USDA Natural Resources Conservation Service

# Ecological site F113XY003MO
# Claypan Summit Woodland

Last updated: 5/17/2024
Accessed: 05/19/2024

## General information

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


**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## MLRA notes

Major Land Resource Area (MLRA): 113X–Central Claypan Areas

The western, Missouri portion of the Central Claypan is a weakly dissected till plain. Elevation ranges from about 1,000 feet in the north along the divide between the Missouri and Mississippi River watersheds to about 625 feet where the North Fork of the Salt River flows out of the area. Relief is generally low, with low slope gradients and relatively narrow drainageways. Most of the Central Claypan is in the Salt River watershed. The characteristic “claypan” occurs in the loess that caps the pre-Illinoisan aged till on the broad interfluves that characterize this region. Till is exposed on lower slopes. The underlying Mississippian aged limestone and Pennsylvanian aged shale is exposed in only a few places along lower slopes above the Salt River.

## Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to an Upland Flatwoods.

Missouri Department of Conservation Forest and Woodland Communities (Missouri Department of Conservation, 2006):
The reference state for this ecological site is most similar to a Mixed Oak Loess/Glacial Till Woodland.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Quercus stellata - Quercus velutina / Schizachyrium scoparium Woodland (CEGL005281).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs throughout the Claypan Till Plains Subsection, and in adjacent Land Type Associations of the Outer Ozark Border and Chariton River Hills Subsections.

## Ecological site concept

NOTE: This is a “provisional” Ecological Site Description (ESD) that is under development. It contains basic ecological information that can be used for conservation planning, application and land management. After additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Claypan Summit Woodlands are scattered mainly on the fringes of the MLRA, in transitional areas between the broad prairie summit ecological sites and the woodland hillslope ecological sites. Soils have a silty clay subsoil that perches water in the spring, and affects rooting depth. The reference plant community is woodland with an overstory dominated by post oak and black oak, and a ground flora of native grasses and forbs.

## Associated sites

| | |
|---|---|
| F109XY007MO | **Till Upland Woodland**<br>Till Upland Woodlands are downslope, on shoulders and upper backslopes. |
| R113XY001MO | **Claypan Summit Prairie**<br>Claypan Summit Prairies are adjacent, on broad prairie landscapes. |

## Similar sites

| | |
|---|---|
| F113XY003MO | **Claypan Summit Woodland**<br>Claypan Summit Woodlands have no similar sites in this MLRA. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Quercus stellata*<br>(2) *Quercus velutina* |
| Shrub | (1) *Prunus americana* |
| Herbaceous | (1) *Panicum virgatum*<br>(2) *Carex* |

## Physiographic features

This site is on upland summit interfluves and ridge crests, with slopes of 2 to 5 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Young and Geller, 1995) shows a typical landscape position of this ecological site, and landscape relationships among the three dominant upland woodland ecological sites in this MLRA. It is within the area labeled “1” on the figure.

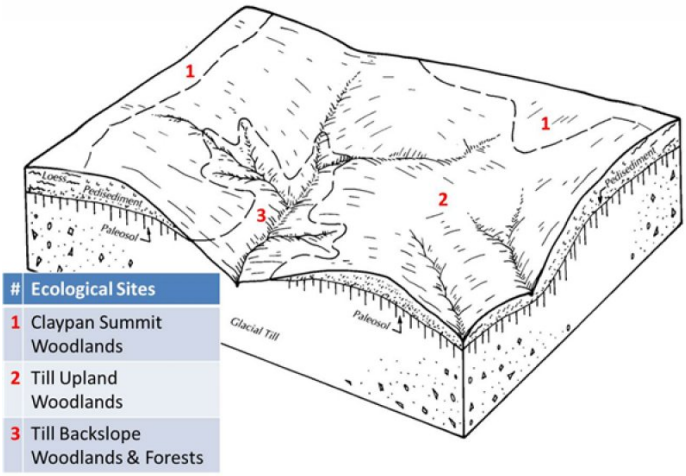



**Figure 2. Landscape sequence of ecological sites**

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Interfluve<br>(2) Divide |
| Runoff class | Very low to low |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 191–305 m |
| Slope | 2–5% |
| Water table depth | 20–25 cm |
| Aspect | Aspect is not a significant factor |

## Climatic features

The western part of the Central Claypan Area MLRA has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce abundant amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over the region, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

This western part of the MLRA experiences regional differences in climates that grade across the region. The basic gradient for most mean annual climatic characteristics is along a line from north to south. Both mean annual temperature and precipitation exhibit modest gradients along this line.

Mean January minimum temperature follows a north to south gradient. However, mean July maximum temperature shows hardly any geographic variation in the region. Mean July maximum temperatures have a range of only two to three degrees across the region.
Mean annual precipitation also varies along the north to south gradient – lower annual precipitation in the north, somewhat higher in the south. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages three to four times greater than January precipitation.

During years when precipitation comes in a fairly normal manner, moisture is stored in the top layers of the soil during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Drought directly influences ecological communities by limiting water supplies, especially at times of high temperatures and high evaporation rates. Drought indirectly affects ecological communities by increasing plant and

animal susceptibility to the probability and severity of fire. Frequent fires encourage the development of grass/forb dominated communities and understories.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. For example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Slope orientation is an important topographic influence on microclimate. Summits and south-and-west-facing slopes are regularly warmer and drier, supporting more grass dominated communities than adjacent north- and-east-facing slopes that are cooler and moister that support more woody dominated communities especially the moister valleys in the region. Finally, the cooler microclimate within a canopied forest is measurably different from the climate of a more open and warmer grassland or savanna area.

Source: University of Missouri Climate Center - http://climate.missouri.edu/climate.php; Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - http://soils.usda.gov/survey/geography/mlra/

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 156-169 days |
| Freeze-free period (characteristic range) | 189-198 days |
| Precipitation total (characteristic range) | 1,067-1,092 mm |
| Frost-free period (actual range) | 148-172 days |
| Freeze-free period (actual range) | 185-199 days |
| Precipitation total (actual range) | 1,067-1,092 mm |
| Frost-free period (average) | 162 days |
| Freeze-free period (average) | 193 days |
| Precipitation total (average) | 1,067 mm |

## Climate stations used

- (1) COLUMBIA RGNL AP [USW00003945], Columbia, MO
- (2) SHELBINA [USC00237720], Shelbina, MO
- (3) VANDALIA [USC00238577], Vandalia, MO
- (4) MOBERLY [USC00235671], Moberly, MO

## Influencing water features

This ecological site is influenced by a seasonal high water table, perched on the clayey subsoil. Some depressional areas pond for short periods of time, mostly in the spring. These shallow depressional areas were more common prior to the conversion of nearly all areas of this ecological site from woodland to cropland. Leveling and surface drainage have reduced or eliminated the shallow depressions. These areas were Forested Palustrine wetlands (Cowardin et al., 1979).

This ecological site contains wetlands which fit into the MINERAL FLAT class in the Hydrogeomorphic (HGM) system (Brinson, 1993). The water source is direct precipitation, because there are no upslope contributing sites. Dominant hydrodynamics are vertical fluctuations. Mineral soil flats lose water by evapotranspiration, overland flow, and seepage to underlying groundwater. Vertical water percolation in the soil is impeded by the clayey subsoil (the “claypan”), resulting in significant lateral discharge to adjacent downslope ecological sites. Adjacent sites include Headwater SLOPE HGM class sites in watershed headwaters. This discharge supports surface saturation in the adjacent areas.

In general, MINERAL FLAT areas provide watershed recharge and runoff that accumulates in downslope reaches as groundwater discharge and surface water accumulation. Wetland hydrology is effectively removed by surface ditches or subsurface tile drainage that directs vertical downward movement in a horizontal direction to the drainage

element.

Wetland hydrology is also influenced by the surface storage afforded by vegetation and natural surface roughness. This storage is a large part of the water budget, allowing the profile to be re-filled with water which would otherwise run off. In extreme cases, conversion to agriculture can completely remove wetland hydrology.

## Soil features

These soils have silty clay subsoils at about 8 to 13 inches, which impede but do not exclude rooting. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. They have silt loam surface horizons, and silty clay to clay subsoils. Parent material is loess underlain by pedisediment derived from loess and till. A seasonal high water table is perched above the clayey subsoil during the spring months in most years. Soil series associated with this site include Calwoods and Marion.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Pedisediment |
| Surface texture | (1) Silt loam<br>(2) Silty clay loam |
| Family particle size | (1) Clayey |
| Drainage class | Somewhat poorly drained |
| Permeability class | Very slow |
| Soil depth | 183 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 15.24 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 5.1–7.3 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–2% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

The reference plant community is an open woodland dominated by an overstory of post oak and black oak, with and occasional pin oak, elm and hickory. The canopy is moderately tall (55 to 70 feet) but less dense (30 to 60 percent closure) and less structurally diverse than adjacent Loess Upland Woodlands or Till Backslope Woodlands and

Forests. Increased light from an open canopy causes a diversity of woodland ground flora species to flourish, especially prairie grasses. The claypan soil subsoil perches water in the spring and affects rooting depth of this ecological site limiting the growth of trees and supporting an abundance of native grasses and forbs in the understory. Seasonal wetness allows an abundance of sedges and wild ryes to occur in the understory. Woodlands are distinguished from forest, by their relatively open understory, and the presence of sun-loving ground flora species. Characteristic plants in the ground flora can be used to gauge the restoration potential of a stand along with remnant open-grown old-age trees, and tree height growth.

Because of their proximity to prairies, fire played a significant role in the maintenance of these systems. It is likely that these ecological sites burned at least once every 3 to 5 years. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. During fire free intervals, woody understory species increased and the herbaceous understory diminished. The return of fire would open the woodlands up again and stimulate the abundant ground flora.

Claypan Summit Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison, prairie elk, and white-tailed deer. 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.

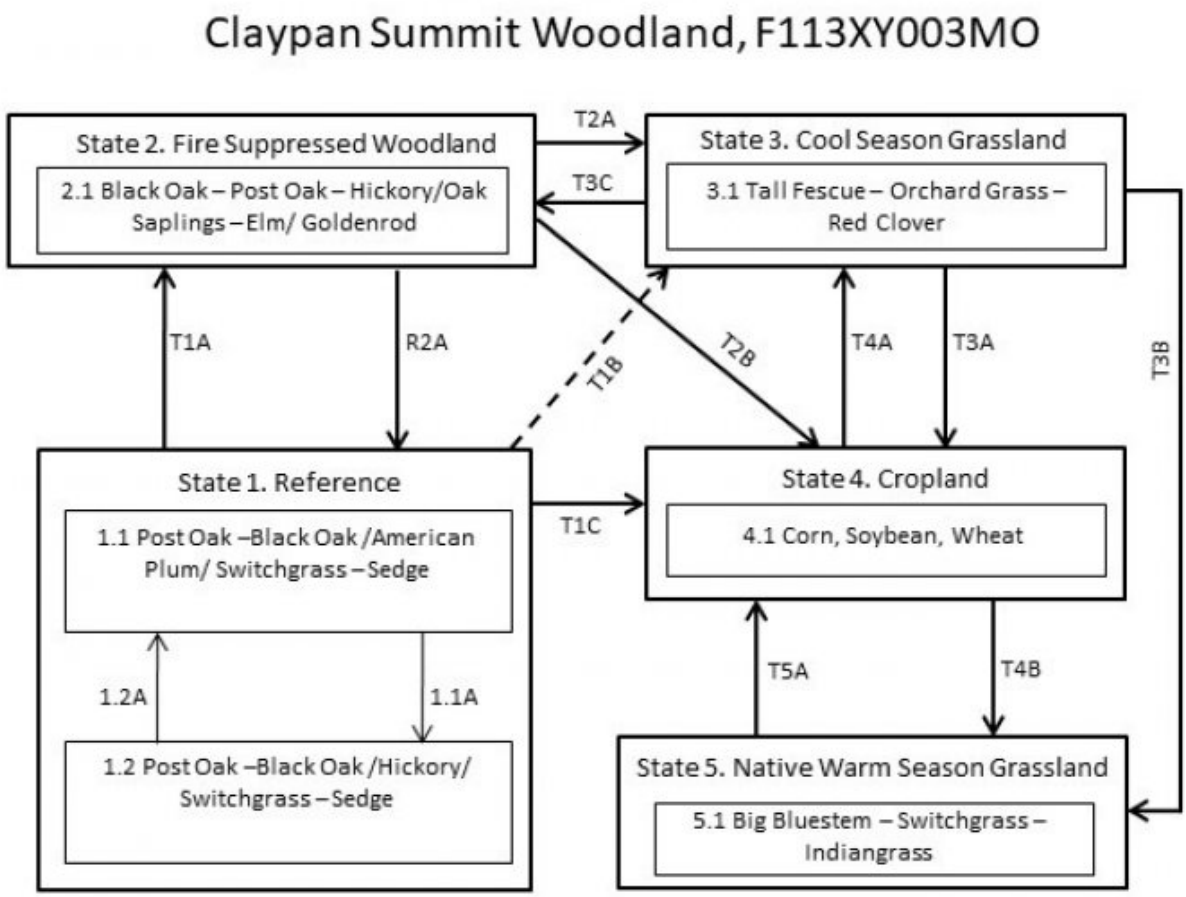
Today, most of these ecological sites have been cleared and converted to pasture and cropland. Remaining woodland ecological sites have a younger (50 to 80 years) canopy layer whose species composition and quality has been altered by timber harvesting practices. In the long term absence of fire, woody species, especially hickory and sugar maple, encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration means.

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, gooseberry, and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and soil erosion can be a problem and lower productivity.

These ecological sites are not very productive. Oak regeneration is typically problematic. Hophornbeam and hickories are often dominant competitors in the understory. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects. Some thinning of the dense stands and periodic fire will be needed to maintain the ground flora diversity and open stand structure.

A State and Transition Diagram follows. 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




| Code | Event/Activity/Process |
|---|---|
| T1A | Fire suppression > 20 years; woody invasion; repeated timber harvests |
| T1B | Woody removal; tillage; vegetative seeding; grassland management |
| T1C, T3A, T5A | Clearing; tillage; conservation cropping system; water management |
| T2A | Woody removal; tillage; vegetative seeding; grassland management |
| T2B | Woody removal; tillage; conservation cropping system |
| T4A | Vegetative seeding ; grassland management |
| T3B, T4B | Vegetative seeding; prescribed fire; grassland management |
| T3C | Woody invasion; fire suppression; grazing exclusion |
| 1.1A | Fire-free interval 10+ years |
| 1.2A | Fire interval 1-3 years |
| R2A | Forest stand improvement; prescribed fire 1-3 years; extended rotations |

**Figure 9. State and Transition Model for this ecological site**

## State 1

## Reference

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

**Dominant plant species**

- post oak (*Quercus stellata*), tree
- black oak (*Quercus velutina*), tree
- American plum (*Prunus americana*), shrub
- switchgrass (*Panicum virgatum*), grass
- sedge (*Carex*), grass

## Community 1.1
## Post Oak - Black Oak/American Plum/Switchgrass - Sedge

The overstory in this phase is dominated by post oak and black oak, with scattered hickories. This open woodland community typically has a two-tiered structure, with canopy height of 35 to 50 feet and 30 to 60 percent closure. The abundant herbaceous layer is dominated by switchgrass, little bluestem, big bluestem and Indian grass. Fire frequency was 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.

**Forest overstory.** The Forest Overstory Species list is based on commonly occurring species listed in Nelson (2010).

**Forest understory.** The Forest Understory Species list is based on commonly occurring species listed in Nelson (2010).

**Dominant plant species**

- post oak (*Quercus stellata*), tree
- black oak (*Quercus velutina*), tree
- American plum (*Prunus americana*), shrub
- switchgrass (*Panicum virgatum*), grass
- sedge (*Carex*), grass

## Community 1.2
## Post Oak - Black Oak/Hickory Saplings/Switchgrass - Sedge

The overstory in this phase is dominated by post oak and black 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.

**Dominant plant species**

- post oak (*Quercus stellata*), tree
- black oak (*Quercus velutina*), tree
- hybrid hickory (*Carya*), shrub
- switchgrass (*Panicum virgatum*), grass
- sedge (*Carex*), grass

## Pathway P1.1A
## Community 1.1 to 1.2

This community pathway is the result of fire-free interval of more than 10 years.

### Pathway P1.2A
### Community 1.2 to 1.1

This community pathway is the result of return to fire intervals of 1to 3 years.

## State 2
## Fire Suppressed Woodland

Most current areas of Claypan Woodlands have experienced fire exclusion for decades. 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 Post Oak – Black Oak – Black Hickory / Oak – Hickory Saplings / Goldenrod woodland. Black oak and mid-story species increase. Herbaceous cover and diversity greatly diminishes, leaf litter builds up, and more shade-tolerant woodland species persist, such as elm-leaved goldenrod, panic grass and spreading aster. The understory also develops with oak and hickory saplings along with sassafras and black cherry.

**Dominant plant species**

- black oak (*Quercus velutina*), tree
- post oak (*Quercus stellata*), tree
- hybrid hickory (*Carya*), tree
- oak (*Quercus*), shrub
- elm (*Ulmus*), shrub
- goldenrod (*Solidago*), other herbaceous

### Community 2.1
### Black Oak - Post Oak - Hickory/Oak Saplings - Elm/Goldenrod

Oak and hickory species are increasing due to fire suppression. Displacement of grasses and forbs is occurring due to shading and competition from the increased densities of oak and hickory saplings. Canopy cover ranges from 70 to 90 percent. Most stands are 50 to 80 years of age.

## State 3
## Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue and red clover has been common in the Missouri Central Claypan area. Occasionally, these pastures will have scattered post and pin oaks. Long term uncontrolled grazing can cause significant soil erosion and compaction.

**Dominant plant species**

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

### Community 3.1
### Tall Fescue - Orchard Grass - Red Clover

This phase is well managed grassland, composed of non-native cool season grasses and legumes. Grazing and haying is occurring. The effects of long-term liming on soil pH, and calcium and magnesium content, is most evident in this phase. Studies show that these soils have higher pH and higher base status in soil horizons as much as two feet below the surface, relative to a poorly managed grassland and to woodland communities (where liming is not practiced).

## State 4
## Cropland

This is the dominant State that exists currently with intensive cropping of corn, soybeans, and wheat 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
- red clover (*Trifolium pratense*), other herbaceous

### Community 4.1
### Corn, Soybean, Wheat

This phase has intensive cropping of corn, soybeans, and wheat. Tillage operations generally leave little residue on the surface over winter. Surface drainage has usually been altered.

### State 5
### Native Warm Season Grassland

Conversion to this State is increasing due to renewed interest in warm season grasses as a supplement to cool season grazing system or as a native restoration activity.

**Dominant plant species**

- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass
- Indiangrass (*Sorghastrum nutans*), grass

### Community 5.1
### Big Bluestem - Switchgrass - Indiangrass

This phase is dominated by planted native warm season grasses. Some plantings are the result of participating in government programs.

### Transition T1A
### State 1 to 2

This transition is the result of fire suppression for at least 20 years and woody invasion or repeated timber harvests.

### Transition T1B
### State 1 to 3

This transition is the result of fire suppression, tillage, vegetative seeding and grassland management.

### Transition T1C
### State 1 to 4

This transition is the result of tillage, conservation cropping system and water management.

### Restoration pathway R2A
### State 2 to 1

This restoration pathway is the result of forest stand improvement, prescribed fire every 1-3 years and extended rotations.

### Transition T2A
### State 2 to 3

This transition is the result of woody removal, tillage, vegetative seeding and grassland management.

### Transition T2B
### State 2 to 4

This transition is the result of woody removal, tillage, conservation cropping system and water management.

### Restoration pathway T3C
### State 3 to 2

Woody invasion; fire suppression; grazing exclusion

### Transition T3A
### State 3 to 4

This transition is the result of tillage, conservation cropping system and water management.

### Transition T3B
### State 3 to 5

This transition is the result of vegetative seeding, prescribed fire, and grassland management.

### Transition T3C
### State 4 to 2

This transition is the result of woody invasion, fire suppression and grazing exclusion.

### Restoration pathway T4A
### State 4 to 3

This transition is the result of vegetative seeding and grassland management.

### Transition T4B
### State 4 to 5

This transition is the result of vegetative seeding, prescribed fire, and grassland management.

### Transition T5A
### State 5 to 4

This transition is the result of tillage, conservation cropping system and water management.

## Additional community tables

**Table 5. Community 1.1 forest overstory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) | Diameter (Cm) | Basal Area (Square M/Hectare) |
|---|---|---|---|---|---|---|---|
| **Tree** | | | | | | | |
| white oak | QUAL | *Quercus alba* | Native | – | 40–60 | – | – |
| black oak | QUVE | *Quercus velutina* | Native | – | 20–30 | – | – |
| post oak | QUST | *Quercus stellata* | Native | – | 10–20 | – | – |
| pin oak | QUPA2 | *Quercus palustris* | Native | – | 5–10 | – | – |
| American elm | ULAM | *Ulmus americana* | Native | – | 5–10 | – | – |
| shagbark hickory | CAOV2 | *Carya ovata* | Native | – | 5–10 | – | – |

**Table 6. Community 1.1 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) |
|---|---|---|---|---|---|
| **Grass/grass-like (Graminoids)** | | | | | |
| little bluestem | SCSC | *Schizachyrium scoparium* | Native | – | 5–20 |
| parasol sedge | CAUM4 | *Carex umbellata* | Native | – | 5–20 |
| rock muhly | MUSO | *Muhlenbergia sobolifera* | Native | – | 5–20 |
| Virginia wildrye | ELVI3 | *Elymus virginicus* | Native | – | 5–20 |
| eastern gamagrass | TRDA3 | *Tripsacum dactyloides* | Native | – | 5–20 |
| switchgrass | PAVI2 | *Panicum virgatum* | Native | – | 5–20 |
| big bluestem | ANGE | *Andropogon gerardii* | Native | – | 5–20 |
| Pennsylvania sedge | CAPE6 | *Carex pensylvanica* | Native | – | 5–20 |
| **Forb/Herb** | | | | | |
| smooth blue aster | SYLAC | *Symphyotrichum laeve var. concinnum* | Native | – | 5–20 |
| eastern purple coneflower | ECPU | *Echinacea purpurea* | Native | – | 5–20 |
| nakedflower ticktrefoil | DENU4 | *Desmodium nudiflorum* | Native | – | 5–20 |
| slender lespedeza | LEVI7 | *Lespedeza virginica* | Native | – | 5–20 |
| Canadian blacksnakeroot | SACA15 | *Sanicula canadensis* | Native | – | 5–20 |
| eastern beebalm | MOBR2 | *Monarda bradburiana* | Native | – | 5–20 |
| fourleaf milkweed | ASQU | *Asclepias quadrifolia* | Native | – | 5–20 |
| eastern beebalm | MOBR2 | *Monarda bradburiana* | Native | – | 5–20 |
| Culver's root | VEVI4 | *Veronicastrum virginicum* | Native | – | 5–20 |
| bluejacket | TROH | *Tradescantia ohiensis* | Native | – | 5–20 |
| hairy woodland brome | BRPU6 | *Bromus pubescens* | Native | – | 5–20 |
| elmleaf goldenrod | SOUL2 | *Solidago ulmifolia* | Native | – | 5–20 |
| hairy sunflower | HEHI2 | *Helianthus hirsutus* | Native | – | 5–20 |
| **Shrub/Subshrub** | | | | | |
| American plum | PRAM | *Prunus americana* | Native | – | 10–20 |
| American hazelnut | COAM3 | *Corylus americana* | Native | – | 10–20 |
| fragrant sumac | RHAR4 | *Rhus aromatica* | Native | – | 10–20 |
| New Jersey tea | CEAM | *Ceanothus americanus* | Native | – | 5–20 |

## Animal community

Wildlife Species (MDC 2006):

Wild turkey, white-tailed deer, and eastern gray squirrel depend on hard and soft mast food sources and are typical upland game species of this type.

Oaks provide hard mast; scattered shrubs provide soft mast; native legumes provide high-quality wildlife food; sedges and native cool-season grasses provide green browse; native warm-season grasses provide cover and nesting habitat; and a diversity of forbs provides a diversity and abundance of insects. Post-burn areas can provide temporary bare-ground – herbaceous cover habitat important for turkey poults and quail chicks.

Bird species associated with mature communities include Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Eastern Wood-Pewee, Broad-winged Hawk, Great-Crested Flycatcher, Summer Tanager, and Red-eyed Vireo.

Reptile and amphibian species associated with this ecological site include tiger salamander, small-mouthed salamander, ornate box turtle, northern fence lizard, five-lined skink, broad-headed skink, flat-headed snake, and

rough earth snake.

## Other information

Forestry (NRCS 2002, 2015):

Management: Field collected site index values average 47 for post oak and 56 for black oak. Timber management opportunities are fair. These sites have an abrupt textural change, which impedes rooting. Reduced rooting depth restricts tree growth and increases windthrow hazards. These groups respond well to even-aged management. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection, group selection cuttings of ½ to 1 acre, or crop tree release are other options that can be used if clear cutting is not desired or warranted. These sites respond well to prescribed fire as a management tool.

Limitations: Restricted rooting depth; seasonal wetness; long term ponding. Unsurfaced roads and traffic areas tend to be slippery and form ruts easily. Graveling roads facilitates year-round use. Equipment use when wet or ponded may compact soil and damage tree roots. Planting is difficult during wet spring periods. Seedling mortality may be high due to excess seasonal wetness, shallow effective rooting depths or sodium. Ridging the soil and planting on the ridges may increase survival. The use of equipment can become restricted in spring and other excessively wet periods.

## Inventory data references

Plot DANVCA_JK07 – Marion soil (altered woodland state)
Located in Danville CA, Montgomery County, MO
Latitude: 38.870406
Longitude: -91.51037884

Plot DANVCA07 – Marion soil (altered woodland state)
Located in Danville CA, Montgomery County, MO
Latitude: 38.870359
Longitude: -91.510096

## Other references

Anderson, R.C. 1990. The historic role of fire in North American grasslands. Pp. 8-18 in S.L. Collins and L.L. Wallace (eds.). Fire in North American tallgrass prairies. University of Oklahoma Press, Norman.

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Corps of Engineers, Engineer Waterways Experiment Station, Vicksburg, MS.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

MDC, 2006. Missouri Forest and Woodland Community Profiles. Missouri Department of Conservation, Jefferson City, Missouri.

Natural Resources Conservation Service. 2002. Woodland Suitability Groups. Missouri FOTG, Section II, Soil Interpretations and Reports. 30 pgs.

Natural Resources Conservation Service. Site Index Reports. Accessed May 2014. https://esi.sc.egov.usda.gov/ESI_Forestland/pgFSWelcome.aspx

Nelson, Paul W. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

Nigh, Timothy A. and Walter A. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri.

Pitts, D.E. and W.D. McGuire. 2000. Wildlife management for Missouri landowners. 3rd ed. Missouri Department of Conservation, Jefferson City.

Schroeder, W.A. 1981. Presettlement prairie of Missouri. Missouri Department of Conservation, Natural History Series No. 2. Jefferson City, Missouri

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. 682 pgs.

Young, Fred J. and Alice W. Geller. 1995. Soil Survey of Audrain County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

## Contributors

Fred Young
Doug Wallace

## Approval

Suzanne Mayne-Kinney, 5/17/2024

## Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support in the development of this ecological site.

## 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 | 05/19/2024 |
| 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:**

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:**

---