USDA Natural Resources Conservation Service

Ecological site F103XY033MN
Wet Floodplains

Last updated: 10/04/2023
Accessed: 04/26/2024

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): 103X–Central Iowa and Minnesota Till Prairies

MLRA 103 is in Minnesota (56 percent) and Iowa (44 percent) and consists of approximately 18 million acres. It is in the Western Lake Section of the Central Lowland Province of the Interior Plains in an area known as the "Des Moines Lobe" of the Wisconsin-age ice sheet.
The MLRA is mostly on a young, nearly level to gently rolling, glaciated till plain that has moraines and glacial lake plains in some areas. The plain is covered with glacial till, outwash, and glacial lake deposits. Recent alluvium consisting of clay, silt, sand, and gravel fill the bottoms of most of the major river valleys. Paleozoic bedrock sediments, primarily shale and limestone, underlie the glacial deposits in most of the area.

The annual precipitation increases from northwest to southeast. Most of the rainfall occurs as high-intensity, convective thunderstorms during the summer. Two-thirds or more of the precipitation falls during the freeze-free period. Snowfall is common in winter. Ground water supplies are adequate for the domestic, livestock, municipal, and industrial needs. Nearly all of this area is farmland, and about four-fifths is cropland.

Classification relationships

Major Land Resource Area (MLRA): Central Iowa and Minnesota Till Prairies (103) (USDA Handbook 296, 2006)

USFS Subregions: North Central Glaciated Plains Section (251B); Upper Minnesota River-Des Moines Lobe (251BA) and Southern Des Moines Lobe (251Be) Subsections (Cleland et al. 2007)

International Vegetation Classification Hierarchy
Class: 1. Forest & Woodland
Subclass: 1.B. Temperate & Boreal Forest & Woodland
Formation: 1.B.3. Temperate Flooded & Swamp Forest
Division: 1.B.3.Na. Eastern North American-Great Plains Flooded & Swamp Forest

The reference community shares similarities with Minnesota Department of Natural FFs68 Southern Floodplain Forest.

Ecological site concept

The Wet Floodplains ecological site occurs in both floodplains and depressions and is extensive throughout MLRA 103. Soils include both Mollisols and Entisols, and soil drainage class is very poorly drained to poorly drained. This site floods.

Associated sites

F103XY031MN	**Sandy Floodplains** The Sandy Floodplains ecological site is located on sandy-textured soils in floodplains and drainageways throughout MLRA 103. Soils drainage class ranges from moderately well drained to excessively drained. Brief flooding may occur on areas within this ecological site.
F103XY032MN	**Loamy Floodplains** The Loamy Floodplains ecological site is located on medium textured alluvium throughout MLRA 103. Soil textures include loam, silt loam, sandy loam, and fine sandy loam. Soils are somewhat poorly drained to moderately well drained. A few areas within this ecological site will exhibit flooding.
R103XY034MN	**Floodplain Marsh** The Floodplain Marsh ecological site is located on soils that have fine or medium textures and very poorly drained. Some soils are calcareous. This site typically floods and ponds. Herbaceous plant communities usually dominate.
R103XY035MN	**Organic Floodplain Marsh** The Organic Floodplain Marsh ecological site is located on floodplains and depressions primarily in the northern portion of MLRA 103. Soils are very poorly drained and derived from organic parent materials. This site both floods and ponds frequently for long periods of time. Herbaceous plant communities usually dominate.

Table 1. Dominant plant species

Tree	(1) *Acer saccharinum*
Shrub	(1) *Salix nigra*
Herbaceous	(1) *Laportea canadensis*

Physiographic features

The Wet Floodplains ecological site is located on lower floodplains along streams and rivers throughout MRLA 103. Each site is uniquely influenced by its hydrologic relationship with the adjacent river as the depth of soil saturation fluctuates depending on river water levels.

This site floods occasionally to frequently; however, due to human influences, current river flooding regimes are often altered from historic levels. Plant community composition will vary due to frequency and duration of flooding and differing stages of community succession.

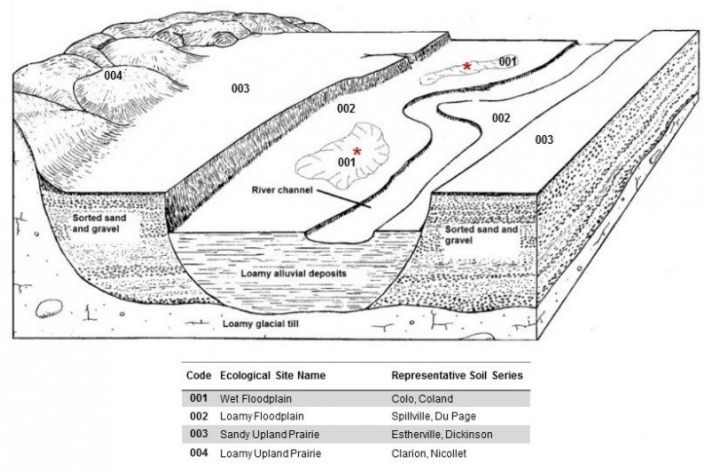


Figure 1. Block diagrams of the representative Wet Floodplains and associated ecological sites.

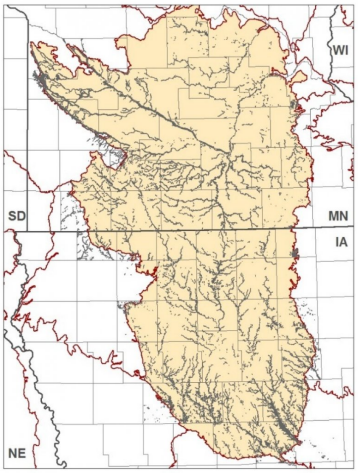


Figure 2. Distribution of the Wet Floodplains ecological site within MLRA 103. In many cases, the data set is not spatially consistent across political boundaries due to the method by which soils were mapped; e.g. due to county subsets.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Depression
Runoff class	Negligible to low
Flooding duration	Very long (more than 30 days)
Flooding frequency	None to frequent
Elevation	689–1,837 ft
Slope	0–2%
Water table depth	0–72 in
Aspect	Aspect is not a significant factor

Climatic features

The soil temperature regime of MLRA 103 is classified as “mesic” (i.e., mean annual soil temperature between 46 and 59°F). The average freeze-free period of this site is 159 days, and the frost-free period is 133 days. The average mean annual precipitation is 33 inches which includes rainfall plus the water equivalent from snowfall. Cold air drainage from above and the fact that wet soils are generally colder than dry soils make this site colder than adjacent, upslope areas. As a result, snow and frost remain longer in the spring, thus resulting in shorter growing seasons than the adjacent uplands.

Table 3. Representative climatic features

Frost-free period (characteristic range)	128-140 days
Freeze-free period (characteristic range)	148-171 days
Precipitation total (characteristic range)	30-36 in
Frost-free period (actual range)	119-147 days
Freeze-free period (actual range)	144-176 days
Precipitation total (actual range)	30-38 in
Frost-free period (average)	133 days
Freeze-free period (average)	159 days
Precipitation total (average)	33 in

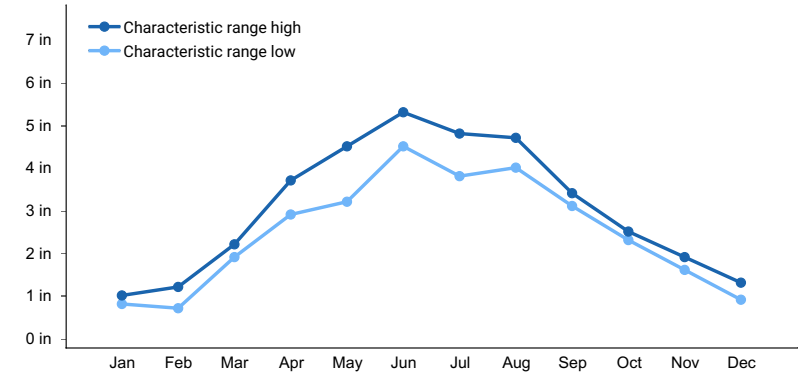


Figure 3. Monthly precipitation range

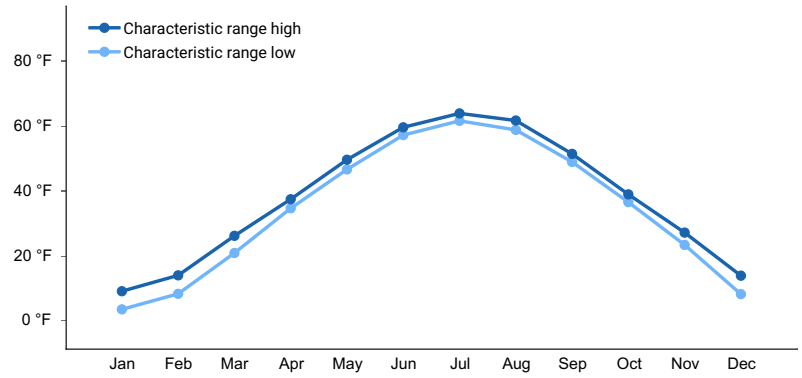


Figure 4. Monthly minimum temperature range

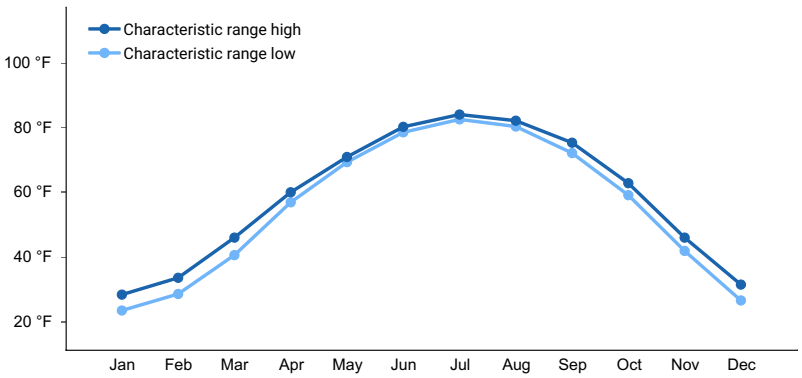


Figure 5. Monthly maximum temperature range

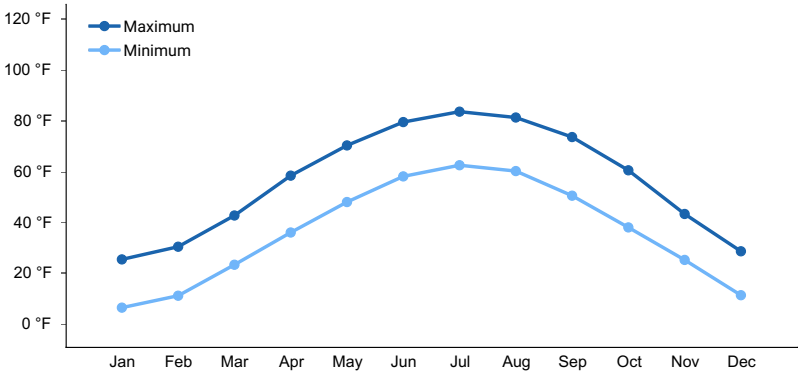


Figure 6. Monthly average minimum and maximum temperature

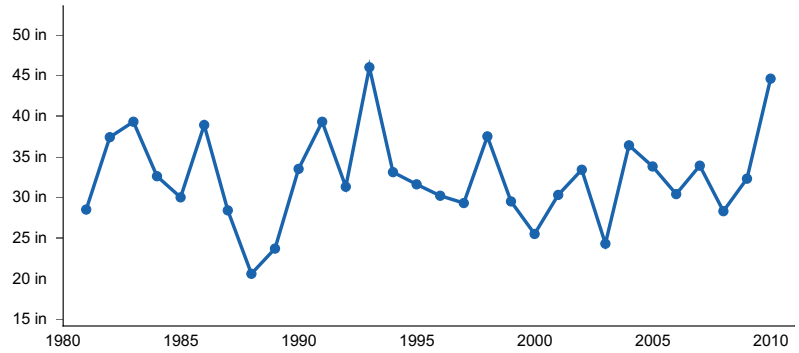


Figure 7. Annual precipitation pattern

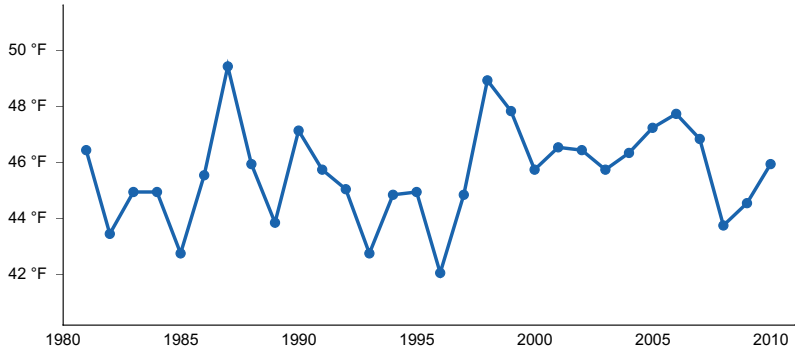


Figure 8. Annual average temperature pattern

Climate stations used

- (1) BOONE [USC00130807], Boone, IA
- (2) STEWART [USC00218025], Brownton, MN
- (3) WILLMAR WWTP [USC00219004], Willmar, MN
- (4) FAIRMONT [USC00212698], Fairmont, MN
- (5) DES MOINES WSFO-JOHNSTON [USC00132209], Johnston, IA
- (6) FARIBAULT [USC00212721], Faribault, MN

Influencing water features

With natural hydrology intact, the Wet Floodplains ecological site is greatly influenced by the level of the adjacent river or stream system. Soils are classified as endosaturated. The water table is near or above the soil surface during the spring months with flooding and/or ponding commonly occurring; however, the water table may drop to as low as 6 feet or more below the surface later in the growing season during dry periods.

This ecological site has a Cowardin Hydrologic classification of Palustrine, Broad-Leaved Deciduous Forested Seasonally Flooded. It also has a United States Army Corps of Engineers Wetland Plant Community of A-Seasonally Flooded Basins. (Eggers, 2011)

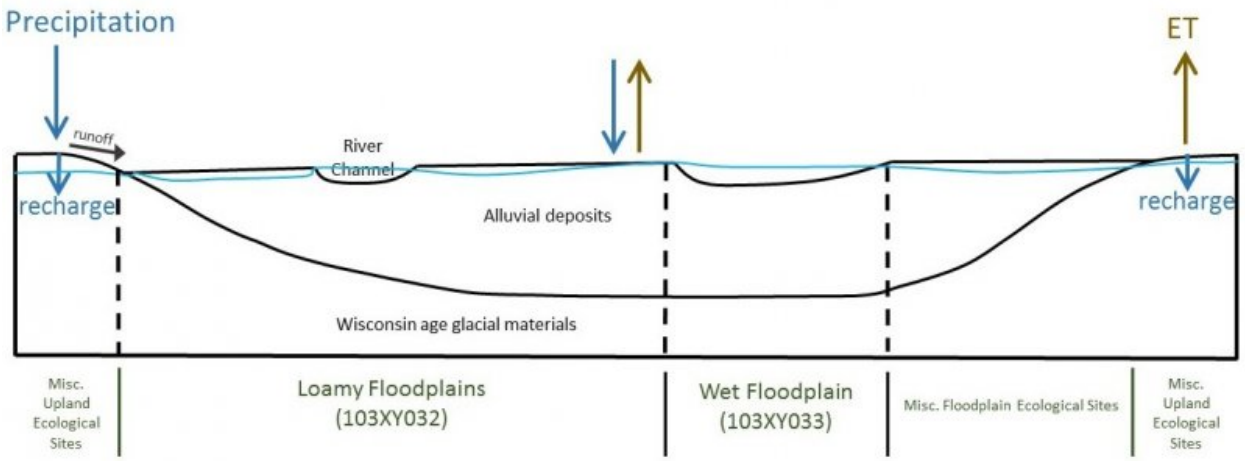


Figure 9. Representation of hydrological factors in a typical area of the Wet Floodplains and associated ecological sites.

Soil features

The Wet Floodplain ecological site is located on the following soil series: Bremer, Burr, Calco, Chaska, Cohoctah, Coland, Colo, Colvin, Comfrey, Havelock, Kalmarville, Lamoure, Marshan, Maxcreek, Mayer, Millington, Nishna, Rushriver, Shandep, Southbrook, Suckercreek, and Zook. These soils are formed from alluvium derived mostly from original Des Moines lobe materials, except in locations where a river or stream crosses the MLRA 103 boundary from an adjacent MLRA. Soil drainage class is very poorly drained and poorly drained. Representative surface textures include clay loam, silty clay, silty clay loam, silt loam, and loam. Available water capacity for soils on this site is 6-13 inches.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Clay loam (2) Silty clay loam (3) Loam (4) Silt loam (5) Silty clay
Family particle size	(1) Fine-loamy (2) Coarse-loamy (3) Fine-silty (4) Coarse-silty (5) Fine
Drainage class	Very poorly drained to poorly drained
Permeability class	Very slow to very rapid
Depth to restrictive layer	80 in
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-60in)	6–13 in
Calcium carbonate equivalent (0-40in)	0–30%
Soil reaction (1:1 water) (0-40in)	5.6–8.4
Subsurface fragment volume <=3" (0-40in)	0–40%

Subsurface fragment volume >3" (0-40in)	0–5%

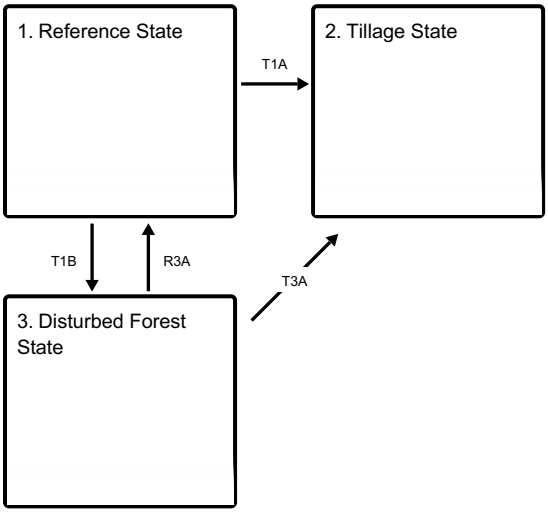
Ecological dynamics

The Wet Floodplains ecological site is influenced by fluctuating water table levels and areas within this ecological site incur occasional to frequent flooding. Historically, this forest community was compositionally and structurally diverse due to substantial variations in the natural flooding regime. Severe flood events created zones of early successional communities which were dominated by willows. The mature reference community is a deciduous, riverine forest with multiple co-dominant canopy species including elm, ash, and maple.

Today, most areas of this ecological site have been cleared and converted to agriculture. (State 2). Site hydrology has been altered through ditching, tiling, site clearing, industrial and residential water use, and/or installation of flood control structures within the watershed. Even sites that remain forested today have usually been disturbed through hydrologic modifications, previous clearing, or introduction of non-native plants. (State 3)

State and transition model

Ecosystem states



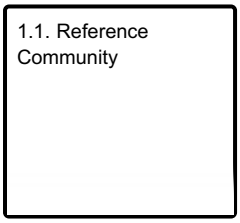
T1A - Site is cleared, tilled, seeded, and managed for crop production

T1B - Site incurs large-scale disturbance and altered plant community

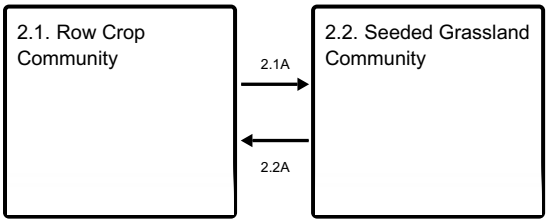
R3A - Restoration of natural hydrology; establishment of desired species; exclusion of anthropogenic disturbances; eradication of invasive species; long-term timber stand management

T3A - Site cleared, soil tillage, crop establishment, and continued agriculture management

State 1 submodel, plant communities



State 2 submodel, plant communities



2.1A - Seeding and management of warm or cool season grasses.

2.2A - Site preparation, soil tillage, crop establishment, weed control

State 3 submodel, plant communities

3.1. Disturbed Forest Community

State 1
Reference State

The Wet Floodplains reference state is a closed-canopy, deciduous, floodplain forest with multiple co-dominant tree species including silver maple (*Acer saccharinum*), black ash (*Fraxinus nigra*), American elm (*Ulmus americana*), and green ash (*Fraxinus pennsylvanica*). The subcanopy and shrub layer varies depending on flooding regime. Open canopy gap areas allow for black willow (*Salix nigra*) and tree seedlings and saplings. The understory on high-quality sites with brief flooding is often diverse and may include a variety of native herbaceous species including wood nettle (*Laportea canadensis*), honewort (Cryptotaenia candensis), jewelweed (*Impatiens capensis*), stinging nettle (*Urtica dioica*), clearweed (*Pilea pumila*), and sedges (Carex spp.). This community has been impacted by the emerald ash borer (Agrilus planipennis) and Dutch elm disease (Ascomycota). These sites will show variations in plant community structure and composition as influenced by the variable hydrology of the site. Large flood events will trigger vegetative changes on this ecological site by creating an initial sparse understory which will transition to an early-successional state dominated by willow and tree seedling and saplings. Common successional stage species include willow, black ash, maple, and elm.

Resilience management. Resilience management practices include monitoring for invasive vegetation, applying herbicides as needed, and excluding grazing and logging.

Dominant plant species

- silver maple (*Acer saccharinum*), tree
- black willow (*Salix nigra*), shrub
- Canadian woodnettle (*Laportea canadensis*), other herbaceous

Community 1.1
Reference Community

This ecological site is a wet floodplain forest. Canopy dominants include silver maple, American elm, and ash. Black willow is a common shrub. High-quality reference sites are now rare in MLRA 103 and many of the remaining forested sites have been disturbed by human activities (State 3). Many sites have been transitioned to agricultural production (State 2).

Resilience management. Resilience management practices include monitoring for invasive vegetation, applying weed control methods as needed, and excluding disturbances such as grazing and timber harvesting.

Dominant plant species

- silver maple (*Acer saccharinum*), tree
- black willow (*Salix nigra*), shrub
- Canadian woodnettle (*Laportea canadensis*), other herbaceous

State 2
Tillage State

The Tillage State contains the Row Crop Community and the Seeded Grassland Community. Pathway mechanisms

include preparing the site, planting desired species, applying herbicide, applying fertilizer, and harvesting. Hydrological modifications (tiling and ditching) are usually installed on this site to improve drainage for crop production. Soil tillage and drainage are the primary triggers to State 2. Tillage alters dynamic soil properties, including bulk density, structure, organic carbon content, and saturated hydraulic conductivity. Intensive tillage negatively impacts soil ecological functions. Conservation practices can help mediate these soil health impacts. For example, conservation tillage minimizes soil disturbance and improves soil structure and soil health. A cover crop rotation can build soil structure, improve infiltration rates, reduce runoff and erosion, and protect water quality. Some areas have been seeded to warm-season or cool-season grasslands. Seed mix selection will depend on the hydrology and landowner objectives.

Dominant plant species

- corn (*Zea mays*), grass
- soybean (*Glycine max*), other herbaceous

Community 2.1
Row Crop Community

Community 2.1 consists of intensive row crop agriculture. This is a common use of this ecological site. Soil tillage and intentional plant establishment are the primary triggers. The most common crops are corn and soybeans on an annual rotation. Many crops, however, are feasible for these areas with hydrological modifications such as ditching and tiling to improve drainage.

Resilience management. Resilience management practices include preparing the sites, planting, fertilizing, controlling weeds, and harvesting. The maintenance of the desired vegetation community is controlled by the intensity, frequency, duration, and timing of agricultural practices. Ditching and tiling are common on these sites.

Dominant plant species

- corn (*Zea mays*), grass
- soybean (*Glycine max*), other herbaceous

Community 2.2
Seeded Grassland Community

The Seeded Grassland Community occurs in areas that were previously tilled and used for crop production but have been transitioned to either warm-season or cool-season grasses. This transition could occur under a NRCS conservation program. The primary trigger is the intentional establishment of a grass species. Seed mix selection will depend on site specifics.

Resilience management. The resilience practices for this site commonly include weed and brush control and a program of planned grazing that manages the intensity, frequency, and duration of grazing.

Dominant plant species

- reed canarygrass (*Phalaris arundinacea*), grass
- big bluestem (*Andropogon gerardii*), grass

Pathway 2.1A
Community 2.1 to 2.2

This pathway converts Community 2.1 (row crops) to Community 2.2 (seeded grassland). The primary mechanism of change is the seeding of desired grass species.

Conservation practices

Forage and Biomass Planting

Pathway 2.2A

Community 2.2 to 2.1

This pathway describes the site transitioning from a seeded grassland to row crop agriculture. The mechanisms of change are tillage and intentional plant establishment (crop seeding). Resilience management practices include weed control (herbicide application), disturbance management (field cultivating), and harvest management.

State 3
Disturbed Forest State

This state describes a wooded site that has been disturbed and exhibits altered forest species composition. Numerous ruderal woodland and forest communities may occur on this ecological site depending on the type and severity of disturbance, available seed sources, and ongoing disturbances (selective harvest, grazing). Tree species will vary depending on hydrology and the age of the community. Common species include silver maple, black ash, American elm, green ash, and willow. Numerous species of non-native shrubs, grasses, and herbaceous plants are often on these disturbed sites. Frequently flooded disturbed sites are often impractical to drain for successful agricultural production and exist in this state.

Dominant plant species

- maple (*Acer*), tree
- ash (*Fraxinus*), tree
- elm (*Ulmus*), tree
- willow (*Salix*), shrub
- reed canarygrass (*Phalaris arundinacea*), grass
- sedge (*Carex*), grass
- garlic mustard (*Alliaria petiolata*), other herbaceous

Community 3.1
Disturbed Forest Community

Community 3.1 is an altered forest community caused by previous or ongoing human disturbances. Invasive species are common in this community. Canopy composition and structural age varies depending on the severity and type of disturbances, community age, and the availability of seed sources. Invasive, non-native species are common on these sites and will continue to increase without management intervention. Many of these sites are frequently flooded making agricultural production extremely difficult even with artificial drainage.

Dominant plant species

- maple (*Acer*), tree
- ash (*Fraxinus*), tree
- elm (*Ulmus*), tree
- willow (*Salix*), shrub
- reed canarygrass (*Phalaris arundinacea*), grass
- sedge (*Carex*), grass
- garlic mustard (*Alliaria petiolata*), other herbaceous

Transition T1A
State 1 to 2

Transition T1A is the conversion of the Reference State to agriculture. The triggers are site clearing, soil tillage, and intentional plant establishment (crop seeding). Resilience management practices include common agricultural practices such as seeding, fertilizing, and managing invasive plants with herbicides or field cultivation. Hydrological modifications, such as ditching and tiling, are common.

Constraints to recovery. Site clearing and soil tillage preclude recovery of the former state.

Transition T1B
State 1 to 3

Transition T1B is a transition from a mature deciduous forest to a disturbed (ruderal) forest. Triggers include timber harvest, surface site disturbance, grazing, and introduction of non-native species. The native plant community is altered, and these areas do not exhibit the ecological function or vegetative composition of State 1.

Restoration pathway R3A
State 3 to 1

Restoration to the Reference State may be feasible for some sites with long-term management inputs including restoration of natural hydrology, establishment of desired species, forest stand management (selective thinning), and control of invasive species. Triggers include intentional plant establishment (planting desired species), absence of disturbance (site protected from grazing and other site altering disturbances), timber stand improvement inputs, hydrological restoration, and eradication of invasive plant species.

Conservation practices

Brush Management
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Forest Stand Improvement

Transition T3A
State 3 to 2

Transition T3A is the transition of a disturbed forest state to agriculture production. The mechanisms of change include clearing, site preparation, tillage, and intentional plant establishment (crop seeding). Continued resilience management practices are necessary and include weed control (herbicide application), disturbance management (field cultivating), and harvest management.

Constraints to recovery. Soils tillage and the transition to agriculture preclude recovery of the former state.

Additional community tables

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were 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 ecological site description.

Other references

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Approval

Suzanne Mayne-Kinney, 10/04/2023

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	04/26/2024
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:**