USDA Natural Resources Conservation Service

Ecological site R055DY004SD
Wet Meadow

Last updated: 11/14/2024
Accessed: 11/23/2024

General information

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

MLRA notes

Major Land Resource Area (MLRA): 055D–Glacial Lake Dakota

MLRA 55D is in South Dakota (92 percent) and southeastern North Dakota (8 percent). It makes up about 3,059 square miles (7,923 square kilometers). This area, which is part of the glacial till plain region, consists of a large, glacial lake plain that was drained by the James River, which flows southward through the area. The MLRA is dominantly farmland converted from prairie, but some areas of grassland remain. Agricultural drainage practices have impacted shallow depressions in many areas.

MLRA 55D has distinct boundaries. Till plains are on all sides. MLRA 55B borders the area largely to the north and is also between the Lake Dakota Plain and two prominent coteaus—the Missouri Coteau on the west and the Prairie Coteau on the east. To the south is MLRA 55C (Southern Black Glaciated Plains), which has a mesic soil temperature regime.

This area is in the Central Lowland province of the Interior Plains. Elevation ranges from 1,250 to 1,330 feet (380 to 405 meters), generally increasing from south to north. The area is characterized by mostly level to moderately sloping lake plains with many depressions and drainages. Much of the area has integrated drainage; drainage channels are poorly to moderately defined.

The glaciolacustrine sediments of the Lake Dakota Plain range from sandy to clayey and are commonly stratified. Some areas of the lake plain are mantled with wind-deposited materials, which are moderately coarse textured or sandy. Alluvial deposits and low terraces are common along the James River and its major tributaries but also occur in narrow and discontinuous strips along other streams.

Classification relationships

Major Land Resource Area (MLRA): Southern Black Glaciated Plains (55D) (USDA-NRCS, 2022)

USFS Sub-region: Located mainly within unit 332Bc and 332Ba (Cleland et al., 2007).

Ecological site concept

The Wet Meadow ecological site is generally located in depressions and on low-lying flats on uplands – till plains, lake plains, outwash plains, and eolian sand plains; however, it also occurs in drainageways, on concave areas of flood plains, and on lake beaches. In addition, a few areas occur on upland seeps. The soil is very deep. It is poorly drained - a seasonal high water table is typically within a depth of 1.5 feet during the months of April through June; in depressions, it is frequently ponded (typically <1.5) in April and May. Generally, redox features are within a depth of 18 inches. Very slight or slight salinity (E.C. <8) is allowable on this site. Effervescence ranges from none to violent. Hydrology (surface and sub-surface) is the primary factor used in identifying this site. All textures are included in the site. Slope is typically less than 2 percent; however, areas of seeps have slopes up to 6 percent. On the landscape, this site is below the Clayey, Loamy, Loamy Overflow, Limy Subirrigated, and Subirrigated Sands

ecological sites and above the Shallow Marsh site. The Subirrigated ecological site occurs in shallow depressions and concave areas on flats; it has redoximorphic features at a depth of 18 to 30 inches. The Saline Lowland site is on similar landscape positions; it has moderate or strong soil salinity (E.C. >8).

Associated sites

R055DY010SD	**Loamy** This site occurs on higher, linear slopes on till plains and lake plains. The surface layer and subsoil layers form a ribbon 1 to 2 inches long. It is >30 inches to redoximorphic features.
R055DY003SD	**Subirrigated** This site occurs on concave areas of flats and in shallow depressions with occasional, brief ponding. It has redoximorphic features at a depth of 18 to 30 inches. All textures are included in this site.
R055DY044SD	**Subirrigated Sands** This site occurs somewhat higher on the landscape on sand plains. The subsoil does not form a ribbon. It is >30 inches to redoximorphic features.
R055DY011SD	**Clayey** This site occurs on higher, linear slopes on lake plains and till plains. The surface layer and subsoil layers form a ribbon >2 inches long. It is >30 inches to redoximorphic features.
R055DY020SD	**Loamy Overflow** This site occurs in upland swales and on floodplains. The surface and subsoil layers form a ribbon 1 to 2 inches long. It is deeper than 30 inches to redoximorphic features.
R055DY001SD	**Shallow Marsh** This site occurs in deep depressions which have frequent ponding through most of the growing season. All textures are included in this site.
R055DY007SD	**Saline Lowland** This site occurs on rims of depressions and adjacent flats. It has an accumulation of salts in the surface and subsoil layers (E.C. >8). Typically, this site does not have a claypan layer, but one is allowed if the soil is poorly drained. All textures are included in this site.

Similar sites

R055DY001SD	**Shallow Marsh** This site occurs in deep depressions which have frequent ponding through most of the growing season. All textures are included in this site.
R055DY003SD	**Subirrigated** This site occurs on concave areas of flats and in shallow depressions with occasional, brief ponding. It has redoximorphic features at a depth of 18 to 30 inches. All textures are included in this site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex pellita* (2) *Spartina pectinata*

Physiographic features

This site typically occurs in depressions on uplands – till plains, lake plains, outwash plains, and eolian sand plains; it also occurs in drainageways, on concave areas of flood plains, and on lake beaches. The parent materials vary widely. Slope are typically less than 2 percent.

Table 2. Representative physiographic features

Landforms	(1) Till plain > Pothole (2) Lake plain > Depression (3) Outwash plain > Flood plain (4) Sand plain > Beach (5) Seep
Runoff class	Negligible to medium
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	299–649 m
Slope	0–1%
Ponding depth	5–30 cm
Water table depth	0–46 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation of MLRA 55D is 22 to 23 inches (549 to 594 millimeters). About 75 percent of the rainfall comes from high-intensity, convective thunderstorms during the growing season. Winter precipitation is typically snow. The average annual snowfall is 25 to 50 inches (635 to 1,270 millimeters). Strong winds commonly deposit the snow unevenly across the landscape. The average annual temperature is 43 to 45 degrees F (6 to 7 degrees C). The freeze-free period averages about 135 days and ranges from 120 to 150 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	114-117 days
Freeze-free period (characteristic range)	129-134 days
Precipitation total (characteristic range)	559-584 mm
Frost-free period (actual range)	114-119 days
Freeze-free period (actual range)	127-134 days
Precipitation total (actual range)	559-584 mm
Frost-free period (average)	116 days
Freeze-free period (average)	131 days
Precipitation total (average)	584 mm

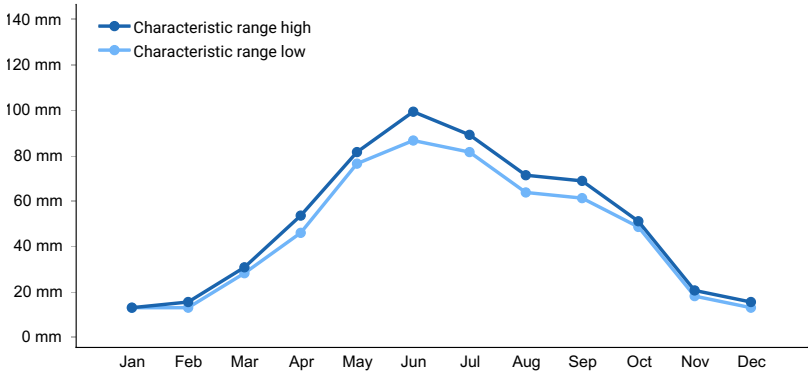


Figure 1. Monthly precipitation range

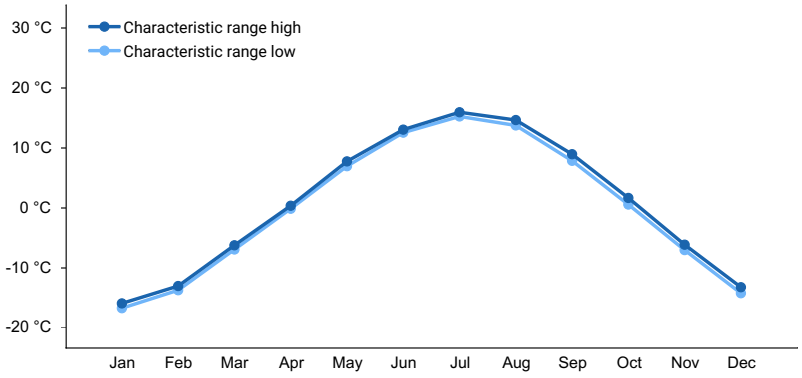


Figure 2. Monthly minimum temperature range

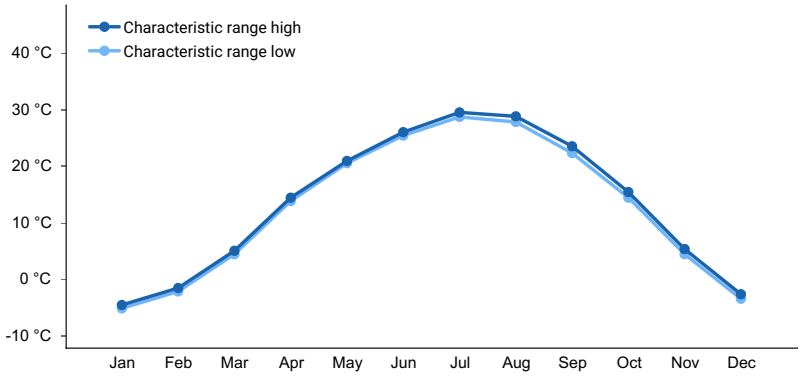


Figure 3. Monthly maximum temperature range

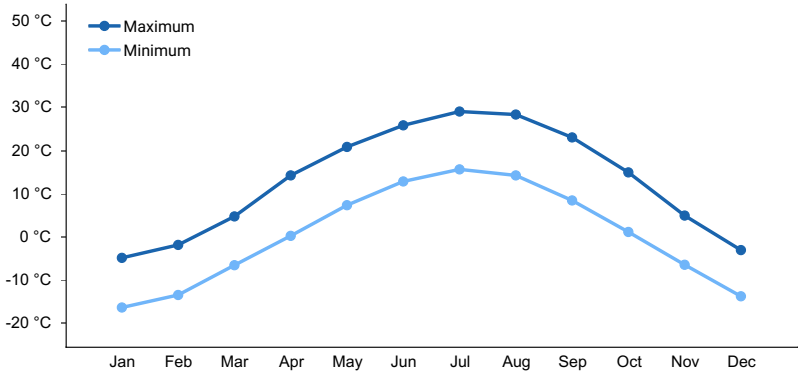


Figure 4. Monthly average minimum and maximum temperature

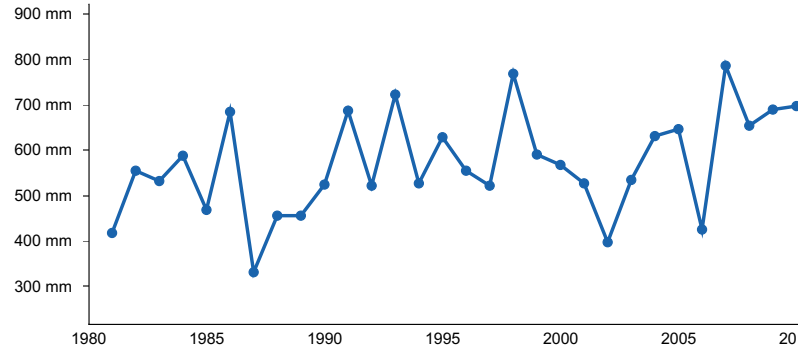


Figure 5. Annual precipitation pattern

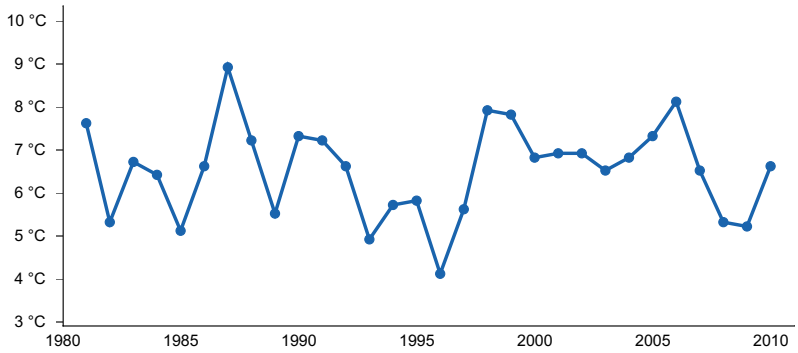


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BRITTON [USC00391049], Britton, SD
- (2) ANDOVER #2 [USC00390120], Andover, SD
- (3) TURTON [USC00398420], Turton, SD
- (4) CONDE [USC00391917], Conde, SD
- (5) REDFIELD [USC00397052], Redfield, SD
- (6) MELLETTE 4 W [USC00395456], Northville, SD
- (7) ABERDEEN [USW00014929], Aberdeen, SD
- (8) COLUMBIA 8 N [USC00391873], Columbia, SD

Influencing water features

This site is poorly drained. Many areas of this site receive additional water as surface runoff from adjacent uplands. Under average climatic conditions, the soils in depressions are frequently ponded in April and May and occasionally ponded in June. Depth of ponding typically is less than 1.5 feet during these months. In mid and late summer, ponded water commonly is not evident except after heavy rains. Ponding is commonly rare on flats, but where adjacent to depressions, it may be occasional. Where present, ponding is less than 1 foot deep and of brief duration. Soils in this site occurring on flood plains have rare, brief to frequent, long flooding. On lake beaches, periodic inundation occurs with fluctuating lake levels.

When not ponded, a seasonal high water table typically fluctuates with precipitation events between the surface and a depth of 1.5 feet during the months of April through June and is typically within a depth 3.5 feet through the remainder of the growing season. Some of the soils in this site have endosaturation (apparent water table) and some have episaturation (perched water table above a subsoil layer with low or moderately low saturated hydraulic conductivity). Seep areas typically are saturated at or near the surface throughout the growing season.

Surface infiltration ranges from slow to rapid. Saturated hydraulic conductivity typically ranges from moderately low to high; some soils have a coarser-textured substratum with very high saturated hydraulic conductivity. Water loss is primarily through evapotranspiration.
Wetlands receive water from different sources including ground water movement. Recharge wetlands (Wet Meadow) have groundwater flow predominantly away from the wetland moving toward or into a discharge wetland basin. Flowthrough wetlands have groundwater flowing away from the wetland basin but is balanced with water flowing into the basin.

Due to the potential high rate of surface evaporation, areas of this site without frequent ponding are at risk of becoming saline (Saline Lowland) if vegetative cover is reduced or removed.

Water loss is primarily through evapotranspiration and lateral movement into (and evaporation from) adjacent soils. During periods of drought or extreme wetness, water table fluctuations will also have an impact on depth of ponding, especially in sandy soils. During periods of drawdown (e.g. prolonged drought), soil and water chemistry may significantly impact the soil/water/vegetation dynamics of the site (see Site Development and Testing Plan).

Fluctuations in specific conductance are less pronounced during average or normal water conditions than during periods of excessive water depth or extreme drought. The approximate normal and extreme range in specific

conductance (micromhos/cm3) of surface water in plant communities that are indicators of differences in average salinity are as follows:

Wetland description

Soils in these depressions are considered temporary wetlands; however, during wetter than normal climate cycles, these soils may have seasonal ponding.

Wetland Description: Cowardin, et al., 1979
System: Palustrine
Subsystem: N/A
Class: Persistent Emergent Wetland
Sub-Class: Seasonally Flooded or Saturated

Soil features

The common feature of soils in this site are inundation or near-surface saturation in the early part of the growing season. The soils are very deep and poorly drained. Some are in depressions and potholes that are ponded in April and May; some are on low-flying flats which have prolonged saturation in the spring; and some are on flood plains with frequent, brief, or long flooding. The ecological site includes poorly drained soils on lake beaches and upland seeps. Since hydrology (surface and sub-surface) is the primary factor used in identifying this site, all textures are included. Therefore, soil physical properties associated with texture vary widely.

This site should show no evidence of rills, wind-scoured areas, or pedestaled plants. The soil surface is stable and intact. In some soils, sub-surface layers are non-restrictive to water movement; in other soils a layer of clay accumulation slows water movement and prolongs surface ponding. The soil/water/plant relationship is strongly influenced by ponded/and or saturated conditions.

Major soil series correlated to the Wet Meadow site are: Arveson, Borup, Colvin, Fossum, Hamar, Kratka, Lamoure, Lindaas, Lowe, Ludden, Marysland, Perella, Rimlap, Tiffany, Tonka, and Vallers. In addition, the poorly drained phase of Bantry is included in this site

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) Alluvium (2) Glaciolacustrine deposits (3) Glaciofluvial deposits (4) Eolian sands
Surface texture	(1) Silt loam (2) Silty clay loam (3) Fine sandy loam (4) Loam (5) Silty clay
Family particle size	(1) Loamy
Drainage class	Very poorly drained
Permeability class	Very slow to very rapid
Soil depth	203 cm
Surface fragment cover <=3"	0–14%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	0 cm

Calcium carbonate equivalent (0-101.6cm)	0–45%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–7
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–35%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the Woolly Sedge/Prairie Cordgrass Plant Community Phase. This community phase and the Reference State has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered. Community phases, community pathways, states, transitions, thresholds and restoration pathways have been determined through similar studies and experience.

The natural disturbance regime consisted of frequent fires caused both by natural and Native American ignition sources. These fires occurred during any season of the year, but were concentrated in the spring and late summer or early fall. Lightning fires occurred most frequently in July and August while fires started by Native Americans occurred in April, September and October. Large ungulate grazing was heavy and occurred often, but usually for short durations. Grazing may have been severe when occurring after a fire event. The grazing and fire interaction especially when coupled with drought events, set up the dynamics discussed and displayed in the following state and transition diagram and descriptions.

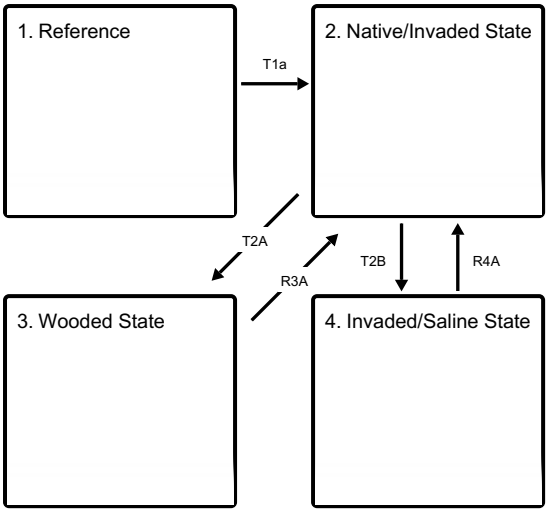
This ecological site has been grazed by domestic livestock since introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the disturbance regime of this site.

Heavy continuous grazing without adequate recovery periods following each grazing occurrence causes this site to depart from the Reference State. Species such as fowl bluegrass, spikerush, and Baltic rush will initially increase. Prairie cordgrass and northern reedgrass will decrease in frequency and production. Continued heavy grazing eventually causes quackgrass, foxtail barley, Kentucky bluegrass, spikerush and unpalatable forbs such as curly dock to increase and dominate.

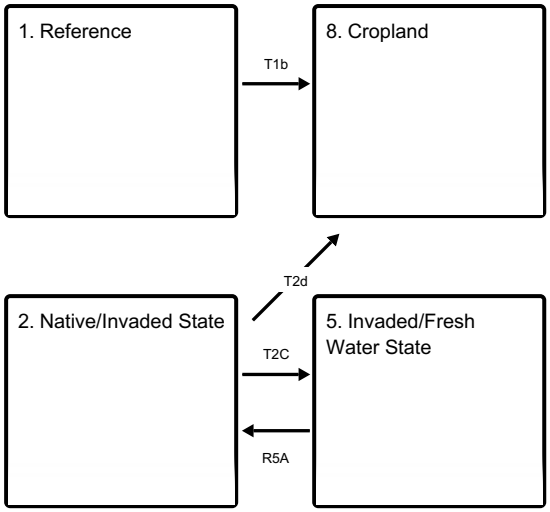
Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

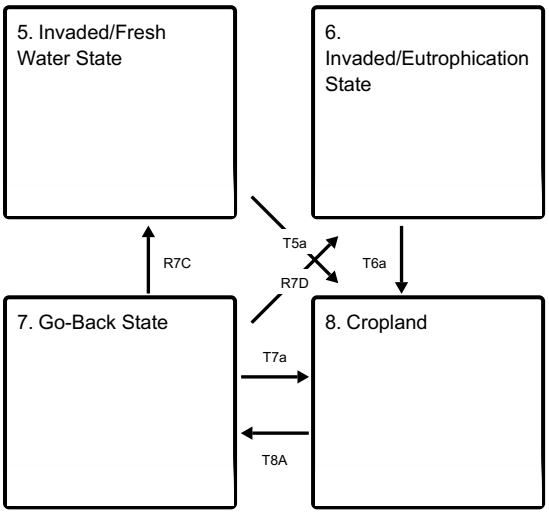
State and transition model

Ecosystem states

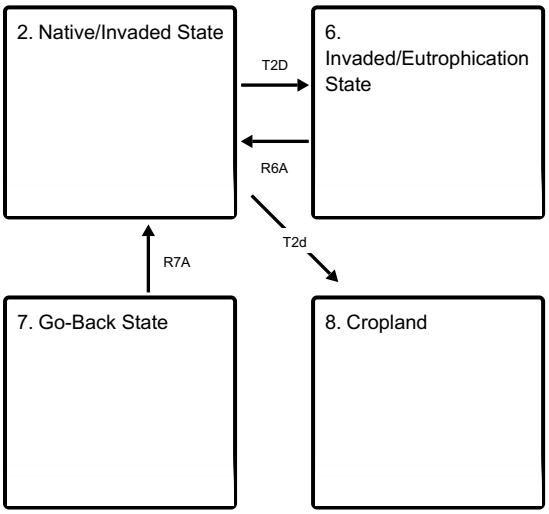


States 1, 8, 2 and 5 (additional transitions)

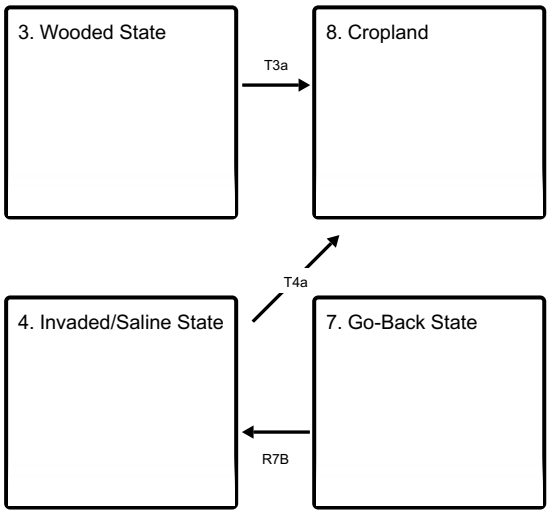




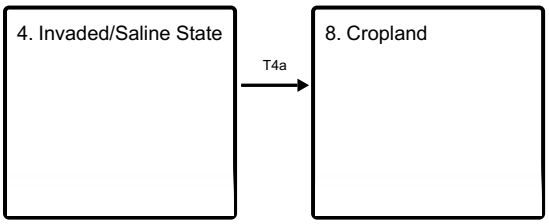
States 2, 6, 7 and 8 (additional transitions)



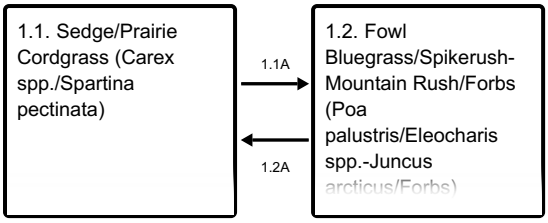
States 3, 8, 4 and 7 (additional transitions)



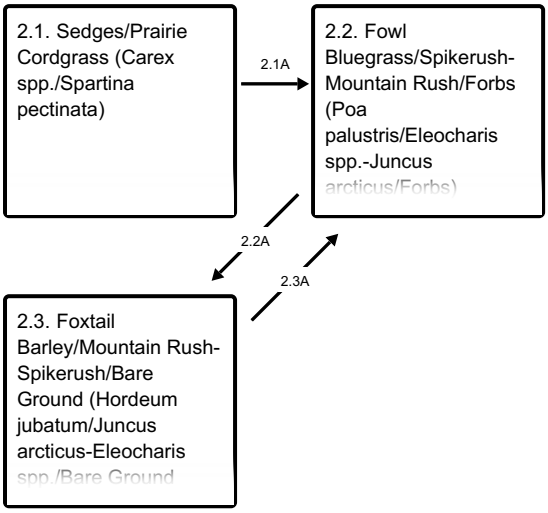
States 4 and 8 (additional transitions)



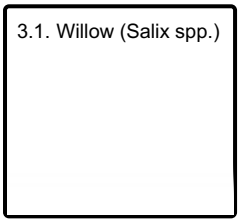
State 1 submodel, plant communities



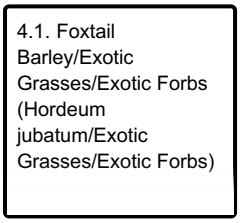
State 2 submodel, plant communities



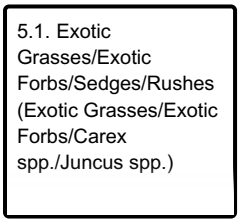
State 3 submodel, plant communities



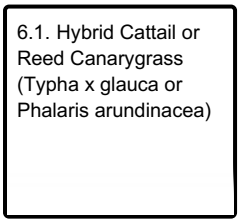
State 4 submodel, plant communities



State 5 submodel, plant communities



State 6 submodel, plant communities



State 7 submodel, plant communities

7.1. Annual/Pioneer Perennial/Exotics

State 1
Reference

This site developed under Northern Great Plains climatic conditions which included frequent droughts and wide fluctuations in temperature and precipitation which can result in both short-term and long-term changes in water levels and water chemistry (e.g. alkalinity/salinity). Hydrology, water chemistry, grazing, and fire can all serve as important drivers of this site. Hydrology is mainly a factor of landscape position, including the size of the contributing watershed, connectivity to other basins and, whether the basin has an outlet. Water chemistry is influenced by soil chemistry and whether the site is a recharge, flow-through, or discharge site. This state is typically co-dominated by a mixture of cool-season and warm-season graminoids, mainly woolly sedge, wheat sedge, and Sartwell's sedge, along with prairie cordgrass and northern reedgrass. Prior to European influence the primary disturbance mechanisms for this site in the reference condition included water level fluctuations, periodic fire, and grazing by large herding ungulates. Spring snowmelt runoff and rainfall events, coupled with timing of fires and grazing events, dictated the dynamics that occurred within the natural range of variability. Along with water level fluctuations and water chemistry, present day primary disturbances are from concentrated livestock grazing and a lack of fire. Under these conditions, vegetation for livestock and wildlife can be expected to decline along with a corresponding increase in less desirable vegetation. Wet Meadow ecological sites are highly influenced by water levels (including saturated soil), water movement, and water chemistry (i.e. discharge and recharge hydrology). Water levels influence fire effectiveness and livestock use. Water levels also influence exotic species invasion. As Wet Meadow sites draw down, drying and losing soil moisture, they transition to functioning as an upland ecological site and can increase in salinity/alkalinity. Exotic cool-season grasses and forbs begin to invade starting from the upland edge of the Wet Meadow ecological site moving toward the deeper portion of the wetland. Many factors will dictate the speed of exotic species invasion including duration of draw-down phase, management of the sites during the draw-down phase, changes in soil chemistry, and availability of exotic species seed or plants parts (e.g. propagules). During extended periods of draw-down, presence of exotic species adjacent to the site and lack of fire or heavy season-long livestock grazing can speed up the invasion of cool-season exotic grasses or forbs such as Canada thistle or sow thistle. Once the site is invaded, increased water depth can begin to reverse the invasion of exotic species. However, the increase in salt accumulation will be difficult to reverse back to levels prior to extended periods of draw-down. In addition, exotic grasses (such as quackgrass and foxtail barley) can tolerate extended periods of inundation or saturation, never totally drowning out along the outer margins of the Wet Meadow site. The continued presence of cool-season exotic grasses prevents the site from transitioning back to State 1: Reference State.

Dominant plant species

- prairie cordgrass (*Spartina pectinata*), grass
- spiked muhly (*Muhlenbergia glomerata*), grass
- northern reedgrass (*Calamagrostis stricta ssp. inexpansa*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- fowl bluegrass (*Poa palustris*), grass
- American sloughgrass (*Beckmannia syzigachne*), grass
- woolly sedge (*Carex pellita*), other herbaceous
- Sartwell's sedge (*Carex sartwellii*), other herbaceous
- wheat sedge (*Carex atherodes*), other herbaceous
- Bicknell's sedge (*Carex bicknellii*), other herbaceous
- fox sedge (*Carex vulpinoidea*), other herbaceous
- Indianhemp (*Apocynum cannabinum*), other herbaceous
- goldenrod (*Solidago*), other herbaceous
- Canada germander (*Teucrium canadense*), other herbaceous
- Flodman's thistle (*Cirsium flodmanii*), other herbaceous

Community 1.1
Sedge/Prairie Cordgrass (Carex spp./Spartina pectinata)

This community phase evolved with grazing by large herbivores, occasional prairie fires, and relatively frequent shallow ponding or saturation events. It may be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. Woolly sedge is typically the dominant graminoid while prairie cordgrass is the dominant warm-season grass and northern reedgrass the dominant cool-season species. A variety of sedges and rushes also occur throughout this community such as wheat sedge, mountain rush, and spikerush). Switchgrass and fowl bluegrass are also common. Common forbs often include Canada germander, goldenrods, Flodman's thistle, Indianhemp, white doll's aster, and white panicle aster. Annual production can vary from roughly 3600-5600 pounds per acre, consisting of about 70 percent grass-like species, 20 percent grasses, 7 percent forbs, and 3 percent shrubs. The community is further described in the "Plant Community Composition and Group Annual Production" portion of this ecological site description. This plant community phase is diverse, stable, productive, and well adapted to the Northern Great Plains. Temporary ponding or a high-water table supplies much of the moisture for plant growth, and the plant composition and diversity will shift with these changes. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3704	4590	5397
Forb	219	379	600
Shrub/Vine	–	76	168
Total	**3923**	**5045**	**6165**

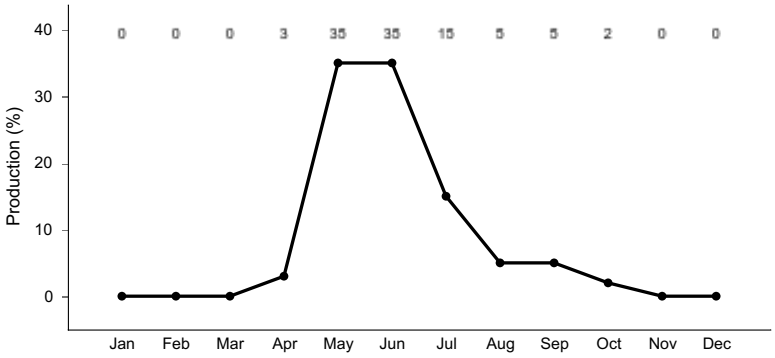


Figure 8. Plant community growth curve (percent production by month). ND5508, Central Black Glaciated Plains, lowland cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant, lowland..

Community 1.2
Fowl Bluegrass/Spikerush-Mountain Rush/Forbs (Poa palustris/Eleocharis spp.-Juncus arcticus/Forbs)

This community develops during periods of heavy season-long grazing, particularly during decreasing or low water conditions when grazing pressure on the site is disproportionately high. Compared to Community Phase 1.1, prairie cordgrass, northern reedgrass, and switchgrass have declined with a noticeable increase in fowl bluegrass, spikerush, mountain rush, and forbs. Common forbs include asters, goldenrods, and cinquefoil.

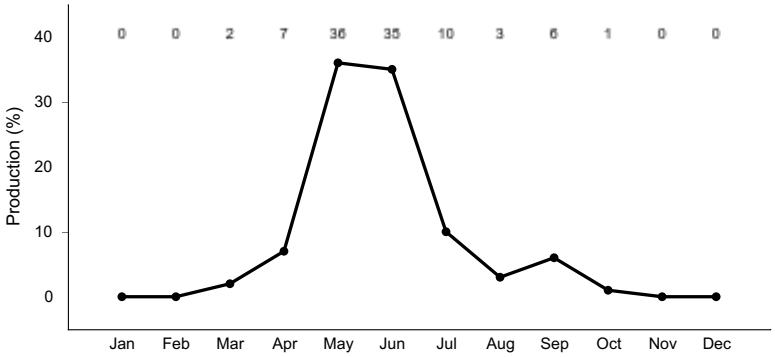


Figure 9. Plant community growth curve (percent production by month). ND5507, Central Black Glaciated Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant, lowland..

Pathway 1.1A
Community 1.1 to 1.2

Community Phase Pathway 1.1 to 1.2 occurs with below average precipitation and heavy season-long grazing. This is associated with a drop in water level and an increased frequency and intensity of grazing due to limited forage availability on the adjacent upland sites

Pathway 1.2A
Community 1.2 to 1.1

Community Phase Pathway 1.2 to 1.1 results with the return to average precipitation resulting in increased water depth and the implementation of prescribed grazing with adequate recovery periods. This results in a noticeable increase in prairie cordgrass, northern reedgrass, and switchgrass

State 2
Native/Invaded State

This State may be characterized as consisting of similar community phases as found in the Reference State (e.g. Community Phase 1.1 and 1.2), but the site has now been colonized by exotic plants, mainly cool-season grasses such as Kentucky bluegrass, quackgrass, smooth brome, or exotic strains/hybrids of reed canarygrass. Canada thistle is also a frequent exotic on the state. Although the state is still dominated by native cool-season grasses and graminoids, an increase in the exotic cool-season grasses can be expected. These exotic cool-season grasses have been particularly and consistently invasive under extended periods of non-use and no fire. To slow or limit the invasion of these exotic grasses it is imperative that managerial options (e.g. prescribed grazing, prescribed burning, other) be carefully constructed 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. Restoration of State 2: Native/Invaded State back to State 1: Reference State is not considered to be achievable. It should be noted, however, that if the major invader is reed canarygrass, prescribed grazing techniques that target reed canarygrass may be a good choice for restoration efforts because the species is not very tolerant of heavy grazing.

Dominant plant species

- prairie cordgrass (*Spartina pectinata*), grass
- spiked muhly (*Muhlenbergia glomerata*), grass
- northern reedgrass (*Calamagrostis stricta ssp. inexpansa*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- fowl bluegrass (*Poa palustris*), grass
- American sloughgrass (*Beckmannia syzigachne*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- quackgrass (*Elymus repens*), grass
- smooth brome (*Bromus inermis*), grass
- creeping bentgrass (*Agrostis stolonifera*), grass

- Canada thistle (*Cirsium arvense*), other herbaceous
- sedge (*Carex*), other herbaceous
- mountain rush (*Juncus arcticus ssp. littoralis*), other herbaceous
- spikerush (*Eleocharis*), other herbaceous

Community 2.1
Sedges/Prairie Cordgrass (Carex spp./Spartina pectinata)

This plant community phase is similar in composition and production to that of Plant Community Phase 1.1 but has been colonized by exotic plants. It often develops under conditions of non-use and no fire which can result in excessive litter accumulates which exacerbates the invasion by exotic plants such as reed canarygrass, Canada thistle, and perhaps red top. It can also develop under heavy season-long grazing. Without prescribed grazing and/or prescribed burning, a transition to State 3: Invaded State can be expected

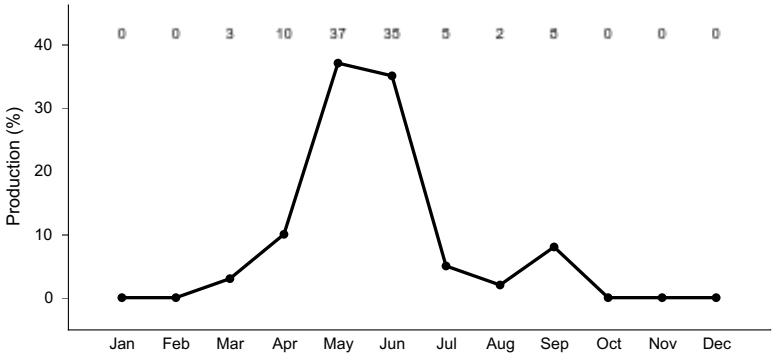


Figure 10. Plant community growth curve (percent production by month). ND5506, Central Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Community 2.2
Fowl Bluegrass/Spikerush-Mountain Rush/Forbs (Poa palustris/Eleocharis spp.-Juncus arcticus/Forbs)

This plant community phase develops with heavy season-long grazing during periods of below average precipitation leading to decreasing water levels. Sedge, mountain rush, spikerush and bulrush will increase noticeably. Prairie cordgrass and sedges will decline, while grazing tolerant invasive plants (e.g. creeping meadow foxtail) may become prevalent if a seed source is present or nearby. This plant community is somewhat resistant to change. A combination of both prescribed grazing and prescribed burning is most effective in moving this plant community towards the Reference State. 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.

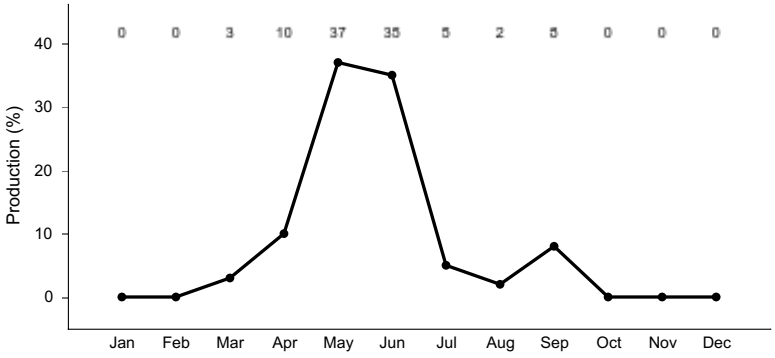


Figure 11. Plant community growth curve (percent production by month). ND5506, Central Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Community 2.3
Foxtail Barley/Mountain Rush-Spikerush/Bare Ground (Hordeum jubatum/Juncus arcticus-Eleocharis spp./Bare Ground

This plant community phase develops under prolonged conditions of disturbance (e.g. heavy season-long grazing) particularly during periods of below average precipitation when water depths decrease and salinity increases (discharge site). 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. The prolonged nature of this disturbance will tend to increase soil temperatures and evaporation, causing this site to become drier. Foxtail barley often becomes a prominent component of the community, largely resulting from an increase in soil salinity/sodicity and lack of utilization by livestock once awns begin to appear. Production and diversity are much reduced compared to that of the Reference State. Production may be in the range of 4150 pounds per acre, with the foxtail barley, mountain rush, and spikerush accounting for over one-half of the total production and forbs contributing less than one percent.

Pathway 2.1A
Community 2.1 to 2.2

Community Phase Pathway 2.1 to 2.2 occurs during times of below average precipitation leading to a decreasing water depth in conjunction with heavy season-long grazing.

Pathway 2.2A
Community 2.2 to 2.3

Community Phase Pathway 2.2 to 2.3 occurs with heavy season-long grazing along with a decrease in water depth and increased salinity (discharge site

Pathway 2.3A
Community 2.3 to 2.2

Community Phase Pathway 2.3 to 2.2 occurs with prescribed grazing in conjunction with increased precipitation leading to an increase in water depth above plant height leading to plant mortality

State 3
Wooded State

This state occurs throughout the MLRA and can result from the colonization by willows during extended period of no disturbance.

Dominant plant species

- sandbar willow (*Salix interior*), shrub
- Bebb willow (*Salix bebbiana*), shrub
- redosier dogwood (*Cornus sericea*), shrub
- white meadowsweet (*Spiraea alba*), shrub
- sedge (*Carex*), other herbaceous
- rush (*Juncus*), other herbaceous

Community 3.1
Willow (Salix spp.)

This plant community phase is dominated by willows (e.g. sandbar and Bebb’s). Associated shrubs may include

redosier dogwood and perhaps white meadowsweet. Sedges and rushes generally dominate the herbaceous understory.

State 4
Invaded/Saline State

This state is similar to Community Phase 2.1, but exotic species now dominate the site. Foxtail barley is a conspicuous component of the community; however, the exotic grasses make up the bulk of the vegetation. Several exotic grasses may be present (alone or in combination) and include barnyardgrass, quackgrass, smooth brome, redtop, and/or exotic strains or hybrids of reed canarygrass. Common exotic forbs include Canada thistle, kochia, lambsquarters, and field sowthistle. Marsh fleabane (aka swamp ragwort) is also occasionally abundant on the site during draw-downs.

Dominant plant species

- foxtail barley (*Hordeum jubatum*), grass
- quackgrass (*Elymus repens*), grass
- barnyardgrass (*Echinochloa crus-galli*), grass
- smooth brome (*Bromus inermis*), grass
- creeping bentgrass (*Agrostis stolonifera*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- saltgrass (*Distichlis spicata*), grass
- alkaligrass (*Puccinellia*), grass
- scratchgrass (*Muhlenbergia asperifolia*), grass
- Canada thistle (*Cirsium arvense*), other herbaceous
- lambsquarters (*Chenopodium album*), other herbaceous
- field sowthistle (*Sonchus arvensis*), other herbaceous
- marsh fleabane (*Senecio congestus*), other herbaceous

Community 4.1
Foxtail Barley/Exotic Grasses/Exotic Forbs (Hordeum jubatum/Exotic Grasses/Exotic Forbs)

This community phase is a saline phase of the invaded states; as such, it is predominantly composed of exotic grasses such as barnyardgrass, quackgrass, smooth brome, redtop, and/or exotic strains or hybrids of reed canarygrass (alone or in combination). Foxtail barley, however, is generally a conspicuous component and is an indicator of the saline conditions. Other grasses are largely halophytic species and may include saltgrass, alkaligrass, and scratchgrass.

State 5
Invaded/Fresh Water State

This community is the freshwater phase of the Invaded State and appears similar to Community Phase 2.2. Exotic grasses dominate the site and may consist of quackgrass, smooth brome, and barnyardgrass (alone or in combination). Although foxtail barley may be present, it is much reduced compared to that of State 4: Invaded/Saline State. Canada thistle, field sowthistle, and lambsquarters are common forbs.

Dominant plant species

- quackgrass (*Elymus repens*), grass
- smooth brome (*Bromus inermis*), grass
- barnyardgrass (*Echinochloa crus-galli*), grass
- foxtail barley (*Hordeum jubatum*), grass
- Canada thistle (*Cirsium arvense*), other herbaceous
- field sowthistle (*Sonchus arvensis*), other herbaceous
- lambsquarters (*Chenopodium album*), other herbaceous

Community 5.1
Exotic Grasses/Exotic Forbs/Sedges/Rushes (Exotic Grasses/Exotic Forbs/Carex spp./Juncus

spp.)

This community is the freshwater phase of the invaded states and appears similar to Community Phase 2.2. Exotic grasses dominate the site and may consist of quackgrass, smooth brome, and barnyard grass (alone or in combination). Although foxtail barley may be present, it is much reduced compared to that of State 4: Invaded/Saline State. Canada thistle, field sowthistle, and lambsquarters are common forbs. Several species of sedges and rushes may still be present but compose a minor component of the community.

State 6
Invaded/Eutrophication State

This state results from eutrophication and sedimentation of the site, often due to tillage on or adjacent to the site. Depending upon what seeds, rhizomes, and propagules are present in the substrate, monotypic stands of hybrid cattails or exotic strains/hybrids of reed canarygrass generally develop.

Dominant plant species

- reed canarygrass (*Phalaris arundinacea*), grass
- cattail (*Typha*), other herbaceous
- Canada thistle (*Cirsium arvense*), other herbaceous
- field sowthistle (*Sonchus arvensis*), other herbaceous
- aster (*Aster*), other herbaceous

Community 6.1
Hybrid Cattail or Reed Canarygrass (Typha x glauca or Phalaris arundinacea)

Whether the site becomes dominated by hybrid cattail or reed canarygrass is largely the result of which seeds, rhizomes or propagules are present on the site. Either way, the community has little diversity, with the cattail or reed canarygrass forming virtual monocultures. Canada thistle, field sowthistle, and some asters may be present in the reed canarygrass stands. Production on cattail dominated communities may be in the range of 5333 pounds per acre with cattails and graminoids contributing 4800 and 425 pounds per acre respectively.

State 7
Go-Back State

This state is highly variable depending on the level and duration of disturbance related to the T8A pathway. In this MLRA, the most probable origin of this state is plant succession following crop abandonment. This plant community will initially include a variety of annual forbs and grasses, some of which maybe noxious weeds.

Dominant plant species

- quackgrass (*Elymus repens*), grass
- foxtail barley (*Hordeum jubatum*), grass
- barnyardgrass (*Echinochloa crus-galli*), grass
- Canada thistle (*Cirsium arvense*), other herbaceous
- goosefoot (*Chenopodium*), other herbaceous
- field sowthistle (*Sonchus arvensis*), other herbaceous
- knotweed (*Polygonum*), other herbaceous
- beggarticks (*Bidens*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Community 7.1
Annual/Pioneer Perennial/Exotics

Plant composition of this state can be quite variable due to variations in hydrology, salinity, and other factors. In this MLRA, the most probable origin of this phase 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 needing control. However, plants commonly occurring in this state include quackgrass, foxtail barley, barnyardgrass, goosefoot, field sowthistle, knotweed, smartweed, burningbush, and beggartick. Restoration efforts to several states

can be successful. It should be noted, however, that well-established stands of Canada thistle, field sowthistle, or quackgrass are particularly difficult to restore.

State 8
Cropland

This plant community generally results from annual cropping.

Transition T1a
State 1 to 2

This is the transition from the State 1: Reference State to State 2: Native/Invaded State over several years of non-use and no fire or heavy season-long grazing. Exotic cool-season grasses such as Kentucky bluegrass, quackgrass, smooth brome, or exotic strains/hybrids of reed canarygrass invade the site. Canada thistle is also a frequent exotic on the state.

Transition T1b
State 1 to 8

Removal of vegetative cover and tilling for agricultural crop production.

Transition T2A
State 2 to 3

This is the transition from State 2: Native/Invaded State to State 3: Wooded State. This often results from lack of disturbance (e.g. fire and/or mechanical) leading to an increase in both the size and extent of willows.

Transition T2B
State 2 to 4

This is the transition from State 2: Native/Invaded State to State 4: Invaded/Saline State due to heavy season-long grazing during times of below average precipitation leading to a decrease in water depth and brackish (alkalinity/salinity) conditions (discharge site).

Transition T2C
State 2 to 5

This is the transition from State 2: Native/Invaded State to State 5: Invaded/Fresh Water State during times of a decrease in water depth and freshwater conditions on conjunction with heavy season-long grazing.

Transition T2D
State 2 to 6

This is the transition from State 2: Native/Invaded State to State 6: Invaded/Eutrophication State resulting from eutrophication and sedimentation of the site, often due to tillage on or adjacent to the site.

Transition T2d
State 2 to 8

Removal of vegetative cover and tilling for agricultural crop production.

Restoration pathway R3A
State 3 to 2

This is the restoration pathway from State 3: Wooded State to State 2: Native/Invaded State due to high willow mortality resulting from mechanical treatment followed by prescribed burning.

Transition T3a
State 3 to 8

Removal of vegetative cover and tilling for agricultural crop production.

Restoration pathway R4A
State 4 to 2

This is the restoration of State 4: Invaded/Saline State to State 2: Native/Invaded State resulting from extended periods of above average precipitation causing an increase in water depth above the height of most exotic grasses. This results in considerable mortality and is sufficient to move the plant composition to more freshwater species.

Transition T4a
State 4 to 8

Removal of vegetative cover and tilling for agricultural crop production.

Restoration pathway R5A
State 5 to 2

This is the restoration of State 5: Invaded/Fresh Water State to State 2: Native/Invaded State during extended periods of above average precipitation leading to an increase in water depth above the height of most exotic grasses, resulting in considerable mortality and sufficient to move the plant composition to more freshwater species.

Transition T5a
State 5 to 8

Removal of vegetative cover and tilling for agricultural crop production.

Restoration pathway R6A
State 6 to 2

This is the restoration pathway from State 6: Invaded/Eutrophication State to State 2: Native/Invaded State resulting from extended periods of above average precipitation leading to increased water depth and chemical treatment, mechanical treatment, sediment removal, prescribed burning, and reseeding. The aquatic version of glyphosate herbicide has been shown to be an effective method in restoration efforts. Reseeding or the planting of plugs of plants (e.g. prairie cordgrass) has also been effective. Physically removing the sediment and associated rhizomes, seeds, etc. above the historical A horizon, coupled with reseeding and replanting adapted plants, is the most effective method of restoration.

Transition T6a
State 6 to 8

Removal of vegetative cover and tilling for agricultural crop production.

Restoration pathway R7A
State 7 to 2

This restoration pathway from State 7: Go-Back State to State 2: Native/Invaded State may be accomplished through a successful hydrological restoration (e.g. breaking tile or plugging a drain) and seeding.

Restoration pathway R7B
State 7 to 4

This restoration pathway from State 7: Go-Back State to State 4: Invaded/Saline State may be accomplished through non-use, no fire, and no seeding with saline conditions and a successful hydrological restoration.

Restoration pathway R7C
State 7 to 5

This restoration pathway from State 7: Go-Back State to State 5: Invaded/Fresh Water State may be accomplished through non-use, no fire, and no seeding with freshwater conditions and a successful hydrological restoration

Restoration pathway R7D
State 7 to 6

This restoration pathway from State 7: Go-Back State to State 6: Invaded/Eutrophication State may be accomplished through non-use and no fire under conditions of eutrophication and sedimentation with a successful hydrological restoration.

Transition T7a
State 7 to 8

Removal of vegetative cover and tilling for agricultural crop production.

Transition T8A
State 8 to 7

This is the transition to State 7: Go-Back State. It generally results from the cessation of annual cropping.

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	**Grass-likes**			1009–2018	
	woolly sedge	CAPE42	*Carex pellita*	252–2018	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	101–757	–
	wheat sedge	CAAT2	*Carex atherodes*	101–757	–
	Bicknell's sedge	CABI3	*Carex bicknellii*	50–252	–
	shortbeak sedge	CABR10	*Carex brevior*	0–252	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	50–252	–
	water sedge	CAAQ	*Carex aquatilis*	0–252	–
	fox sedge	CAVU2	*Carex vulpinoidea*	50–252	–
	spikerush	ELEOC	*Eleocharis*	50–151	–
	rush	JUNCU	*Juncus*	50–151	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–50	–
	bulrush	SCHOE6	*Schoenoplectus*	0–50	–
2	**Warm-season Grasses**			504–1261	
	prairie cordgrass	SPPE	*Spartina pectinata*	252–1261	–
	switchgrass	PAVI2	*Panicum virgatum*	0–151	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	50–151	–
	Mexican muhly	MUME2	*Muhlenbergia mexicana*	0–101	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–50	–
3	**Cool-season Grasses**			504–1110	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	252–1009	–

	reed canarygrass	PHAR3	*Phalaris arundinacea*	50–252	–
	fowl bluegrass	POPA2	*Poa palustris*	50–252	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	50–252	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	50–252	–
	prairie wedgescale	SPOB	*Sphenopholis obtusata*	0–151	–
Forb					
4	**Forbs**			252–504	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	50–202	–
	Indianhemp	APCA	*Apocynum cannabinum*	50–151	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–151	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	50–101	–
	swamp milkweed	ASIN	*Asclepias incarnata*	50–101	–
	Canadian anemone	ANCA8	*Anemone canadensis*	50–101	–
	mint	MENTH	*Mentha*	50–101	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	50–101	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	50–101	–
	cinquefoil	POTEN	*Potentilla*	50–101	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	50–101	–
	western dock	RUAQ	*Rumex aquaticus*	0–101	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	50–101	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	50–101	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	50–101	–
	blazing star	LIATR	*Liatris*	0–101	–
	giant goldenrod	SOGI	*Solidago gigantea*	50–101	–
	goldenrod	SOLID	*Solidago*	50–101	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	50–101	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	50–101	–
	Canada germander	TECA3	*Teucrium canadense*	0–50	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–50	–
	northern bog violet	VINE	*Viola nephrophylla*	0–50	–
	wood lily	LIPH	*Lilium philadelphicum*	0–50	–
	American water horehound	LYAM	*Lycopus americanus*	0–50	–
	golden dock	RUMA4	*Rumex maritimus*	0–50	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–50	–
	white doll's daisy	BOAS	*Boltonia asteroides*	0–50	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–50	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–50	–
Shrub/Vine					
5	**Shrubs**			0–151	
	willow	SALIX	*Salix*	0–151	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–101	–

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. Those involved in developing this site description include: Stan Boltz, NRCS Range Management Specialist; David Dewald, NRCS State Biologist; Jody Forman, NRCS Range Management Specialist; Jeff Printz, NRCS State Range Management Specialist; Kevin Sedivec, Extension Rangeland Management Specialist; Shawn Dekeyser, North Dakota State University; Rob Self, The Nature Conservancy and Lee Voigt, NRCS Range Management Specialist.

MLRA 55D was split from MLRA 55B in 2022. Many of the site concepts for this MLRA are borrowed from neighboring MLRA 55B pending further vegetation and soils validation.

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Approval

Suzanne Mayne-Kinney, 11/14/2024

Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	11/14/2024
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

17. **Perennial plant reproductive capability:**