USDA Natural Resources
Conservation Service

Ecological site FX053A99X060
Overflow (Ov)

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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.

MLRA notes

Major Land Resource Area (MLRA): 053A–Northern Dark Brown Glaciated Plains

The Northern Dark Brown Glaciated Plains, MLRA 53A, is a large, agriculturally and ecologically significant area. It consists of approximately 6.1 million acres and stretches 140 miles from east to west and 120 miles from north to south, encompassing portions of 8 counties in northeastern Montana and northwestern North Dakota. This region represents part of the southern edge of the Laurentide Ice Sheet during maximum glaciation. It is one of the driest and westernmost areas within the vast network of glacially derived prairie pothole landforms of the Northern Great Plains and falls roughly between the Missouri Coteau to the east and the Brown Glaciated Plains to the west. Elevation ranges from 1,800 feet (550 meters) to 3,300 feet (1,005 meters).

Soils are primarily Mollisols, but Inceptisols and Entisols are also common. Till from continental glaciation is the predominant parent material, but alluvium and bedrock are also common. Till deposits are typically less than 50 feet thick (Soller, 2001). Underlying the till is sedimentary bedrock largely consisting of Cretaceous shale, sandstone, and mudstone (Vuke et al., 2007). The bedrock is commonly exposed on hillslopes, particularly along drainageways. Significant alluvial deposits occur in glacial outwash channels and along major drainages, including portions of the Missouri, Poplar, and Big Muddy Rivers. Large eolian deposits of sand occur in the vicinity of the ancestral Missouri River channel east of Medicine Lake (Fullerton et al., 2004). The northwestern portion of the MLRA contains a large unglaciated area containing paleoterraces and large deposits of sand and gravel known as the Flaxville gravel.

Much of this MLRA was glaciated towards the end of the Wisconsin age, and the maximum glacial extent occurred approximately 20,000 years ago (Fullerton and Colton, 1986; Fullerton et al., 2004). Subsequent erosion from major stream and river systems has created numerous drainageways throughout much of the MLRA. The result is a geologically young landscape that is predominantly a dissected till plain interspersed with alluvial deposits and dominated by soils in the Mollisol and Inceptisol orders. Much of this area is typic ustic, making these soils very productive and generally well suited to production agriculture.

Dryland farming is the predominant land use, and approximately 50 percent of the land area is used for cultivated crops. Winter, spring, and durum varieties of wheat are the major crops, with over 48 million bushels produced annually (USDA-NASS, 2017). Areas of rangeland typically are on steep hillslopes along drainages. The rangeland is mostly native mixed-grass prairie similar to the Stipa-Agropyron, Stipa-Bouteloua-Agropyron, and Stipa-Bouteloua faciations (Coupland, 1950, 1961). Cool-season grasses dominate and include rhizomatous wheatgrasses, needle and thread, western porcupine grass, and green needlegrass. Woody species are generally rare; however, many of the steeper drainages support stands of trees and shrubs, such as green ash and chokecherry. Seasonally ponded, prairie pothole wetlands may occur throughout the MLRA, but the greatest concentrations are in the east and northeast where receding glaciers stagnated and formed disintegration moraines with hummocky topography and numerous areas of poorly drained soils.

Classification relationships

NRCS Soil Geography Hierarchy
• Land Resource Region: Northern Great Plains
• Major Land Resource Area (MLRA): 053A Northern Dark Brown Glaciated Plains

National Hierarchical Framework of Ecological Units (Cleland et al., 1997; McNab et al., 2007)
• Domain: Dry
• Division: Temperate Steppe
• Province: Great Plains-Palouse Dry Steppe Province 331
• Section: Glaciated Northern Grasslands Section 331L
• Subsection: Glaciated Northern Grasslands Subsection 331La
• Landtype association/Landtype phase: N/A

National Vegetation Classification Standard (Federal Geographic Data Committee, 2008)
• Class: Mesomorphic Shrub and Herb Vegetation Class (2)
• Subclass: Temperate and Boreal Grassland and Shrubland Subclass (2.B)
• Formation: Temperate Grassland, Meadow, and Shrubland Formation (2.B.2)
• Division: Great Plains Grassland and Shrubland Division (2.b.2.Nb)
• Macrogroup: *Hesperostipa comata – Pascopyrum smithii* – Festuca hallii Grassland Macrogroup (2.B.2.Nb.2)
• Group: *Pascopyrum smithii – Hesperostipa comata* – Schizachyrium scoparium – Bouteloua spp. Mixedgrass Prairie Group (2.B.2.Nb.2.c)

EPA Ecoregions
• Level 1: Great Plains (9)
• Level 2: West-Central Semi-Arid Prairies (9.3)
• Level 3: Northwestern Glaciated Plains (42)
• Level 4: Glaciated Dark Brown Prairie (42i)
Glaciated Northern Grasslands (42j)

Montana Riparian and Wetland Sites (Hansen et. al, 1995)
• *Artemisia cana*/Agropyron smithii Habitat Type

Ecological site concept

Overflow is a common ecological site occurring on flood plains and stream terraces. The distinguishing characteristics of this site are that it is located on flood plains and that it receives additional moisture from flooding and surface water runoff. Sometimes, but not always, a seasonal water table is present at a depth of more than 40 inches below the soil surface, especially during peak runoff periods. Soils for this ecological site are typically very deep (more than 60 inches), well drained, and derived from alluvium. Characteristic vegetation is green needlegrass (*Nassella viridula*), western wheatgrass (*Pascopyrum smithii*), silver sagebrush (*Artemisia cana*), and, in some cases, snowberry (Symphoricarpos spp.).

Associated sites

FX053A99X061	**Riparian Woodland (RW)** The Riparian Woodland site is adjacent to the Overflow site, typically on lower terraces where flooding is more frequent and riparian woody plants are dominant.
FX053A99X150	**Subirrigated (Sb)** The Subirrigated site is adjacent to the Overflow site, typically on lower terraces where ground water is closer to the surface and contributes significantly to site production.
FX053A99X084	**Slough (Sl)** The Slough site is adjacent to the Overflow site, typically in oxbows or channels where flooding is very frequent and a water table is shallow and persistant.
FX053A99X713	**Saline Lowland (SLL)** The Saline Lowland site is adjacent to the Overflow site in similar landscape positions but in areas where salts have accumulated due to geology, hydrology, or soil properties.

Similar sites

FX053A99X061	**Riparian Woodland (RW)** This site differs from the Overflow site in that it occupies lower terraces and is dominated by riparian woody species. Shrubs and trees dominate the site in terms of cover and production.
FX053A99X150	**Subirrigated (Sb)** This site differs from the Overflow site in that it occupies lower terraces. It receives additional moisture primarily from ground water whereas the Overflow site receives it from surface water. Depth to a water table is 24 to 40 inches.
FX053A99X713	**Saline Lowland (SLL)** This site differs from the Overflow site in that soils are saline, sodic, or saline-sodic (EC ≥ 4 or SAR ≥ 13). It supports more sodium-tolerant vegetation and is less productive.
FX053A99X062	**Swale (Se)** This site differs from the Overflow site in that it does not receive additional moisture from stream overflow but gets run-in from above. It is located in upland swales rather than on floodplains, is slightly less productive, and has a higher proportion of mid-statured bunchgrasses than the Overflow site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia cana* (2) *Symphoricarpos occidentalis*
Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Legacy ID

R053AY709MT

Physiographic features

This ecological site occurs on the upper steps of active floodplains. The slopes typically range from 0 to 5 percent. This site occurs on all aspects.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood-plain step
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None

Elevation	1,800–3,300 ft
Slope	0–5%
Water table depth	40–72 in
Aspect	Aspect is not a significant factor

Climatic features

The Northern Dark Brown Glaciated Plains is a semi-arid region with a temperate continental climate that is characterized by frigid winters and warm to hot summers (Coupland, 1958; Richardson and Hanson, 1977; Heidel et al., 2000). The majority of precipitation occurs as steady, soaking, frontal system rains in late spring to early summer. Summer rainfall comes mainly from convection thunderstorms that typically deliver scattered amounts of rain in intense bursts. These storms may be accompanied by damaging winds and large-diameter hail and result in flash flooding along low-order streams. Approximately 80 percent of the annual precipitation occurs during the growing season. June is the wettest month, followed by July and May (Richardson and Hanson, 1977; Heidel et al., 2000). Average annual precipitation ranges from 11 inches (280 mm) near Richey, Montana, to 15 inches (380 mm) in the Little Muddy drainage near Williston, North Dakota, but precipitation varies greatly from year to year. On average, severe drought and very wet years occur with the same frequency, which is 1 out of 10 years (Coupland, 1958; Heidel et al., 2000). Extreme climatic variations, especially droughts, have the greatest influence on species cover and production (Coupland, 1958, 1961; Biondini et al., 1998). The frost-free period for this ecological site ranges from 90 to 130 days, and the freeze-free period ranges from 115 to 155 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	90-130 days
Freeze-free period (characteristic range)	115-155 days
Precipitation total (characteristic range)	11-15 in
Frost-free period (average)	110 days
Freeze-free period (average)	135 days
Precipitation total (average)	13 in

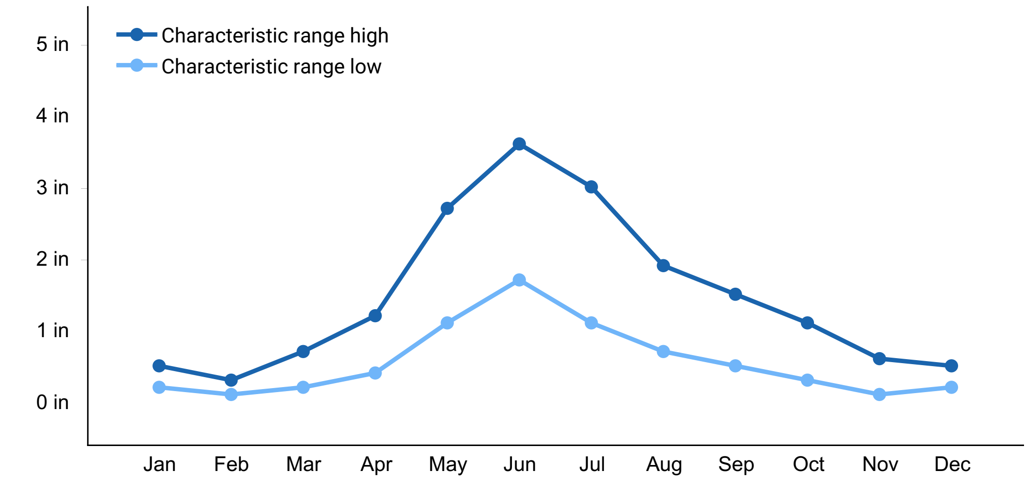


Figure 1. Monthly precipitation range

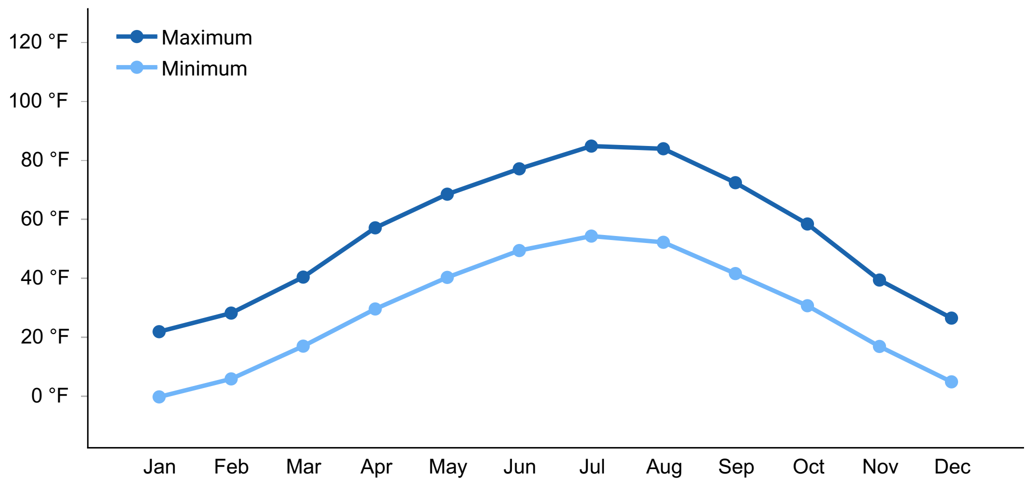


Figure 2. Monthly average minimum and maximum temperature

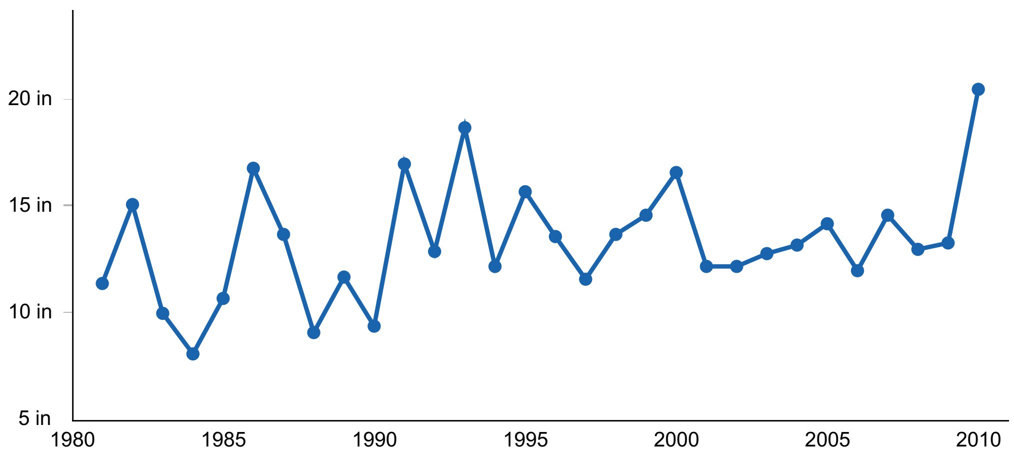


Figure 3. Annual precipitation pattern

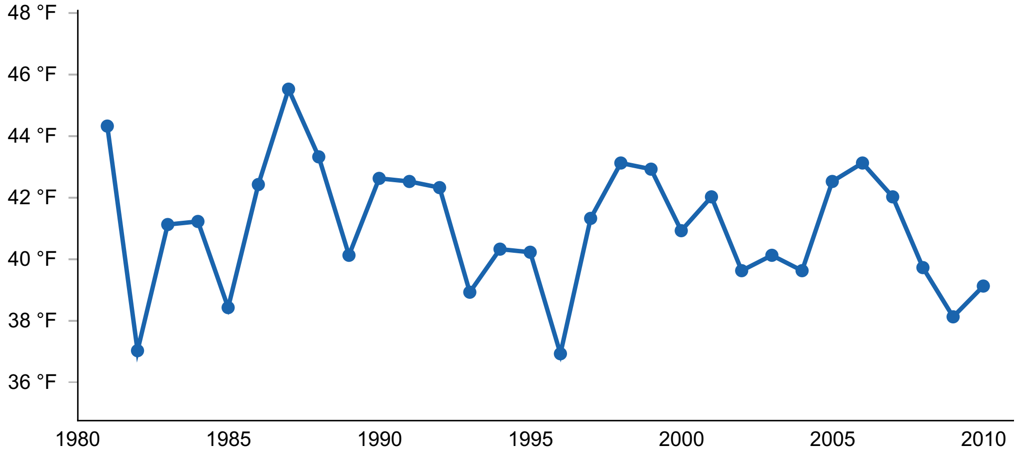


Figure 4. Annual average temperature pattern

Climate stations used

- (1) BREDETTE [USC00241088], Poplar, MT
- (2) CULBERTSON [USC00242122], Culbertson, MT
- (3) OPHEIM 10 N [USC00246236], Opheim, MT
- (4) OPHEIM 12 SSE [USC00246238], Opheim, MT
- (5) PLENTYWOOD [USC00246586], Plentywood, MT
- (6) SCOBEY 4 NW [USC00247425], Scobey, MT
- (7) SIDNEY [USC00247560], Sidney, MT
- (8) VIDA 6 NE [USC00248569], Vida, MT
- (9) WILLISTON SLOULIN INTL AP [USW00094014], Williston, ND

Influencing water features

This is a riparian site that receives additional moisture via surface runoff and from stream overflow. Hydrology is typical of upper flood plain steps in that the site contributes recharge to the stream reach during peak precipitation cycles (May-June). The site receives additional moisture from surrounding uplands that saturates the soil profile then enters the stream as either surface flow or subsurface flow. During major flood events, the site may be flooded for brief durations. Sometimes, a seasonal groundwater table deeper than 40 inches below the soil surface is present, particularly during spring runoff.

Soil features

Soils for this ecological site are typically very deep (more than 60 inches), well drained, and derived from alluvium. They have a typic ustic moisture regime, which means that the soils are moist in some or all parts for either 180 cumulative days or 90 consecutive days during the growing season but are dry in some or all parts for over 90 cumulative days, and a frigid soil temperature regime (Soil Survey Staff, 2014). All soils in this site concept receive additional moisture from surface runoff and/or brief flooding. Surface textures found on this site are typically loam, silt loam, or silty clay loam. The underlying horizons are typically comprised of stratified alluvial deposits, characterized by many thin layers of sediment deposited by past flood events. Textures are highly variable and may range from sandy loam to clay loam. In the upper 20 inches, electrical conductivity is less than 4 and the sodium absorption ratio is less than 13. Calcium carbonate equivalent is typically less than 15 percent throughout the soil profile. Soil pH classes are slightly acid to strongly alkaline in the surface horizon and slightly alkaline to strongly alkaline in the subsurface horizons. Content of coarse fragments is less than 35 percent in the upper 20 inches of soil.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Drainage class	Well drained
Soil depth	60–72 in
Electrical conductivity (0-20in)	0–3 mmhos/cm
Sodium adsorption ratio (0-20in)	0–12

Ecological dynamics

The information in this ecological site description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

The Overflow provisional ecological site in MLRA 53A consists of five states: the Historic Reference state (1), the Current Potential state (2), the Invaded state (3), the Cropland state (4), and the Post Cropland state (5). Plant communities associated with this ecological site evolved under the combined influences of climate, grazing, fire, and hydrology. Extreme climatic variability results in frequent droughts, which have the greatest influence on the relative contribution of species cover and production (Coupland, 1958, 1961; Biondini et al., 1998). Due to the dominance of cool-season graminoids, annual production is highly dependent upon mid- to late-spring precipitation (Heitschmidt and Vermeire, 2005; Anderson, 2006).

The historic ecosystem experienced periodic lightning-caused fires with estimated fire return intervals of 6 to 25 years (Bragg, 1995). Historically, Native Americans also set periodic fires. The majority of lightning-caused fires occurred in July and August, whereas Native Americans typically set fires during spring and fall to correspond with the movement of bison (Higgins, 1986). The precise effects of the historic fire return interval are not definitive, but in general the mixed-grass ecosystem was resilient to fire. Potential effects are generally temporary and may include reduction of litter, fluctuations in production, and changes in species composition (Vermeire et al., 2011, 2014).

Native grazers also shaped these plant communities. American bison (Bison bison) were the dominant historic grazer, but pronghorn (Antilocapra americana), elk (Cervus canadensis), and deer (Odocoileus spp.) were also common. Additionally, small mammals such as prairie dogs (Cynomys spp.) and ground squirrels (Urocitellus spp.) influenced this plant community (Salo et al., 2004). Grasshoppers and periodic outbreaks of Rocky Mountain locusts (Melanoplus spretus) also played an important role in the ecology of these communities (Lockwood, 2004). The mixed-grass ecosystem was resilient to grazing, although localized areas could experience shifts in species composition due to heavy grazing.

Hydrology, particularly flooding, is another major ecological driver for this site. The amount of moisture received from runoff and/or flooding has a significant effect on species composition and production. If the hydrology is altered, or if downcutting or incisment of the stream channel occurs, production will decrease and the site may transition into a drier upland site. Excessive ponding or flooding of the site may, in some cases, cause salinization. On a large portion of this site, the hydrology has been significantly altered by irrigation, major dams, and diversions. The implications of this alteration have not been fully studied and require further investigation.

Following European settlement, fire was largely eliminated, domestic livestock replaced native ungulates as the primary grazers, and non-native species were introduced to the ecosystem. Improper grazing of this site can result in a reduction of the cover of the cool-season midgrasses and an increase in blue grama (Hansen et al., 1995; Smoliak et al., 1972). Bunchgrasses are generally affected first. While western wheatgrass appears to be relatively resistant to grazing on this site, presumably due to the increased moisture availability and its rhizomatous nature, it can eventually be significantly reduced by improper grazing. Improper grazing practices include any practices that do not allow sufficient opportunity for plants to physiologically recover from a grazing event or multiple grazing events within a given year and/or that do not provide adequate cover to prevent soil erosion over time. These practices may include, but are not limited to, overstocking, continuous grazing, and/or inadequate seasonal rotation moves over multiple years. Periods of drought can also reduce mid-statured, cool-season grasses (Coupland, 1958, 1961). Further degradation of the site due to improper grazing can result in substantial reduction or elimination of mid-statured bunchgrasses, reduced vigor of rhizomatous wheatgrasses, and dominance of unpalatable forbs (Hansen et al., 1995).

The effects of an altered fire regime are not completely understood at the time of this writing, but evidence suggests that long-term fire suppression can result in accumulations of litter and may contribute to increased abundance of non-native grasses (Murphy and Grant, 2005; Vermeire et al., 2011; Whisenant, 1990). Conversely, fire return intervals of less than 6 years, such as annual burning, can reduce productivity and shift species composition toward warm-season, short-statured grasses (Shay et al., 2001; Smith and McDermid, 2014).

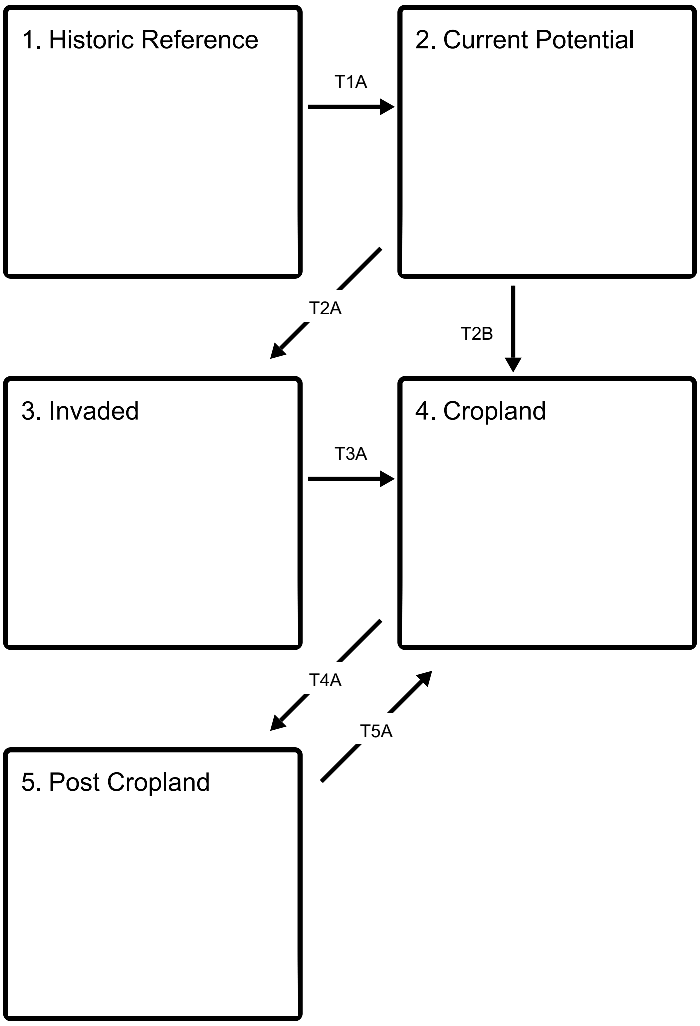
This ecological site is highly susceptible to invasion by non-native species and most, if not all, extant examples of this site have some degree of invasion. Non-native grasses such as bluegrasses (Poa spp.) and smooth brome (*Bromus inermis*) are the most common invasive species. These species are widespread throughout the Northern Great Plains and can invade relatively undisturbed grasslands (Heidinga and Wilson, 2002; Henderson and Naeth, 2005; Toledo et al., 2014). In most cases native ecological function is relatively intact, but in some cases non-native grasses will displace native species and dominate the ecological functions of the site.

The Overflow ecological site is often considered prime farmland and the vast majority of this site has been converted to cropland, mostly for irrigated hay. Common crop species include alfalfa, orchardgrass, and a grass/alfalfa mix. Annual crops such as wheat and barley are occasionally planted as part of a rotation or when renovating hay fields. Flood irrigation is common and extensive irrigation systems are in place in many parts of the MLRA. Water is typically diverted from nearby streams and delivered to fields via canals. When taken out of production, this site is either allowed to revert back to perennial grassland or is seeded back to perennial grass. When this site is taken out of production, the site is either allowed to revert back to native vegetation or is managed as perennial pasture. Sites left to undergo natural plant succession after cultivation can, over several decades, support cool-season midgrasses, although hydrology is typically drastically altered from the Reference State and invasion of non-native species is highly probable. Those sites seeded with non-native species may persist with this cover type indefinitely. Even when reseeded to native species, the site is unlikely to return to reference conditions due to altered hydrology and soil properties.

The state-and-transition model (STM) suggests possible pathways that plant communities on this site may follow as a result of a given set of ecological processes and management. The site may also support states not displayed in the STM diagram. Landowners and land managers should seek guidance from local professionals before prescribing a particular management or treatment scenario. Plant community responses vary across this MLRA due to variability in weather, soils, and aspect. The reference community phase may not necessarily be the management goal. The lists of plant species and species composition values are provisional and are not intended to cover the full range of conditions, species, and responses for the site. Species composition by dry weight is provided when available and is considered provisional based on the sources identified in the narratives associated with each community phase.

State and transition model

Ecosystem states



T1A - Introduction of non-native grass species, such as Kentucky bluegrass, smooth brome, and crested wheatgrass.

T2A - Displacement of native species by non-native invasive species (Kentucky bluegrass, smooth brome, noxious weeds, etc.)

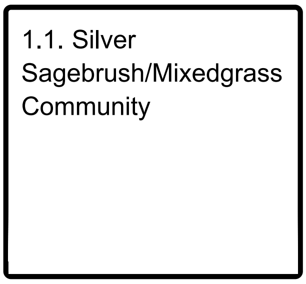
T2B - Conversion to cropland

T3A - Conversion to cropland

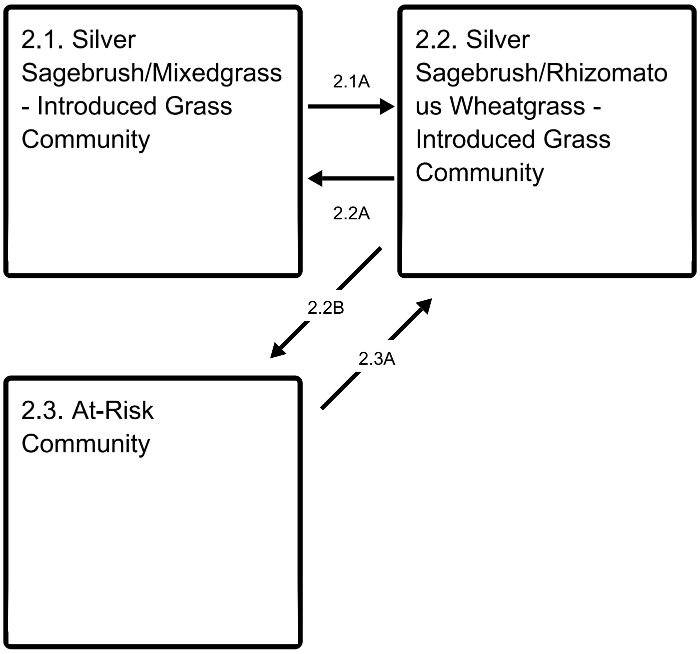
T4A - Cessation of annual cropping

T5A - Conversion to cropland

State 1 submodel, plant communities



State 2 submodel, plant communities



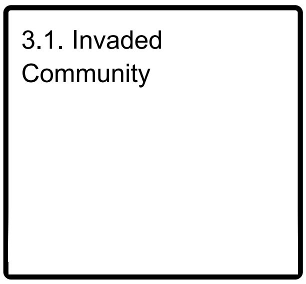
2.1A - Drought, improper grazing management

2.2A - Return to normal or above average precipitation, proper grazing management

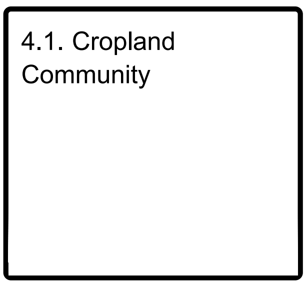
2.2B - Prolonged drought, improper grazing management, or a combination of these factors.

2.3A - Normal or above-normal spring moisture, proper grazing management.

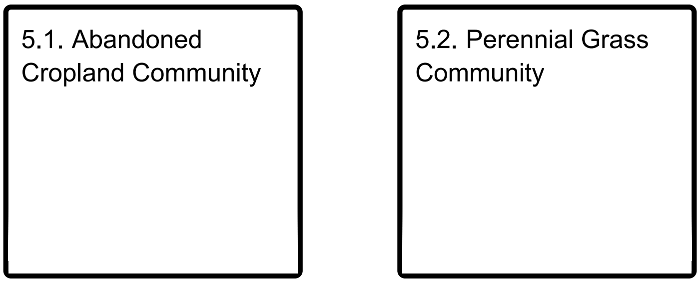
State 3 submodel, plant communities



State 4 submodel, plant communities



State 5 submodel, plant communities



State 1
Historic Reference

The Historic Reference state (1) contains one community phase characterized by silver sagebrush, mid-statured bunchgrasses and rhizomatous wheatgrasses. This state is considered extinct and is included here for historical reference purposes. It evolved under the combined influences of climate, grazing, and fire, with climatic variation having the greatest influence on cover and production. In general, this state was resilient to grazing and fire, although these factors could influence species composition in localized areas.

Community 1.1
Silver Sagebrush/Mixedgrass Community

The Silver Sagebrush/Mixedgrass Community Phase (1.1) was characterized by silver sagebrush, rhizomatous wheatgrasses, and mid-statured bunchgrasses. The predominant rhizomatous wheatgrasses were western wheatgrass (*Pascopyrum smithii*) and thickspike wheatgrass (*Elymus lanceolatus*). Both species were present, but thickspike wheatgrass became more common in the northern extent of this site. Mid-statured, cool-season bunchgrasses were common with green needlegrass (*Nassella viridula*) by far the most abundant species. The mat-forming, warm-season, perennial grass blue grama (*Bouteloua gracilis*) and prairie Junegrass (*Koeleria macrantha*) were the predominant shortgrasses (Coupland, 1950, 1961). Forbs comprised about 15 percent of the cover and shrubs about 30 percent.

State 2
Current Potential

The Current Potential state (2) contains three community phases characterized by rhizomatous wheatgrasses and mid-statured bunchgrasses. It evolved under the combined influences of climate, grazing, and fire, with climatic variation having the greatest influence on cover and production. This state differs from the historical reference state in that it is influenced by introduced plant species and has altered fire and grazing regimes. In general, this state is resilient to grazing and fire, although these factors can influence species composition in localized areas.

Community 2.1

Silver Sagebrush/Mixedgrass - Introduced Grass Community

The Silver Sagebrush/Mixedgrass - Introduced Grass Community Phase (2.1) is predominantly native rhizomatous wheatgrasses and mid-statured bunchgrasses but has some degree of non-native grass establishment. The predominant rhizomatous wheatgrasses are western wheatgrass and thickspike wheatgrass. Both species may be present, but thickspike wheatgrass becomes more common in the northern extent of this site. Mid-statured, cool-season bunchgrasses are common with green needlegrass by far the most abundant species. The mat-forming, warm-season, perennial grass blue grama and prairie Junegrass are the predominant shortgrasses (Coupland, 1950, 1961). Other grass species that may be present at low cover are bearded slender wheatgrass (*Elymus trachycaulus* ssp. subsecundus), western porcupine grass (*Hesperostipa curtiseta*), and needle and thread (*Hesperostipa comata*). Shrubs and subshrubs occur at about 30 percent cover and include silver sagebrush (*Artemisia cana*), western snowberry (*Symphoricarpos occidentalis*) and rose (Rosa spp). Non-native species typically comprise 1 to 3 percent of the plant community and may include Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*).

Community 2.2
Silver Sagebrush/Rhizomatous Wheatgrass - Introduced Grass Community

The Silver Sagebrush/Rhizomatous Wheatgrass - Introduced Grass Community Phase (2.2) is characterized by declining abundance of desirable grasses and an increase in unpalatable forbs (Hansen et al., 1995). Rhizomatous wheatgrass are still the dominant grass species, but their abundance and production are beginning to decline. Green needlegrass has been significantly reduced and persists at low cover and low vigor. Unpalatable forbs, such as cudweed sagewort (*Artemisia ludoviciana*) and common yarrow (*Achillea millefolium*), also increase in abundance. Cover of shrubs remains around 30 percent.

Community 2.3
At-Risk Community

The At-Risk Community Phase (2.3) occurs when site condition declines due to prolonged drought (approximately 3 years or more) or improper grazing management. The plant community has become dominated by silver sagebrush and unpalatable forbs such as cudweed sagewort and common yarrow. Rhizomatous wheatgrasses, such as western wheatgrass persist, but cover is low, and vigor is substantially reduced. Mid-statured bunchgrasses, particularly green needlegrass, have been eliminated or nearly so. Introduced grasses such as Kentucky bluegrass may also increase in this phase. The decreased vigor of native species may make them more susceptible to displacement by non-native species such as introduced bluegrasses.

Pathway 2.1A

Community 2.1 to 2.2

Drought, improper grazing management, or a combination of these factors can shift the Silver Sagebrush/Mixedgrass - Introduced Grass Community Phase (2.1) to the Silver Sagebrush/Rhizomatous Wheatgrass - Introduced Grass Community Phase (2.2).

Pathway 2.2A
Community 2.2 to 2.1

Normal or above-normal spring precipitation and proper grazing management transitions the Silver Sagebrush/Rhizomatous Wheatgrass - Introduced Grass Community Phase (2.2) back to the Silver Sagebrush/Mixedgrass - Introduced Grass Community Phase (2.1).

Conservation practices

Prescribed Grazing

Pathway 2.2B
Community 2.2 to 2.3

Prolonged drought, continued improper grazing practices, or a combination of these factors can shift the Silver Sagebrush/Rhizomatous Wheatgrass - Introduced Grass Community Phase (2.2) to the At-Risk Community Phase (2.3). The Silver Sagebrush/Rhizomatous Wheatgrass - Introduced Grass Community Phase (2.2) transitions to the At-Risk Community Phase (2.3) when mid-statured bunchgrasses become rare and contribute little to production. In addition, mid-statured rhizomatous grass cover and vigor are substantially reduced.

Pathway 2.3A
Community 2.3 to 2.2

Normal or above-normal spring precipitation and proper grazing management transition the At-Risk Community Phase (2.3) back to the Silver Sagebrush/Rhizomatous Wheatgrass - Introduced Grass Community Phase (2.2)

Conservation practices

Prescribed Grazing

State 3
Invaded

The Invaded state (3) occurs when invasive plant species invade adjacent native grassland communities and displace the native species. Data suggest that native species diversity declines significantly when invasive species exceed 30 percent of the plant community. The most common concerns are non-native perennial grasses such as Kentucky bluegrass and smooth brome, which are widespread throughout the Northern Great Plains (Toledo et al., 2014). Kentucky bluegrass, in particular, is very competitive and displaces native species by forming dense root mats, altering nitrogen cycling, and having allelopathic effects on germination (DeKeyser et al., 2013). It may also alter soil surface hydrology and modify soil surface structure (Toledo et al., 2014). Plant communities dominated by Kentucky bluegrass have significantly less cover of native grass and forb species (Toledo et al., 2014; DeKeyser et al., 2009). Invasive grass species can invade relatively undisturbed grasslands, although it is not clear what triggers them to displace native species. In some cases, they have been found to substantially increase under long-term grazing exclusion (DeKeyser et al., 2009, 2013; Grant et al., 2009), but a consistent correlation to grazing management practices cannot be made at this time. Reduced plant species diversity, simplified structural complexity, and altered biologic processes result in a state that is substantially departed from both the Reference state (1) and the Current Potential state (2). Noxious weeds such as leafy spurge and Canada thistle are not widespread in MLRA 53A, but they can be a concern in localized areas. These species are very aggressive perennials. They typically displace native species and dominate ecological function when they invade a site. In some cases, these species can be suppressed through intensive management (herbicide application, biological control, or intensive grazing management). Control efforts are unlikely to eliminate noxious weeds, but their density can be sufficiently suppressed so that species composition and structural complexity are similar to that of the Current Potential state (2). However, cessation of control methods will most likely result in recolonization of the site by the noxious species.

Community 3.1
Invaded Community

Encroachment by introduced grasses, noxious weeds, and other invasive species is common. Rangeland health attributes have departed substantially from both the Reference State (1) and the Contemporary Reference State (2).

State 4
Cropland

The Cropland state (4) occurs when land is put into cultivation. Deep, fertile soils and favorable moisture conditions make the Overflow ecological site prime farmland. Additionally, its proximity to perennial streams make it ideal for irrigation. Because of this, much of the Overflow ecological site has been converted to farmland. It is most commonly planted to non-native perennial species and irrigated for production of hay. Common species include alfalfa, orchardgrass, and grass/alfalfa mixes. Annual crops such as wheat and barley may also be planted in rotation. Flood irrigation is most common but center pivot sprinklers are used in some areas. Cropping, irrigation projects, and the Fort Peck dam have vastly altered vegetation and hydrology on much of the Overflow ecological site.

Community 4.1
Cropland Community

Typically non-native, perennial hay. Cool-season cereal grains such as wheat or barley may be grown in rotation in some instances.

State 5
Post Cropland

The Post Cropland state (5) occurs when cultivated cropland is abandoned and allowed to either revegetate naturally or is seeded back to perennial species for grazing or wildlife use. This state can transition back to the Cropland state (4) if the site is put back into cultivation.

Community 5.1
Abandoned Cropland Community

The Abandoned Cropland Community Phase (5.1) typically occurs when cropland is abandoned with no further management. It may also occur when cropland is abandoned and seeded to perennial forage species and the reseeding fails. Shortly after cropland is abandoned, annual forbs invade the site (Samuel and Hart, 1994). At this phase, the site is highly susceptible to erosion due to the absence of perennial species. Eventually, these pioneering annual species are replaced by perennial species such as rhizomatous wheatgrasses. This phase is highly susceptible to invasion by exotic species, and nonnative species such as smooth brome, Kentucky bluegrass, and noxious weeds may be common. Due to significant changes in soil structure, organic matter content, and possibly hydrology, the site is unlikely to return to the Contemporary Reference State (2) within a reasonable amount of time.

Community 5.2
Perennial Grass Community

The Perennial Grass Community Phase (5.2) occurs when the site is seeded to perennial species for livestock forage or wildlife cover. Most frequently the site is seeded to introduced rhizomatous grasses, such as intermediate wheatgrass (*Thinopyrum intermedium*), which can persist for several decades. Some introduced species, such as smooth brome, are very aggressive, commonly form a monoculture, and can invade adjacent sites if conditions are favorable. Sometimes irrigation and fertilization are used to boost production. Fine-textured soils may be subject to ponding and salinization if irrigation is not carefully managed. A mixture of native species may also be seeded to provide species composition and structural complexity similar to that of the Contemporary Reference State (2). However, soil quality and hydrology have been substantially altered and are unlikely to return to pre-cultivation conditions.

Transition T1A
State 1 to 2

Introduction of non-native grass species occurred in the early 20th century. The naturalization of these species in relatively undisturbed grasslands, coupled with changes in fire and grazing regimes, transitions the Reference state (1) to the Current Potential state (2).

Transition T2A
State 2 to 3

The Current Potential state (2) transitions to the Invaded state (3) when aggressive perennial grasses or noxious weeds displace native species. The most common concerns are introduced bluegrasses and smooth brome, which are widespread invasive species in the Northern Great Plains (Grant et al., 2009; Toledo et al., 2014). The precise triggers of this transition are not clear, but data suggest that exclusion of grazing and fire may be a contributing factor in some cases (DeKeyser et al., 2013). In addition, other rangeland health attributes, such as reproductive capacity of native grasses and soil quality, have been substantially altered.

Transition T2B
State 2 to 4

Tillage or application of herbicide followed by seeding of cultivated crops, such as winter wheat, spring wheat, and barley, transitions the Current Potential state (2) to the Cropland state (4).

Transition T3A
State 3 to 4

Tillage or application of herbicide followed by seeding of cultivated crops, such as winter wheat, spring wheat, and barley, transitions the Invaded state (3) to the Cropland state (4).

Transition T4A
State 4 to 5

The transition from the Cropland state (4) to the Post Cropland state (5) occurs with the cessation of cultivation. The site may also be seeded to perennial forage species. Such seedings may be comprised of introduced grasses and legumes, or a mix of native species.

Transition T5A
State 5 to 4

Tillage or application of herbicide followed by seeding of cultivated crops, such as winter wheat, spring wheat, and barley, transitions the Post Cropland state (5) to the Cropland state (4).

Additional community tables

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience was used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in this ecological site description.

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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)	
Contact for lead author	
Date	04/23/2025
Approved by	Kirt Walstad

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:**