

## **Ecological site R111XE002OH Limnic Muck**

Last updated: 5/28/2020  
Accessed: 05/08/2024

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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): 111X–Indiana and Ohio Till Plain

111E – Indiana and Ohio Till Plain, Eastern Part. Most of this area is in the Till Plains Section of the Central Lowlands Province of the Interior Plains. The northeast tip of the area is in the Southern New York Section of the Appalachian Highlands. The entire area has been glaciated. It is dominated by ground moraines that are broken in places by kames, lake plains, outwash plains, terraces, and stream valleys. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 580 to 1,400 feet (175 to 425 meters), increasing gradually from west to east. Relief is mainly a few meters, but in some areas hills rise as much as 100 feet (30 meters) above the adjoining plain.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Scioto (0506), 33 percent; Muskingum (0504), 31 percent; and Western Lake Erie (0410), 28 percent; Upper Ohio (0503), 5 percent; and Southern Lake Erie (0411), 3 percent. The headwaters of many rivers in central Ohio, including the Vermillion, Black Fork, Sandusky, Little Scioto, and Olentangy Rivers, are in this MLRA.

This MLRA is underlain by late Devonian shale and sandstone. Surficial materials include glacial deposits of till, glaciolacustrine sediments, and outwash from Wisconsin and older glacial periods.

### **Classification relationships**

Major Land Resource Area (USDA-Natural Resources Conservation Service, 2006)

USFS Ecological Regions (USDA, 2007):

Sections – Central Till Plains, Beech Maple (222H), Western Glaciated Allegheny Plateau (221F)

Subsections – Allegheny Plateau (221Fa), Bluffton Till Plains (222Ha), Miami-Scioto Plain – Tipton Till Plain (222Hb)

NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture – Pasture/Hay, North-Central Interior Beech-Maple Forest,

LANDFIRE Biophysical Settings anticipated (USGS, 2010): Central Interior and Appalachian Floodplain Systems, North-Central Interior Beech-Maple Forest

### **Ecological site concept**

This site is an upland site formed on herbaceous organic soil parent material overlaying coprogenous material in depressions on lake and till plains. Disturbance to the site by fire was driven by the seasonal presence of water on the site. In the spring and early summer the site is often ponded to a depth of 15 inches and for up to 30 days. The water table recedes as the summer progresses creating a drier situation. The drier conditions that can occur in very

early spring or late fall, coupled with the then dormant vegetation, increases the susceptibility of the site to fire. The seasonal flooding and relatively short fire return interval (~10 years or less) created a situation where the site is dominated by herbaceous vegetation.

The characteristic vegetation is herbaceous in nature, mostly dominated by tall prairie grass species, most notably big bluestem and eastern gamagrass. Sedge species are also common throughout the site and are the most abundant sub-dominant group of species. The influence of water via flooding and ponding along with fire maintain the herbaceous species dominance of the site. The absence of fire will lead this site to being converted to woodland and then potentially a closed canopy forest. The lack of fire will allow hydrophilic shrub species to get established, further altering the fire cycle. Continued absence of fire will have the site progress to a forest dominated by wetland tree species such as elm and ash. Invasive species, specifically, reed canarygrass and phragmites, can invade and come to dominate the site in the absence of management to curtail or prevent their establishment and proliferation. Currently, a large percentage of the site is in agricultural production, notably corn and soybean rotations, after the installation of drainage. These sites can be very productive, once drained, due in large part to the high amounts of organic matter.

### Associated sites

R111XE001OH	<b>Mineral Muck</b> Underlain by mineral soil
R111XE003OH	<b>Deep Muck</b> Not underlain by mineral soil
F111XE501OH	<b>Till Depression</b> On till parent material

### Similar sites

R111XE001OH	<b>Mineral Muck</b> Underlain by mineral soil
R111XE003OH	<b>Deep Muck</b> Underlying material is not limnic (coprogenous earth).
R111XE401OH	<b>Wet Outwash Mollisol</b> Soil parent material is outwash; site generally higher on the landscape; soils are mollisols

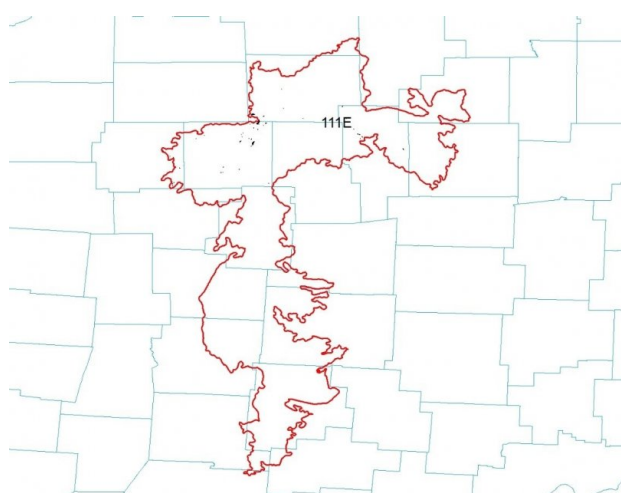


Figure 1.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Tripsacum dactyloides</i>

## Physiographic features

This site is located in the 111E – Indiana and Ohio Till Plain, Eastern Part MLRA. This site was formed on herbaceous organic material, occasionally with a top layer alluvium. It is located in depressions with slopes ranging from 0 to 2 percent.

**Table 2. Representative physiographic features**

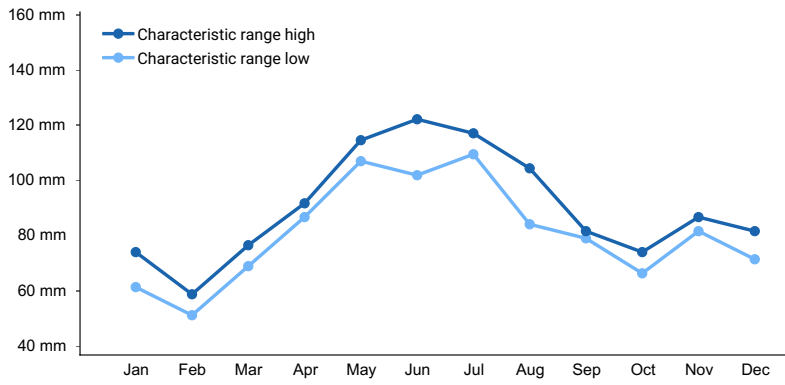
Landforms	(1) Depression
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	244–427 m
Slope	0–2%
Ponding depth	0–38 cm
Water table depth	15 cm
Aspect	Aspect is not a significant factor

## Climatic features

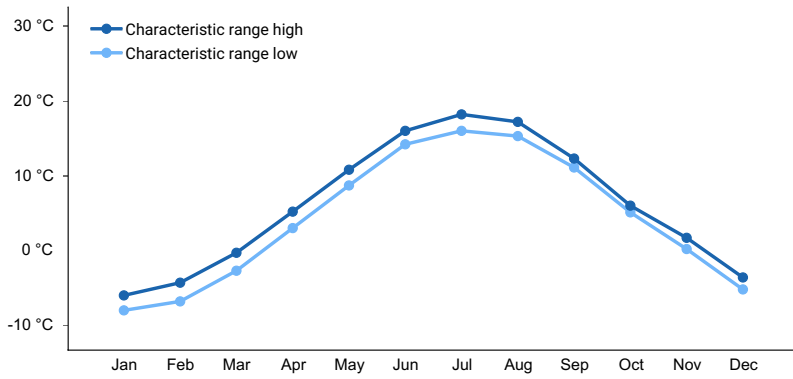
The average annual precipitation in this area is 35 to 41 (890 to 1,040 millimeters). Most of the rainfall occurs as convective thunderstorms during the growing season. About half or more of the precipitation occurs during the freeze-free period. Snowfall is common in winter. The average annual temperature is 48 to 52 degrees F (9 to 11 degrees C). The freeze-free period averages about 185 days and ranges from 165 to 205 days.

**Table 3. Representative climatic features**

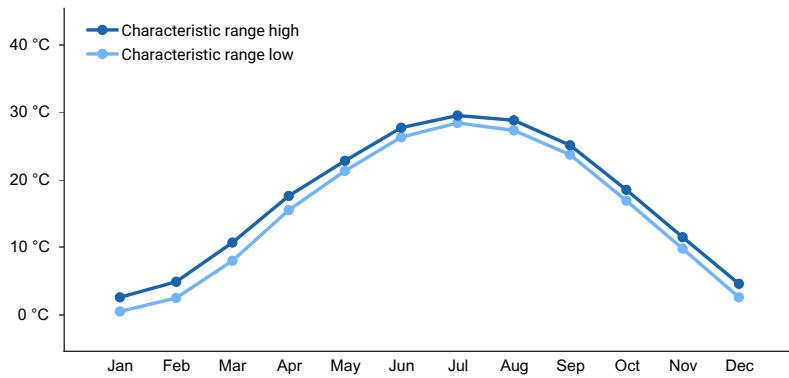
Frost-free period (characteristic range)	131-150 days
Freeze-free period (characteristic range)	172-181 days
Precipitation total (characteristic range)	991-1,041 mm
Frost-free period (actual range)	127-153 days
Freeze-free period (actual range)	167-185 days
Precipitation total (actual range)	991-1,092 mm
Frost-free period (average)	142 days
Freeze-free period (average)	177 days
Precipitation total (average)	1,016 mm



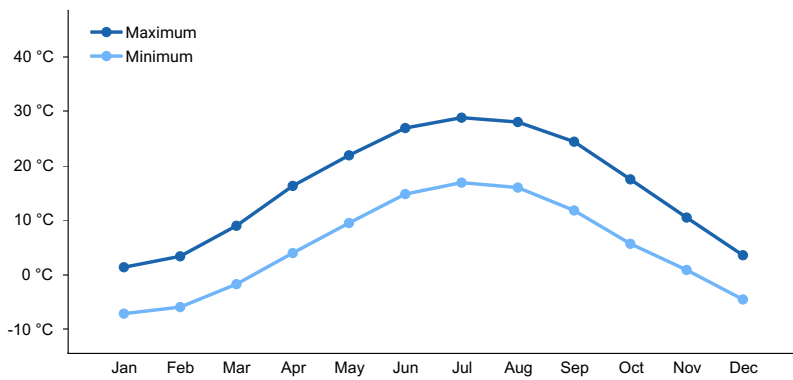
**Figure 2. Monthly precipitation range**



**Figure 3. Monthly minimum temperature range**



**Figure 4. Monthly maximum temperature range**



**Figure 5. Monthly average minimum and maximum temperature**

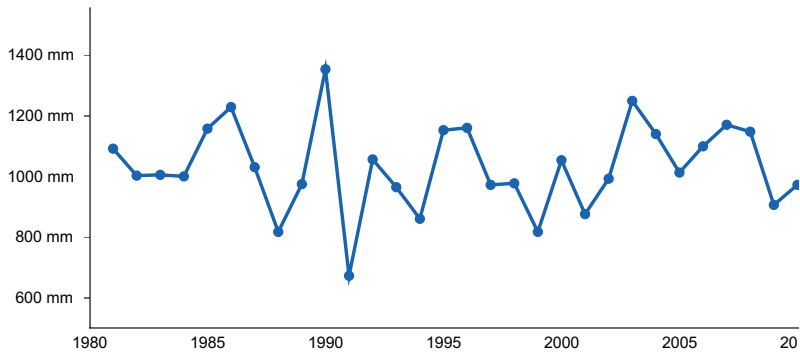


Figure 6. Annual precipitation pattern

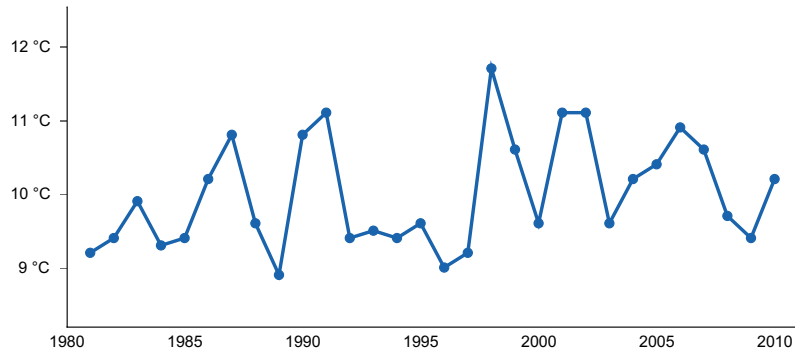


Figure 7. Annual average temperature pattern

### Climate stations used

- (1) MANSFIELD LAHM MUNI AP [USW00014891], Mansfield, OH
- (2) COLUMBUS PORT COLUMBUS INTL AP [USW00014821], Columbus, OH
- (3) LANCASTER [USC00334403], Lancaster, OH
- (4) ASHLAND 2 SW [USC00330256], Ashland, OH
- (5) BUCYRUS [USC00331072], Bucyrus, OH
- (6) GALION WTR WKS [USC00333021], Galion, OH

### Influencing water features

These wetland systems are groundwater-dependent as well as being, generally, the lowest point in the landscape, making them a discharge depression. Water levels fluctuate seasonally, reaching their peak in spring and lows in late summer. Ponding can occur on the site, generally in the spring, to a depth of 15 inches and can have a very long duration (> 30 days). Water levels typically remain at or near the soils surface throughout the year. The hydrogeographic model classification for this site is DEPRESSION: Muck, Ground Water Influenced; coprogenous/herbaceous. This site has a Cowardin Classification of PEM1Eg; it is a Palustrine system with persistent, emergent vegetation that is seasonally flooded/saturated on organic soil.

### Soil features

The soil series associated with this site are: Olentangy and Muskego. They are very deep, very poorly drained, and slow to moderately rapid permeable soils, with very acidic to moderately alkaline soil reaction, that formed in coprogenous material.

Parent Materials Kind: coprogenous material

Surface Texture: silt loam

Subsurface Texture group: loamy

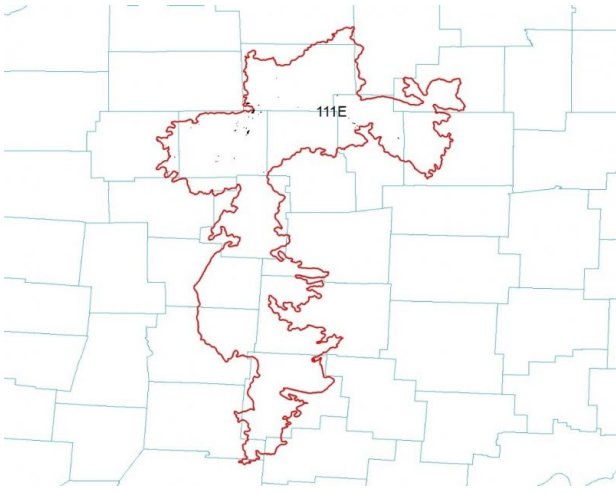


Figure 8. map showing mapunit location in the MLRA

Table 4. Representative soil features

Parent material	(1) Coprogenic material
Surface texture	(1) Silt loam
Drainage class	Very poorly drained
Permeability class	Slow to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	22.86–33.02 cm
Calcium carbonate equivalent (Depth not specified)	0–70%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	4.8–7.9
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

The historic plant community of the Limnic Muck is a mucky prairie. This site is characterized by the soil parent material being composed of herbaceous organic matter with the subsoil being largely coprogenous, limnic material. The plant community is dominated by tall-grass prairie species along with an assortment of tall sedge species. The site is located in depressional areas often associated with glacial lake plains and till plains. Being the lowest portion of the local landscape, the site is dependent upon groundwater and its fluctuation, which reaches its peak in the spring and low in the late summer. This fluctuation and dominate herbaceous species create a fire dependent system. Replacement fires about every decade and seasonal flooding worked in concert to drive the species dominance and richness of the site. Both mechanisms work in concert to inhibit the establishment and perpetuation of woody species.

## State and transition model

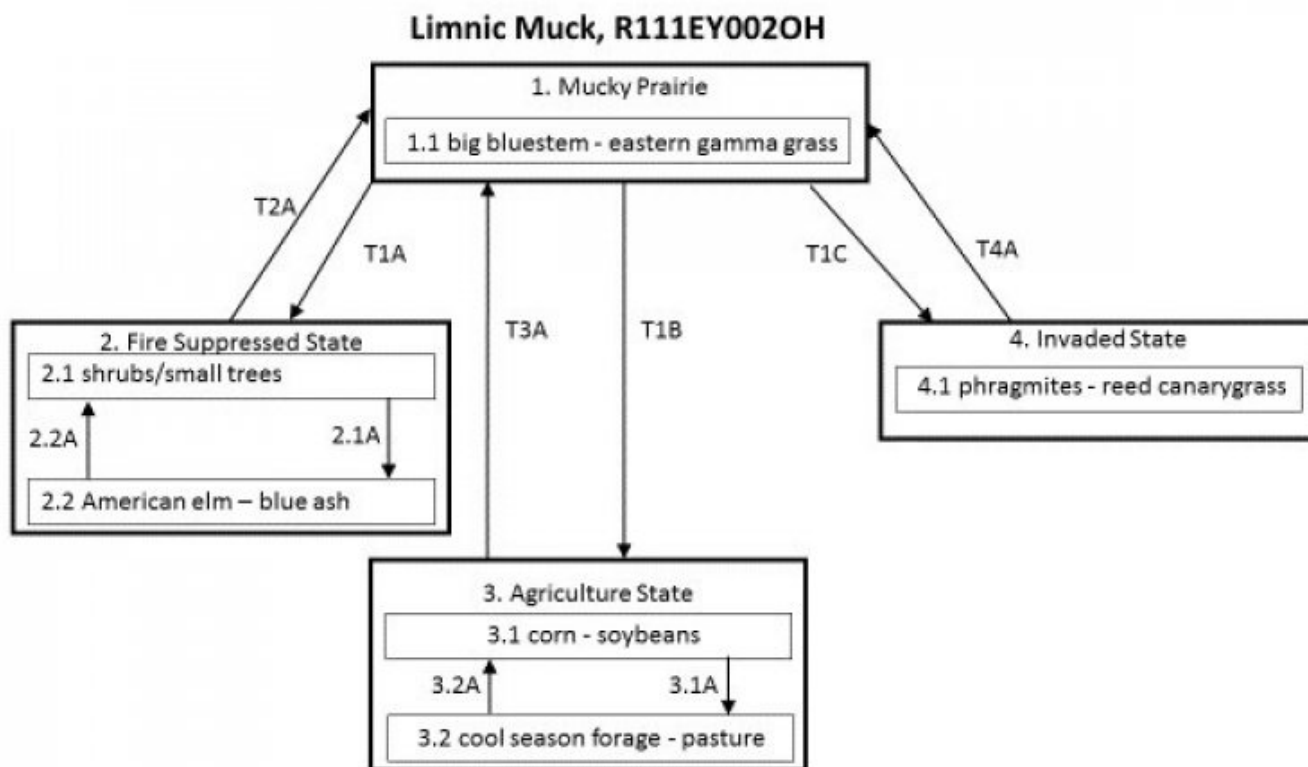


Figure 9. STM

**Limnic Muck, R111EY002OH**

**Diagram Legend**

T1A	No fire, no woody species management
T1B	Drainage, site preparation, planting, management
T1C	Invasion, no management
T2A	Tree removal, planting, fire
T3A	Drainage removal, planting, fire
T4A	Chemical/mechanical treatment of invasive species, fire
2.1A	No fire, no woody species management
2.2A	Tree removal, no fire
3.1A	Pasture/forage planting and maintenance
3.2A	Tillage/no-till planting and management of row crops.

Figure 10. Legend

**State 1  
Mucky Prairie**

This is the reference or diagnostic plant community for this site. In reference conditions, this site was dominated by tall prairie grasses specifically big bluestem and eastern gammagrass. Sedge species were also a large component of this site, especially upright sedge and hairy sedge. This state was maintained by nearly seasonal flooding and a fire frequency of 10 years. Both mechanisms work in concert to inhibit the establishment and perpetuation of woody species.

### **Dominant plant species**

- big bluestem (*Andropogon gerardii*), grass
- eastern gamagrass (*Tripsacum dactyloides*), grass

### **Community 1.1**

#### **big bluestem - Eastern gamagrass**

This is the reference or diagnostic plant community for this site. In reference conditions, this site was dominated by tall prairie grasses specifically big bluestem and eastern gamagrass. Sedge species were also a large component of this site, especially upright sedge and hairy sedge.

### **Dominant plant species**

- big bluestem (*Andropogon gerardii*), grass
- eastern gamagrass (*Tripsacum dactyloides*), grass

### **State 2**

#### **Fire Suppressed State**

This state is characterized by a longer than normal fire return interval or the absence of fire as a disturbance agent. Absence of fire allows for a thick layer of leaf litter to accumulate which suppresses the production of the herbaceous species and allows the woody species to establish and flourish. Similarly, the woody species that colonize this site are generally intolerant of fire. The seasonal flooding and fire work in concert to help prevent woody species establishment. Continued lack of fire allows the site to transition from a shrub/herbaceous site, to a woodland, and eventually to a forest.

### **Dominant plant species**

- dogwood (*Cornus*), shrub
- willow (*Salix*), shrub

### **Community 2.1**

#### **shrubs / small trees**

This phase is characterized by the establishment and dominance shrubby species and small trees. Common species include dogwood, white sweetmeadow, and willow species.

### **Dominant plant species**

- dogwood (*Cornus*), tree
- willow (*Salix*), tree

### **Community 2.2**

#### **American elm - blue ash**

This phase is characterized by the establishment and dominance tree species that convert the site to a forest. Common species include American elm and blue ash as dominants.

### **Dominant plant species**

- American elm (*Ulmus americana*), tree
- blue ash (*Fraxinus quadrangulata*), tree

### **Pathway P2.1A**

#### **Community 2.1 to 2.2**

Continued absence of fire and/or woody species management will move the site towards phase 2.2.



## **Pathway P2.2A**

### **Community 2.2 to 2.1**

Removal of most or all the trees without the application of fire will move the site towards phase 2.1.

## **State 3**

### **Agricultural State**

This site has largely been converted to agricultural use. Most of the historic acres are now in row crop agricultural use. Most common is a corn and soybean rotation of various types. Roughly 8% of the site is used to grow hay or cool season forage and used for grazing. The conversion of the site to agricultural use begins with the installation of a drainage system which most often employs either or both ditching and field tile.

### **Community 3.1**

#### **Row crops (corn - soybeans)**

This phase is characterized by row crop agriculture of small grains, primarily corn and soybeans.

### **Community 3.2**

#### **Cool season forage - pasture**

This phase is characterized by forage or grazing agriculture. Different mixes of, generally, cool season grasses and forbs, largely clovers, are grown.

## **Pathway P3.1A**

### **Community 3.1 to 3.2**

Planting of cool season pasture/forage species and management to maintain them.

## **Pathway P3.2A**

### **Community 3.2 to 3.1**

Planting, either by conventional or no-till methods, of row crop. Management that keeps the site in row crop production

## **State 4**

### **Invaded State**

This site is characterized by the establishment of invasive species. Without management to control them, the invasive species come to be the dominant species to the exclusion of nearly all other species.

### **Community 4.1**

#### **phragmites - reed canarygrass**

This phase is characterized by the establishment and dominance of invasive species. The two most common for this site are phragmites and reed canarygrass. Most often only one of the two species will come to dominate the site.

#### **Dominant plant species**

- reed canarygrass (*Phalaris arundinacea*), grass
- common reed (*Phragmites australis*), grass

## **Transition T1A**

### **State 1 to 2**

No fire or woody species management will transition this site towards the fire suppressed state. This will result in a

loss of herbaceous species production and richness.

### **Transition T1B**

#### **State 1 to 3**

The installation of drainage either through ditches or field tile or both facilitates the start of the transition to the agriculture state. Planting and management of the selected crop complete the transition.

### **Transition T1C**

#### **State 1 to 4**

The establishment of invasive species without management, to include the use of fire, move the site towards the invaded state. This results in a loss in species richness of the site.

### **Restoration pathway R2A**

#### **State 2 to 1**

Removal of trees and other woody species then planting the site to the desired species. Following these actions with fire will help restore the site to state 1.

### **Restoration pathway R3A**

#### **State 3 to 1**

Removal of drainage system, site preparation, planting of the desired species, and regular application of fire move the site back to State 1.

### **Restoration pathway R4A**

#### **State 4 to 1**

Chemical and mechanical treatment of the invasive species is the first restoration step. At times biological treatment, to include grazing, can be helpful but is not common in this area. The reapplication of fire after seeding of the appropriate species helps maintain the species dominate in State 1.

## **Additional community tables**

### **Inventory data references**

Site concept developed through expert opinion, review of the literature, and field work.

### **Other references**

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## Approval

Chris Tecklenburg, 5/28/2020

## 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)	TYLER STAGGS
Contact for lead author	
Date	05/08/2024
Approved by	Chris Tecklenburg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

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

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

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

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

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

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

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

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

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

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

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

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

Dominant:

Sub-dominant:

Other:

Additional:

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

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

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

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