

## Ecological site F115XA007IL Wet Clayey Terrace

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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): 115X—Central Mississippi Valley Wooded Slopes

This MLRA is characterized by deeply dissected, loess-covered hills bordering well defined valleys of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers and their tributaries. It is used to produce cash crops and livestock. About one-third of the area is forested, mostly on the steeper slopes. This area is in Illinois (50 percent), Missouri (36 percent), Indiana (13 percent), and Iowa (1 percent) in two separate areas. It makes up about 25,084 square miles (64,967 square kilometers).

Most of this area is in the Till Plains section and the Dissected Till Plains section of the Central Lowland province of the Interior Plains. The Springfield-Salem plateaus section of the Ozarks Plateaus province of the Interior Highlands occurs along the Missouri River and the Mississippi River south of the confluence with the Missouri River. The nearly level to very steep uplands are dissected by both large and small tributaries of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers. The Ohio River flows along the southernmost boundary of this area in Indiana. Well defined valleys with broad flood plains and numerous stream terraces are along the major streams and rivers. The flood plains along the smaller streams are narrow. Broad summits are nearly level to undulating. Karst topography is common in some parts along the Missouri and Mississippi Rivers and their tributaries. Well-developed karst areas have hundreds of sinkholes, caves, springs, and losing streams. In the St. Louis area, many of the karst features have been obliterated by urban development.

Elevation ranges from 90 feet (20 meters) on the southernmost flood plains to 1,030 feet (320 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters) but can be 50 to 150 feet (15 to 45 meters) in the steep, deeply dissected hills bordering rivers and streams. The bluffs along the major rivers are generally 200 to 350 feet (60 to 105 meters) above the valley floor.

The uplands in this MLRA are covered almost entirely with Peoria Loess. The loess can be more than 7 feet (2 meters) thick on stable summits. On the steeper slopes, it is thin or does not occur. In Illinois, the loess is underlain mostly by Illinoian-age till that commonly contains a paleosol. Pre-Illinoian-age till is in parts of this MLRA in Iowa and Missouri and to a minor extent in the western part of Illinois. Wisconsin-age outwash, alluvial deposits, and sandy eolian material are on some of the stream terraces and on dunes along the major tributaries. The loess and glacial deposits are underlain by several bedrock systems. Pennsylvanian and Mississippian bedrock are the most extensive. To a lesser extent are Silurian, Devonian, Cretaceous, and Ordovician bedrock. Karst areas have formed where limestone is near the surface, mostly in the southern part of the MLRA along the Mississippi River and some of its major tributaries. Bedrock outcrops are common on the bluffs along the Mississippi, Ohio, and Wabash Rivers and their major tributaries and at the base of some steep slopes along minor streams and drainageways.

The annual precipitation ranges from 35 to 49 inches (880 to 1,250 millimeters) with a mean of 41 inches (1,050 millimeters). The annual temperature ranges from 48 to 58 degrees F (8.6 to 14.3 degrees C) with a mean of 54 degrees F (12.3 degrees C). The freeze-free period ranges from 150 to 220 days with a mean of 195 days.

**Soils** The dominant soil orders are Alfisols and, to a lesser extent, Entisols and Mollisols. The soils in the area have

a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or smectitic mineralogy. They are shallow to very deep, excessively drained to poorly drained, and loamy, silty, or clayey.

The soils on uplands in this area support natural hardwoods. Oak, hickory, and sugar maple are the dominant species. Big bluestem, little bluestem, and scattered oak and eastern redcedar grow on some sites. The soils on flood plains support mixed forest vegetation, mainly American elm, eastern cottonwood, river birch, green ash, silver maple, sweetgum, American sycamore, pin oak, pecan, and willow. Sedge and grass meadows and scattered trees are on some low-lying sites. (United States Department of Agriculture, Natural Resources Conservation Service, 2022)

## **LRU notes**

Most of this LRU (Land Resource Unit) is in the glaciated Till Plains Section of the Central Lowland Province of the Interior Plains. The southeast corner is in the Highland Rim Section (locally known as the Shawnee Hills Section) of the Interior Low Plateaus Province of the Interior Plains. The nearly level to very steep uplands in this LRU are dissected by both large and small tributaries of the Wabash and Ohio Rivers. Well defined valleys with broad flood plains and numerous stream terraces are along the major streams and rivers. The flood plains along the smaller streams are narrow. Broad summits are nearly level to gently sloping.

This area is covered almost entirely with Wisconsin loess. The loess can be more than 7 feet (2 meters) thick on stable summits. On the steeper slopes, it is thin or does not occur. The loess throughout the area is underlain dominantly by glacial till. Wisconsin outwash, alluvial deposits, and sandy eolian material are on some of the stream terraces and on dunes along the major tributaries in the area. The loess and glacial drift are underlain by Pennsylvanian-age bedrock. Bedrock outcrops are common in the walls of the valleys along the Wabash and Ohio Rivers and at the base of some steep slopes along minor streams and drainageways.

The dominant soil orders in this LRU are Alfisols, Entisols, Inceptisols, and Mollisols. The soils in the area have a mesic soil temperature regime, a udic or aquic soil moisture regime, and dominantly mixed or smectitic mineralogy. The soils are very deep, poorly drained to excessively drained, and loamy, silty, or clayey. Nearly level Endoaqualfs (Iva series) and Argiaquolls (Ragsdale series) formed in loess on broad upland summits and flats. Nearly level to steep Hapludalfs (Alford, Iona, Muren, Stoy, and Sylvan series) and Fragiudalfs (Hosmer series) formed in loess on uplands. Hapludalfs (Alvin, Bloomfield, and Princeton series) and Argiudolls (Ade series) formed in sandy eolian material in areas of dunes on uplands and stream terraces. Steep and very steep Hapludalfs (Hickory series) formed in Illinoian till along the major streams and dissected upland drainageways. Hapludalfs (Wellston series) formed in siltstone or sandstone residuum on strongly sloping to steep side slopes underlain by bedrock.

The soils in the major stream valleys include Hapludolls (Carmi series), Argiudolls (Elston series), and Hapludalfs (Skelton series), all of which formed in outwash on nearly level to moderately sloping stream terraces and outwash plains. Endoaquolls (Montgomery series), Endoaquepts (Zipp series), Epiaqualfs (McGary series), and Hapludalfs (Shircliff and Markland series) formed in clayey lacustrine sediments on nearly level to strongly sloping lacustrine terraces or lake plains. Endoaquepts (Evansville series), Endoaquolls (Patton series), and Hapludalfs (Henshaw and Uniontown series) formed in silty sediments on terraces and lake plains.

LRU notes (excerpts from Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. USDA Handbook 296, 2006)

## **Classification relationships**

Major Land Resource Area (MLRA) (USDA-NRCS, 2022):  
115X–Central Mississippi Valley Wooded Slopes

U.S. Forest Service Ecoregions (Cleland et al. 2007):

Domain: Humid Temperate Domain

Division: Hot Continental Division

Province: Eastern Broadleaf Forest (Continental)

Province Code: 222

Section Code: 222G, 222D

These PES sites are similar to other established ecological classifications. Field verification is needed to confirm this association.

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  
Macrogroup: M029. Central Hardwood Floodplain Forest  
Group: G652. Midwest Floodplain Forest

Ecological site concept

The historic pre-European settlement vegetation or reference plant community for Wet Clayey Terrace ecological site was a mature, mixed, deciduous forest with a dense tree canopy and an oak component. The understory consisted of shade-tolerant shrubs and a diverse shade-tolerant herbaceous layer. These sites occurred on somewhat poorly drained to very poorly drained terraces with slopes ranging from 0-2%, so sites are not influenced by slope or aspect.

The canopy species are typically pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), cherrybark oak (*Quercus pagoda*), American elm (*Ulmus americana*), green ash (*Fraxinus pensylvanica*), and silver maple, (*Acer saccharinum*). Wet tolerant herbaceous species such as sweet woodreed (*Cinna arundinacea*), Possumhaw (*Ilex decidua*) and green hawthorn (*Crataegus viridis*) are common in the shrub layer.

Sedges (*Carex* spp.) may dominate the herbaceous layer, but many different native forbs are also present. Common vine species include trumpet creeper (*Campsis radicans*) and eastern poison ivy (*Toxicodendron radicans*) which dominate the vine stratum. Vegetative communities on these sites were historically influenced by fire drought, windstorms, ice storms, and grazing. (LANDFIRE; NatureServe, 2020)

Today, anthropogenic disturbances such as grazing, oak removal, invasive species, and agriculture uses have modified most sites. Remaining woodlands have usually incurred repeated disturbances and may exhibit an increased density of maples, ash, and non-native plant species.

Associated sites

F115XA018IL	<b>Wet Clayey Floodplain</b> Wet Clayey Floodplains are located on lower sites in the floodplain and soils are poorly drained.
F115XA012IL	<b>Clayey Floodplain</b> Clayey Floodplains are located on lower sites in the floodplain but are moderately well drained wo well drained.

Similar sites

F115XA018IL	<b>Wet Clayey Floodplain</b> Wet Clayey Floodplains are located on on lower sites within the floodplain and soils are poorly drained.
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Table 1. Dominant plant species

Tree	(1) <i>Fraxinus pennsylvanica</i> (2) <i>Quercus bicolor</i>
Shrub	(1) <i>Crataegus viridis</i>
Herbaceous	(1) <i>Cinna arundinacea</i> (2) <i>Carex</i>

Physiographic features

These sites are located on various landforms including stream terraces, lake terrace, lakeplains, floodplains,

outwash plains, and glacial lakes (relic). Elevation of these sites are generally between 341' to 1017' and slopes vary from 0-10%. Runoff class is very low to low and permeability is impermeable to very slow. Flooding and ponding ranges from none to frequent. (NASIS, 2020)

**Table 2. Representative physiographic features**

Landforms	(1) Stream terrace (2) Lake terrace (3) Terrace (4) Lake plain (5) Glacial lake (relict)
Runoff class	Very low to low
Flooding frequency	None to frequent
Ponding frequency	None to frequent
Elevation	341–1,017 ft
Slope	0–2%
Water table depth	0–24 in
Aspect	Aspect is not a significant factor

**Table 3. Representative physiographic features (actual ranges)**

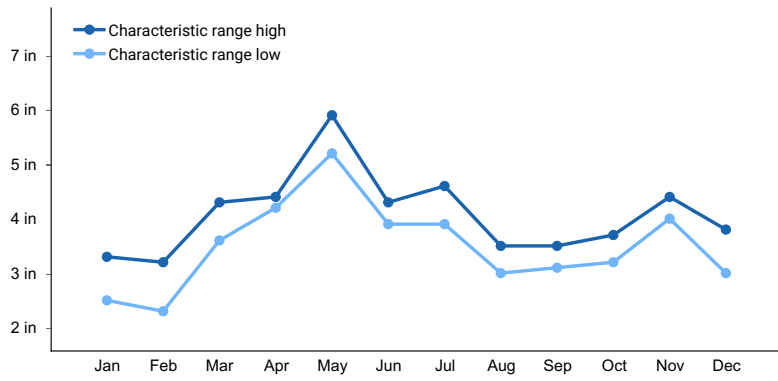
Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–10%
Water table depth	Not specified

## Climatic features

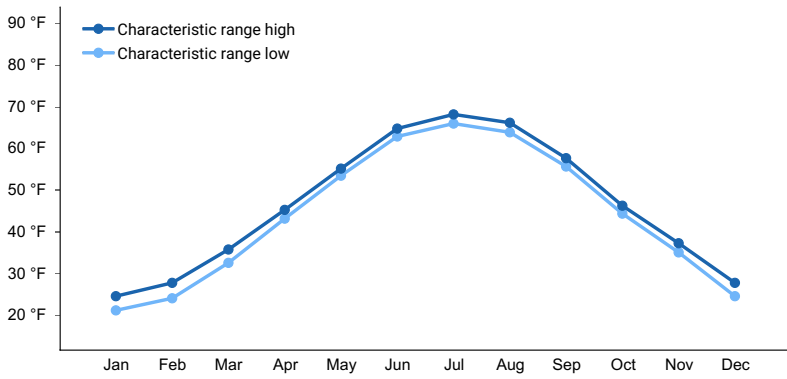
About 60 percent of the precipitation falls during the freeze-free period. Most of the rainfall occurs as high-intensity, convective thunderstorms in summer. Snowfall is common in winter. The representative freeze-free period ranges from 192-199 days and the representative frost -free period ranges from 171-179 days.

**Table 4. Representative climatic features**

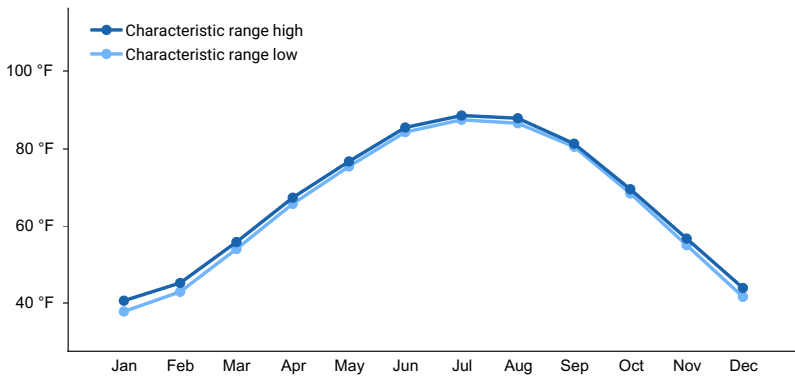
Frost-free period (characteristic range)	171-179 days
Freeze-free period (characteristic range)	192-199 days
Precipitation total (characteristic range)	44-47 in
Frost-free period (actual range)	166-180 days
Freeze-free period (actual range)	190-204 days
Precipitation total (actual range)	40-48 in
Frost-free period (average)	175 days
Freeze-free period (average)	196 days
Precipitation total (average)	45 in



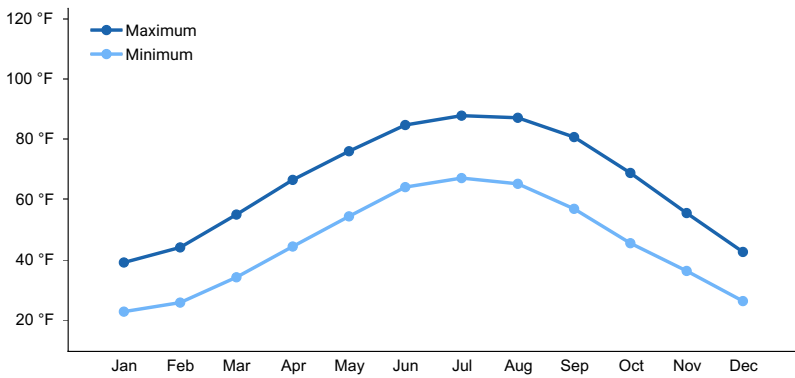
**Figure 1. Monthly precipitation range**



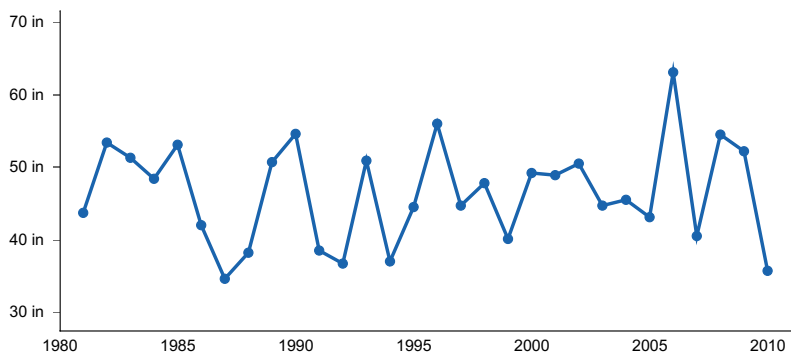
**Figure 2. Monthly minimum temperature range**



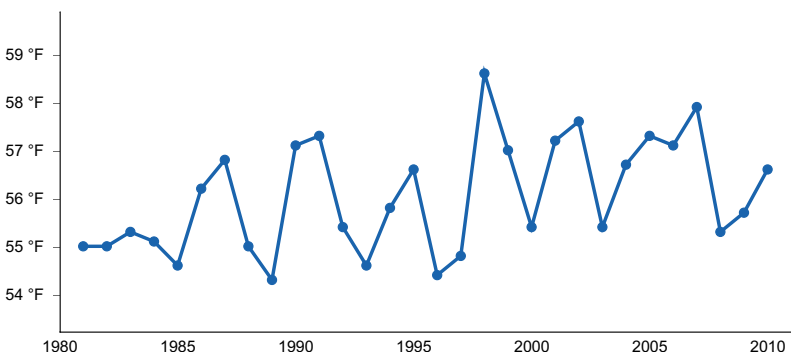
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) PRINCETON 1 W [USC00127125], Princeton, IN
- (2) VINCENNES 5 NE [USC00129113], Vincennes, IN
- (3) EVANSVILLE REGIONAL AP [USW00093817], Evansville, IN
- (4) TERRE HAUTE CAA AP [USW00093823], Terre Haute, IN
- (5) MT VERNON [USC00126001], Uniontown, IN

## Influencing water features

Wet Clayey Terrace sites can be frequently influenced by flooding and ponding. Ponding may occur and a seasonally high groundwater level is characteristic of these sites. Precipitation is the main source of water for vegetation.

## Soil features

These sites are very deep, somewhat poorly drained to very poorly drained, with a permeability ranging from impermeable to very slow. They are formed from clayey lacustrine deposits, loess over clayey lacustrine deposits, and fine-textured alluvium. Wet layers range between 24 inches to the surface. (NASIS, 2020)

Official soil series description Taxonomic Classes:

McGary: Fine, mixed, active, mesic Aeric Epiaqualfs

Montgomery: Fine, mixed, active, mesic Vertic Endoaquolls

Kings: Fine, smectitic, mesic Vertic Endoaquolls

Sexton: Fine, smectitic, mesic Typic Endoaqualfs

Zipp: Fine, mixed, active, nonacid, mesic Typic Endoaquepts

**Table 5. Representative soil features**

Parent material	(1) Lacustrine deposits (2) Loess (3) Outwash
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Surface texture	(1) Silty clay loam (2) Silt loam (3) Silty clay
Drainage class	Very poorly drained to somewhat poorly drained
Permeability class	Very slow to slow
Soil depth	60–80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	5–7 in
Calcium carbonate equivalent (Depth not specified)	0–35%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–4%
Subsurface fragment volume >3" (Depth not specified)	0%

**Table 6. Representative soil features (actual values)**

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	4–8 in
Calcium carbonate equivalent (Depth not specified)	Not specified
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

## Ecological dynamics

Vegetative community species, structure and density is regulated by the frequency, duration and depth of flooding, moisture availability, and soil physical properties. Soils in the Wet Clayey Terrace group are very slowly permeable due to a high clay content in the soil horizon. This results in a shallow, perched water table during the winter and

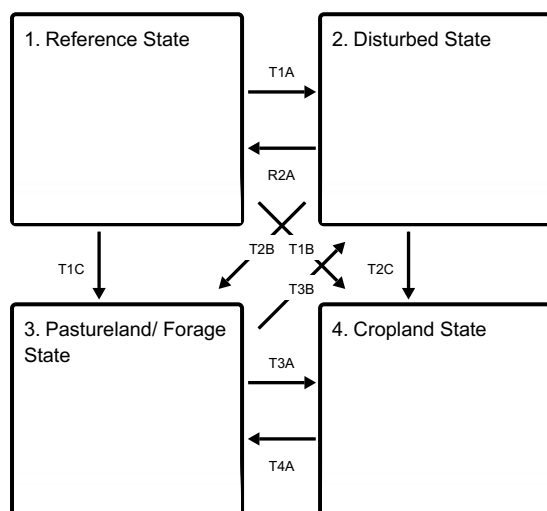
early spring months. This clay layer also creates dry conditions for plants during the summer and fall, thereby restricting growth and rooting depth. Ponding of water can occur on these sites, especially on convex landscapes. Shallow, ponded depressions encourage growth of hydrophytic vegetation. During periods of drought, these sites can get extremely dry.

Historically, fire played a role in the maintenance of these systems, especially during extended dry periods. Periodic, low-severity fires kept woodlands open, removed the litter, and stimulated the understory growth. During longer periods without fire, woody brush and understory species will increase and the herbaceous understory will diminish due to competition and shade. The return of fire would open the woodlands up again and stimulate an increase in density and diversity of ground flora species

Today, most of these ecological sites have been cleared, drained and converted to pastureland or cropland. Invasive non-native vegetation is a serious concern in many remaining wooded areas as bush honeysuckle, euonymus, Japanese honeysuckle, privet, and other non-native plants have been introduced and are increasing without management controls.

## State and transition model

### Ecosystem states



**T1A** - Large scale disturbance

**T1C** - Clearing of site; agricultural production - forage

**T1B** - Clearing of site; agricultural production -row crops.

**R2A** - Restoration inputs such as planting, brush control, prescribed fire, and timber stand improvement.

**T2B** - Clearing; agricultural production - forage

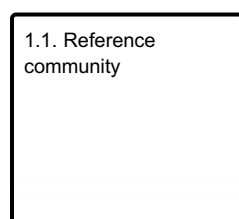
**T2C** - Clearing; agricultural production - row crops

**T3B** - Abandonment of agricultural practices

**T3A** - Site preparation and tillage, seeding, weed control, cropland management

**T4A** - Transition site to forage production; seeding; weed/brush control; pasture management

### State 1 submodel, plant communities





## State 2 submodel, plant communities

2.1. Disturbed  
community

## State 3 submodel, plant communities

3.1.  
Pastureland/Forage  
community

## State 4 submodel, plant communities

4.1. Cropland  
community

## State 1 Reference State

The Wet Clayey Terrace Reference State is characterized by a mature deciduous forest with a oak component. Flooding regime will be a major influencer on plant community composition as flooding on these sites ranges from none to frequent. Canopy species on sites often include green ash, maple, pin oak, swamp white oak, elm, and sweetgum. The shrub layer varies but often includes green hawthorn, possumhaw, and pawpaw. Understory composition and density will be varied depending on drainage, depth of wet layer, and flooding regime.

### Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree
- sweetgum (*Liquidambar styraciflua*), tree
- green hawthorn (*Crataegus viridis*), shrub
- possumhaw (*Ilex decidua*), shrub
- sedge (*Carex*), grass
- sweet woodreed (*Cinna arundinacea*), grass
- grape (*Vitis*), other herbaceous
- eastern poison ivy (*Toxicodendron radicans*), other herbaceous

## Community 1.1 Reference community

The reference community was a mature, deciduous forest with a diverse understory composed of wet -tolerant native forbs, grasses, and sedges. The canopy species are typically pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), and silver maple, (*Acer saccharinum*). Wet tolerant herbaceous species such as sweet woodreed (*Cinna arundinacea*), Possumhaw (*Ilex decidua*) and green hawthorn (*Crataegus viridis*) are common. Sedges (*Carex* spp.) may dominate the herbaceous layer, but many different native forbs are also present. Common vine species include grape (*Vitis* spp.), trumpet creeper (*Campsis radicans*) and eastern poison ivy (*Toxicodendron radicans*) which dominate the vine stratum. Vegetative communities will vary due to flooding and ponding regimes.

### **Dominant plant species**

- pin oak (*Quercus palustris*), tree
- sweetgum (*Liquidambar styraciflua*), tree
- swamp white oak (*Quercus bicolor*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- green hawthorn (*Crataegus viridis*), shrub
- possumhaw (*Ilex decidua*), shrub
- sedge (*Carex*), grass
- sweet woodreed (*Cinna arundinacea*), grass
- grape (*Vitis*), other herbaceous
- eastern poison ivy (*Toxicodendron radicans*), other herbaceous

## **State 2**

### **Disturbed State**

Most Wet Clayey Terrace sites have been altered due to human disturbances such as hydrological modifications, clearing, grazing or selective harvest (i.e. oak removal). Trees on site will depend on the type, length and severity of disturbances. These sites may be frequently flooded and ponded which will impact understory vegetation especially. Sites that have had a long-term absence of a natural fire regime will display the following characteristics: an increase in fire-intolerant species, decrease in oak regeneration, an increase in shrub density, an increase in leaf-litter buildup, and an increase in shade-tolerant understory species. Diversity of species may also be reduced, especially if there has been an introduction of non-native species.

### **Dominant plant species**

- green ash (*Fraxinus pennsylvanica*), tree
- silver maple (*Acer saccharinum*), tree
- red maple (*Acer rubrum*), tree
- sweetgum (*Liquidambar styraciflua*), tree

## **Community 2.1**

### **Disturbed community**

This is a disturbed, successional community that includes a variety of fast-growing trees such as maple, elm, sweetgum, poplar, and ash. Shrub and understory species will depend on the type, severity, and length of disturbances, available seed sources, and flooding regime. These sites can have substantial plant community changes if the hydrology has been altered.

### **Dominant plant species**

- maple (*Acer*), tree
- ash (*Fraxinus*), tree
- elm (*Ulmus*), tree
- cottonwood (*Populus*), tree
- sweetgum (*Liquidambar styraciflua*), tree

## **State 3**

### **Pastureland/ Forage State**

A portion of these sites have been converted to pastureland or forage production. Species selection will depend upon the objectives and goals of the landowner; however, commonly planted grasses include tall fescue (*Schedonorus arundinaceus*), brome (*Bromus* spp.), white clover (*Trifolium repens*) and red clover (*Trifolium pratense*). Species health and productivity are determined by the management and long-term overgrazing on some sites has caused soil erosion and compaction.

### **Dominant plant species**

- tall fescue (*Schedonorus arundinaceus*), grass

- brome (*Bromus*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- white clover (*Trifolium repens*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous

## Community 3.1

### Pastureland/Forage community

These sites are managed for forage production and often include tall fescue (*Schedonorus arundinaceus*), brome (*Bromus* spp.), white clover (*Trifolium repens*) and red clover (*Trifolium pratense*). Selection of species will depend on the landowner's objectives.

#### Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- brome (*Bromus*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- red clover (*Trifolium pratense*), other herbaceous
- white clover (*Trifolium repens*), other herbaceous

## State 4

### Cropland State

Hydrological modifications such as ditching and tiling are often installed on these sites to increase crop production. Common crops include corn (*Zea mays*), soybeans (*Glycine max*), and occasionally winter wheat (*Triticum aestivum*). Some landowners choose to convert sites to cool season grasses for a period before resuming cropland production. A return to the historical Reference State from State 4 is unlikely, if not impossible.

#### Dominant plant species

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

## Community 4.1

### Cropland community

This community is characterized by the management and production of row crop agriculture. Common species include corn, soybean and wheat. Many other crops are suitable for these sites, and species selection will depend upon the landowners goals and objectives.

#### Dominant plant species

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

## Transition T1A

### State 1 to 2

Severe disturbances, such as clearing, grazing, or selective harvesting (oak/hickory removal) will transition this site to State 2.

## Transition T1C

### State 1 to 3

Site is transitioned to an agricultural site focused on forage production. Management inputs would include clearing, site preparation, seeding and weed/brush control.

## Transition T1B

## **State 1 to 4**

Site is transitioned to an agricultural site focused on row crop production. Management inputs would include clearing, site preparation, seeding and weed control. Hydrological modifications are often installed to aid in drainage.

## **Restoration pathway R2A**

### **State 2 to 1**

Restoration would require long-term management inputs including planting of desired species, weed control, brush control, timber stand improvement, and prescribed fire. Sites altered by ditching and tiling would require the restoration of the natural hydrology.

## **Transition T2B**

### **State 2 to 3**

Site is cleared and forage/pasture production is initiated. Management inputs would include tree/shrub removal, site preparation, seeding, and weed/brush control.

## **Transition T2C**

### **State 2 to 4**

Site is cleared and row crop production is initiated. Management inputs would include tree/shrub removal, site preparation, tillage, seeding, and weed control. Hydrological modifications such as ditching and tiling are often installed to facilitate improved drainage.

## **Transition T3B**

### **State 3 to 2**

Site is abandoned and slowly would transition to a wooded state dominated by deciduous trees. Species on site would depend on the severity and length of disturbance and available seed sources.

## **Transition T3A**

### **State 3 to 4**

Management inputs that transition a site from pasture or forage production to a site that is utilized for row crop production.

## **Transition T4A**

### **State 4 to 3**

Management inputs to transition a site from cropland production to a state of pasture/forage production.

## **Additional community tables**

## **Inventory data references**

A Provisional Ecological Site Description (PESD) describes ecological potential and ecosystem dynamics of land areas and their potential management. Ecological sites are linked to soil survey map unit components, which allows for mapping of ecological sites. A PESD with a provisional status represents the lowest tier of documentation that is releasable to the public. No field level data have been collected as part of this PESD. It is expected that a PESD will continue to be refined through field verification and field sampling.

Reference and alternative state concepts, including the state-and-transition model and vegetative communities are not yet well-documented and will require field sampling for verification.

This document is provisional.

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## Approval

Suzanne Mayne-Kinney, 12/30/2024

## Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	05/12/2025
Approved by	Suzanne Mayne-Kinney
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:

- 
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:

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17. **Perennial plant reproductive capability:**

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