

Ecological site F114XB403IN Wet Outwash Upland Forest

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 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 is 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 pedisediment on 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

Ecological site concept

Wet Outwash Upland Forest reference sites will encompass a mosaic of species depending on microtopography and drainage. Sites will often exhibit a mosaic of wet to dry-mesic species. Oak and hickory were historically on these sites; however, modified hydrology and disturbances have transitioned most remaining wooded sites to a mixed hardwood forest. Maples, green ash, boxelder, beech and sweetgum are now common. The resulting dense canopy shade on these sites often results in a more sparse understory community. Many ruderal forest communities may be found on these sites, as few high-quality, old-growth communities remain. Agriculture is the largest use of these soils in MLRA 114XB.

Associated sites

F114XB404IN	Dry Outwash Upland Forest The Dry Outwash Upland Forest site has well drained soils with no water table , but does receive run-in moisture due to its low position on the landscape. the Wet Outwash Upland Forest site has a somewhat poorly drained to very poorly drained with a water table from 12-36 inches in depth.
F114XB503IN	Till Upland Forest Till Upland Forest ecological site is found on a till plain and the parent material is till where as the Wet Outwash Upland Forest is fond on flood plains, stream terraces, terraces and fans and the parent material is outwash.

Similar sites

F114XB502IN	Wet Till Upland Forest Wet Till Upland Forest sites have a soil parent material of till and occur on till plains, ground moraines, whereas the soil parent material of the Wet Outwash Upland Forest is outwash and occurs on flood plains, stream terraces, terraces and fans.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus palustris</i> (2) <i>Quercus rubra</i>
Shrub	(1) <i>Cornus</i>
Herbaceous	(1) <i>Carex</i> (2) <i>Elymus virginicus</i>

Physiographic features

Wet Outwash Upland Forest sites are found on backslopes, footslopes, and summits.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace (3) Terrace (4) Fan
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	340–1,000 ft
Slope	0–5%
Water table depth	12–36 in
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 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)	148-167 days
Freeze-free period (characteristic range)	182-191 days
Precipitation total (characteristic range)	43-46 in

Frost-free period (actual range)	135-168 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)	187 days
Precipitation total (average)	45 in

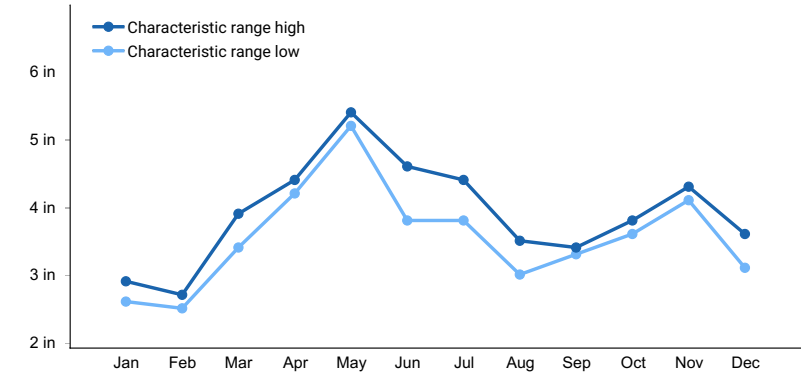


Figure 1. Monthly precipitation range

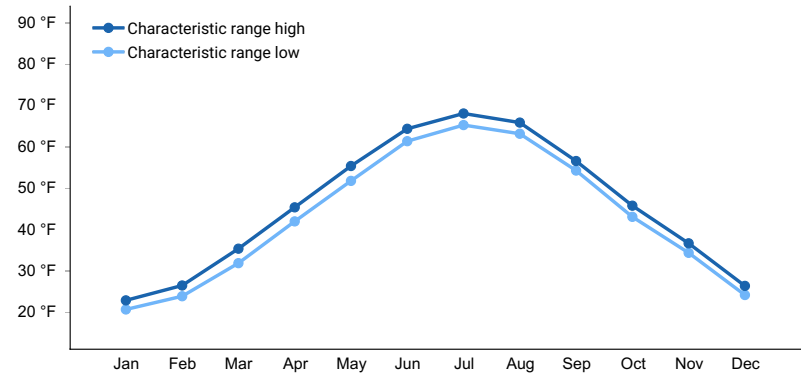


Figure 2. Monthly minimum temperature range

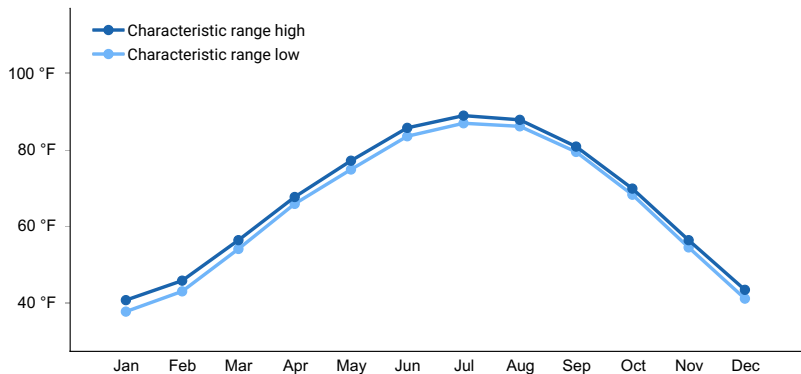


Figure 3. Monthly maximum temperature range

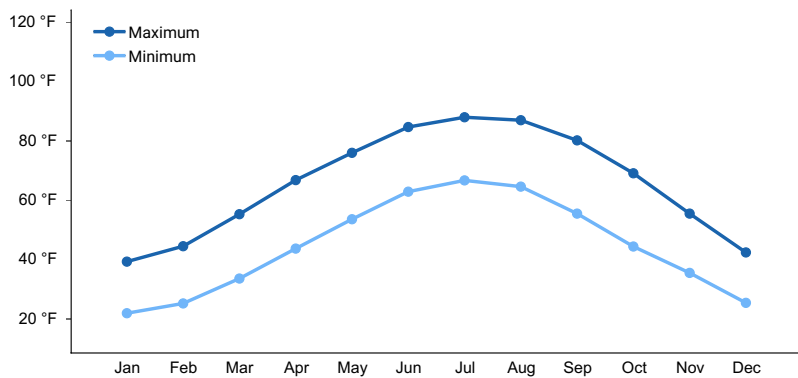


Figure 4. Monthly average minimum and maximum temperature

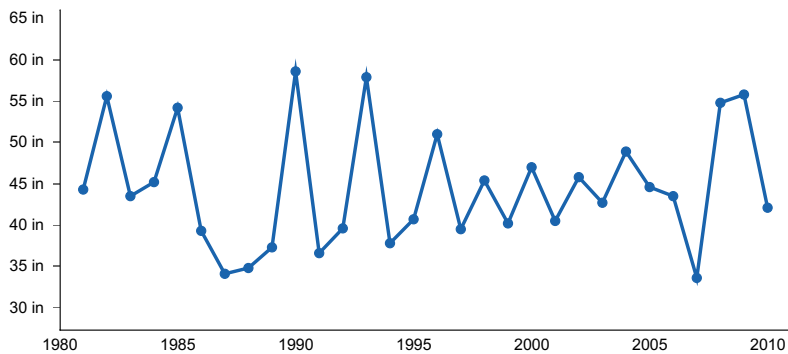


Figure 5. Annual precipitation pattern

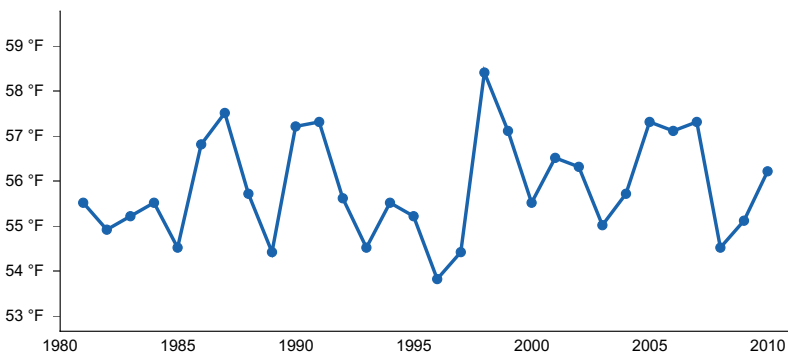


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

These sites may be influenced by flooding, ponding, and seasonally high water tables.

Wetland description

Wetlands may occur on these sites.

Soil features

Soils in this group are somewhat poorly drained to poorly drained and generally located on outwash plains. Loess, eolian deposits, silty alluvium may overlay the outwash. The soil series associated with this site are Creal, Geff,

Whitaker, Lyles, Kendall and Roby. Future ESD development with field verification may well result in this group being split due to drainage differences and duration of ponding and/or flooding.

Table 4. Representative soil features

Parent material	(1) Outwash
Surface texture	(1) Silt loam (2) Sandy loam (3) Fine sandy loam
Family particle size	(1) Fine-silty
Drainage class	Very poorly drained to somewhat poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6.1–8.5 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–7.3
Subsurface fragment volume <=3" (0-40in)	0–5%
Subsurface fragment volume >3" (0-40in)	0%

Ecological dynamics

Wet Outwash Upland reference sites will have a variable canopy cover with oaks as a dominant species. These sites are often a mosaic of wet to wet-mesic to mesic zones within the landscape. Wetter zones will have pin oak, green ash, sweetgum, silver maple, and swamp white oak. These sites will have a diversity of water-tolerant shrub and understory species such as dogwood (*Cornus* spp.), red maple (*Acer rubrum*), possumhaw (*Ilex decidua*), green hawthorn (*Crataegus viridis*), ferns (*Osmunda* spp.), and sedges (*Carex* spp.).

More mesic zones (higher microtopography) will favor more mesic species such as northern red oak (*Quercus rubra*), hickories (*Carya* spp.), white oak (*Q. alba*), white ash (*Fraxinus alba*), sugar maple (*Acer saccharum*), black walnut (*Juglans nigra*), and tulip poplar (*Liriodendron tulipifera*). The subcanopy may include persimmon (*Diospyros virginiana*), American beech (*Fagus grandifolia*), and dogwoods (*Cornus* spp.). The understory may include spicebush (*Lindera benzoin*), dogwoods (*Cornus* spp.), poison ivy (*Toxicodendron radicans*) and trumpet creeper (*Campsis radicans*).

The shrub and herbaceous layers are 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*. 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.

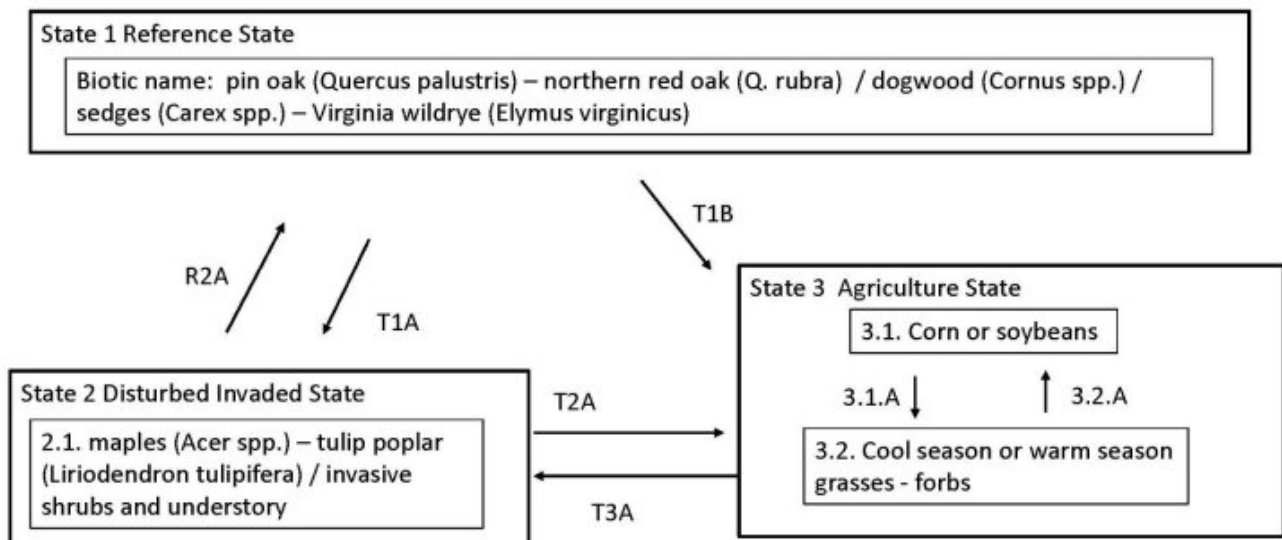
These soils can also be managed as a historic warm season native grassland; however, this would require regular management inputs since grazing and fire was historically utilized to maintain the grassland state. Species to

consider would include big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), prairie cordgrass (*Spartina pectinate*), switchgrass (*Panicum virgatum*), sedges (*Carex* spp.), Virginia wild rye (*Elymus virginicus*), Virginia mountainmint (*Pycnanthemum virginianum*), and bulrush (*Scirpus* spp.)

Today most acreage is in cropland or cool season grasses. Sites utilized for agricultural purposes have often had hydrological modifications such as ditching or tiling to improve drainage.

State and transition model

MLRA 114B -Illinois and Indiana –Outwash Upland Forest- F114BY403IN



State 1 Reference State

Multiple species may be present on these sites depending on fire regime (or lack of), seed sources, microtopography, and soil characteristics. Historically, these communities were mature hardwood forest with a substantial oak component. Oak species may include northern red oak, swamp white oak, pin oak, and bur oak. Associates include hickories, maple, white ash, tulip poplar, and sweetgum. A variety of native understory species may be on site.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree
- sweetgum (*Liquidambar styraciflua*), tree
- northern red oak (*Quercus rubra*), tree
- southern arrowwood (*Viburnum dentatum*), shrub
- dogwood (*Cornus*), shrub

- pawpaw (*Asimina triloba*), shrub
- northern spicebush (*Lindera benzoin*), shrub
- sedge (*Carex*), grass
- wildrye (*Elymus*), grass

Community 1.1

Reference Community

Wet Outwash Upland Forest reference sites will have a variable canopy cover with oaks as one of the dominant species. These sites are often a mosaic of wet to wet-mesic to mesic zones within the landscape. Wetter zones will have pin oak (*Quercus palustris*), green ash (*Fraxinus pennsylvanica*), silver maple (*Acer saccharinum*), and swamp white oak (*Quercus bicolor*). These sites will have a diversity of water-tolerant shrub and understory species such as dogwood (*Cornus* spp.), red maple (*Acer rubrum*), possumhaw (*Ilex decidua*), green hawthorn (*Crataegus viridis*), paw paw (*Asimina triloba*), ferns (*Osmunda* spp.), and sedges (*Carex* spp.). More mesic zones within the landscape matrix will include northern red oak (*Quercus rubra*), hickories (*Carya* spp.), white oak (*Q. alba*), white ash (*Fraxinus alba*), sugar maple (*Acer saccharum*), black walnut (*Juglans nigra*), and tulip poplar (*Liriodendron tulipifera*). The subcanopy may include persimmon (*Diospyros virginiana*), American beech (*Fagus grandifolia*), and dogwoods (*Cornus* spp.). The understory may include spicebush (*Lindera benzoin*), dogwoods (*Cornus* spp.), poison ivy (*Toxicodendron radicans*) and trumpet creeper (*Campsis radicans*). Most of these sites have been disturbed through clearing, selective harvest of oaks, hydrological modification, and agriculture.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- northern red oak (*Quercus rubra*), tree
- sweetgum (*Liquidambar styraciflua*), tree
- hybrid hickory (*Carya*), tree
- maple (*Acer*), tree
- bur oak (*Quercus macrocarpa*), tree
- dogwood (*Cornus*), shrub
- pawpaw (*Asimina triloba*), shrub
- southern arrowwood (*Viburnum dentatum*), shrub
- sedge (*Carex*), grass
- wildrye (*Elymus*), grass

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 consisting of maples, pin oak, and green ash. 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 and numerous species may be present depending on disturbance and seed sources.

Dominant plant species

- oak (*Quercus*), tree
- maple (*Acer*), tree
- sweetgum (*Liquidambar styraciflua*), tree
- hybrid hickory (*Carya*), tree
- honeysuckle (*Lonicera*), shrub
- autumn olive (*Elaeagnus umbellata*), shrub
- sedge (*Carex*), grass
- garlic mustard (*Alliaria petiolata*), other herbaceous

Community 2.1

Disturbed Invaded Community

This state is characterized by a reduction of oaks and an increase in fast-growing, shade tolerant species such as maple and ash. Disturbances such as timber harvest, clearing and adjacent construction activities can result in numerous non-native species.

Dominant plant species

- maple (*Acer*), tree
- ash (*Fraxinus*), tree
- pin oak (*Quercus palustris*), tree
- honeysuckle (*Lonicera*), shrub
- garlic mustard (*Alliaria petiolata*), other herbaceous

State 3

Agricultural State

This state is characterized by the conversion of the site to agricultural use. Most common practice is a corn and soybean rotation of various types. A small portion of the historic acres are used for forage and pasture. Numerous species and management scenarios can occur depending on landowner's objectives. Hydrology modifications such as ditching and tiling are common.

Dominant plant species

- fescue (*Festuca*), grass
- corn (*Zea mays*), other herbaceous
- soybean (*Glycine max*), other herbaceous
- clover (*Trifolium*), other herbaceous

Community 3.1

Agriculture - Cropland

This community is characterized by row crop agriculture of small grains, corn and/or soybeans. This use is feasible for lower slope sites only. Species planted and management implemented will depend on landowner goals and objectives.

Dominant plant species

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

Community 3.2

Agriculture - Forage Production

Many species are feasible for these sites and may include grazing, hay production, and silage production. Management inputs will vary depending on crop being produced and the landowner's management objectives.

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

Pathway 3.1.A

Community 3.1 to 3.2

Planting of cool or warm season pasture/forage species and management to maintain them. Species planted and management will depend on landowner's goals and objectives.

Pathway 3.2.A

Community 3.2 to 3.1

Transitioning sites from pasture to cropland will require multiple management inputs and continual management. Numerous crops can be grown on these sites depending on the landowner's goals. Corn and beans are a commonly grown row crop rotation.

Transition T1A

State 1 to 2

Large scale disturbance such as clearing or oak removal. Little or no post-harvest timber stand management. No control of non-native species.

Transition T1B

State 1 to 3

Clearing of mature high-quality forest for conversion to agricultural production. Landowners should be aware of any potential wetland issues on these sites prior to clearing.

Restoration pathway R2A

State 2 to 1

Restoration of site would include planting of oaks and timber stand improvement activities to insure desired trees gain dominance. Sites may require restoration of the natural hydrology.

Transition T2A

State 2 to 3

Transition from forest or woodland state to an agricultural state. Species selection, management inputs, and conservation practices would be determined by the landowner's goals and objectives. Landowners should be aware of potential wetland determinations on these sites prior to clearing.

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, poplar etc. Species present will be a mix of native and non-native species and community composition will depend on the type/severity of disturbances and the available seed sources.

Additional community tables

Inventory data references

No field plots were evaluated for this PES. A review of the scientific literature was used to approximate the plant communities and ecological dynamics for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on the sources identified in ecological site description (ESD). ESD development is needed to conduct field surveys and verify the hypotheses in this PES narrative.

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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	05/06/2024
Approved by	Suzanne Mayne-Kinney
Approval date	

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