

## Ecological site F115XA008IL Loamy Terrace

Last updated: 12/30/2024  
Accessed: 05/12/2025

---

### 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

Hierarchical framework relationships

Major Land Resource Area (MLRA) 115X—Central Mississippi Valley Wooded Slopes

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 Loamy Terrace ecological sites was a mature deciduous forest with a dense tree canopy and a substantial oak component. The understory consisted of shade-tolerant shrubs and a diverse shade-tolerant herbaceous layer. These sites occurred on well-drained and moderately well drained terraces with slopes ranging from 0-4%. Tree species included northern red oak (*Quercus rubra*), Shumard oak (*Quercus shumardii*), shellbark hickory (*Carya laciniosa*), sugar maple (*Acer saccharum*), white oak (*Quercus alba*), American elm (*Ulmus americana*), tulip poplar (*Liriodendron tulipifera*), basswood (*Tilia americana*), mockernut hickory (*Carya tomentosa*), black walnut (*Juglans nigra*), white ash (*Fraxinus americana*), and green ash (*Fraxinus pennsylvanica*).

Today, anthropogenic disturbances such as grazing, oak and walnut logging, invasive species, and agriculture have modified most sites. Remaining woodlands have usually incurred repeated disturbance and are often exhibit an increased density of tulip poplar (*Liriodendron tulipifera*), ash (*Fraxinus* spp.), basswood (*Tilia americana*), and sugar maple (*Acer saccharum*).

## Associated sites

F115XA007IL	<b>Wet Clayey Terrace</b> Wet Clayey Terrace sites are somewhat poorly to poorly drained, so will exhibit more wet-tolerant species.
F115XA015IL	<b>Loamy Floodplain</b> Loamy Floodplain sites are located lower on the landscape but may exhibit some similar species.

## Similar sites

F115XA001IL	<b>Silty Upland</b> Silty Upland sites are located on uplands and are well drained.
R115XA105IL	<b>Wet Sandy Terrace</b> Loamy Floodplain sites are located lower on the landscape but may exhibit some similar species.

**Table 1. Dominant plant species**

Tree	(1) <i>Quercus rubra</i> (2) <i>Ulmus americana</i>
Shrub	(1) <i>Lindera benzoin</i>
Herbaceous	(1) <i>Claytonia</i> (2) <i>Trillium</i>

## Physiographic features

These sites are located on various landforms including floodplain steps, outwash terraces, stream terraces, and outwash plains. Elevation of these sites are generally between 325' to 820' and slopes vary from 0-4%. Runoff class is very low to low. Flooding is none to rare and sites do not pond.

**Table 2. Representative physiographic features**

Landforms	(1) Stream terrace (2) Terrace (3) Outwash terrace (4) Outwash plain
Runoff class	Very low to low

Flooding frequency	None to rare
Ponding frequency	None
Elevation	99–250 m
Slope	0–4%
Water table depth	0–76 cm
Aspect	Aspect is not a significant factor

### 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 183-196 days and the representative frost -free period ranges from 149-169 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	149-169 days
Freeze-free period (characteristic range)	183-196 days
Precipitation total (characteristic range)	1,118-1,194 mm
Frost-free period (actual range)	138-174 days
Freeze-free period (actual range)	182-202 days
Precipitation total (actual range)	1,118-1,194 mm
Frost-free period (average)	159 days
Freeze-free period (average)	190 days
Precipitation total (average)	1,168 mm

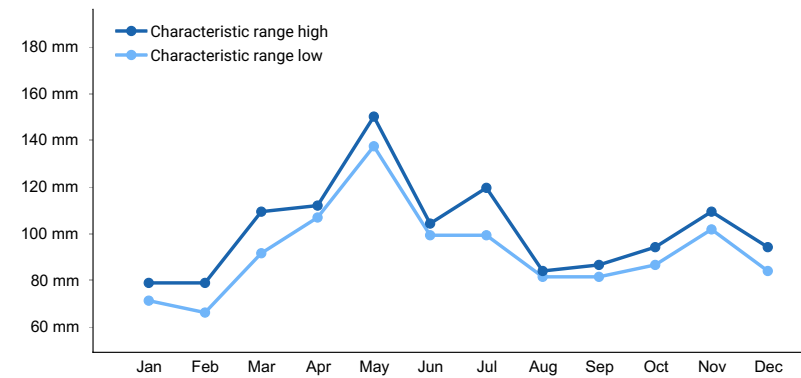


Figure 1. Monthly precipitation range

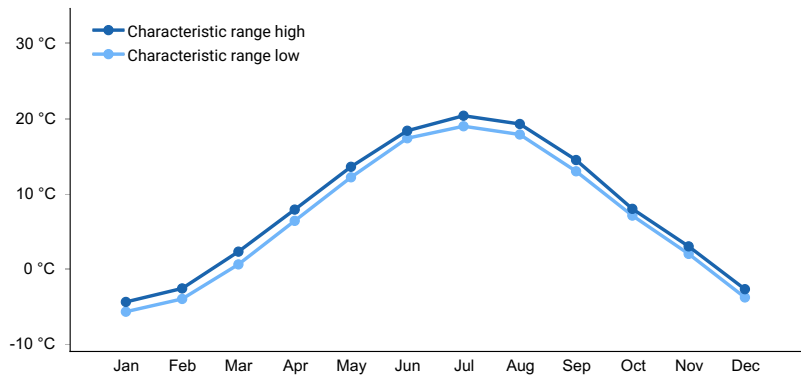
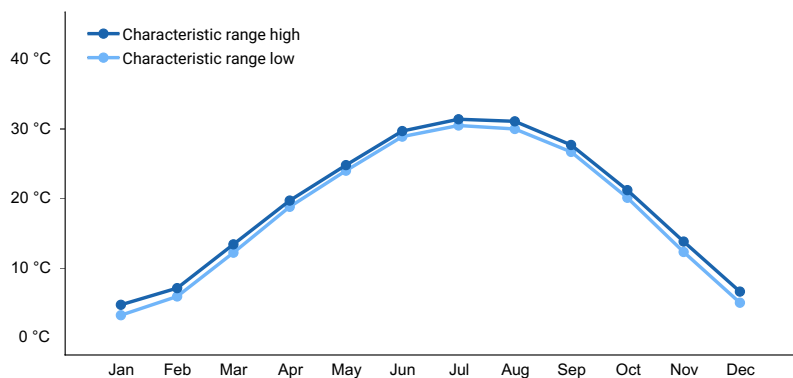
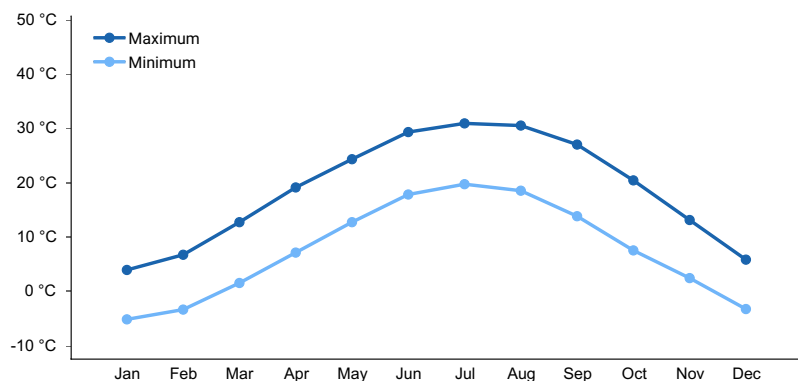


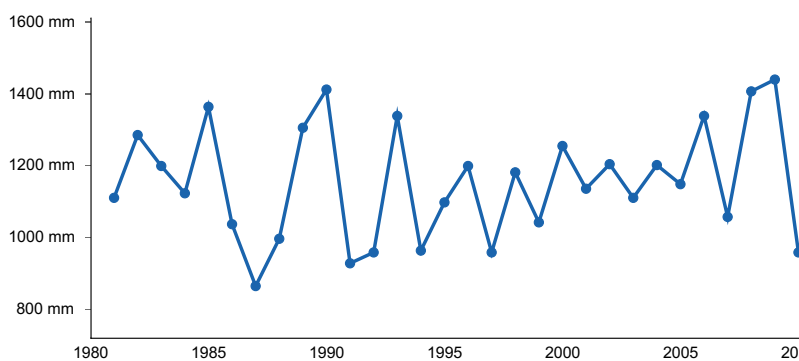
Figure 2. Monthly minimum temperature range



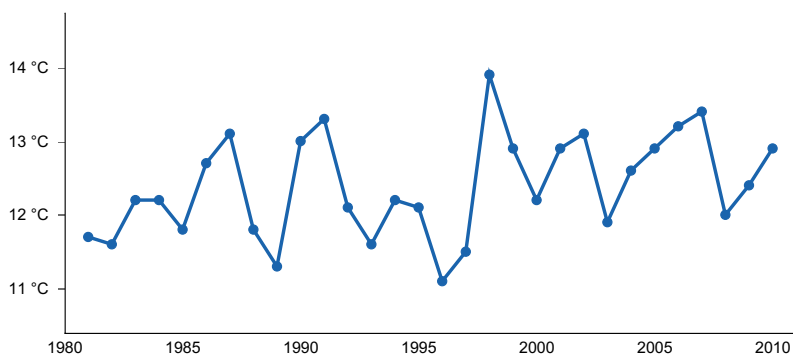
**Figure 3. Monthly maximum temperature range**



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



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) TERRE HAUTE INDIANA ST [USC00128723], Terre Haute, IN
- (2) PALESTINE [USC00116558], Palestine, IL
- (3) FREELANDVILLE [USC00123104], Bicknell, IN

- (4) MT CARMEL [USC00115888], Mount Carmel, IL
- (5) GRAYVILLE [USC00113612], Mount Carmel, IL
- (6) J T MYERS LOCKS & DAM [USC00128967], Morganfield, IN

## Influencing water features

This site is commonly not influenced by riparian flooding. A few components within this group may flood rarely. Ponding does not occur.

## Soil features

These sites are very deep, moderately well drained to well drained, with slow to moderately slow permeability. They are formed in loess over silty material over outwash, loess over fine-silty alluvium over outwash, fine-loamy outwash, and silty lacustrine deposits. Taxonomic classes of soils in this group include mesic Typic Hapludalfs, mesic Ultic Hapludalfs, mesic Typic Argiudolls, Mesic Cumulic Hapludolls, and mesic Oxyaquic Hapludalfs.

**Table 4. Representative soil features**

Parent material	(1) Loess (2) Alluvium
Surface texture	(1) Silt loam (2) Silty clay loam
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately slow
Soil depth	102–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	15.24–20.32 cm
Calcium carbonate equivalent (Depth not specified)	0–40%
Sodium adsorption ratio (Depth not specified)	0–15
Soil reaction (1:1 water) (Depth not specified)	4.5–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–2%

## Ecological dynamics

This ecological site is located on moderately well drained to well drained soils and are generally located on stream terraces. Sites either do not flood or rarely flood and ponding does not occur. The characteristic ecological community for Loamy Terrace site is a deciduous forest with an substantial oak component and a high level of canopy diversity. Sites will exhibit variations in species composition based on drainage, slope, aspect, and water table depth. Multiple species of oaks were historically present on these sites. Tree species included northern red oak (*Quercus rubra*), Shumard oak (*Quercus shumardii*), shellbark hickory (*Carya laciniosa*), sugar maple (*Acer saccharum*), white oak (*Quercus alba*), American elm (*Ulmus americana*), tulip poplar (*Liriodendron tulipifera*), basswood (*Tilia americana*), mockernut hickory (*Carya tomentosa*), black walnut (*Juglans nigra*), white ash (*Fraxinus americana*), and green ash (*Fraxinus pennsylvanica*).

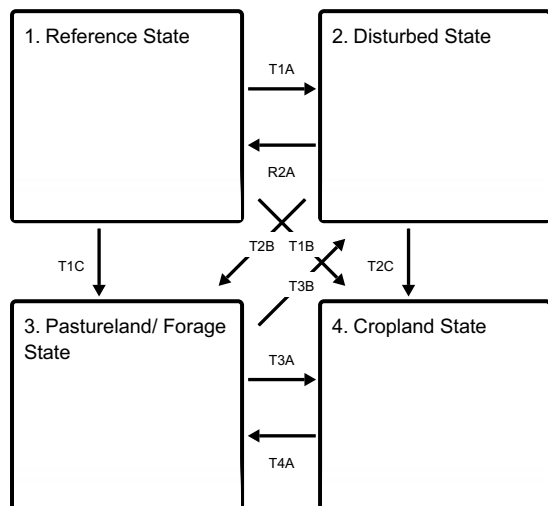
Reoccurring fire was an influencing factor on Loamy Terrace sites. Other natural impacts such as drought, floods, wind damage, and ice storms influenced these communities over centuries. Long-term periods of drought,

especially if fire occurred in conjunction with a drought, would have influenced the species composition, shrub density, plant mortality, and tree growth rates.

Most sites have now been converted to agriculture – either cropland or hayland production. Landowners should be aware of potential overgrazing impacts such as soil erosion, soil compaction, water quality impacts, and noxious weeds. 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

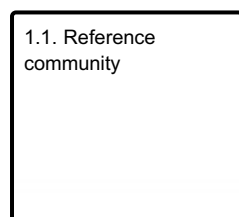
**T2C** - Clearing; agricultural production - row crops

**T3B** - Abandonment of agricultural practices

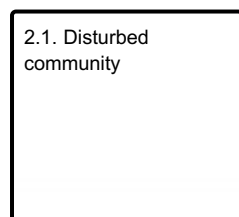
**T3A** - Site preparation and tillage, seeding, weed control, cropland management

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

### State 1 submodel, plant communities



### State 2 submodel, plant communities



### State 3 submodel, plant communities

3.1.  
Pastureland/Forage  
community

### State 4 submodel, plant communities

4.1. Cropland  
community

## State 1 Reference State

This State is characterized by a mature, mixed, deciduous forest with an oak component. Species on these sites include northern red oak (*Quercus rubra*), Shumard oak (*Quercus shumardii*), American elm (*Ulmus americana*), white ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), black walnut (*Juglans nigra*), basswood (*Tilia americana*), white oak (*Quercus alba*), and multiple species of hickory (*Carya* spp.). The shrub layer consists of multiple species including spicebush (*Lindera benzoin*), American hazelnut (*Corylus americana*), and blackberry (*Rubus* spp.). Understory composition and density will be varied depending depth of wet layer and drainage. Historically these sites were influenced by wildfires, wind damage, ice storms, and grazing by native mammals. Severe disturbances (clearing, selective harvest) or a lack of a natural fire regime will increase fire-intolerant species on site. Maple, ash, and tulip poplar are common species. Shrub density and sapling numbers will increase.

### Dominant plant species

- northern red oak (*Quercus rubra*), tree
- mockernut hickory (*Carya tomentosa*), tree
- bitternut hickory (*Carya cordiformis*), tree
- black walnut (*Juglans nigra*), tree
- northern spicebush (*Lindera benzoin*), shrub
- springbeauty (*Claytonia*), other herbaceous
- trillium (*Trillium*), other herbaceous
- grape (*Vitis*), other herbaceous

## Community 1.1 Reference community

The characteristic ecological community for Loamy Terrace site is a mature, mixed, deciduous forest with an substantial oak and hickory components and a high level of canopy diversity. Sites will exhibit some variations in species composition based on drainage, slope, aspect, and water table depth.

### Dominant plant species

- northern red oak (*Quercus rubra*), tree
- Shumard oak (*Quercus shumardii* var. *shumardii*), tree
- mockernut hickory (*Carya tomentosa*), tree
- black walnut (*Juglans nigra*), tree
- northern spicebush (*Lindera benzoin*), shrub
- springbeauty (*Claytonia*), other herbaceous
- trillium (*Trillium*), other herbaceous
- grape (*Vitis*), other herbaceous



## State 2

### Disturbed State

Today, most Loamy Terrace ecological sites have been altered due to disturbances. Some sites have also been grazed or had intermittent selective harvest (i.e. oak removal). Trees on site, will depending on the type, length and severity of disturbances. Sites that have had a long-term absence of fire 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 such as bush honeysuckle (*Lonicera maackii*) and garlic mustard (*Alliaria petiolate*). Many of these sites are eventually transitioned to Pastureland (State 3) or cropland (State 4) on lower slope sites.

#### Dominant plant species

- sugar maple (*Acer saccharum*), tree
- white ash (*Fraxinus americana*), tree
- American basswood (*Tilia americana*), tree
- dogwood (*Cornus*), shrub
- blackberry (*Rubus*), shrub
- black elderberry (*Sambucus nigra*), shrub

## Community 2.1

### Disturbed community

This is a disturbed, successional community that includes a variety of fast-growing trees such as maples and ashes. Community 2.1. has a greater number of maple, ash, and/or poplar samplings and seedlings. Shrub density is greater than in community 1.1. Understory species will depend on the type, severity and length of disturbances, available seed sources, and management inputs, if present.

#### Dominant plant species

- sugar maple (*Acer saccharum*), tree
- white ash (*Fraxinus americana*), tree
- maple (*Acer*), shrub
- dogwood (*Cornus*), shrub
- elderberry (*Sambucus*), shrub
- northern spicebush (*Lindera benzoin*), shrub

## 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**

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. Hydrological modifications such as ditching and tiling may be utilized on sites. 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 or selective harvesting (oak/hickory removal) , will transition this site to State 2.

### **Transition T1C**

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

A transition 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.

### **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.

## **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.

## **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.

### **Other references**

Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Corps of Engineers, Engineer Waterways Experiment Station, Vicksburg, MS.

Braun, E. Lucy. 2001. Deciduous forests of eastern North America. Caldwell, N.J.: Blackburn Press.

Cleland, D. T., J. A. Freeouf, J. E. Keys, G. J. Nowacki, C. Carpenter, and W. H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 92 pp.

Comer P. J., Faber-Langendoen D, Evans R, Gawler S. C, Josse C, Kittel G, Menard S, Pyne M, Reid M, Schulz K, Snow K, and Teague J. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial

Systems. NatureServe, Arlington, Virginia.

Cowardin, L.M., V. Carter, F. C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep water habitats of the United States. U.S. Dept. of Interior, Fish & Wildlife Service, Office of Biological Services, Washington DC. FWS/OBS-79/31. 142 pp.

Homoya, M. A., Abrell, D. B., Aldrich, J. R., & Post, T. W. (1985). The Natural Regions of Indiana. Indiana Academy of Science, 94, 245-269

Jackson, Marion T. 1997. The Natural heritage of Indiana. Bloomington: Indiana University Press, published in association with the Indiana Department of Natural Resources and the Indiana Academy of Science.

Landfire (Landfire National Vegetation Dynamics Database). 2009. Landfire National Vegetation Dynamics Models. Landfire Project, USDA Forest Service, U.S. Department of Interior. (<http://www.LANDFIRE.gov/index.php>: accessed 2020).

Mohlenbrock, R. H. and D. M. Ladd. 1978. Distribution of Illinois Vascular Plants. Southern Illinois Univ. Press, Carbondale and Edwardsville, Ill. 282 pp.

Mohlenbrock, R. H. 2003. Vascular Flora of Illinois, 3rd edition. Carbondale, Illinois: Southern Illinois University Press. 736 pp.

National Cooperative Soil Survey (NCSS). National Cooperative Soil Characterization Database. Available online: <https://ncsslabsdatamart.sc.egov.usda.gov/>. Accessed: 2020.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>. (Association Detail Report: CEGLO02427) (Accessed: 2020)

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey (SSS NRCS WSS). Available online at the following link: <https://websoilsurvey.sc.egov.usda.gov/>. Accessed 2020.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions (SSS NRCS OSD). Available online. Accessed 2020. <https://soilseries.sc.egov.usda.gov/osdname.aspx>

United States Department of Agriculture, Natural Resources Conservation Service (USDA – NRCS). 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. USDA Handbook 296. 682 pp.

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

USDA, NRCS. 2018. The PLANTS Database (<http://plants.usda.gov>, 1 March 2018). National Plant Data Team, Greensboro, NC 27401-4901 USA.

Voigt, J. W., and R. H. Mohlenbrock. 1964. Plant communities of southern Illinois. Southern Illinois University Press, Carbondale. 202 pp.

Whitaker, John O., Charles J. Amlaner, Marion T. Jackson, George R. Parker, and Peter Evans Scott. 2012. Habitats and ecological communities of Indiana presettlement to present. Bloomington: Indiana University Press.

## Contributors

Anita Arends, Ecological Site Specialist, USDA-NRCS, Illinois  
Ralph Tucker, Soil Survey Office Leader, USDA-NRCS, Missouri

## 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:**

---

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:**
-