USDA Natural Resources Conservation Service

Ecological site F113XY913IL
Clayey Till Backslope Woodland

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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): 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

This woodland community type is found in south-central Illinois in the northern region of the Central Claypan Areas MLRA. Clayey Till Backslope Woodland ecological sites are scattered along transitional areas between broad summit ecological sites and steeper hillslope ecological sites. This ecological site occurs on soils that formed in clayey glacial till containing a strongly developed brownish colored paleosol.

The historic pre-European settlement vegetation on this ecological site had an open tree canopy dominated by white oak (Quercus alba L.)*, bur oak (Quercus macrocarpa Michx.), or less commonly swamp white oak (Quercus bicolor Willd.) (White, 1978). The trees are generally shorter in stature than those occurring in a forested situation, and older trees typically exhibit spreading lower branches. Shagbark hickory (Carya ovata (Mill.) K. Koch), pin oak

(Quercus palustris Münchh.)1, post oak (Quercus stellata Wangenh.), black oak (Quercus velutina Lam.), and red maple (Acer rubrum L.) were occasional canopy associates. Shrubs were usually sparse, sometimes scattered ericaceous species, but more typically New Jersey tea (Ceanothus americanus L.) or American hazelnut (Corylus americana Walter). The herbaceous flora is usually dominated by grasses and forbs such as little bluestem (Schizachyrium scoparium (Michx.) Nash), Indian grass (Sorghastrum nutans (L.) Nash), big bluestem (Andropogon gerardii Vitman), sundial lupine (Lupinus perennis L.), sunflower (Helianthus spp.), butterfly weed (Asclepias tuberosa L.), ticktrefoil Desmodium spp., and lespedeza (Lespedeza spp.) and Pennsylvania sedge (Carex pensylvanica Lam.) (Anderson, 1975; Brugam et.al., 2016; Coates, 1992; Edgin, 1996, 2002, 2003; Anderson et.al., 2007; Taft et.al., 1994; Edgin and Ebinger. 1997; White, 1978).

The canopy was probably moderately tall but less dense and less structurally diverse than lower backslope forest ecological sites (White, 1978). Increased light from an open canopy causes a diversity of woodland ground flora species to flourish, especially prairie grasses.

Woodlands are distinguished from forest, by their relatively open understory, and the presence of sun-loving ground flora species (White, 1994). Fire was the primary disturbance factor that maintains this ecological site, while drought, windthrow, and grazing were secondary factors (LANDFIRE 2009).

* 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

F113XY911IL	**Loamy Till Backslope Forest** Forest ecological site on loess over till loamy soils with slopes greater than 5 percent.
R113XY904IL	**Upland Prairie** Prairie ecological site is often upslope but on dark colored soils associated with nearly level till plains.
F113XY912IL	**Wet Clayey Till Backslope Woodland** Wet Clayey Till Backslope Woodland ecological sites are mapped as a complex with Clayey Till Backslope Woodlands.

Similar sites

F113XY912IL	**Wet Clayey Till Backslope Woodland** Wet Clayey Till Backslope Woodland ecological sites also support an oak-hickory community, but poorer drainage results in a wetter growth environment that is less productive with more moisture tolerant species present.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus macrocarpa*
Shrub	(1) *Ceanothus americanus* (2) *Corylus americana*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Lespedeza*

Physiographic features

This site is on convex slopes along drainageways in dissected uplands with slopes of 5 to 15 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) Upland > Till plain

Runoff class	High
Elevation	155–210 m
Slope	5–15%
Water table depth	152 cm
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)	152-163 days
Freeze-free period (characteristic range)	187-192 days
Precipitation total (characteristic range)	1,092-1,118 mm
Frost-free period (actual range)	151-167 days
Freeze-free period (actual range)	185-194 days
Precipitation total (actual range)	1,092-1,118 mm
Frost-free period (average)	158 days
Freeze-free period (average)	189 days
Precipitation total (average)	1,118 mm

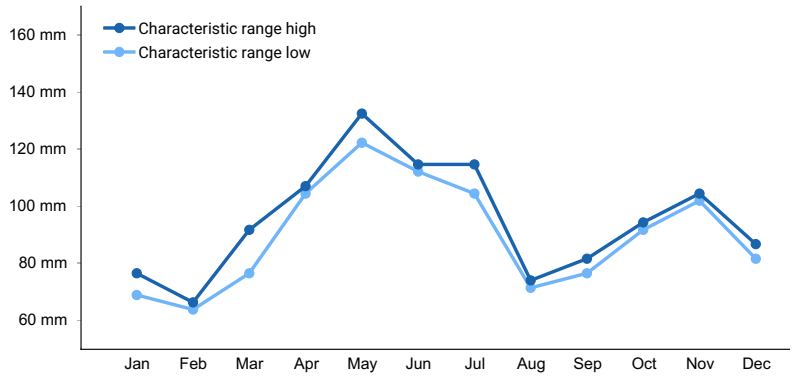


Figure 1. Monthly precipitation range

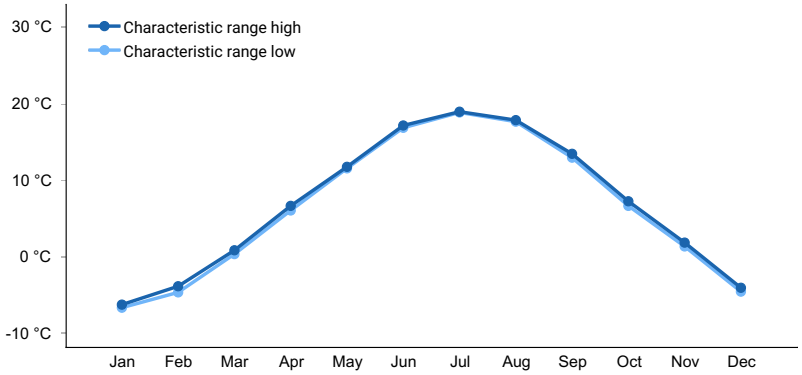


Figure 2. Monthly minimum temperature range

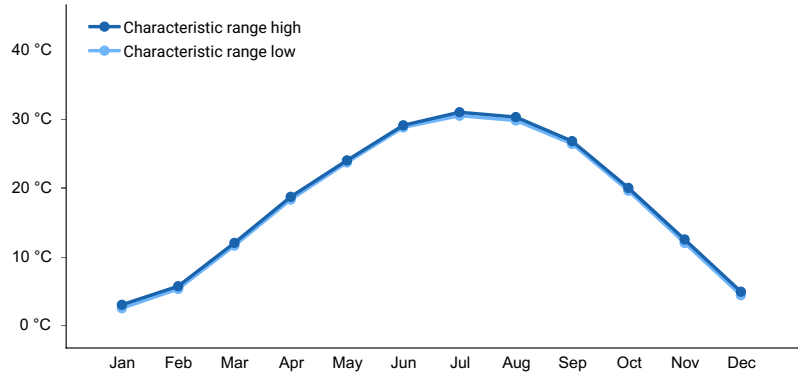


Figure 3. Monthly maximum temperature range

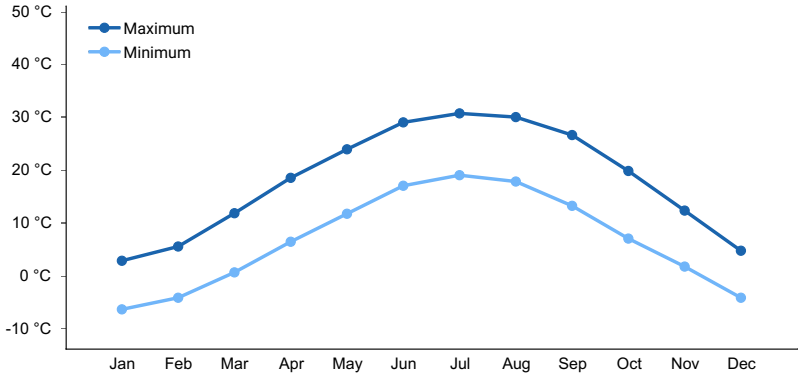


Figure 4. Monthly average minimum and maximum temperature

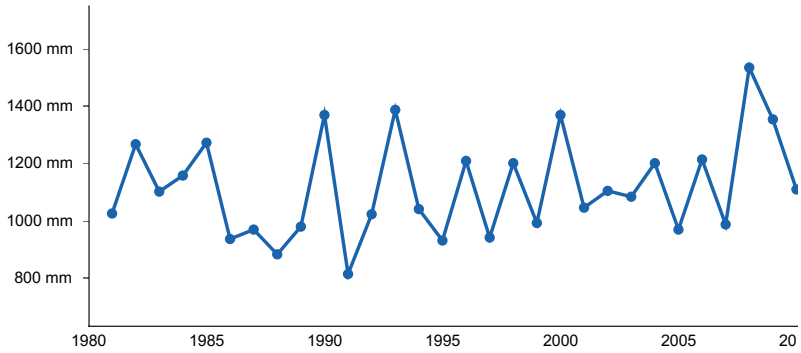


Figure 5. Annual precipitation pattern

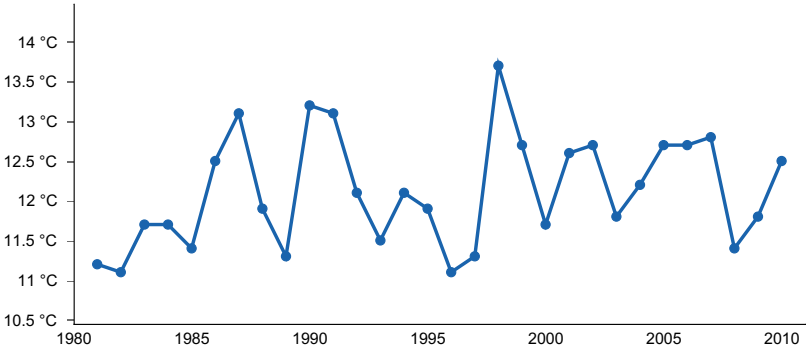


Figure 6. Annual average temperature pattern

Climate stations used

- (1) CHARLESTON [USC00111436], Charleston, IL
- (2) NEWTON [USC00116157], Newton, IL
- (3) EFFINGHAM 3SW [USW00093816], Effingham, IL

Influencing water features

Clayey Till Backslope Woodlands are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is slow (Hydrologic Group C/D), and surface runoff is moderate to high (SSS NRCS WSS, 2018). Surface runoff contributes some water to downslope ecological sites. These areas have a claypan or clay layer at or near the surface, with a slow rate of water transmission. Water seeps from the loess up slope and runs onto these soils at the interface of materials at the surface of the till.

Soil features

These soils are very deep, well drained, and slowly permeable. They formed in glacial till that contains a strongly developed brown mottled paleosol. They are very strongly acid to moderately acid. The dominant clay mineral in the upper part of the control section is montmorillonite, and in the lower part of the control section and substratum it is illite. The control section averages between 35 and 45 percent clay, 15 and 35 percent sand, and 2 and 3 percent gravel. Soils of this ecological site are in the Alfisol order, further classified as fine, smectitic, mesic Chromic Vertic Hapludalfs. Soil series associated with this site include Ursa.

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Loam
Family particle size	(1) Fine
Drainage class	Well drained
Permeability class	Very slow
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	7.62–21.34 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–2
Soil reaction (1:1 water) (Depth not specified)	4.5–7.8
Subsurface fragment volume <=3" (Depth not specified)	3%
Subsurface fragment volume >3" (Depth not specified)	2%

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. Clayey Till Backslope Woodlands form an aspect of this vegetative continuum. This ecological site occurs on convex slopes along drainageways in dissected uplands with slopes of 5 to 15 percent on well drained, slowly permeable soils. Species characteristic of this ecological site consist of an open canopy of oaks and hickories with a continuous understory of herbaceous vegetation.

Fire is a critical factor that maintains Clayey Till Backslope Woodlands. Fire typically consisted of low- to moderate-severity surface fires every 15 to 25 years ((Anderson, 1975; Brugam et.al., 2016; LANDFIRE 2009). Ignition

sources included summertime lightning strikes from convective storms and bimodal, human ignitions during the spring and fall seasons. Native Americans regularly set fires to improve sight lines for hunting, drive large game, improve grazing and browsing habitat, agricultural clearing, and enhance vital ethnobotanical plants (Barrett 1980; LANDFIRE 2009).

Drought, grazing, and windthrow have also played a role in shaping this ecological site. Clayey Till Backslope Woodland ecological sites were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison (Bos bison), prairie elk (Cervus elaphus), and white-tailed deer (Odocoileus virginianus). Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees.

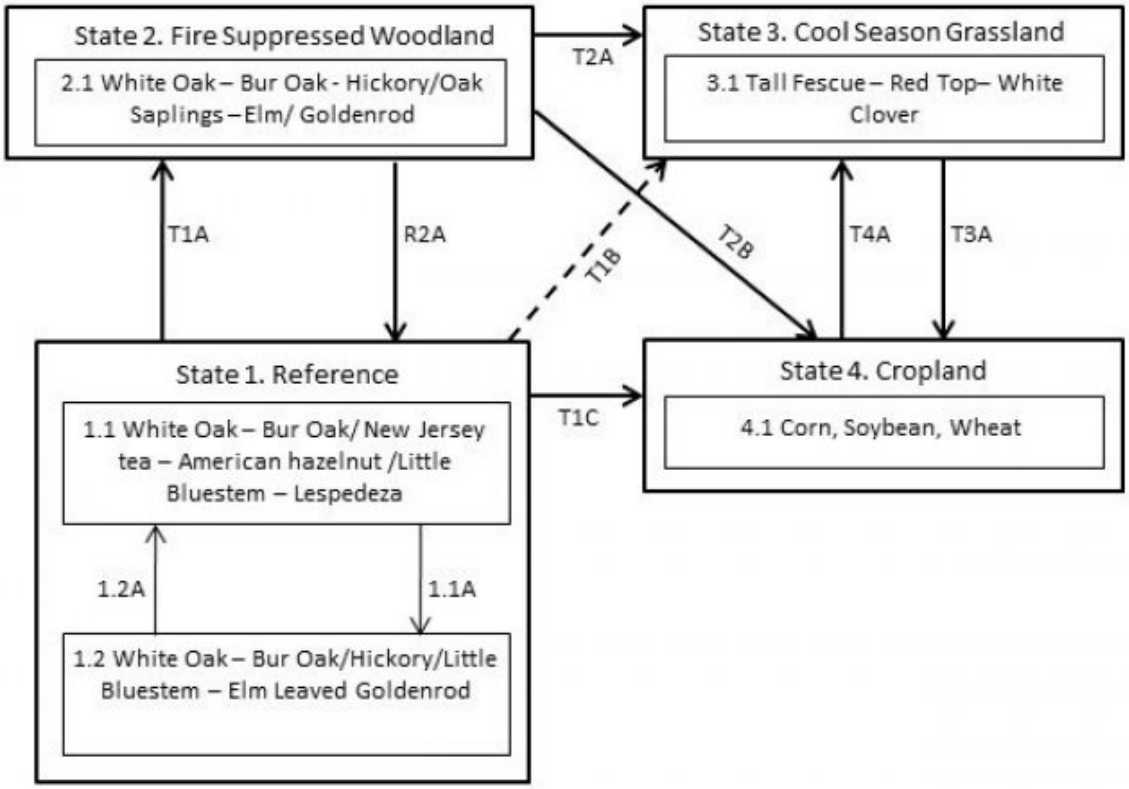
Grazing by large native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and woodland ground flora species (Anderson, 1982; Irland 2000; Peterson 2000). When coupled with fire, periods of drought, herbivory, and high wind events can greatly delay the establishment and maturation of woody vegetation (Pyne et al. 1996).

Extensive conversion for agriculture has fragmented this system. These ecological sites are moderately productive. Today, many of these ecological sites have been cleared and converted to pasture and cropland. Uncontrolled domestic grazing has also impacted these 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. In addition, soil compaction and soil erosion can be a problem and lower productivity. In the long term absence of fire, woody species, especially hickory (Carya spp.) and hophornbeam (*Ostrya virginiana* (Mill.) encroach into these woodlands (IDNR, 2018). Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora (Dey and Kabrick, 2015). Remaining woodland ecological sites have a younger (50 to 80 years) canopy layer whose species composition and quality has been altered by timber harvesting practices.

A provisional state and transition diagram is depicted. 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

Clayey Till Backslope Woodland, F113XY913IL
(Provisional)



Code	Event/Activity/Process
T1A	Fire suppression > 20 years; woody invasion; repeated timber harvests; domestic grazing
T3A	Tillage; conservation cropping system; water management
T1B, T2A	Woody removal; tillage; vegetative seeding; grassland management
T1C, T2B	Woody removal; tillage; conservation cropping system, water management
T4A	Vegetative seeding ; grassland management
1.1A	Fire-free interval 10+ years
1.2A	Fire interval 3-5 years
R2A	Forest stand improvement; access control; prescribed fire, 3-5 years; long term stand rotation

State 1
Reference

These woodland communities were strongly influenced by fire and seasonal soil wetness. Herbivory by native (now expatriated) ungulates also played a role. Consequently, fire-tolerant oaks over a ground flora of native prairie grasses, sedges and wildflowers made up the Clayey Till Backslope Woodland ecological site. There are two phases associated with this reference state.

Dominant plant species

- white oak (*Quercus alba*), tree
- bur oak (*Quercus macrocarpa*), tree
- New Jersey tea (*Ceanothus americanus*), shrub
- American hazelnut (*Corylus americana*), shrub
- little bluestem (*Schizachyrium scoparium*), grass
- lespedeza (*Lespedeza*), other herbaceous

Community 1.1
White Oak – Bur Oak/ New Jersey tea – American hazelnut /Little Bluestem – Lespedeza

The overstory in this phase is dominated by white oak and bur oak, with scattered hickories and other oaks. This woodland community typically has a two-tiered structure. The abundant herbaceous layer is dominated by little bluestem, big bluestem, Indian grass and wide variety of forbs. Fire frequency was probably every 1 to 3 years. This continued fire and natural native grazing would have maintained the more open canopy and profusion of ground flora species.

Community 1.2
White Oak – Bur Oak/Hickory/Little Bluestem – Elm leaved Goldenrod

The overstory in this phase is dominated by white oak and bur oak, with scattered hickories. This brushy woodland community typically has a three-tiered structure, with 50 to 80 percent closure. It is characterized by a thick understory of oak saplings, and shrubs. The herbaceous layer is dominated by prairie grasses and sedges. Fire-free intervals ranged from 5 to 10 years.

Pathway 1.1A
Community 1.1 to 1.2

Fire free interval of 10 years or more.

Pathway 1.2A
Community 1.2 to 1.1

Fire interval 3-5 years.

State 2
Fire Suppressed Woodland

Most current areas of Clayey Till 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. This results in the formation of White Oak – Bur Oak - Hickory/Oak Saplings – Elm/ Goldenrod woodland. Black oak and midstory species may also increase. Herbaceous cover and diversity greatly diminishes, leaf litter builds up, and more shade-tolerant woodland species persist, such as elmleaf goldenrod (*Solidago ulmifolia* Muhl. ex Willd.) panic grass (*Dichanthelium dichotomum* (L.) Gould) and late purple aster (*Symphyotrichum patens* (Aiton) G.L. Nesom). The understory also changes with oak and hickory saplings along with sassafras (*Sassafras albidum* (Nutt.) Nees) and black cherry (*Prunus serotina* Ehrh.). Transition to cool season grasslands (State 3) or intensive cropland (State 4) is common, especially on slopes less than 10 percent.

Dominant plant species

- white oak (*Quercus alba*), tree

- bur oak (*Quercus macrocarpa*), tree
- hybrid hickory (*Carya*), shrub
- elm (*Ulmus*), 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.), red top (*Agrostis stolonifera* L.) and white clover (*Trifolium repens* L.) has been common in the Illinois Central Claypan area. Occasionally, these pastures may have scattered bur and pin 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
- creeping bentgrass (*Agrostis stolonifera*), grass
- white clover (*Trifolium repens*), other herbaceous

State 4
Cropland

This is a minor state that exists currently on slopes less than 10 percent with intensive cropping of corn (*Zea mays* L.), soybeans (*Glycine max* (L.) Merr.), and winter wheat (*Triticum aestivum* L.) occurring. Some conversion to cool season grassland occurs for a limited period of time before transitioning back to cropland.

Dominant plant species

- corn (*Zea mays*), grass
- common wheat (*Triticum aestivum*), grass
- soybean (*Glycine max*), other herbaceous

Transition T1A
State 1 to 2

Fire suppression > 20 years; woody invasion; repeated timber harvests; domestic grazing

Transition T1B
State 1 to 3

Clearing/woody removal; tillage; vegetative seeding; grassland management

Transition T1C
State 1 to 4

Clearing/woody removal; tillage; conservation cropping system, water management

Restoration pathway R2A
State 2 to 1

Forest stand improvement; access control; prescribed fire, 3-5 years; long term stand rotation

Transition T2A
State 2 to 3

Woody removal; tillage; vegetative seeding; grassland management

Transition T2B
State 2 to 4

Woody removal; tillage; conservation cropping system, water management

Transition T3A
State 3 to 4

Tillage; conservation cropping system; water management

Transition T4A
State 4 to 3

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 stellata - Quercus velutina / Schizachyrium scoparium Woodland (CEGL005281) and Quercus alba - Quercus macrocarpa - Quercus bicolor Woodland Alliance (A3324)

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

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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	08/17/2024
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:**

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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):**

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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:**
