USDA Natural Resources Conservation Service

Ecological site F114XB302IN
Residuum Upland Forest

Last updated: 11/16/2023
Accessed: 05/13/2025

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): 114X–Southern Illinois and Indiana Thin Loess and Till Plain

This MLRA is a loess-covered till plain with broad, nearly level summits and steeper slopes in areas. dissected by tributaries of the Ohio and Mississippi Rivers. It is used to produce cash crops, feed grain, and livestock. This MLRA is in Indiana (47 percent), Illinois (38 percent), and Ohio (15 percent) in four separate areas. It makes up about 10,388 square miles (26,904 square kilometers).

This area is in the Till Plains section of the Central Lowland province of the Interior Plains. 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 or gently sloping. Steep slopes are along rivers and streams. Elevation ranges from 310 feet (90 meters) on the southernmost flood plains to 1,340 feet (410 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters) but can be 50 to 100 feet (15 to 30 meters) along drainageways and streams.
The Little Miami River flows through the part of this MLRA in Ohio. The Ohio River flows along the southernmost boundary in some parts of this area in Ohio. The Kaskaskia River flows through the part of this area in Illinois. Tributaries to the Mississippi and Ohio Rivers drain this MLRA.

This area is covered dominantly by loess and Illinoian-age till or outwash. Most of the loess is Late Wisconsin-age Peoria Loess. In some places the Peoria Loess in underlain by Early Wisconsin-age Roxana Silt or by sandier or grittier loess. The loess ranges from 3 to 7 feet (1 or 2 meters) in thickness on stable summits and does not occur on some of the steeper slopes. The underlying Illinoian-age till and outwash commonly contain a paleosol. Meltwater outwash and lacustrine and alluvial deposits are on some of the stream terraces along the major tributaries. The till and outwash are underlain by several bedrock systems. Mississippian and Pennsylvanian bedrock occurs mostly in the western part of the MLRA. Ordovician, Silurian, and Devonian bedrock occurs mostly in the central part. Bedrock outcrops are common on the bluffs along the large rivers and their major tributaries. They also are evident at the base of steep slopes along minor streams and drainageways.

The average annual precipitation ranges from 39 to 47 inches (990 to 1,190 millimeters) with a mean of 42 inches (1,060 millimeters). The annual temperature ranges from 53 to 56 degrees F (11.8 to 13.6 degrees C) with a mean of 55 degrees F (13 degrees C). The freeze-free period ranges from 185 to 215 days with a mean of 200 days.

The dominant soil orders are Alfisols and Entisols. 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 deep or very deep, poorly drained to well drained, and loamy, silty, or clayey. Although limited in extent, some soils have a natric horizon in the part of the MLRA in Illinois. The main soils and their series: Albaqualfs that formed in loess or loess over pedisediment on till plains (Marine series); Endoaqualfs that formed in loess or loess over pedisedimenton till plains (Oconee series); Fluvaquents that formed in alluvium on flood plains (Wakeland series); Fragiudalfs that formed in loess over pedisediment over till (Cincinnati series) and loess over till (Rossmoyne series) on till plains; Glossaqualfs that formed in loess over till on till plains (Avonburg, Clermont, and Cobbsfork series) Hapludalfs that formed in till (Hickory series) and loess over pedisediment (Homen series) on till plains.

The soils on uplands support natural hardwoods. Oak, hickory, beech, and sugar maple are the dominant species. Native grasses grow in some scattered areas between the trees. The soils in low-lying areas support mixed forest vegetation. Pin oak, shingle oak, sweetgum, and black oak are the dominant species on the wetter sites. White oak, black oak, northern red oak, hickory, yellow-poplar, ash, sugar maple, and black walnut grow on the better drained sites. Honey locust is dominant on soils that formed in shaly limestone residuum. Silver maple, eastern cottonwood, American sycamore, pin oak, elm, and sweetgum grow along rivers and streams. Black walnut is abundant on very deep, well drained soils on some small flood plains. Sedge and grass meadows and scattered trees are on some low-lying sites.

Most of this MLRA is in farms and used to produce corn, soybeans, and livestock. Some small grains, including winter wheat, oats, and grain sorghum, also are grown. A small acreage is used for specialty crops, such as popcorn and apple orchards. The grassland supports introduced and native grasses. The forested areas are mainly on steep valley sides and in low-lying parts of flood plains. Surface coal mines make up a small acreage. (USDA, Natural Resources Conservation Service. 2022)

LRU notes

LRU 114B is in two separate areas in Illinois (66 percent) and Indiana (34 percent). It makes up about 7,005 square miles (18,150 square kilometers). It includes the towns of Brazil, Bloomfield, Cloverdale, and Spencer, Indiana, and Carlyle, Nashville, Hillsboro, Greenville, Vandalia, and Pinckneyville, Illinois. Interstates 55, 64, and 70 cross the part of the MLRA in Illinois. They converge in St. Louis, which is just west of this MLRA.
This area is in the Till Plains Section of the Central Lowland Province of the Interior Plains. Both large and small tributaries of the West Fork of the White River, the Eel River, the Kaskaskia River, and the Little Muddy River dissect the nearly level to very steep uplands. 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. Elevation ranges from 350 feet (105 meters) on the southernmost flood plains along the Ohio and Wabash Rivers to 1,190 feet (365 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters), but it can be 50 to 100 feet (15 to 30 meters) along drainageways and streams. It generally is low on broad, flat till plains and flood plains and high on the dissected hills bordering rivers or drainage systems.

Classification relationships

Major Land Resource Area (MLRA) (USDA-NRCS, 2006):
114B– Southern Illinois and Indiana Thin Loess and Till Plain, Western Part

U.S. Forest Service Ecoregions
Domain: Humid Temperate Domain
Division: Hot Continental Division
Province: Eastern Broadleaf Forest (Continental)
Province Code: 222

NatureServe Ecological System(s)
The following Nature Serve Explorer Ecological System Record has a high level of probability to match the ecological site found on these soils. Southern Interior Low Plateau Dry-Mesic Oak Forest- CES202.898

Ecological site concept

Residuum Upland Forest sites are a mesic to dry-mesic oak-hickory forest. Multiple oak and hickory species may be found on these sites. Common species include white oak, northern red oak, black oak, shagbark hickory, pignut hickory, white ash, eastern black cherry, persimmon, and sassafras. Reduction in fire frequency has increased sugar maple, beech, and tulip poplar on sites. Undisturbed high-quality sites will have a diverse understory community of native shrubs, herbs and forbs including an array of native spring wildflowers. Shrubs include blackhaw (Viburnum prunifolium, flowering dogwood (*Cornus florida*), common serviceberry (*Amelanchier arborea*), hophornbeam (*Ostrya virginiana*), and American hazelnut (Corylus americana). Understory species will vary depending on aspect, soil depth, and topography. Common herbs include Canadian blacksnakeroot (Sanicula canadensis), clustered blacksnakeroot (Sanicula odorata), American hogpeanut (Amphicarpaea bracteata),

Pennsylvania sedge (Carex pensylvanica), bedstraws (Galium spp.), hairy sunflower (Helianthus hirsutus),

Most sites in LRU114XB have incurred historic disturbances including selective harvest (oak removal), clearing, grazing, recreational uses, development, or absence of natural fire regimes. These disturbances will transition this community to a woodland dominated by fast-growing, shade-tolerant species such as sugar maple, tulip poplar, white ash, and beech. The resulting dense canopy shade on these sites often results in a more sparse understory community.

Many forest sites in Indiana and Illinois have been invaded by non-native plant species such as garlic mustard (Alliaria petiolate) and Amur bush honeysuckle (*Lonicera maackii*). Other common invasives include creeping Charlie (Glechoma hederacea), periwinkle (*Vinca minor*), multiflora rose (Rosa multiflora), English ivy (Hedera helix), Japanese honeysuckle (*Lonicera japonica*), Burning bush (*Euonymus alatus*) and wintercreeper (*Euonymus fortunei*)

Few high-quality, old-growth communities remain. Agriculture is the largest use of these soils in MLRA 114X.

Associated sites

F114XB503IN	**Till Upland Forest** The Till Upland Forest soils are formed in till and occur on till plains whereas the Residuum Upland Forest soils are formed in residuum. and occur on ground moraines, hills and hillslopes.
F114XB404IN	**Dry Outwash Upland Forest** The Dry Outwash Upland Forest occurs on outwash plains, outwash terraces, stream terraces, esker and Terraces and outwash is the parent material; where as the Residuum Upland Forest occurs on ground moraines, hills and hillslopes and residuum is the parent material.

Similar sites

F114XB404IN	**Dry Outwash Upland Forest** The Dry Outwash Upland Forest occurs on outwash plains, outwash terraces, stream terraces, esker and Terraces and outwash is the parent material; where as the Residuum Upland Forest occurs on ground moraines, hills and hillslopes and residuum is the parent material.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Carya*
Shrub	(1) *Amelanchier arborea* (2) *Lindera benzoin*
Herbaceous	(1) *Sanicula canadensis*

Physiographic features

These sites are found on ground moraines, hillslopes, and till plains.

Table 2. Representative physiographic features

Landforms	(1) Ground moraine (2) Hill (3) Hillslope (4) Till plain
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	104–305 m
Slope	2–70%

Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

About 60 percent of the precipitation falls during the freeze-free period. Most of the rainfall occurs as high-intensity, convective thunderstorms during summer. Snowfall is common in winter. The freeze-free period averages about 185 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	150-166 days
Freeze-free period (characteristic range)	180-190 days
Precipitation total (characteristic range)	1,118-1,168 mm
Frost-free period (actual range)	136-168 days
Freeze-free period (actual range)	176-194 days
Precipitation total (actual range)	1,067-1,219 mm
Frost-free period (average)	156 days
Freeze-free period (average)	186 days
Precipitation total (average)	1,143 mm

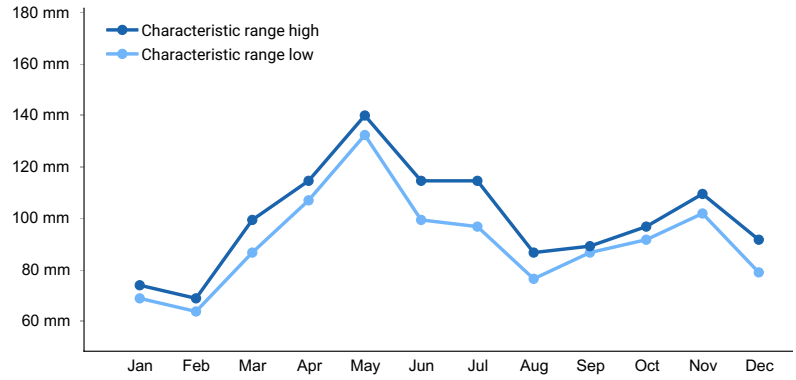


Figure 1. Monthly precipitation range

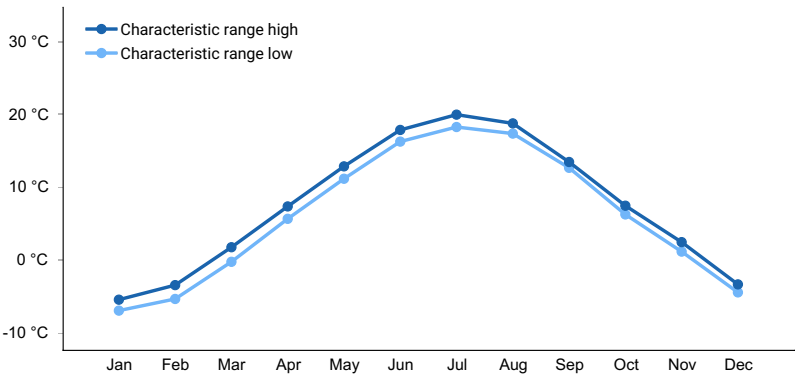


Figure 2. Monthly minimum temperature range

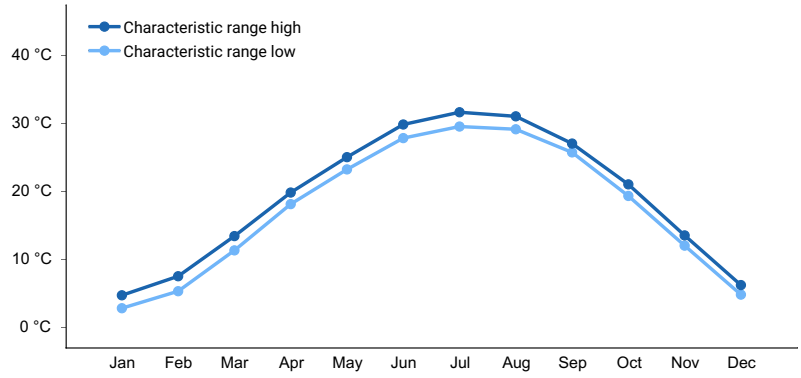


Figure 3. Monthly maximum temperature range

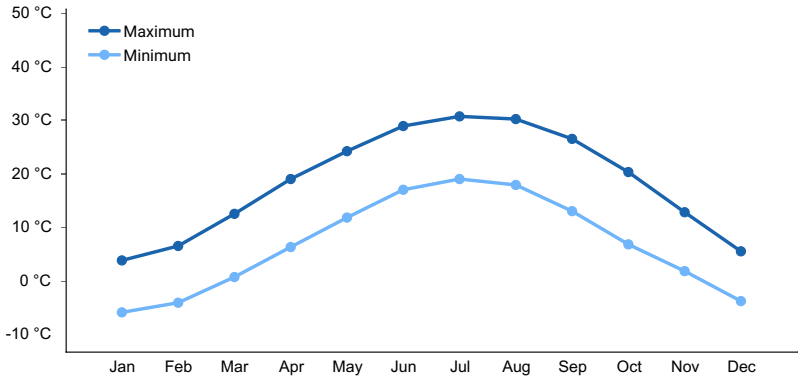


Figure 4. Monthly average minimum and maximum temperature

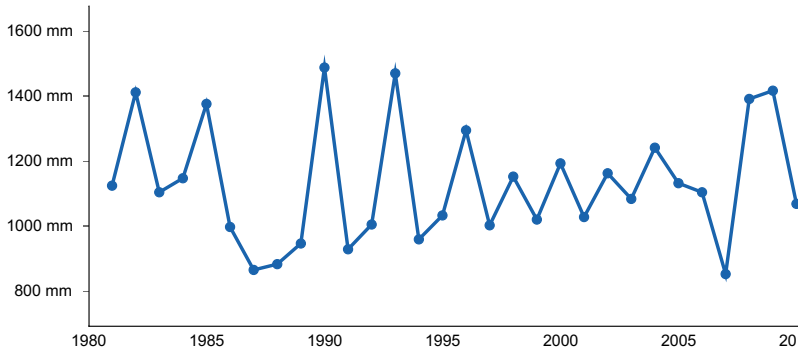


Figure 5. Annual precipitation pattern

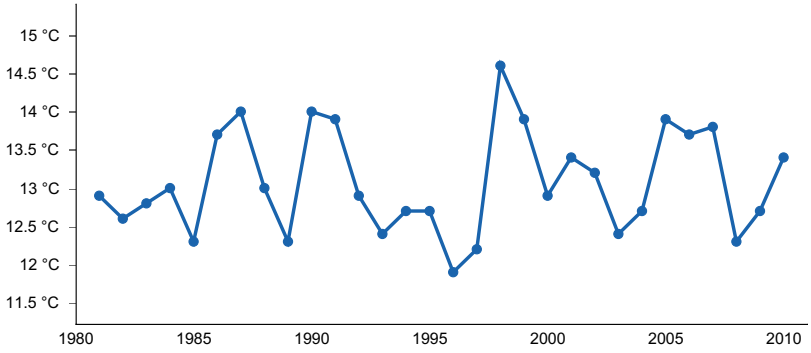


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SPARTA 1 W [USC00118147], Sparta, IL
- (2) CARBONDALE SOUTHERN IL AP [USW00093810], De Soto, IL
- (3) HILLSBORO [USC00114108], Hillsboro, IL

- (4) SPENCER [USC00128290], Spencer, IN
- (5) SHAKAMAK SP [USC00127959], Jasonville, IN

Influencing water features

These sites are not impacted by riparian or wetland features.

Soil features

The soil series associated with this site are: moderately deep to very deep, well drained and with very acidic to slightly acidic soil reaction, that have been formed in residuum of limestone, sandstone and shale, and/or shale. Loess, till and palesols or glacial drift may overlay the residuum. Series currently include Blocher, Caneyville, Coolville, Deputy, Grayford, Jennings, Ryker, Scottsburg, Stonehead, Weddel, and Wellston.

Table 4. Representative soil features

Parent material	(1) Residuum
Surface texture	(1) Clay loam (2) Silt loam
Family particle size	(1) Fine-silty (2) Fine-loamy
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderate
Soil depth	76–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	11.43–19.81 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.6–6
Subsurface fragment volume <=3" (0-101.6cm)	3–15%
Subsurface fragment volume >3" (0-101.6cm)	2–9%

Ecological dynamics

Residuum Upland Forest sites have variable canopy cover with oaks as a dominant species including white oak (*Quercus alba*), northern red oak (*Q. rubra*), and black oak (*Q. velutina*). Hickories are also common including shagbark (*Carya ovata*), pignut (*C. ovalis*) and mockernut (*C. tomentosa*). The subcanopy will include white ash (*Fraxinus americana*), eastern black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), persimmon (*Diospyros virginiana*) and dogwoods (Cornus spp.)

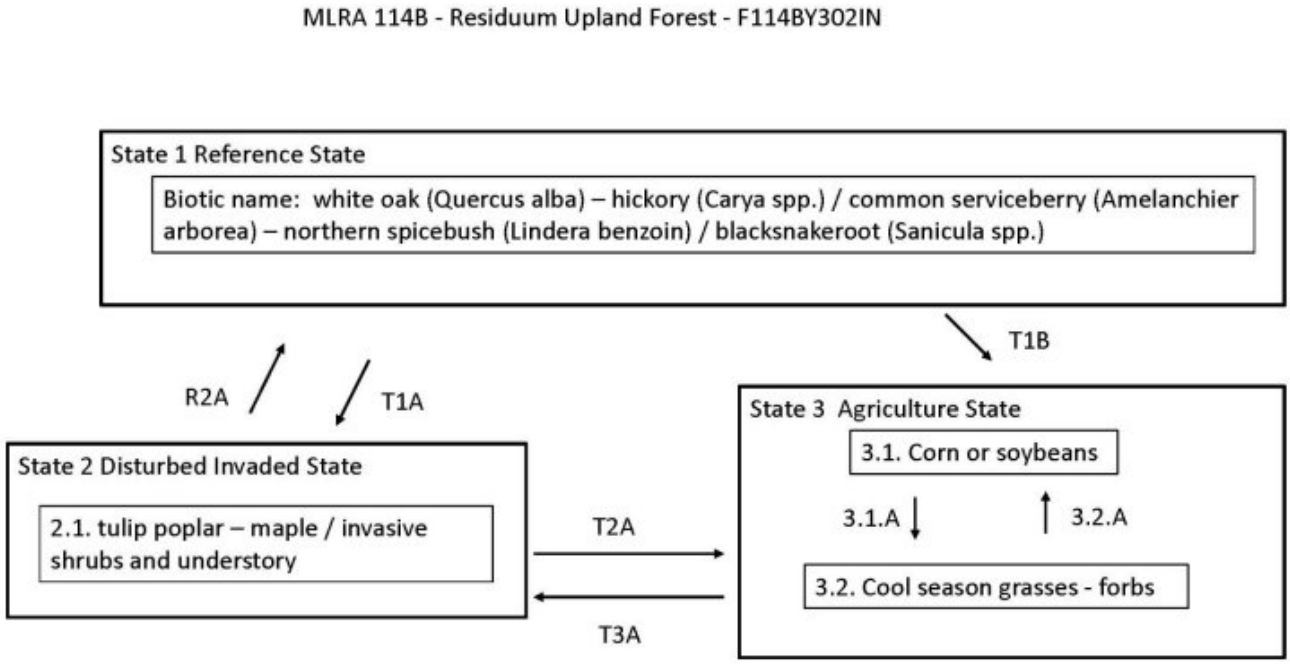
The shrub layer can be quite variable but may include flowering dogwood (*Cornus florida*), alternative leaf dogwood (*Cornus alternifolia*), Virginia creeper (*Parthenocissus quinquefolia*), maple-leaf viburnum (*Viburnum acerifolium*), Allegheny serviceberry (*Amelanchier laevis*), common serviceberry (*Amelanchier arborea*), prickly ash (*Zanthoxylum americanum*), and hophornbeam (*Ostrya virginiana*).

The herbaceous layer is often quite diverse and will vary from site to site.

Disturbances such as selective harvest, clear cutting, grazing, recreational uses, urban development and fire suppression have transitioned these communities to a more mesic woodland dominated by *Acer saccharum*, *Acer rubrum*, and/or *Liriodendron tulipifera*, especially in upland areas adjacent to floodplains. Understory composition on these sites is altered due to heavy shade, lack of natural fire, and thick leaf litter.

These sites are also highly susceptible to invasion from non-native vegetation species such as autumn olive (Elaeagnus umbellate), Asian bush honeysuckle (*Lonicera maackii*), Japanese honeysuckle (*Lonicera japonica*), tree-of-heaven (*Ailanthus altissima*), garlic mustard (Alliaria petiolate), winged burning bush (*Euonymus alatus*), periwinkle (*Vinca minor*), and winter creeper (*Euonymus fortunei*).

State and transition model



State 1
Reference State

These sites have variable canopy cover with oaks as a dominant species. Topography, aspect, rock content and soil depth will influence species composition. Canopy species may include white oak (*Quercus alba*), northern red oak (*Q. rubra*), black oak (*Q. velutina*), shagbark (*Carya ovata*), pignut hickory(*C. ovalis*) and mockernut (*C. tomentosa*). The subcanopy will also be influenced by topography, aspect and available water. Common species include white ash (*Fraxinus americana*), eastern black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), persimmon (*Diospyros virginiana*) and dogwoods (Cornus spp.) The shrub layer can be quite variable but may include flowering dogwood (*Cornus florida*), alternative leaf dogwood (*Cornus alternifolia*), Virginia creeper (*Parthenocissus quinquefolia*), maple-leaf viburnum (*Viburnum acerifolium*), Allegheny serviceberry (*Amelanchier*

laevis), common serviceberry (*Amelanchier arborea*), prickly ash (*Zanthoxylum americanum*), and hophornbeam (*Ostrya virginiana*). The herbaceous layer is often quite diverse and will vary from site to site.

Dominant plant species

- white oak (*Quercus alba*), tree
- northern red oak (*Quercus rubra*), tree
- hybrid hickory (*Carya*), tree
- common serviceberry (*Amelanchier arborea*), shrub
- northern spicebush (*Lindera benzoin*), shrub
- hophornbeam (*Ostrya virginiana*), shrub
- flowering dogwood (*Cornus florida*), shrub
- eastern redbud (*Cercis canadensis*), shrub
- Canadian blacksnakeroot (*Sanicula canadensis*), other herbaceous
- clustered blacksnakeroot (*Sanicula odorata*), other herbaceous
- Pennsylvania sedge (*Carex pensylvanica*), other herbaceous

Community 1.1
Reference community

The Residuum Upland Forest community is characterized by a closed canopy dominated by oaks, hickories and other deciduous species. Associates include maples, elm, and ash. The understory will include a diverse variety of native upland species including many spring wildflowers.

Dominant plant species

- white oak (*Quercus alba*), tree
- shagbark hickory (*Carya ovata*), tree
- black oak (*Quercus velutina*), tree
- mockernut hickory (*Carya tomentosa*), tree
- common serviceberry (*Amelanchier arborea*), shrub
- northern spicebush (*Lindera benzoin*), shrub
- hophornbeam (*Ostrya virginiana*), shrub
- eastern redbud (*Cercis canadensis*), shrub
- flowering dogwood (*Cornus florida*), shrub
- Canadian blacksnakeroot (*Sanicula canadensis*), other herbaceous
- clustered blacksnakeroot (*Sanicula odorata*), other herbaceous
- Pennsylvania sedge (*Carex pensylvanica*), other herbaceous

State 2
Disturbed Invaded State

Disturbances such as selective harvest, clear cutting, grazing, recreational uses, urban development and fire suppression have transitioned these communities to a more mesic woodland dominated by *Acer saccharum*, *Acer rubrum*, and/or *Liriodendron tulipifera*. Understory composition on these sites is altered due to heavy shade, lack of natural fire, and thick leaf litter. Disturbance also often results in an invasion of non-native species. Numerous species may be possible depending on seed sources. Mesophication of upland residuum sites is also occurring due to lack of a natural fire regime. Lack of fire is increasing the abundance of fire-sensitive species (maples, ashes, poplar) and poor recruitment of oak (Quercus spp.) in the absence of frequent fire..

Dominant plant species

- maple (*Acer*), tree
- white ash (*Fraxinus americana*), tree
- tuliptree (*Liriodendron tulipifera*), tree
- honeysuckle (*Lonicera*), shrub
- autumn olive (*Elaeagnus umbellata*), shrub
- Nepalese browntop (*Microstegium vimineum*), grass
- garlic mustard (*Alliaria petiolata*), other herbaceous

- Japanese honeysuckle (*Lonicera japonica*), other herbaceous
- winter creeper (*Euonymus fortunei*), other herbaceous

Community 2.1
Disturbed Invaded Community

This community is characterized by substantial disturbances including lack of fire, selective harvest, clearing, grazing, and subsequent invasion of non-native vegetation, which if not controlled, will overtake the site and impede oak reproduction.

Dominant plant species

- tuliptree (*Liriodendron tulipifera*), tree
- white ash (*Fraxinus americana*), tree
- maple (*Acer*), tree
- hybrid hickory (*Carya*), tree
- honeysuckle (*Lonicera*), shrub
- autumn olive (*Elaeagnus umbellata*), shrub
- Nepalese browntop (*Microstegium vimineum*), grass
- garlic mustard (*Alliaria petiolata*), other herbaceous
- winter creeper (*Euonymus fortunei*), other herbaceous
- Japanese honeysuckle (*Lonicera japonica*), other herbaceous

State 3
Agricultural State

Many sites are currently used for agricultural production. Row crop production is limited to lower slope mapunits only. Numerous crops may be produced on sites and the specific species will be determined by the landowners goals and objectives given the suitability of the site.

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

Community 3.1
Cropland

This phase is characterized by row crop agriculture of small grains, primarily corn and soybeans. Numerous crops can be grown on these sites and species will depend on landowner's goals and objectives.

Dominant plant species

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

Community 3.2
Forage / Pastureland

Planting of cool or warm season pasture/forage species and management to maintain them including brush and weed control. Species will depend on landowners objectives and management goals. Numerous warm season and cool season grasses may be grown along with many species of clover.

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

Pathway 3.1.A
Community 3.1 to 3.2

Planting of cool or warm season pasture/forage species and management to maintain them. Inputs will including seeding and weed control.

Pathway 3.2.A
Community 3.2 to 3.1

Planting, either by conventional or no-till methods, of row crops. Multiple plant species could be grown on these sites depending on landowner goals. Inputs will require management that keeps the site in row crop production, such as site preparation, cultivation and weed control. This transition is a consideration on lower sloping sites only.

Transition T1A
State 1 to 2

Substantial disturbance such as altered fire regime, selective harvest of oaks, clearing of site, and/or development. Introduction of non-native species with no management input to control spread.

Transition T1B
State 1 to 3

Clearing of mature high-quality forest for conversion to agricultural production. This transition is a consideration for lower slopes only.

Restoration pathway R2A
State 2 to 1

Restoration of site would include planting of oaks and timber stand improvement activities to insure high value trees thrive including selective thinning, brush control, and understory weed control. Prescribed fire may be appropriate for some sites.

Transition T2A
State 2 to 3

Transition to agricultural state. Activities would be determined by the landowner’s production objectives and goals for the site. Numerous crops with varying management scenarios may be feasible. This transition is appropriate for low-slopes only.

Transition T3A
State 3 to 2

Cropland or pastureland that is abandoned will slowly, but naturally, transition to a mixed deciduous woodland usually dominated by fast growing trees such as maple, ash, elm, etc. Species will depend on available seed sources.

Additional community tables

Inventory data references

INo field monitoring was conducted as part of this PES development. Future ESD development may result in plant community edits, soil mapunits being added or removed from this grouping, and/or additions or modifications to the narratives, tables, vegetation descriptions and state and transition model.

Other references

Anderson, R. C., J. S. Fralish, Jerry M. Baskin. 2007. Presettlement forests of Illinois. In Proceedings of the Oak Woods Management Workshop, ed. G. V. Burger, J. E. Ebinger, and G. S. Wilhelm, pp. 9-19. Charleston, Ill.: Eastern Illinois University.

Barrett, S.W. 1980. Indians and fire. Western Wildlands Spring: 17-20.

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 Coterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 92 pp.

Comer PJ, Faber-Langendoen D, Evans R, Gawler SC, 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, & 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.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC

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.

Illinois Department of Natural Resources (IDNR). 2018. Natural Divisions - Southern Till Plain. Accessed; March 2018.
https://www.dnr.illinois.gov/conservation/IWAP/Documents/NaturalDivisions/SouthernTillPlain

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.
Keyser, Tara L.; Arthur, Mary; Loftis, David L. 2017.Repeated burning alters the structure and composition of hardwood regeneration in oak-dominated forests of eastern Kentucky, USA. Forest Ecology and Management. 393: 1-11. https://doi.org/10.1016/j.foreco.2017.03.015.

Kilburn, P. and R. B. Brugam. 2014. Inventory of Vegetation Studies in Illinois Based on the Public Land Survey Records. Transactions of the Illinois State Academy of Science. Vol. 107, pp. 13-17.

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 22 February 2018).

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. 2014. Vascular Flora of Illinois, 4rd edition. Carbondale, Illinois: Southern Illinois University Press. 736 pp.

National Cooperative Soil Survey (NCSS). National Cooperative Soil Characterization Database. Available online: https://ncsslabdatamart.sc.egov.usda.gov/. Accessed: February 2018.

National Oceanic and Atmospheric Administration (NOAA). 1980-2010. https://www.ncdc.noaa.gov/data-access/land-based-station-data/find-station.

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: CEGL002427) (Accessed: May 22, 2018).

Nowacki, Gregory J.; Abrams, Marc D. 2008. The demise of fire and "mesophication" of forests in the eastern United States. BioScience. 58(2): 123-138.

Schwegman, J. E., G. B. Fell, M. D. Hutchinson, G. Paulson, W. M. Shephard, and J. White. 1973. Comprehensive plan for the Illinois Nature Preserve system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, IL. 32 pp.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions (SSS NRCS OSD). Available online. Accessed 2019.

USDA. 2019. The PLANTS Database (http://plants.usda.gov, 1 March 2018). National Plant Data Team, Greensboro, NC 27401-4901 USA.

USDA, 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. 2008. Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service. Technical Note No. 190–8–76. Washington D.C.

USGS. (2010). LANDFIRE Biophysical Settings. Retrieved from http://www.landfire.gov

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.

White, J. 1994. How the terms savanna, barrens, and oak openings were used in early Illinois. In J.S. Fralish, R. C. Anderson, J.E. Ebinger and R. Szafoni, eds., Proceedings of the North American Conference on Barrens and Savannas, Illinois State University, Normal Illinois.

White, J. 1978. Classification of natural communities in Illinois. Natural Areas Inventory Technical Report: Volume I, Survey Methods and Results. Illinois Natural Areas Inventory, Department of Landscape Architecture, University of Illinois at Urbana/Champaign. 426 pp.

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Approval

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	05/13/2025
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:**