Ecological site FX053A99X756
Woody Draw (WD)

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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 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: Forest and Woodland Class (1)
• Subclass: Temperate and Boreal Forest and Woodland Subclass (1.B)
• Formation: Cool Temperate Forest and Woodland Formation (1.B.2)
• Division: North American Great Plains Forest and Woodland Division (1.B.2.Ne)
• Macrogroup: Great Plains Forest and Woodland Macrogroup (1.B.2.Ne.1)
• Group: Great Plains Mesic Forest and Woodland Group (1.B.2.Ne.1.b)
• Alliance: Great Plains Ash - Elm Ravine Forest

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)

Ecological site concept

Woody Draw is an extensive ecological site occurring on moderately steep to very steep landscapes where the till plain has been dissected by streams or rivers. It typically occurs in the narrowest, most sheltered swales and is most common on northerly aspects. The distinguishing characteristic of this site is that it receives additional moisture via surface runoff from adjacent sites and that it supports a predominantly woody plant community. Soils for this ecological site are typically very deep (more than 60 inches), well drained, and derived from alluvium or till. Characteristic vegetation is green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), chokecherry (*Prunus virginiana*), and serviceberry (*Amelanchier alnifolia*).

Associated sites

FX053A99X062	**Swale (Se)** The Swale ecological site is found adjacent to the Woody Draw ecological site on similar landforms. It is typically downslope from the Woody Draw ecological site and generally occurs on broader, less sheltered swale microfeatures.
FX053A99X032	**Loamy (Lo)** The Loamy ecological site is found upslope from and commonly surrounding the Woody Draw ecological site. It is typically found in summit positions where the upper 4 inches of soil contains 18 to 35 percent clay.
FX053A99X040	**Loamy Steep (LoStp)** The Loamy Steep ecological site is found on slopes of 15 percent or greater upslope from the Woody Draw ecological site. It occurs on backslope positions whereas the Woody Draw ecological site occurs on toeslopes on swale microfeatures.
FX053A99X029	**Limy Steep (LyStp)** The Limy Steep ecological site is found on slopes of 15 percent or greater upslope from the Woody Draw ecological site. It occurs on convex backslope positions whereas the Woody Draw ecological site occurs on swale microfeatures.

Similar sites

FX053A99X062	**Swale (Se)** This site differs from the Woody Draw ecological site in that it is dominated by herbaceous species. Bunchgrasses dominate the site in terms of cover and production.
FX053A99X061	**Riparian Woodland (RW)** This site differs from the Woody Draw ecological site in that it is on flood plains rather than upland swales. It generally is on stream terraces adjacent to a perennial stream reach. Woody vegetation typically contains riparian species such as sandbar willow and plains cottonwood.
FX053A99X032	**Loamy (Lo)** This site differs from the Woody Draw ecological site in that it is in higher topographical positions that do not receive additional moisture and it does not support woody vegetation whereas the Woody Draw ecological site is in the bottoms of coulees or swales and receives additional moisture.

Table 1. Dominant plant species

Tree	(1) *Fraxinus pennsylvanica* (2) *Ulmus americana*
Shrub	(1) *Prunus virginiana* (2) *Amelanchier alnifolia*
Herbaceous	Not specified

Legacy ID

R053AY723MT

Physiographic features

This ecological site occurs on moderately steep to very steep landscapes, typically where the landscape has been dissected by streams, rivers, or drainageways. Slopes typically range from 15 to 45 percent. This site occurs most commonly on northern aspects.

Table 2. Representative physiographic features

Landforms	(1) Till plain > Draw (2) Till plain > Drainageway
Flooding frequency	None
Ponding frequency	None
Elevation	1,800–3,300 ft
Slope	15–45%
Aspect	NW, N, NE

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

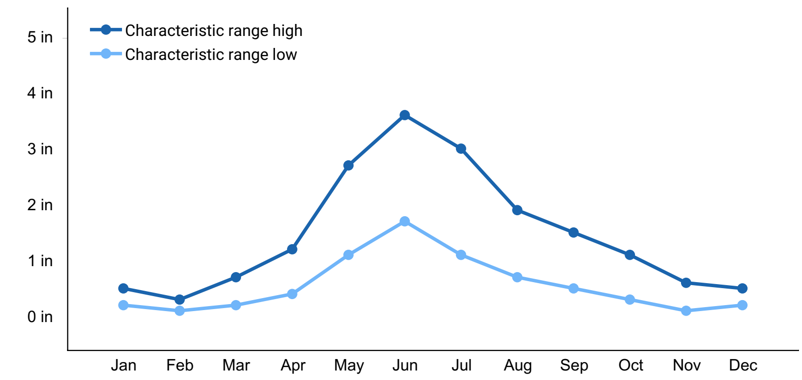


Figure 1. Monthly precipitation range

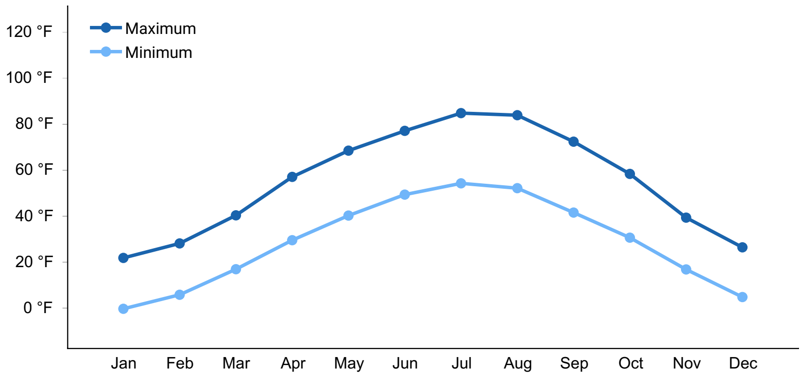


Figure 2. Monthly average minimum and maximum temperature

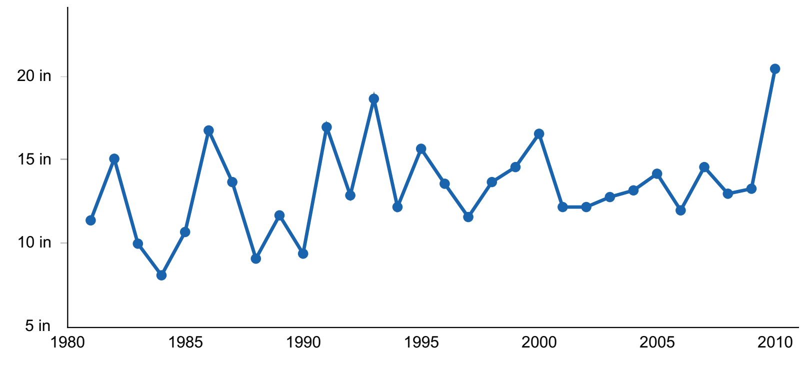


Figure 3. Annual precipitation pattern

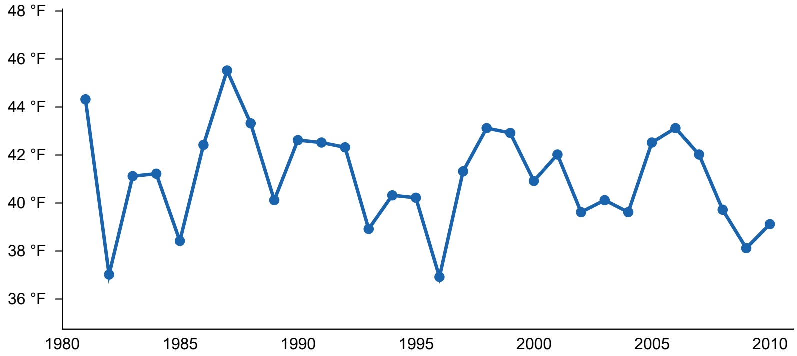


Figure 4. Annual average temperature pattern

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 an upland ecological site and is not influenced by a water table but does receive run in from adjacent sites. Due to the semi-arid climate in which it occurs, the water budget is normally contained within the soil pedon. Soil moisture is recharged by spring rains, but it but rarely exceeds field capacity in the upper 40 inches before being depleted by evapotranspiration. During intense precipitation events, precipitation rates frequently exceed infiltration rates and this site receives additional moisture from upslope sites via surface runoff. Moisture loss through evapotranspiration exceeds precipitation for the majority of the growing season, but this site receives enough moisture from runoff to remain moist much longer than adjacent sites.

Soil features

Soils for this ecological site are typically very deep (more than 60 inches), well drained, and derived from alluvium or till. Most soils in this concept are classified as pachic, meaning they have a mollic epipedon that is at least 16 inches thick. They have a typic ustic soil 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).

Surface textures found in this site are most commonly loam, silt loam or clay loam and typically contain between 25 to 35 percent clay. The underlying horizons typically contain 18 to 35 percent clay and have loam or clay loam textures. Calcium carbonate equivalent is typically less than 10 percent throughout the soil profile. In the upper 20 inches, electrical conductivity is less than 4 and the sodium absorption ratio is less than 13. Soil pH classes are neutral in the surface horizon and moderately to strongly alkaline in the subsurface horizons. Content of coarse fragments is less than 35 percent in the upper 20 inches of soil and is typically less than 15 percent.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock (2) Till–igneous, metamorphic and sedimentary rock
Surface texture	(1) Loam (2) Silt loam (3) Clay loam

Drainage class	Well drained
Soil depth	60–72 in
Calcium carbonate equivalent (0-72in)	0–10%
Electrical conductivity (0-20in)	0–3 mmhos/cm
Sodium adsorption ratio (0-20in)	0–12
Subsurface fragment volume <=3" (0-20in)	0–15%
Subsurface fragment volume >3" (0-20in)	0–15%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Soil depth	Not specified
Calcium carbonate equivalent (0-72in)	Not specified
Electrical conductivity (0-20in)	Not specified
Sodium adsorption ratio (0-20in)	Not specified
Subsurface fragment volume <=3" (0-20in)	0–34%
Subsurface fragment volume >3" (0-20in)	0–34%

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 Woody Draw provisional ecological site in MLRA 53A consists of four states: the Historic Reference State (1), the Contemporary Reference State (2), the Shrub Dominated State (3), and the Herbaceous Understory State (4). Plant communities associated with this ecological site evolved under the combined influences of climate, grazing, and fire. 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 woody draw ecosystem was resilient to fire. The primary effect of fire is believed to be a temporary reduction in tree and shrub cover.

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).

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. Aside from drought, livestock grazing is now the principle disturbance on the landscape.

Improper grazing of this site can result in a reduction of shrub diversity and an increase in less palatable shrubs (Hansen et al., 1995). Improper grazing in combination with a stand replacing fire can result in a shrub dominated state with low species diversity. 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. Further degradation of the site due to improper grazing will eventually eliminate nearly all shrubs and result in an open, decadent stand of green ash and American elm in the top canopy with an herbaceous dominated understory. Once the stand has transitioned from a shrub-dominated understory to an herbaceous dominated understory, returning it to its former state is very difficult (Hansen et al., 1995).

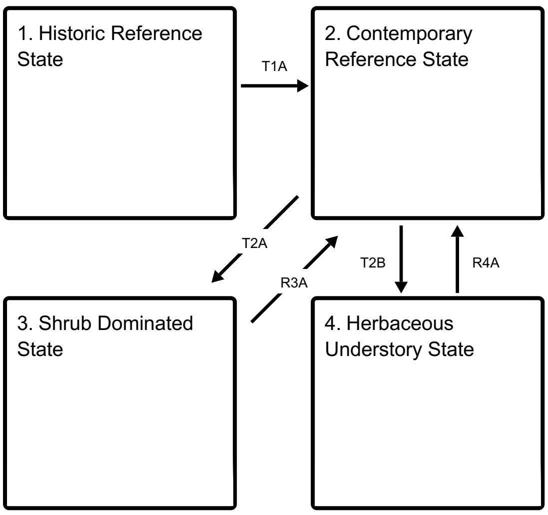
Most, if not all, extant examples of this site have some degree of invasion by non-native species. Introduced bluegrasses (Poa spp.) are the most common invasive species, but smooth brome (*Bromus inermis*) and noxious weeds can also be a concern in some areas. These species are widespread throughout the Northern Great Plains can invade relatively undisturbed grasslands (Toledo et al., 2014). 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).

Due to the steep and broken topographic setting, this ecological site is generally not suitable for cropland. In general, this site has not been converted to cropland and has remained in native vegetation.

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, etc.

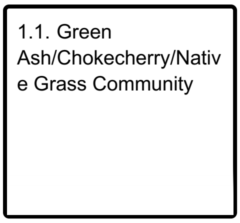
T2A - Stand-replacing fire in combination with prolonged improper grazing management

T2B - Prolonged improper grazing management

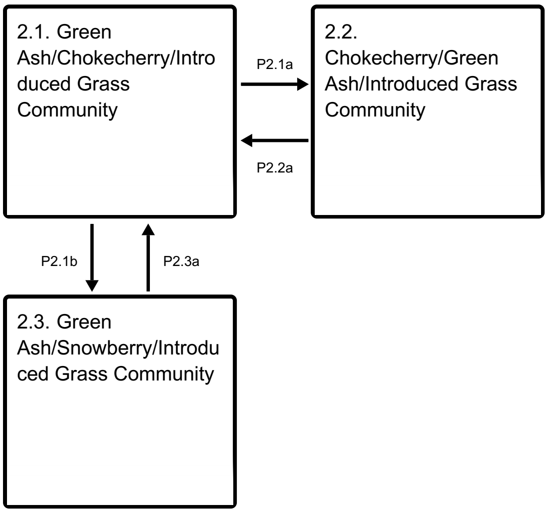
R3A - Proper grazing management, tree/shrub planting, intensive weed management (management intensive and costly)

R4A - Proper grazing management, tree/shrub planting, intensive weed management (management intensive and costly)

State 1 submodel, plant communities



State 2 submodel, plant communities



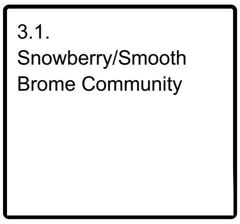
P2.1a - Stand-replacing fire

P2.1b - Improper grazing management

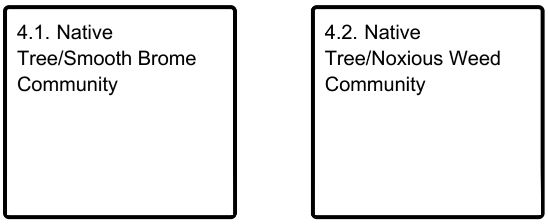
P2.2a - Lack of disturbance, tree regeneration, and woody plant regrowth

P2.3a - Proper grazing management

State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Historic Reference State

The Historic Reference State (1) contained one community phase characterized by three primary vegetation layers: trees, shrubs, and herbaceous species. Primary species were green ash (*Fraxinus pennsylvanica*), chokecherry (*Prunus virginiana*), and native grasses. This state is considered extinct and is included here for historical reference purposes. It evolved under the combined influences of climate, grazing, and fire. Climatic variation generally had the greatest influence on cover and production. In general, this state was resilient to grazing, however, heavy grazing pressure could influence species composition in localized areas. This state was believed to be resilient to fire. Most tree and shrub species in this state are capable of re-sprouting from crowns or roots following fire (Coladonato, 1992; Fryer, 1997; Johnson, 2000; Gucker, 2005). Woody vegetation would likely recover from fire in 3 years or less.

Community 1.1
Green Ash/Chokecherry/Native Grass Community

The Green Ash/Chokecherry/Native Grass Phase (1.1) was characterized by a diverse mix of native trees, shrubs, and grasses. The predominant overstory species were green ash and American elm (*Ulmus americana*). The understory was diverse and shrubs such as chokecherry and serviceberry (*Amelanchier alnifolia*) were common. The herbaceous layer was comprised mostly of native grasses such as Canada wildrye (*Elymus canadensis*) and slender wheatgrass (*Elymus trachycaulus*).

State 2
Contemporary Reference State

The Contemporary Reference State (2) contains three community phases phase characterized by three primary vegetation layers: trees, shrubs, and herbaceous species. 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, however, heavy grazing pressure could influence species composition in localized areas. This state is believed to be resilient to fire since most tree and shrub species in this state are capable of re-sprouting from crowns or roots following fire; however, further study of fire dynamics is needed. The herbaceous layer has been significantly altered and is predominantly non-native species such as smooth brome (*Bromus inermis*), quackgrass (*Elymus repens*), and Kentucky bluegrass (*Poa pratensis*).

Community 2.1
Green Ash/Chokecherry/Introduced Grass Community

The Green Ash/Chokecherry/Introduced Grass Phase (2.1) is characterized by a diverse community of trees and shrubs. The primary tree species are green ash and American elm, but other native trees such as quaking aspen (*Populus tremuloides*) and box elder (*Acer negundo*) may also occur. The tree canopy is typically 20 to 80 percent, with tree diameters of 4 to 16 inches diameter at breast height (DBH). Chokecherry and serviceberry are the dominant shrubs, but the shrub layer is diverse and may also contain western snowberry (*Symphoricarpos occidentalis*), gooseberry (Ribes spp.), Woods' rose (*Rosa woodsii*), and redosier dogwood (*Cornus sericea*). The herbaceous layer is mostly non-native grasses, but some native grasses such as Canada wildrye may also persist. Common forbs are goldenrod (Solidago spp.), purple meadow rue (*Thalictrum dasycarpum*), and Northern bedstraw (*Galium boreale*). Though not abundant, western poision ivy (*Toxicodendron rydbergii*) frequently occurs at low cover.

Community 2.2
Chokecherry/Green Ash/Introduced Grass Community

The Chokecherry/Green Ash/Introduced Grass Phase (2.2) occurs following a stand replacing fire. It is characterized by a decline in tree cover and a predominance of shrubs, particularly chokecherry. Fire mortality reduces tree cover, particularly American elm which is sensitive to fire and may decline in cover by 40 to 90 percent (Coladonato, 1992). Green ash is more resilient to fire and commonly resprouts from roots following fire (Gucker, 2005), but it does not regrow as rapidly as the shrub component. Therefore, tree canopy cover is reduced for some time following fire and recovers gradually. The tree canopy is typically 10 to 25 percent, and diameters are 4 inches or less DBH. Shrubs such as chokecherry and serviceberry sprout prolifically from roots following fire (Fryer, 1997; Johnson, 2000) and will likely recover to pre-fire densities in 3 years or less. Nonnative herbaceous species are common in this phase.

Community 2.3
Green Ash/Snowberry/Introduced Grass Community

The Green Ash/Snowberry/Introduced Grass Phase (2.3) occurs when the site condition declines due to improper grazing management. Improper grazing management will sharply reduce tree reproduction, resulting in an older, more open stand (Hansen et al., 1995). The tree canopy is approximately 20 to 60 percent, with tree diameters of 12 inches or more DBH. Diversity and structure of the shrub layer is also reduced. Palatable shrubs such as chokecherry and serviceberry become rare or absent and are replaced by less favored species such as snowberry and Woods' rose (Hanson et al., 1995). Nonnative herbaceous species are common in this phase.

Pathway P2.1a
Community 2.1 to 2.2

A stand replacing fire transitions the Green Ash/Chokecherry/Introduced Grass Phase (2.1) to the Chokecherry/Green Ash/Introduced Grass Phase (2.2).

Pathway P2.1b
Community 2.1 to 2.3

Improper grazing management can shift the Green Ash/Chokecherry/Introduced Grass Phase (2.1) to the Green Ash/Snowberry/Introduced Grass Phase (2.3).

Pathway P2.2a
Community 2.2 to 2.1

A lack of disturbance, tree regeneration, and natural woody plant regrowth transitions the Chokecherry/Green Ash/Introduced Grass Phase (2.2) to the Green Ash/Chokecherry/Introduced Grass Phase (2.1).

Pathway P2.3a
Community 2.3 to 2.1

Proper grazing management can return the Green Ash/Snowberry/Introduced Grass Phase (2.3) to the Green Ash/Chokecherry/Introduced Grass Phase (2.1).

Conservation practices

Prescribed Grazing

State 3
Shrub Dominated State

The Herbaceous Understory State (2) consists of one community phase. The dynamics of this state are driven by fire and long-term improper grazing management practices. It is characterized by a shrub dominated community with little or no tree regeneration. Once the stand has transitioned to a shrub-dominated state, reestablishment of tree cover may be a very difficult and lengthy process.

Community 3.1
Snowberry/Smooth Brome Community

The Snowberry/Smooth Brome Phase (3.1) occurs when the tree layer has been largely removed due to a combination of fire and prolonged improper grazing practices. Normal post-fire tree resprouting is severely restricted or eliminated by browsing and trampling (Hansen et al., 1995). Palatable shrubs such as chokecherry are also severely suppressed. Less favored shrubs such as snowberry and Woods' rose dominate the plant community. The herbaceous layer is predominantly smoooth brome but may also contain other non-native species such as quackgrass and Kentucky bluegrass.

State 4
Herbaceous Understory State

The Herbaceous Understory State (4) occurs when the shrub understory has been removed due to long-term improper grazing practices. The overstory typically consists of a mature, open stand green ash and American elm. The understory consists primarily of non-native grasses, particularly smooth brome. Noxious weeds such as leafy spurge (*Euphorbia esula*) and Canada thistle (*Cirsium arvense*) may be prominent in some cases. Once the stand has transitioned from a shrub-dominated understory to an herbaceous dominated understory, returning it to its former state is very difficult (Hansen et al., 1995).

Community 4.1
Native Tree/Smooth Brome Community

The Native Tree/Smooth Brome Phase (4.1) consists of a mature, open tree overstory with a non-native grass understory. The overstory is typically green ash and American elm, but may also include, juniper (*Juniperus scopulorum*), box elder, or other native tree species. The understory is dominated by the introduced grass smooth brome but may also include other species, such as quackgrass and Kentucky bluegrass.

Community 4.2
Native Tree/Noxious Weed Community

The Native Tree/Noxious Weed Phase (4.2) consists of a mature, open tree overstory with a noxious weed understory. This community develops when removal of the understory by improper grazing occurs in proximity to a noxious weed seed source. The overstory is typically green ash and American elm, but may also include, juniper, box elder, or other native tree species. The understory is dominated by noxious weeds such as leafy spurge and Canada thistle.

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 Contemporary Reference State (2).

Transition T2A
State 2 to 3

A stand replacing fire in combination with improper grazing practices weaken the resilience of the Contemporary Reference State (2) and drive its transition to the Shrub Dominated State (3). The Contemporary Reference State (2) transitions to the Shrub Dominated State (3) when post-fire tree reproduction becomes rare and shrubs dominate the stand.

Transition T2B
State 2 to 4

Prolonged improper grazing practices weaken the resilience of the Contemporary Reference State (2) and drive its transition to the Herbaceous Understory State (4). The Contemporary Reference State (2) transitions to the Herbaceous Understory State (2) when shrub reproduction becomes rare and the stand becomes open and decadent.

Restoration pathway R3A
State 3 to 2

A change in management alone may not be sufficient to restore the Shrub Dominated State (3) to the Contemporary Reference State (2). Tree/shrub planting, normal or above-normal moisture, and proper grazing management can transition the Shrub Dominated State (3) back to the Contemporary Reference State (2). These restoration methods are labor intensive and costly and may not be a practical in all situations.

Conservation practices

Prescribed Grazing

Tree/Shrub Establishment
Herbaceous Weed Control

Restoration pathway R4A
State 4 to 2

A change in management alone may not be sufficient to restore the Herbaceous Understory State (4) to the Contemporary Reference State (2). Tree/shrub planting, normal or above-normal moisture, and proper grazing management can transition the Herbaceous Understory State (4) back to the Contemporary Reference State (2). These restoration methods are labor intensive and costly and may not be a practical in all situations.

Conservation practices

Tree/Shrub Establishment
Prescribed Grazing
Herbaceous Weed Control

Additional community tables

Inventory data references

Two low-intensity plots were available for this provisional ecological site. These plots were used in conjunction with a review of the scientific literature and professional experience 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	04/24/2024
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:**