USDA Natural Resources Conservation Service

Ecological site F114XB503IN
Till Upland Forest

Last updated: 11/16/2023
Accessed: 05/06/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 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 114XB 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. The east edge of the Scott Air Force Base is on the western edge of the area in Illinois.

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, 2022):
114X–Southern Illinois and Indiana Thin Loess and Till Plain

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

The following NatureServe Explorer Ecological System Record(s) have a high level of probability to match the ecological site reference community found on these soils : NORTH-CENTRAL INTERIOR DRY-MESIC OAK FOREST ANDWOODLAND (CES202.046)
CLASSIFIERS

Ecological site concept

The Till Upland Forest reference site is an mesic to dry-mesic oak -hickory forest. Species composition will be influenced by topography, soil characteristics, past and present disturbances, and seed sources. Common species are northern red oak (*Quercus rubra*), white oak (*Quercus alba*), black oak (*Quercus velutina*), post oak (*Quercus stellata*), shagbark hickory (*Carya ovata*), and mockernut hickory (*Carya tomentosa*). Associates include sassafras, wild black cherry, sugar maple, red maple, ash, black walnut, and elm.

Fire was the primary historical disturbance factor for these ecological sites, while drought, windthrow, and grazing were secondary factors (LANDFIRE). Sites that were influenced by frequent fire return intervals were characterized by an open and oak-dominated tree community with the presence of graminoid and sun-loving ground flora. Today, forest composition on these sites vary greatly depending logging, grazing, non-native vegetation, and lack of natural fire regimes. Many sites are dominated by associate tree species due to oak removal and lack of fire.

Associated sites

F114XB502IN	**Wet Till Upland Forest** The Wet Till Upland Forest ecological site and the Till Upland Forest ecological site occur on similar landscape positions and are often intermixed. The Till Upland Forest does not have a water table above 42 inches, whereas the Wet Till Upland Forest ecological site does have a at 0 to 42 inches in depth.

Similar sites

F114XB302IN	**Residuum Upland Forest** Residuum Upland Forest sites have a soil parent material of residuum, whereas Till Upland Forest sites have a soil parent material of till.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Carya ovata*
Shrub	(1) *Cornus florida*
Herbaceous	(1) *Desmodium* (2) *Galium*

Physiographic features

These sites located on till plains.

Table 2. Representative physiographic features

Landforms	(1) Till plain
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	350–1,200 ft
Slope	2–50%
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)	44-46 in
Frost-free period (actual range)	136-168 days
Freeze-free period (actual range)	176-194 days

Precipitation total (actual range)	42-48 in
Frost-free period (average)	156 days
Freeze-free period (average)	186 days
Precipitation total (average)	45 in

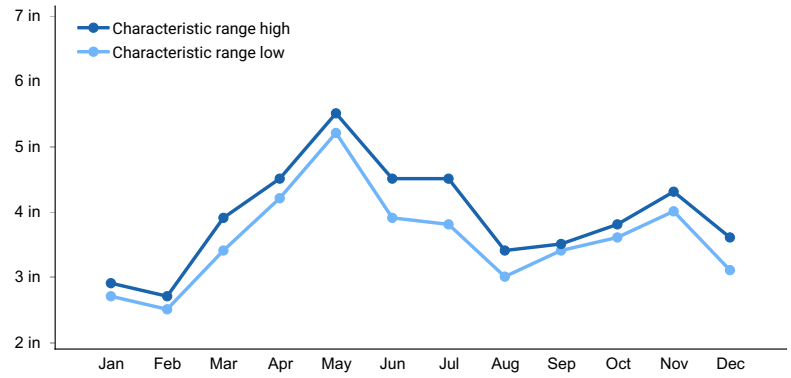


Figure 1. Monthly precipitation range

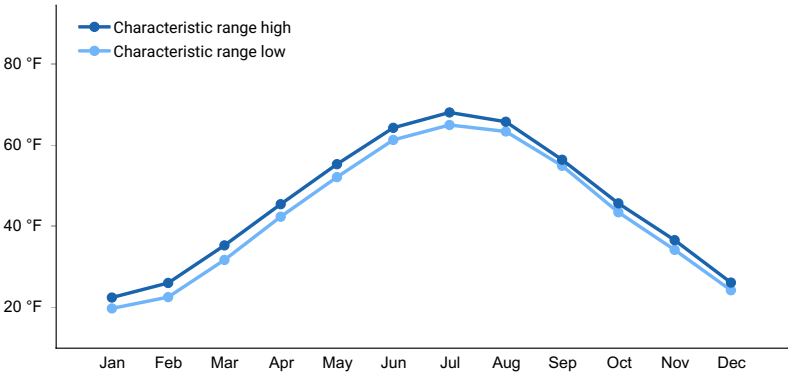


Figure 2. Monthly minimum temperature range

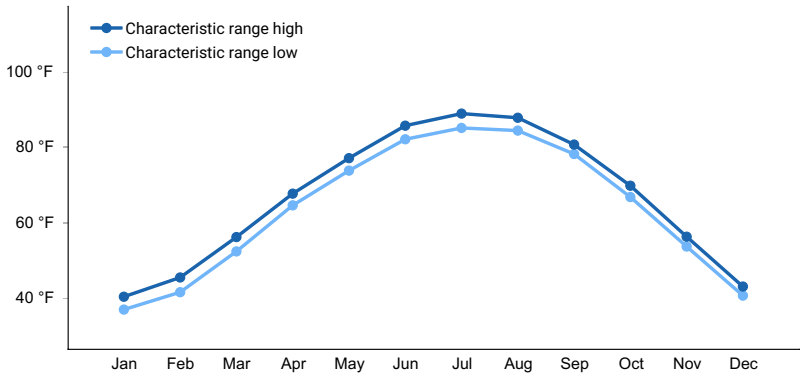


Figure 3. Monthly maximum temperature range

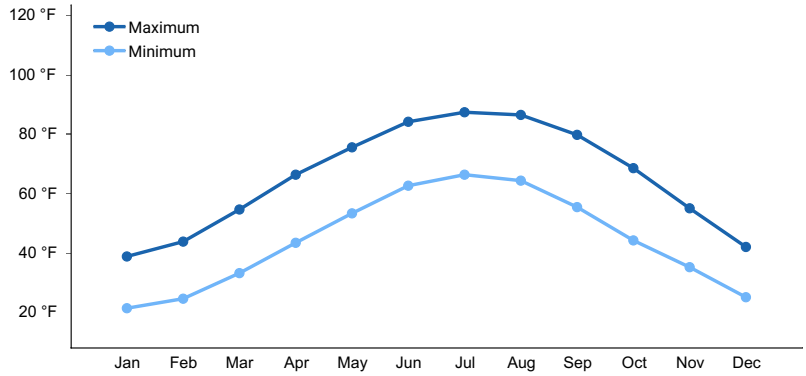


Figure 4. Monthly average minimum and maximum temperature

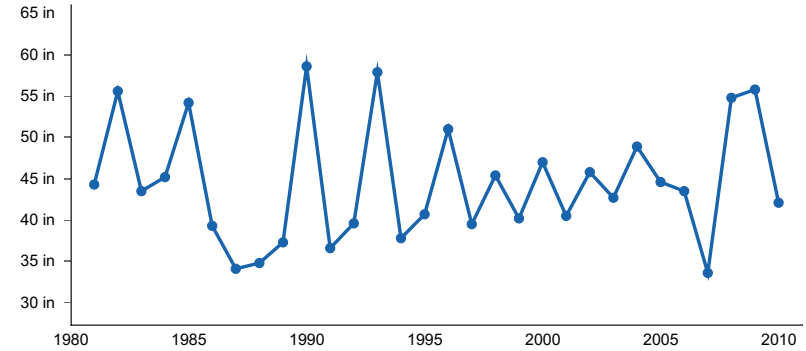


Figure 5. Annual precipitation pattern

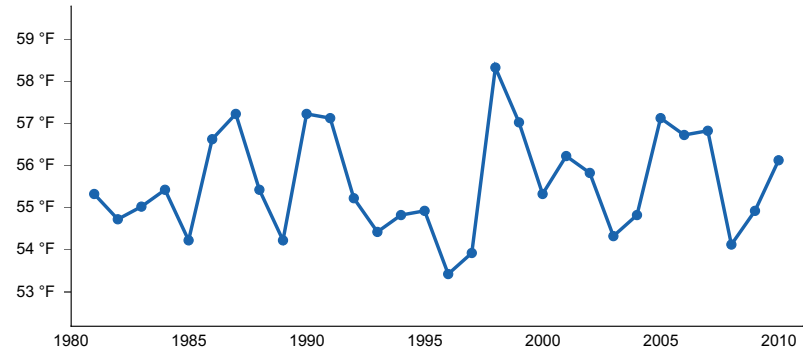


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SPENCER [USC00128290], Spencer, IN
- (2) HILLSBORO [USC00114108], Hillsboro, IL
- (3) CARBONDALE SOUTHERN IL AP [USW00093810], De Soto, IL
- (4) SPARTA 1 W [USC00118147], Sparta, IL
- (5) SHAKAMAK SP [USC00127959], Jasonville, IN

Influencing water features

These sites are not influenced by water features.

Soil features

The soil series associated with this site are: Bonnell, Cincinnati, and Hickory. Parent Material is till. The till may be overlaid by loess, pedisediment over paleosol

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Clay loam (2) Loam (3) Silt loam (4) Silty clay loam
Family particle size	(1) Fine (2) Fine-loamy (3) Fine-silty
Drainage class	Well drained
Permeability class	Very slow to moderate
Soil depth	80 in
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	4.5–7.5 in
Calcium carbonate equivalent (0-40in)	0–15%
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5–8.4
Subsurface fragment volume <=3" (0-40in)	0–6%
Subsurface fragment volume >3" (0-40in)	0–2%

Ecological dynamics

The historic reference community is an old-growth oak-hickory forest. Species may include white oak, shagbark hickory, northern red oak, mockernut hickory, black walnut, wild black cherry, white ash, and maple.

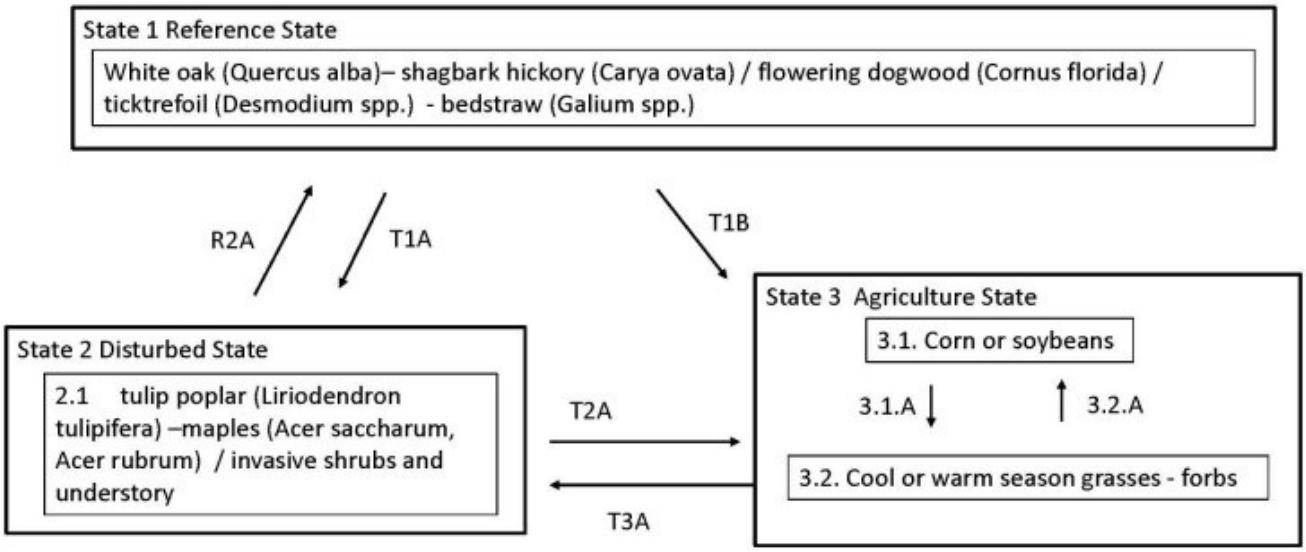
Multiple soils in this group (Ava, Cincinnati, Solsberry, Shakamak) have a hardpan (fragipan) that restrict water movement resulting in a seasonally perched water table. Soil moisture on these sites will fluctuate substantially during the growing season. Post oak (*Quercus stellata*), black oak (*Q. velutina*), pignut hickory (*C. glabra*), and blackjack oak (*Q. marilandica*) may also occur on these sites.

Disturbances, including fire suppression, has resulted in other tree species gaining dominance on many sites. Sugar maple (*Acer saccharum*), red maple (*A. rubrum*), common hackberry (*Celtis occidentalis*), and tuliptree (*Liriodendron tulipifera*) are now prevalent, and in some cases, dominant.

Many forest sites have been invaded by non-native plant species. Few high-quality, old-growth communities remain. Agriculture is the largest use of these soils in MLRA 114X.

State and transition model

MLRA 114B -Illinois and Indiana –Till Upland Forest- F114BY503IN



State 1
Reference State

The historic reference community on these sites was a mature oak-hickory forest. Dominant species include white oaks, red oaks, and hickories. Multiple species of oaks and hickories were present on these sites depending on aspect, topography, and disturbance regimes.

Dominant plant species

- white oak (*Quercus alba*), tree
- northern red oak (*Quercus rubra*), tree
- shagbark hickory (*Carya ovata*), tree
- mockernut hickory (*Carya tomentosa*), tree
- flowering dogwood (*Cornus florida*), shrub
- eastern redbud (*Cercis canadensis*), shrub
- ticktrefoil (*Desmodium*), other herbaceous
- bedstraw (*Galium*), other herbaceous
- trillium (*Trillium*), other herbaceous
- springbeauty (*Claytonia*), other herbaceous

Community 1.1
Reference community

The historic reference community on these sites was an old-growth oak-hickory forest. Dominant species include white oaks, red oaks, and hickories. Common species include white oak (*Q. alba*), northern red oak (*Quercus*

rubra), mockernut hickory (*Carya tomentosa*), shagbark hickory (*Carya ovata*), American elm (*Ulmus americana*), black walnut (*Juglans nigra*), wild black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), and maples (Acer spp.). Tulip poplar (*Liriodendron tulipifera*) is now found on many sites, especially in Indiana. Multiple soils in this group have a hardpan (fragipan) that restrict water movement resulting in a seasonally perched water table. Soil moisture on these sites will fluctuate during the growing season impacting vegetation community structure.

Dominant plant species

- white oak (*Quercus alba*), tree
- northern red oak (*Quercus rubra*), tree
- shagbark hickory (*Carya ovata*), tree
- mockernut hickory (*Carya tomentosa*), tree
- flowering dogwood (*Cornus florida*), shrub
- eastern redbud (*Cercis canadensis*), shrub
- ticktrefoil (*Desmodium*), other herbaceous
- bedstraw (*Galium*), other herbaceous
- trillium (*Trillium*), other herbaceous
- springbeauty (*Claytonia*), other herbaceous

State 2
Disturbed Invaded State

Today, disturbances such as selective harvest, clear cutting, grazing, and fire suppression have transitioned these communities from mixed oak - hickory to a greater maple-ash-poplar dominance. Sugar maple, red maple, tulip poplar, American beech and white ash often are prevalent. Understory composition on these sites may be altered due to non-native vegetation, heavy shade, lack of natural fire, and thick leaf litter. These sites are 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*).

Dominant plant species

- maple (*Acer*), tree
- tuliptree (*Liriodendron tulipifera*), tree
- ash (*Fraxinus*), 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

Disturbance of these sites without post-disturbance management inputs often results in a shift of dominant species and the introduction of non-native vegetation. On many sites, the oaks and hickory have been removed resulting in a forest dominated by maple, ash, elm and/or poplar. Invasive species will vary from site to site depending on seed sources. Species may include 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*)

Dominant plant species

- maple (*Acer*), tree
- tuliptree (*Liriodendron tulipifera*), tree
- ash (*Fraxinus*), 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

State 3
Agriculture State

This state exists on lower sloping sites and is characterized by the conversion of the site to agricultural use - specifically row crops. Most common practice is a corn and soybean rotation. Many crops can be grown on these sites. Species selection and management inputs depend on landowner's goals and objectives.

Dominant plant species

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

Community 3.1
Agricultural - Cropland

This phase is characterized by row crop agriculture of small grains, primarily corn and soybeans. However, many different crops can be produced on these sites. Species and a management actions will depend upon landowner's goals and objectives.

Dominant plant species

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

Community 3.2
Pasture -Forage production

This phase is characterized by forage production. Different mixes of warm and/or cool season grasses and forbs, largely clovers, may be grown. Sites may be grazed or utilized for hay production. Many different grass and forb species can be grown and management activities will depend upon 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

Pathway 3.1.A
Community 3.1 to 3.2

Planting of cool or warm season pasture/forage species and associated management inputs such as weed treatment and brush control.

Pathway 3.2.A

Community 3.2 to 3.1

Planting, either by conventional or no-till methods, of row crop. Management that keeps the site in row crop production will be needed. Species selection and management inputs will depend upon the crop produced and the landowners objectives.

Transition T1A
State 1 to 2

This transition can occur due to substantial canopy disturbance such as oak/hickory removal followed by no timber standing improvement activities and no control of non-native species. Tree regeneration will be dependent upon a number of factors such as the type of disturbance, the length and severity of the disturbance, and available seed sources. Site resilience will determine the recovery rate and species composition. Most sites are repopulated by maple, ash, elm, and poplar.

Transition T1B
State 1 to 3

Clearing of mature high-quality forest for conversion to agricultural production. Species planted and management activities will depend on the landowner's goals.

Restoration pathway R2A
State 2 to 1

Restoration of site would include planting of oaks and long-term timber stand improvement activities such as planting desired species, selective thinning, weed control and brush control.

Transition T2A
State 2 to 3

Transition from disturbed forest to agricultural state. Activities would be determined by the landowner’s production objectives.

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, shade tolerant species such as poplar, maple, and ash.

Additional community tables

Inventory data references

No 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.

PES documents developed by Doug Wallace for MLRA 113 were referenced as many of the soil series are also found in MLRA 114X. Readers interested in Hickory soils may want to refer to MLRA 113 PES Loamy Till Backslope Forest (F113XY911IL) which included the Hickory soil series.

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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)	
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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:

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

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

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

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

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17. **Perennial plant reproductive capability:**
