USDA Natural Resources Conservation Service

Ecological site F113XY908IL
Moderately Deep Bedrock Backslope

Last updated: 5/17/2024
Accessed: 05/11/2025

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): 113X–Central Claypan Areas

The eastern Illinois portion of the Central Claypan Areas MLRA is in the Till Plains Section of the Central Lowland Province of the Interior Plains (USDA-NRCS, 2006) and includes the Southern Till Plain Natural Division of the natural divisions of Illinois (Schwegman, 1973; 1997; IDNR, 2018) in south-central Illinois. South-central Illinois is a dissected Illinoisan till plain south of the terminal Wisconsin moraine. This region consists of nearly level to gently sloping, old till plains. Stream valleys are shallow and generally are narrow. Elevation is about 660 feet (200 meters), increasing gradually from south to north. Local relief is generally low on the broad, flat till plains and flood plains and high on the dissected hills bordering rivers or drainage systems. The Kaskaskia, Little Muddy, Little Wabash, Embarras, and Skillet Fork rivers are part of this area. This region is covered with loess, which overlies old glacial drift (Illinoisan till) that has a high content of clay. Fragipans are also present. Pennsylvanian limestone and shale bedrock underlay the glacial till. The dominant soil orders in this region are Alfisol and Mollisol. The soils in the area predominantly have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or smectitic mineralogy. They generally are very deep, well drained to poorly drained, and loamy or clayey. (USDA-NRCS, 2006).

Classification relationships

Major Land Resource Area (MLRA) (USDA-NRCS, 2006):
113 – Central Claypan Areas, Eastern Part
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
Section: Central Till Plains, Oak-Hickory Section
Section Code: 222G

Ecological site concept

The historic pre-European settlement vegetation or reference plant community was an oak-hickory woodland with an open shrubby understory. Moderately Deep Bedrock Backslope Woodland ecological sites occurred on convex, moderately steep to steep backslopes on soils that formed in loess over residuum from sandstone, siltstone and shale (Figure 1; green areas). This reference woodland ecological site had a somewhat open tree canopy dominated by oaks and hickories such as white oak (Quercus alba L.)*, shagbark hickory (Carya ovata (Mill.) K. Koch), mockernut hickory (Carya tomentosa (Lam.) Nutt.), pignut hickory (Carya ovalis (Mill.) Sweet), black oak (Quercus velutina Lam.) and post oak (Quercus stellata Wangenh.) along with red oak (Quercus rubra L.) on protected slopes (Anderson et. al. 2007; White, 1978; NatureServe 2018).

The tree canopy is moderately tall (60 to 75 feet), somewhat open-grown with somewhat spreading canopies.

Canopy cover can range from 30 to 80 percent, and varies with fire regimes. The woody sapling layer is variable, typically absent or scattered, but increasing in the absence of fire. Shrubs and saplings may include stiff dogwood (Cornus foemina Mill.), American hazelnut (Corylus americana Walter), hawthorn (Crataegus spp.), prairie crab apple (Malus ioensis (Alph. Wood) Britton), and fragrant sumac (Rhus aromatica Aiton), and, in the absence of fire or on protected northern slopes, common serviceberry (Amelanchier arborea (Michx. f.) Fernald), flowering dogwood (Cornus florida L.), hophornbeam (Ostrya virginiana (Mill.) K. Koch), and blackhaw (Viburnum prunifolium L.). The ground layer is a mix of graminoids and forbs. Typical graminoid species may include big bluestem (Andropogon gerardii Vitman), Pennsylvania sedge (Carex pensylvanica Lam.), Virginia wildrye (Elymus virginicus L.), nodding fescue (Festuca subverticillata (Pers.) Alexeev), eastern bottlebrush grass (Elymus hystrix L.), Heller's rosette grass (Dichanthelium oligosanthes (Schult.) Gould), Bosc's panicgrass (Dichanthelium boscii (Poir.) Gould & C.A. Clark), and Indian woodoats (Chasmanthium latifolium (Michx.) Yates). Common herbs include American hogpeanut (Amphicarpaea bracteata (L.) Fernald), purple milkweed (Asclepias purpurascens L.), Drummond's aster (Symphyotrichum drummondii (Lindl.) G.L. Nesom), eastern purple coneflower (Echinacea purpurea (L.) Moench), hairy sunflower (Helianthus hirsutus Raf.), paleleaf woodland sunflower (Helianthus strumosus L.), violet lespedeza (Lespedeza violacea (L.) Pers.), foxglove beardtongue (Penstemon digitalis Nutt. ex Sims), Canadian blacksnakeroot (Sanicula canadensis L.), clustered blacksnakeroot (Sanicula odorata (Raf.) K.M. Pryer & L.R. Phillippe), elm leaf goldenrod (Solidago ulmifolia Muhl. ex Willd.), and others. Fires and soil depth were important influences on this community, maintaining its open character. (Anderson et. al. 2007; Nelson 2010; NatureServe 2018)

*All plant common and scientific names in this document were obtained from the U.S. Department of Agriculture – Natural Resources Conservation Service National PLANTS Database (USDA NRCS, 2018).

Associated sites

R113XY904IL	**Upland Prairie** Prairie ecological sites are upslope but on dark colored soils associated with nearly level till plains.
F113XY911IL	**Loamy Till Backslope Forest** Loamy Till Backslope Forests are typically mapped as a complex with Moderately Deep Bedrock Backslope Woodlands.
F113XY910IL	**Fragic Backslope Woodland** Fragic Backslope Woodlands have a fragipan and are upslope.
F113XY919IL	**Wet Silty Floodplain Forest** Wet Silty Floodplain Woodlands are downslope in valley floodplains.

Similar sites

F113XY911IL	**Loamy Till Backslope Forest** Loamy Till Backslope Forests are typically mapped as a complex with Moderately Deep Bedrock Backslope Woodlands but have deeper soil profiles.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Carya*
Shrub	(1) *Rhus aromatica*
Herbaceous	(1) *Carex pensylvanica* (2) *Solidago ulmifolia*

Physiographic features

These sites are on convex backslopes and escarpment-like areas with moderately steep to steep slopes formed in a mantle of loess over residuum from acid sandstone, siltstone and shale. Slopes range from 10 to 60 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope
Landforms	(1) Till plain > Ground moraine (2) Till plain > Hillslope (3) Till plain > Rock pediment
Runoff class	High
Elevation	361–836 ft
Slope	10–60%
Water table depth	72 in
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The soil temperature regime of MLRA 113 is classified as mesic, where the mean annual soil temperature is between 47 and 59°F. Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south you travel (USDA-NRCS 2006). The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season.

Table 3. Representative climatic features

Frost-free period (characteristic range)	149-169 days
Freeze-free period (characteristic range)	180-195 days
Precipitation total (characteristic range)	41-44 in
Frost-free period (actual range)	142-173 days
Freeze-free period (actual range)	179-201 days
Precipitation total (actual range)	40-44 in
Frost-free period (average)	159 days
Freeze-free period (average)	188 days
Precipitation total (average)	43 in

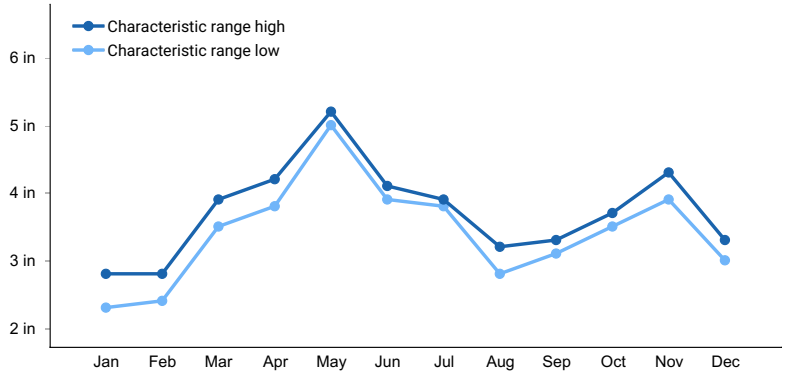


Figure 1. Monthly precipitation range

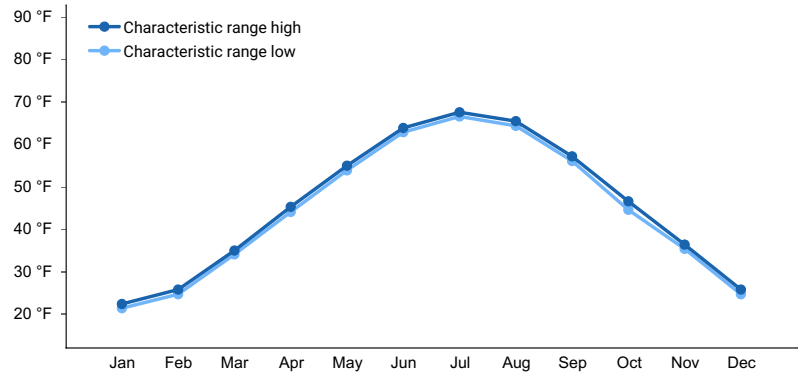


Figure 2. Monthly minimum temperature range

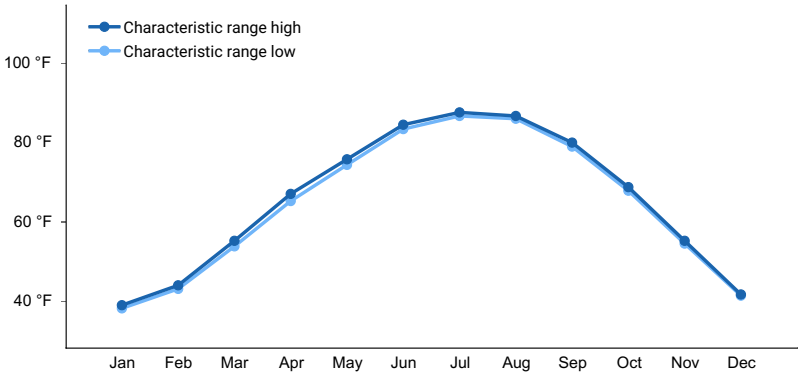


Figure 3. Monthly maximum temperature range

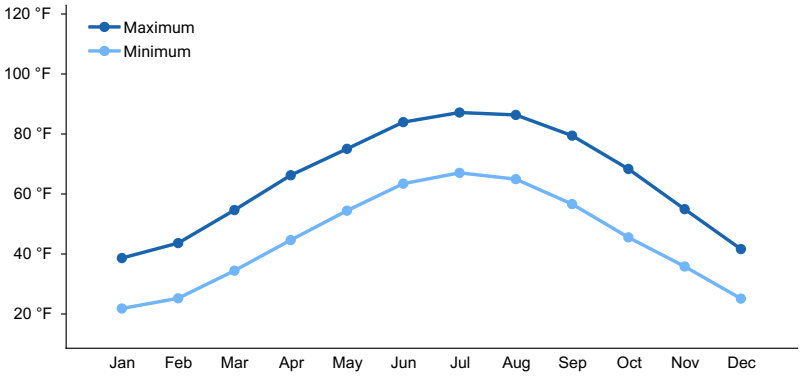


Figure 4. Monthly average minimum and maximum temperature

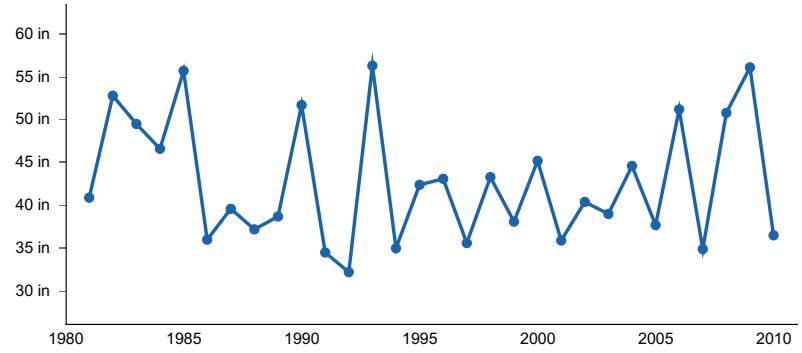


Figure 5. Annual precipitation pattern

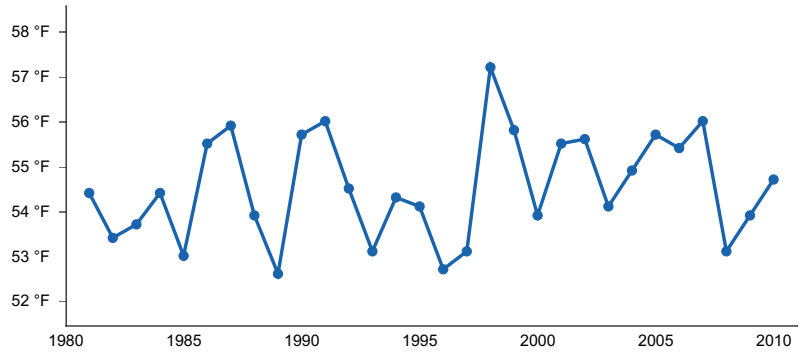


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MT VERNON 3 NE [USC00115943], Mount Vernon, IL
- (2) NASHVILLE 1 E [USC00116011], Nashville, IL
- (3) FLORA 5 NW [USC00113109], Flora, IL

Influencing water features

Moderately Deep Bedrock Backslope Woodlands are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is moderate and surface runoff is medium to high. Sites have a water table that is present at a depth of greater than 6 feet below the surface (SSS NRCS WSS, 2018). Surface runoff contributes water to downslope ecological sites. (SSS NRCS OSD, 2018).

Soil features

These soils are moderately deep (<40 inches to bedrock), well drained soils formed in a mantle of loess over residuum from sandstone, siltstone and shale, with moderate permeability. (NCSS, 2018; SSS NRCS OSD, 2018). Soil series associated with this site (Table 5) include Frondorf, Kell, and Gosport. Soils of this ecological site are in the Alfisol and Inceptisol orders, further classified as Ultic Hapludalfs and Oxyaquic Dystrudepts (NCSS, 2018; SSS NRCS OSD, 2018).

Table 4. Representative soil features

Parent material	(1) Drift (2) Loess (3) Residuum
Surface texture	(1) Silt loam
Drainage class	Moderately well drained to well drained
Permeability class	Moderate
Soil depth	30–38 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	4–5 in
Calcium carbonate equivalent (Depth not specified)	0–25%
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	3.5–7.3

Subsurface fragment volume <=3" (Depth not specified)	8–20%
Subsurface fragment volume >3" (Depth not specified)	3–48%

Ecological dynamics

The MLRA lies within the transition zone between the eastern deciduous forests and the tallgrass prairies. The heterogeneous topography of the area results in variable microclimates and fuel matrices that in turn are able to support prairies, savannas, woodlands, and forests. Moderately Deep Bedrock Backslope Woodlands form an aspect of this vegetative continuum. This ecological site occurs on mid to lower upland backslopes. Species characteristic of this ecological site consist of a somewhat open oak-hickory overstory with an open understory.

Fires were an important influence on this community, maintaining its open character and preventing shrubby and mesophytic trees from invading maintain. Fire typically consisted of infrequent low-severity surface fires. Ignition sources included summertime lightning strikes from convective storms and human ignitions during the spring and/or fall seasons. Human ignitions by Native Americans regularly set fires to improve sight lines for hunting, drive large game, improve grazing and browsing habitat, develop agricultural clearings, and enhance vital ethnobotanical plants (Barrett 1980; LANDFIRE 2009). During fire free intervals, woody understory species increased and the herbaceous understory diminished. (Anderson and Anderson 1975; White 1978; Nelson 2010; NatureServe 2018)

Drought, wind and ice storm damage, and grazing by native large herbivores also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture favored the proliferation of plant species tolerant of such conditions. Drought can also slow the growth of plants and result in dieback of certain species. Damage to trees from storms can vary from minor, patchy effects of individual trees to stand effects that temporarily affect community structure and species richness and diversity. When coupled with fire, periods of drought and catastrophic storm damage can greatly delay the establishment and maturation of woody vegetation (Pyne et al. 1996). Finally, grazing by large native herbivores such as bison (Bos bison), prairie elk (Cervus elaphus), and white-tailed deer (Odocoileus virginianus)would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and ground flora species (Anderson, 1982; Nelson 2010; NatureServe 2018)

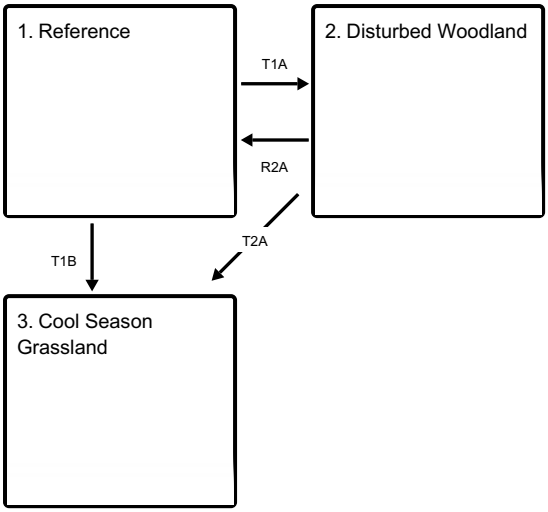
Extensive conversion for agriculture has fragmented this system. Today, many of these ecological sites have been cleared and converted to pasture. The remaining forested ecological sites have a younger (50 to 80 years) canopy layer whose species composition and quality has been altered by timber harvesting practices and lack of fire. Uncontrolled domestic grazing has also impacted the existing forested communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as coralberry (*Symphoricarpos orbiculatus* Moench), gooseberry (Ribes spp.), and Virginia creeper (*Parthenocissus quinquefolia* (L.) Planch.). Grazed sites also have a more open understory along with increased soil compaction and soil erosion further lowering productivity.

In the long term absence of fire, woody species, especially hickory, maple (Acer spp.) and ironwood encroach or increase into these ecological sites. Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora. Oak regeneration is typically problematic. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration means (Dey and Kabrick, 2015).

A provisional state and transition diagram is depicted in Figure 2. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It may change as knowledge increases.

State and transition model

Ecosystem states



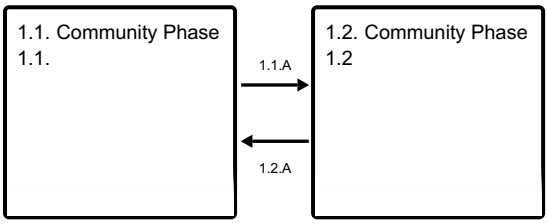
T1A - Fire suppression > 30 years; disturbances

T1B - Clearing; tillage; vegetative seeding, grassland management

R2A - Forest stand improvement; access control; prescribed fire; long term stand rotation

T2A - Woody removal; tillage; vegetative seeding; grassland management

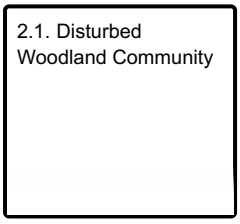
State 1 submodel, plant communities



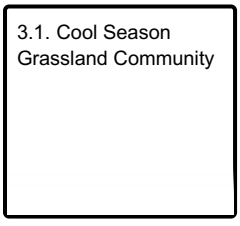
1.1.A - Fire free interval of > 30 years.

1.2.A - Fire interval of 15-25 years.

State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference

These woodland communities is dominated by oaks and hickories were influenced by fire, drought, and wind. Herbivory by native (now expatriated) ungulates also played a role. There are two phases associated with this reference state.

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- fragrant sumac (*Rhus aromatica*), shrub
- Pennsylvania sedge (*Carex pensylvanica*), grass
- elmleaf goldenrod (*Solidago ulmifolia*), other herbaceous

Community 1.1
Community Phase 1.1.

This woodland community typically had a two-tiered structure. Fire frequency was probably every 15 to 25 years. Fire, drought and natural native grazing would have maintained a more open canopy and abundant ground flora species.

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- fragrant sumac (*Rhus aromatica*), shrub
- Pennsylvania sedge (*Carex pensylvanica*), grass
- elmleaf goldenrod (*Solidago ulmifolia*), other herbaceous

Community 1.2
Community Phase 1.2

This woodland community had a more closed structure, characterized by an understory of ironwood and dogwood saplings and shrubs. The herbaceous layer is diminished. Fire-free intervals probably exceeded 30 years.

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- flowering dogwood (*Cornus florida*), shrub
- hophornbeam (*Ostrya virginiana*), shrub
- Canadian blacksnakeroot (*Sanicula canadensis*), other herbaceous

Pathway 1.1.A
Community 1.1 to 1.2

Fire free interval of > 30 years.

Pathway 1.2.A
Community 1.2 to 1.1

Fire interval of 15-25 years.

State 2
Disturbed Woodland

Most current areas of Moderately Deep Bedrock Backslope Woodlands have experienced fire exclusion for decades along with periodic domestic livestock grazing. In the absence of fire, ongoing recruitment of trees into the canopy develops a closed canopy, shading out the herbaceous ground flora. Herbaceous cover and diversity greatly diminishes, leaf litter builds up, and more shade-tolerant species persist. Transition to cool season grasslands (State 3) is common.

Dominant plant species

- black oak (*Quercus velutina*), tree

- hybrid hickory (*Carya*), tree
- hophornbeam (*Ostrya virginiana*), shrub
- goldenrod (*Solidago*), other herbaceous

Community 2.1
Disturbed Woodland Community

In the absence of fire, ongoing recruitment of trees into the canopy develops a closed canopy, shading out the herbaceous ground flora.

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- hophornbeam (*Ostrya virginiana*), shrub
- goldenrod (*Solidago*), other herbaceous

State 3
Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue (*Schedonorus arundinaceus* (Schreb.) Dumort., nom. cons.) and red clover (*Trifolium pratense* L.) has been common in the Illinois Central Claypan area. Occasionally, these pastures may contain scattered oaks. Long term uncontrolled grazing can cause significant soil erosion and compaction. A return to the Reference State may be impossible, requiring a very long term series of management options.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- red clover (*Trifolium pratense*), other herbaceous

Community 3.1
Cool Season Grassland Community

This community is characterized by cool season grasses. Species such as tall fescue (*Schedonorus arundinaceus* (Schreb.) Dumort., nom. cons.) and red clover (*Trifolium pratense* L.) are common.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- red clover (*Trifolium pratense*), other herbaceous

Transition T1A
State 1 to 2

Fire suppression > 30 years; woody invasion; repeated timber harvests; uncontrolled livestock grazing

Transition T1B
State 1 to 3

Clearing; tillage; vegetative seeding; grassland management

Restoration pathway R2A
State 2 to 1

Forest stand improvement; access control; prescribed fire; long term stand rotation

Transition T2A

State 2 to 3

Woody removal; tillage; vegetative seeding; grassland management

Additional community tables

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were 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.

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Other references

Relationship to other established ecological classifications:
Biophysical Setting (LANDFIRE, 2009); the reference community of this ecological site is most similar to: North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046)

National Vegetation Classification System (NatureServe, 2018): the reference community of this ecological site is most similar to: Quercus alba - (Carya ovata)/Carex pensylvanica Glaciated Woodland (CEGL002134)

Illinois Natural Areas Survey (INAS) (White, 1978); the reference community of this ecological site is most similar to: INAS Community Class – Forest; Natural community –Dry-Mesic Upland Forest

Contributors

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Approval

Suzanne Mayne-Kinney, 5/17/2024

Acknowledgments

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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	05/11/2025
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:**