exotic cool-season grasses. The threshold between states 1.0 and 2.0 is crossed when Kentucky bluegrass, smooth brome, crested wheatgrass, or other exotic species become established. This plant community phase has a very similar appearance and function to the Reference State of Community 1.1, except it has a minor amount of cool-season exotic grasses and forbs. This phase still functions at a high level for native wildlife; therefore, managers should consider the 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 secondary resource benefits as Community Phase 1.1.

Community Phase 2.2 Blue Grama-Western Wheatgrass: Extended heavy season-long grazing, with or without drought, leads to shorter-statured grasses (such as blue grama). Forbs commonly found in this plant community include white sagebrush, upright prairie coneflower, and common yarrow. Prescribed grazing with adequate recovery periods along Community Phase Pathway 2.2A may reduce blue grama and increase western wheatgrass and also increase diversity of forb components found in Community Phase 2.1.

This community phase is often found in a mosaic in the pasture in an overgrazed/undergrazed pattern typical of properly stocked pastures grazed season-long. Some areas will be impacted by heavy use while other areas will have a build-up of litter and a high amount of plant decadence. This mosaic of grazed and ungrazed areas provides a short- to mid- vegetative stature. Depending on the patch size of overgrazed vs. undergrazed, grassland nesting

birds preferring short/mid-vegetative stature may prefer this plant community phase.

Invertebrates: The loss of native forb diversity and increase in turf forming grasses (blue grama) limit foraging and nesting sites for all pollinators. Extended heavy season-long grazing reduces ground-nesting site availability and cause increased soil compaction. Homogeneity of forb species may limit season-long nectar availability. Increase in field sagewort, a wind-pollinated forb, reduces pollen availability; common yarrow favors flies and small native bees. However, depending on the amount of overgrazed vs. undergrazed area, the undergrazed areas may provide similar life requisites as Community Phase 2.1.

Birds: Long-term heavy season-long grazing will reduce forage (invertebrates) and cover. Heavy late- season grazing reduces residual cover available for the following year's nesting season. Stature is generally short, serving both mid- and short-grass nesting birds. Short-grass nesting birds favor this phase. Species that prefer a midgrass stature will be generally successful with normal to above normal precipitation and a change in management along the 2.2A Community Phase Pathway. In years with reduced precipitation or heavy grazing during the nesting season, use by mid-grass nesting species may be compromised. This plant community provides areas suitable for sharp-tailed grouse lek site development. Limited stature and diverse prey populations provide good hunting opportunities for grassland raptors.

Mammals: Suitable food and thermal, protective, and escape cover (reduction in litter) for small mammals also becomes limited. However, dependent upon the amount of overgrazed vs. undergrazed area, vegetative stature in the undergrazed areas could provide thermal and escape cover for mammals, especially small mammals.

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

Fish and Mussels: Provides similar secondary resource benefits as Community Phase 1.1.

Community Phase 2.3 *Bare Ground*/Curlycup Gumweed/Exotic Cool-Season Grasses/Saltgrass: This plant community phase is characterized by bare ground and saltgrass with an increase of exotic cool- season grasses. Long-term, heavy season-long grazing with or without drought increases bare ground and grazing tolerant grasses and forbs, curlycup gumweed. Bare ground increases and litter amounts and infiltration rates decline while soil surface temperatures increase. Although, this plant community is resilient, retaining sufficient grazing sensitive native plant species to return to Community Phase 2.1 (via Community Phase Pathway 2.3A) will take long term management.

Invertebrates: A switch to mainly grazing tolerant grasses and forbs will have a significant impact to invertebrates due to the reduction of season-long nectar and pollen. Season-long nectar sources may be found on adjacent plant communities or ecological sites for mobile species. Increased bare ground provides increased nesting sites for bumble bees and other ground-nesting insects.

Birds: Dependent upon the amount of bare ground, adequate habitat for grassland nesting birds, maybe compromised. This plant community may be attractive grassland nesting birds preferring short-statured vegetation.

Mammals: Bare ground and short-statured grasses provides limited food, thermal, shelter, and escape cover for most mammals.

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

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

Community Phase 2.4 Western Wheatgrass/Exotic Cool-Season Grasses/Forbs: Community Phase Pathway 2.1B is characterized by light or non-use and elimination of fire. Plant community diversity is reduced with a decline of deeper-rooted native species being replaced by shallow-rooted exotic cool- season grasses with increased plant litter. This plant community is on the cusp of crossing the threshold to the 3.0 Invaded State. The most effective method to regain diverse cool-season grass and forb components in Community Phase 2.1 is prescribed grazing with adequate recovery periods between grazing to shift the competitive edge to native species along Community Phase Pathway 2.4A. Every effort should be used to manage within Community Phase Pathway 2.4A to avoid crossing the threshold into State 3.0. If the threshold is crossed to Invaded State 3.0, the Restoration Pathway R3A requires intensive management and economic inputs to successfully cross back to State 2.0.

Insects: The loss of native tap rooted forbs and increase in sod-forming grasses limit foraging and nesting sites for all pollinators. Homogeneity of forb species may limit season-long nectar availability. Litter buildup, resulting from complete rest or light utilization, may reduce ground-nesting site availability and plant litter contact with the soil surface.

Birds: An increase in cool-exotic cool-season grasses moves this plant community toward homogeneity. Native grasses still dominate this plant community; however, the increase in cool-season exotic grasses reduces plant stature. With reduced amounts of native grasses and forbs, reduced plant stature, and increased litter, bird species shift from mid- to short-grass species. Sharp-tailed grouse may still use this plant community for leks and brood rearing; however, winter cover must be provided by adjacent ecological sites or plant communities. Management for bird species that prefer mid-statured grasses should follow Community Phase Pathway 2.4A.

Mammals: The increased litter from total rest from grazing combined with no fire events provides protective, thermal, and escape cover for small mammals but limited protective, thermal, or escape cover for large mammals.

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

Fish and Mussels: Provides similar secondary resource benefits as Community Phase 1.1.

3.0 Invaded State

Community Phase 3.1 Exotic Cool-Season Grasses/Forbs: Community phase pathway T2B is characterized by complete rest from grazing and elimination of fire. This plant community phase is characterized by a dominance (>30%) of exotic cool-season grasses, such as Kentucky bluegrass. However, due to soil chemistry and structure issues of this site, native grasses (such as saltgrass and blue grama) may still be present. Range planting and intensive management to control invasive species along Restoration pathway R3A may be required to cross back to Native/Invaded 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 habitat functions.

Invertebrates: Exotic grasses limits 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. Lack of nectar-producing plants and native forb and grass host plants eliminates life requisites for invertebrate species of concern in 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 go prostrate or “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. Thermal, protective, or escape cover is limited for large mammals.

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

Fish and Mussels: Provides similar life requisites as Community Phase 3.1.

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.

Successful restoration of native species along Transition Pathway R4A results in a native grass and forb community in State 2.0. Failed restoration to native species through Restoration Pathway R4B results in Invaded State 3.0. Wildlife species response will be dependent upon plant community composition, vegetative stature, patch size, and management activities (such as prescribed grazing, burning, interseeding, haying, or noxious weed control).

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 accessible range shows grazing. Little or no use of poor forage. Little evidence of trailing to grazing.

Full 40-60 All fully accessible 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.

Hydrological functions

Available water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration ranges from slow to very slow; runoff potential for this site varies from medium to very high depending on surface texture, slope shape, slope percent, and ground cover. The dense claypan layer

slows water movement through the soil profile. In many cases, areas with greater than 75% ground cover have the greatest potential for higher infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, bluegrass, and/or smooth brome will result in reduced infiltration and increased runoff. 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 significant wood productions on the site.

Other products

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

Other information

Site Development and Testing Plan

• Further investigation is recommended on somewhat poorly drained areas of this site. The current plant community and production data may only reflect the moderately well drained areas and may need revision after field investigations are completed.
• Further evaluation and refinement of the State-and-Transition model may be 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.

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.

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	USDA-NRCS North Dakota
Contact for lead author	NRCS State Rangeland Management Specialist
Date	04/25/2025
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not expected on this site.

2. **Presence of water flow patterns:** Water flow patterns are not visible.

3. **Number and height of erosional pedestals or terracettes:** Neither pedestals nor terracettes are expected on this site.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 10 to 35%. Bare ground patches (including slickspots) should be small (4 to 8 inches in diameter) and disconnected. Animal activity (burrows and ant mounds) may occasionally result in isolated bare patches of up to 24 inches in diameter.

5. **Number of gullies and erosion associated with gullies:** Active gullies are not expected on this site.

6. **Extent of wind scoured, blowouts and/or depositional areas:** No wind-scoured or depositional areas expected on this site.

7. **Amount of litter movement (describe size and distance expected to travel):** Fine/small class of plant litter associated with slick spots may be moved 4 to 8 inches following rain events. Small accumulations of plant litter may be visible.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class averages 3 or greater. Lower averages expected on the "slickspots" or plant interspaces while higher averages expected under plant canopy.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth, color, and structure of A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Mid- and short-statured rhizomatous grasses and mid- and short-statured bunchgrasses are dominant and well distributed across the site. Forbs are subdominant.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer would be expected except for the naturally occurring pan within 6 inches of the soil surface.

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

    Dominant: Phase 1.1:
    Mid & short C3 rhizomatous grasses (1); Mid & short C4 bunch grasses (2)

    Sub-dominant: Phase 1.1:
    Mid & short C3 bunch grasses (2); Forbs (6)

    Other: Phase 1.1:
    Mid & short C4 rhizomatous grasses; Grass-likes; Shrub

    Additional: 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.

    To see a full version 5 rangeland health worksheet with functional/structural group tables, please use the following hyperlink:
    https://efotg.sc.egov.usda.gov/references/public/ND/55B_Thin_Claypan_Narrative_FINAL_Ref_FSG.pdf

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Rare to not occurring on this site.

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14. **Average percent litter cover (%) and depth (in):** Plant litter cover is 35 to 55% with a depth of 0.1 to 0.25 inches.

Litter is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual air-dry production is 1300 lbs./ac (reference value) with normal precipitation and temperatures. Low and high production years should yield 800 lbs./ac to 1800 lbs./ac, respectively.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** State and local noxious species, Kentucky bluegrass, smooth bromegrass, crested wheatgrass, and Eastern red cedar/juniper.

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17. **Perennial plant reproductive capability:** Noninvasive species in all functional/structural groups are vigorous and capable of reproducing annually under normal weather conditions.
