USDA Natural Resources
Conservation Service

Ecological site F114XA504IN
Sloping Till Upland Forest

Last updated: 9/26/2024
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): 114X–Southern Illinois and Indiana Thin Loess and Till Plain

MLRA 114A makes up about 4,550 square miles (11,795 square kilometers). The three parts of this MRLA are mostly in the Till Plains Section of the Central Lowland Province of the Interior Plains. The western third of the western part is in the Highland Rim Section of the Interior Low Plateaus Province of the Interior Plains. The eastern half of the eastern part is in the Kanawha Section of the Appalachian Plateaus Province of the Appalachian Highlands. Both large and small tributaries of the Ohio River dissect the nearly level to very steep glaciated uplands in this area. The major streams and rivers have well defined valleys with broad flood plains and numerous stream terraces. The flood plains along the smaller streams are narrow. Broad summits are nearly level to gently sloping. Elevation ranges from 320 feet (100 meters) on the southernmost flood plain along the Ohio River to 1,250 feet (380 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. Also, the Ohio River bluffs are as much as 300 feet (90 meters) above the river valley floor.

Classification relationships

USFS: 222 Eastern Broadleaf Forest (Continental) Province

Homoya's Natural Regions of Indiana: Bluegrass Region

The following NatureServe Explorer Ecological System has a high level of probability to match the ecological site found on these soils:
Southern Interior Low Plateau Dry-Mesic Oak Forest- Unique Identifier: CES202.898.
North-Central Interior Dry-Mesic Oak Forest and Woodland- CES202.046

Ecological site concept

The Sloping Till Upland Forest reference community is a mature mixed hardwood forest with an oak component. Multiple tree species may share dominance on these sites including white oak, hickory, black walnut, sugar maple, basswood, northern red oak, white ash,. Other species include eastern black cherry, American elm, beech, and tulip poplar. Quality sites will have a wonderfully diverse understory community of native herbs and forbs, including an array of native spring wildflowers.

Few high-quality, old-growth communities remain. Agriculture is the largest use of these soils in MLRA 114A. Most sites have incurred repeated disturbances including selective harvest (oak removal), clearing, grazing, invasive species and absence of natural fire regimes. Disturbance 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.

Associated sites

F114XA502IN	**Till Uplands** These sites are generally lower on the landscape and less well drained.

Similar sites

F114XA305IN	**Non-Acidic Upland Forest** This group is a well-drained oak-hickory forest but is on limestone residuum and/or limestone and calcareous shale.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Carya ovata*
Shrub	(1) *Viburnum acerifolium* (2) *Ostrya virginiana*
Herbaceous	(1) *Trillium* (2) *Parthenocissus quinquefolia*

Physiographic features

These soils are on sloping till. Slopes are generally 12- 40%.

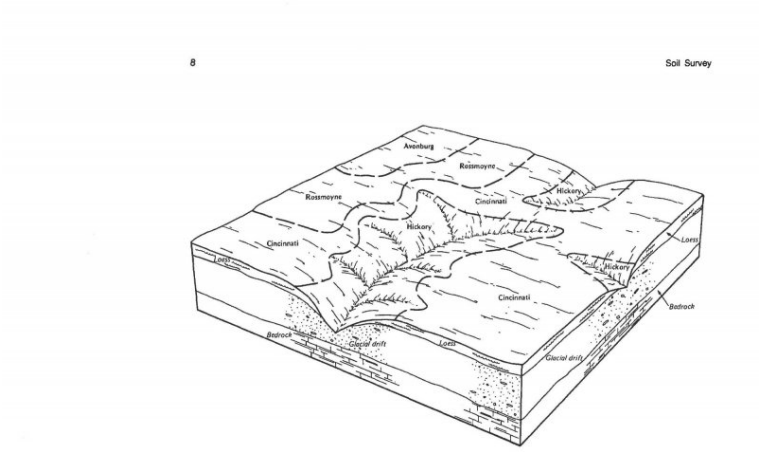


Figure 1. Physiographic Image - Block diagram with Hickory soils on the landscape.

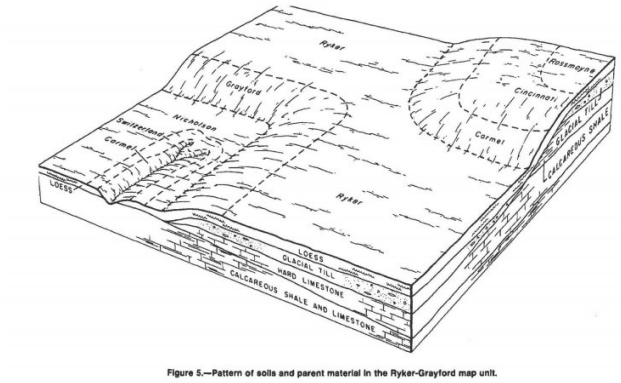


Figure 2. Physiographic Image - Block diagram with Grayford and Ryker soils on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Upland > Till plain
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	107–366 m
Slope	12–35%
Water table depth	152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	2–60%
Water table depth	Not specified

Climatic features

About 60 percent of the precipitation falls during the freeze-free period. Most of the rainfall occurs as high-intensity, convective thunderstorms during summer. Snowfall is common in winter. The freeze-free period averages about 180 days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	154-160 days
Freeze-free period (characteristic range)	179-185 days
Precipitation total (characteristic range)	1,118-1,194 mm
Frost-free period (actual range)	153-160 days
Freeze-free period (actual range)	177-190 days
Precipitation total (actual range)	1,092-1,194 mm
Frost-free period (average)	157 days
Freeze-free period (average)	183 days
Precipitation total (average)	1,168 mm

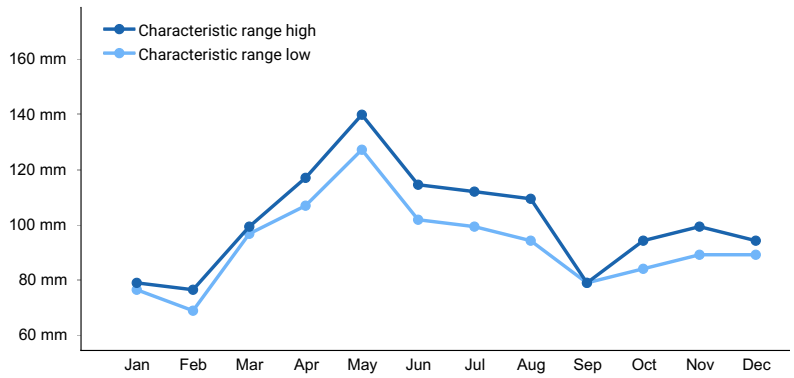


Figure 3. Monthly precipitation range

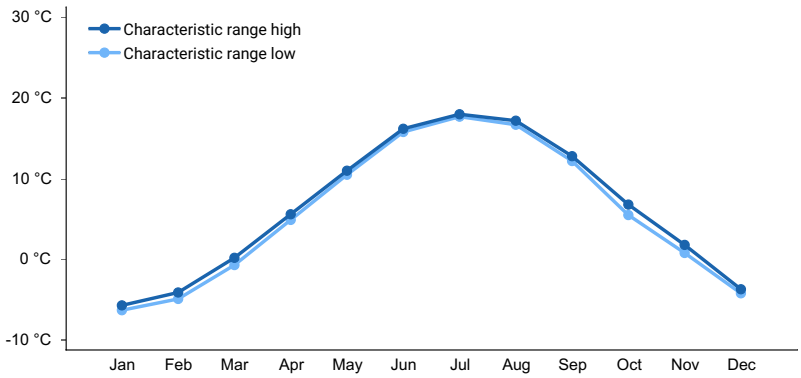


Figure 4. Monthly minimum temperature range

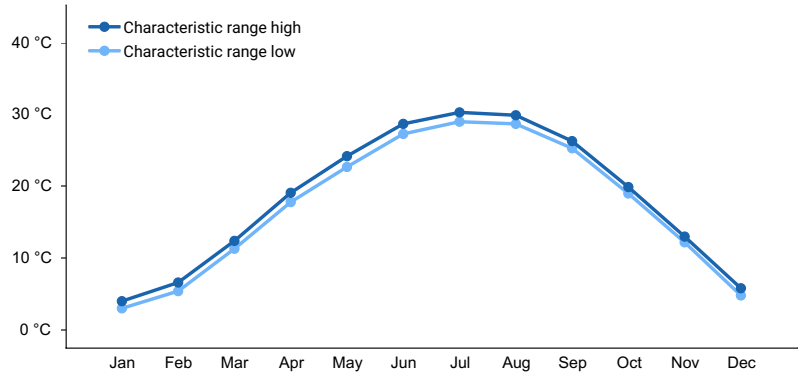


Figure 5. Monthly maximum temperature range

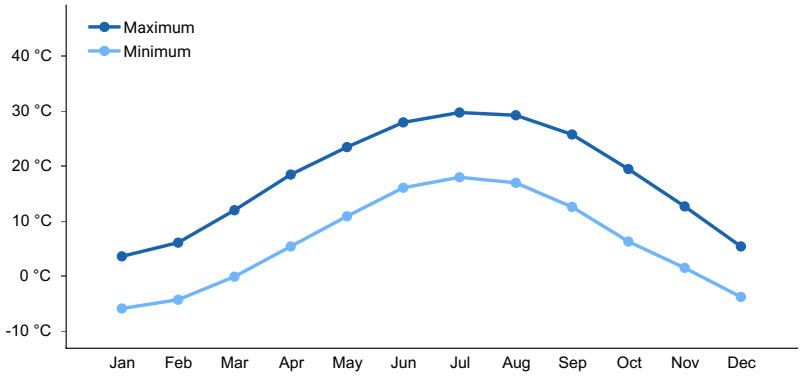


Figure 6. Monthly average minimum and maximum temperature

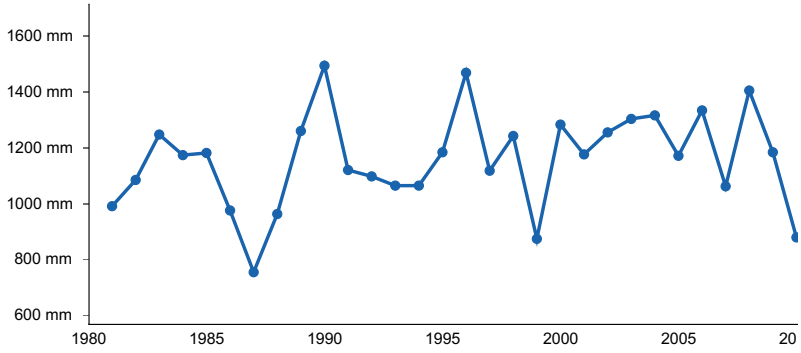


Figure 7. Annual precipitation pattern

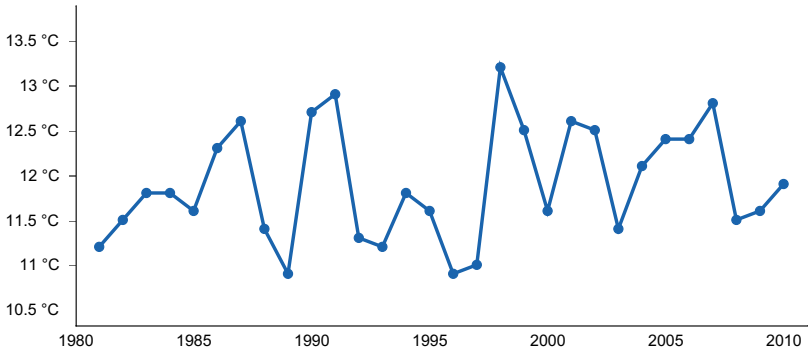


Figure 8. Annual average temperature pattern

Climate stations used

- (1) NORTH VERNON 2 ESE [USC00126435], North Vernon, IN
- (2) MILFORD [USC00335268], Milford, OH
- (3) HILLSBORO [USC00333758], Hillsboro, OH
- (4) SEYMOUR 2 N [USC00127935], Seymour, IN

Influencing water features

These sites are not influenced by riparian or wetland features.

Soil features

The soils in this group are very deep, well drained, with a slope in excess of 12% and located on till plains. Series include Bonnell, Grayford, Hickory, Ryker, Weisburg.

Table 5. Representative soil features

Parent material	(1) Till (2) Residuum–limestone (3) Residuum–limestone and shale (4) Loess
Surface texture	(1) Silt loam (2) Silty clay loam (3) Clay loam (4) Loam
Drainage class	Well drained
Permeability class	Slow to moderate
Depth to restrictive layer	89–127 cm
Soil depth	152–203 cm
Surface fragment cover <=3"	1–25%
Surface fragment cover >3"	1–25%
Available water capacity (Depth not specified)	12.7–17.78 cm
Calcium carbonate equivalent (Depth not specified)	0–8%
Soil reaction (1:1 water) (Depth not specified)	5–7
Subsurface fragment volume <=3" (Depth not specified)	0–20%

Subsurface fragment volume >3" (Depth not specified)	0–20%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	36–203 cm
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	Not specified
Calcium carbonate equivalent (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

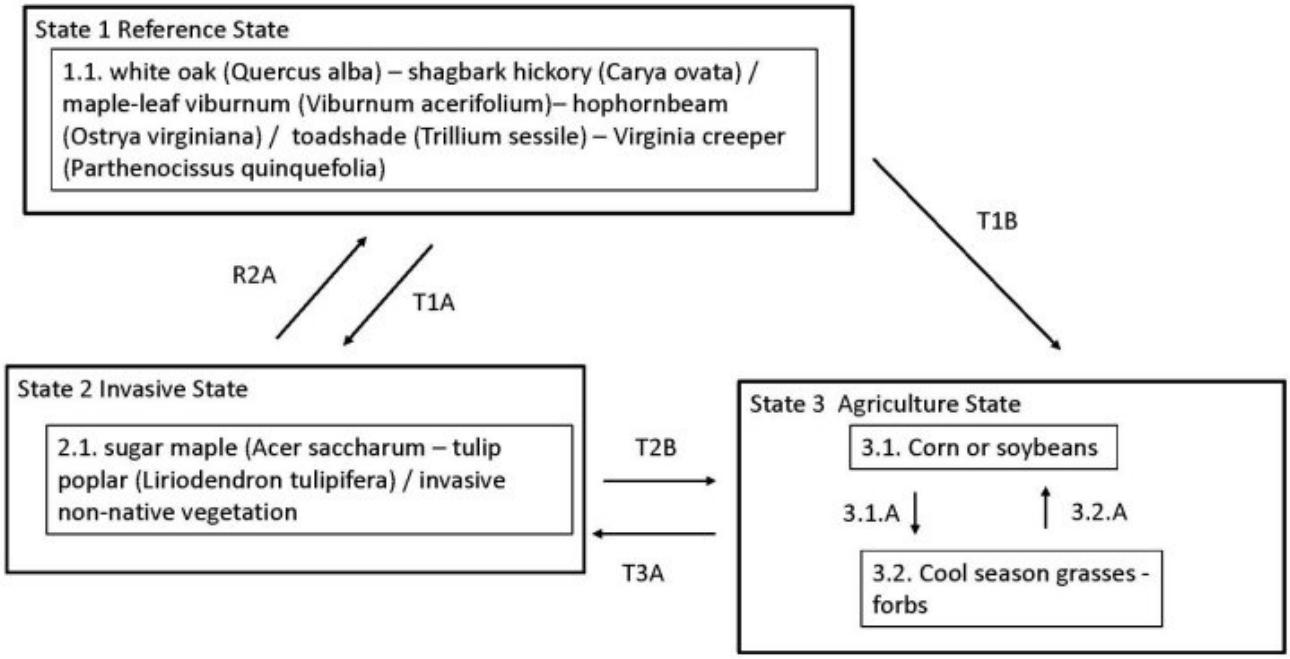
Ecological dynamics

Reference sites are a mature hardwood forest with a substantial oak component. Multiple species may be co-dominant. White oak, shagbark hickory, sugar maple, white ash, black walnut and American beech are common. The subcanopy will include eastern black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), and red maple (*Acer rubrum*). 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. Species may include tall thimbleweed (*Anemone virginiana*), rattlesnake fern (*Botrychium virginianum*), broadleaf enchanters' nightshade (*Circaea lutetiana* ssp. Canadensis), ticktrefoil (Desmodium ssp.), bedstraw (Galium spp.), spotted geranium (*Geranium maculatum*), Clayton's Sweetroot (*Osmorhiza claytonii*), snakeroot (Sanicula spp.), and feathery false lily of the valley (*Maianthemum racemosum*). At the forest edge or in sunny openings, species such as the common blue aster (*Symphyotrichum cordifolium*) and bearded shorthusk (*Brachyelytrum erectum*) occur.

Disturbances such as selective harvest, clear cutting, grazing, recreational uses, invasive plants, and fire suppression have transitioned most remaining wooded sites to a mesic woodland dominated by sugar maple, red maple, white ash, American beech, and tulip poplar. Understory composition and tree regeneration on these sites is altered due to heavy shade, lack of natural fire, and thick leaf litter.

State and transition model



State 1
Forestland

Historically these sites had a variable canopy cover with dominants such as white oak (*Quercus alba*), black oak (*Quercus velutina*), and shagbark hickory (*Carya ovata*). Associates will usually include sugar maple (*Acer saccharum*), mockernut hickory (Cary tomentosa), black walnut (*Juglans nigra*), and tulip poplar (*Liriodendron tulipifera*). The subcanopy will include eastern black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), and red maple (*Acer rubrum*) The shrub layer is often quite variable but may include flowering dogwood (*Cornus florida*), alternative leaf dogwood (*Cornus alternifolia*), maple-leaf viburnum (*Viburnum acerifolium*), common serviceberry (*Amelanchier arborea*), prickly ash (*Zanthoxylum americanum*), and hophornbeam (*Ostrya virginiana*). The herbaceous layer will be a diverse mix of native perennial herbs and forbs.

Dominant plant species

- white oak (*Quercus alba*), tree
- shagbark hickory (*Carya ovata*), tree
- sugar maple (*Acer saccharum*), tree
- dogwood (*Cornus*), shrub
- viburnum (*Viburnum*), shrub
- hophornbeam (*Ostrya virginiana*), shrub
- Virginia creeper (*Parthenocissus quinquefolia*), other herbaceous
- trillium (*Trillium*), other herbaceous
- American lopseed (*Phryma leptostachya*), other herbaceous

Community 1.1

Forestland

The reference community of these sites is a mature deciduous forest with a dominant oak-hickory component.

Dominant plant species

- white oak (*Quercus alba*), tree
- shagbark hickory (*Carya ovata*), tree
- viburnum (*Viburnum*), shrub
- dogwood (*Cornus*), shrub
- hophornbeam (*Ostrya virginiana*), shrub
- Virginia creeper (*Parthenocissus quinquefolia*), other herbaceous
- trillium (*Trillium*), other herbaceous
- American lopseed (*Phryma leptostachya*), other herbaceous

State 2
Disturbed - Invaded State

This state is characterized by a substantial disturbance with a subsequent increase in non-native vegetation that is altering the ecological diversity of the sites. Numerous species may be present depending on the available seed source.

Dominant plant species

- oak (*Quercus*), tree
- maple (*Acer*), 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 state is characterized by the establishment of invasive plants. Species will depend upon the type and severity of disturbance and the available seed sources. Numerous species are possible. The density of shrubs in the understory will eventually impact tree regeneration.

Dominant plant species

- oak (*Quercus*), tree
- maple (*Acer*), 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

State 3
Agricultural State

This state is generally row crops (corn and bean rotation is common) or pasture/forage production. Some mapunits in the initial PES groups have slopes that are not suitable for row crop production due to high risk of soil erosion and difficulty utilizing mechanical equipment.

Community 3.1
Cropland

Some of the lower sloping mapunits in this PES group may be appropriate for cropland, however, many sites have slopes that preclude crop production due to soil erosion and potential water quality impacts.

Dominant plant species

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

Community 3.2
Pastureland

Species selected for this use will vary depending on management goals and objectives. Commonly, cool season grasses such as tall fescue are seeded. White or red clover are often in the seeding mix. Multiple species of warm or cool season grasses may be planted on these sites.

Dominant plant species

- brome (*Bromus*), grass
- tall fescue (*Schedonorus arundinaceus*), 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

Transitioning cropland to pastureland would require site preparation, seeding of desired species, and weed control. species selection will depend upon management goals and objectives.

Pathway 3.2.A
Community 3.2 to 3.1

Transitioning from a pastureland to a cropland will require multiple management inputs such as site preparation, seeding desired species, and weed control.

Transition T1A
State 1 to 2

Major disturbance followed by an Invasion of non-native vegetation that changes the community structure of the sites.

Transition T1B
State 1 to 3

Conversion to cropland or pastureland will require tree removal, brush control, weed control, and seeding of desired species. Plant selection will depend on management goals. Due to slope, some mapunits are not be suitable for cropland conversion due to slope.

Restoration pathway R2A
State 2 to 1

Restoration inputs will include long-term brush control and weed control. Planting native species may be needed along with timber stand improvement inputs.

Transition T2A
State 2 to 3

Conversion to cropland or pastureland will require tree removal, brush control, weed control, and seeding of desired species. Plant selection will depend on management goals. Due to slope, some mapunits are not be suitable for cropland conversion due to slope.

Transition T3A
State 3 to 2

Properties that are abandoned move through a series of successional plant communities to an eventual woodland. Species depend on previous uses and available seed sources.

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.

Other references

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Approval

Greg Schmidt, 9/26/2024

Acknowledgments

PES documents developed for adjacent MLRAs in Indiana and Ohio served as a source of information as these MLRAs often split counties and/or shared similar soil series with MLRA 114A. USDA-NRCS county soil surveys for

the counties within MLRA 114A where a valuable reference including tree species observed on site by NRCS staff. NRCS Indiana resource soil scientists contributed field observation, field notes, and extensive soil mapping expertise.

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)	A. Arends, ESI Specialist
Contact for lead author	
Date	05/12/2025
Approved by	Greg Schmidt
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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):**

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:**