Ecological site F115XC010IL
Chert Exposed 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): 115X–Central Mississippi Valley Wooded Slopes

This MLRA is characterized by deeply dissected, loess-covered hills bordering well defined valleys of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers and their tributaries. It is used to produce cash crops and livestock. About one-third of the area is forested, mostly on the steeper slopes. This area is in Illinois (50 percent), Missouri (36 percent), Indiana (13 percent), and Iowa (1 percent) in two separate areas. It makes up about 25,084 square miles (64,967 square kilometers).

Most of this area is in the Till Plains section and the Dissected Till Plains section of the Central Lowland province of the Interior Plains. The Springfield-Salem plateaus section of the Ozarks Plateaus province of the Interior Highlands occurs along the Missouri River and the Mississippi River south of the confluence with the Missouri River. The nearly level to very steep uplands are dissected by both large and small tributaries of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers. The Ohio River flows along the southernmost boundary of this area in Indiana. Well defined valleys with broad flood plains and numerous stream terraces are along the major streams and rivers. The flood plains along the smaller streams are narrow. Broad summits are nearly level to undulating. Karst topography is common in some parts along the Missouri and Mississippi Rivers and their tributaries. Well-developed karst areas have hundreds of sinkholes, caves, springs, and losing streams. In the St. Louis area, many of the karst features have been obliterated by urban development.

Elevation ranges from 90 feet (20 meters) on the southernmost flood plains to 1,030 feet (320 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters) but can be 50 to 150 feet (15 to 45 meters) in the steep, deeply dissected hills bordering rivers and streams. The bluffs along the major rivers are generally 200 to 350 feet (60 to 105 meters) above the valley floor.

The uplands in this MLRA are covered almost entirely with Peoria Loess. The loess can be more than 7 feet (2 meters) thick on stable summits. On the steeper slopes, it is thin or does not occur. In Illinois, the loess is underlain mostly by Illinoian-age till that commonly contains a paleosol. Pre-Illinoian-age till is in parts of this MLRA in Iowa and Missouri and to a minor extent in the western part of Illinois. Wisconsin-age outwash, alluvial deposits, and sandy eolian material are on some of the stream terraces and on dunes along the major tributaries. The loess and glacial deposits are underlain by several bedrock systems. Pennsylvanian and Mississippian bedrock are the most extensive. To a lesser extent are Silurian, Devonian, Cretaceous, and Ordovician bedrock. Karst areas have formed where limestone is near the surface, mostly in the southern part of the MLRA along the Mississippi River and some of its major tributaries. Bedrock outcrops are common on the bluffs along the Mississippi, Ohio, and Wabash Rivers and their major tributaries and at the base of some steep slopes along minor streams and drainageways.

The annual precipitation ranges from 35 to 49 inches (880 to 1,250 millimeters) with a mean of 41 inches (1,050 millimeters). The annual temperature ranges from 48 to 58 degrees F (8.6 to 14.3 degrees C) with a mean of 54 degrees F (12.3 degrees C). The freeze-free period ranges from 150 to 220 days with a mean of 195 days.

Soils The dominant soil orders are Alfisols and, to a lesser extent, Entisols and Mollisols. The soils in the area have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or smectitic mineralogy. They are shallow to very deep, excessively drained to poorly drained, and loamy, silty, or clayey.

The soils on uplands in this area support natural hardwoods. Oak, hickory, and sugar maple are the dominant species. Big bluestem, little bluestem, and scattered oak and eastern redcedar grow on some sites. The soils on flood plains support mixed forest vegetation, mainly American elm, eastern cottonwood, river birch, green ash, silver maple, sweetgum, American sycamore, pin oak, pecan, and willow. Sedge and grass meadows and scattered trees are on some low-lying sites. (United States Department of Agriculture, Natural Resources Conservation Service, 2022)

LRU notes

The Central Mississippi Valley Wooded Slopes, Northern part (Land Resource Unit (LRU) (115XC) encompasses the Wyaconda River Dissected Till Plains, Mississippi River Hills, and Mississippi River Alluvial Plain (Schwegman et al. 1973; Nelson 2010). It spans three states – Illinois (73 percent), Iowa (6 percent), and Missouri (21 percent) – comprising about 13,650 square miles (Figure 1). The elevation ranges from 420 feet above sea level (ASL) along the Mississippi River floodplains to 885 feet on the upland ridges. Local relief varies from 10 to 20 feet but can be as high as 50 to 100 feet along drainageways and streams and the bluffs on the major rivers reaching 250 feet above valley floors. Wisconsin-aged loess covers the uplands, while Illinoian glacial drift lies directly below. The loess and drift deposits are underlain by several bedrock systems, including the Cretaceous, Pennsylvania, Mississippian, Silurian, Devonian, and Ordovician Systems. Wisconsin outwash deposits and sandy eolian material occur along stream terraces of major tributaries (USDA-NRCS 2006).

The vegetation across the region has undergone drastic changes over time. At the end of the last glacial episode – the Wisconsinan glaciation – the evolution of vegetation began with the development of tundra habitats, followed by a phase of spruce and fir forests, and eventually spruce-pine forests. Not until approximately 9,000 years ago did the climate undergo a warming trend which prompted the development of deciduous forests dominated by oak and hickory. As the climate continued to warm and dry, prairies began to develop approximately 8,300 years ago. Another shift in climate that resulted in an increase in moisture prompted the emergence of savanna-like habitats from 8,000 to 5,000 years before present (Taft et al. 2009). During the most recent climatic shifts, forested ecosystems maintained footholds on steep valley sides and wet floodplains. Due to the physiography of the MLRA, forests were the dominant ecosystems and were affected by such natural disturbances as droughts, wind, lightning, and occasional fire (Taft et al. 2009).

Classification relationships

USFS Subregions: Central Dissected Till Plains (251C)Section; Western Mississippi River Hills (251Ce), Mississippi River and Illinois Alluvial Plains (251Cf), Eastern Mississippi River Hills (251Ci), Galesburg Dissected Till Plain (251Cj), and Wyaconda River Dissected Till Plain (251Cm) Subsections (Cleland et al. 2007)

U.S. EPA Level IV Ecoregion: Upper Mississippi River Alluvial Plain (72d), River Hills (72f), and Western Dissected Illinoian Till Plain (72i) (USEPA 2013)

National Vegetation Classification – Ecological Systems: Ozark-Ouachita Dry-Mesic Oak Forest (CES202.708) (NatureServe 2018)

National Vegetation Classification – Plant Associations: Quercus alba – Quercus rubra – Carya tomentosa/Cornus florida Acidic Forest (CEGL002067) (Nature Serve 2018)

Biophysical Settings: North-Central Interior Dry-Mesic Oak Forest and Woodland (BpS 4913100)

Illinois Natural Areas Inventory: Dry upland forest (White and Madany 1978)

Missouri Terrestrial Natural Communities: Dry chert woodland, dry-mesic chert woodland (Nelson 2010)

Ecological site concept

Chert Exposed Backslope Woodlands are located within the green areas on the map. They occur on south and west facing upland backslopes. The soils are Alfisols that are well to somewhat excessively drained and very deep, formed in residuum weathered from cherty limestone.

The historic pre-European settlement vegetation on this ecological site was dominated by a closed canopy of oaks. White oak (Quercus alba L.) and black oak (Quercus velutina Lam.) are the dominant species in the tree canopy, but shagbark hickory (Carya ovata (Mill.) K. Koch) and mockernut hickory (Carya tomentosa (Lam.) Nutt.) can also be present (NatureServe 2018). Little bluestem (Schizachyrium scoparium (Michx.) Nash) and woman's tobacco (Antennaria plantaginifolia (L.) Richardson) are dominant herbs (Nelson 2010). Fire is the primary disturbance factor that maintains this ecological site, while storm damage and drought are secondary factors (LANDFIRE 2009).

Associated sites

F115XC005IL	**Loess Upland Forest** Loess and loess-covered substrates on uplands including Atlas, Baylis, Bunkum, Caseyville, Creal, Derinda, Dodge, Fayette, Fishhook, Hickory, Kendall, Keomah, Keswick, Menfro, Metea, Navlys, Rozetta, Seaton, Stookey, Stronghurst, Sylvan, Thebes, Timula, Ursa, and Winfield soils
F115XC009IL	**Chert Protected Backslope Forest** Parent material is residuum from cherty limestone on north and east-facing backslopes including Goss soils

Similar sites

F115XC008IL	**Loess Exposed Backslope Woodland** Loess Exposed Backslope Woodlands occur on similar landscapes and positions but parent material is loess or loess-covered substrates.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus velutina*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Antennaria plantaginifolia*

Physiographic features

Chert Exposed Backslope Woodlands occur on south and west facing upland backslopes. They are situated on elevations ranging from approximately 800 to 1200 feet ASL. The site does not experience flooding but rather generates runoff to adjacent, downslope ecological sites.

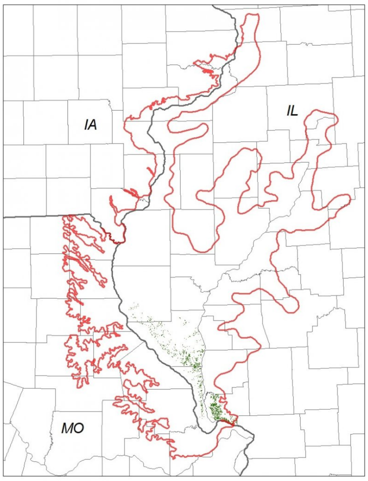


Figure 1. Location of Chert Exposed Backslope Woodland ecological site within LRU 115XC.

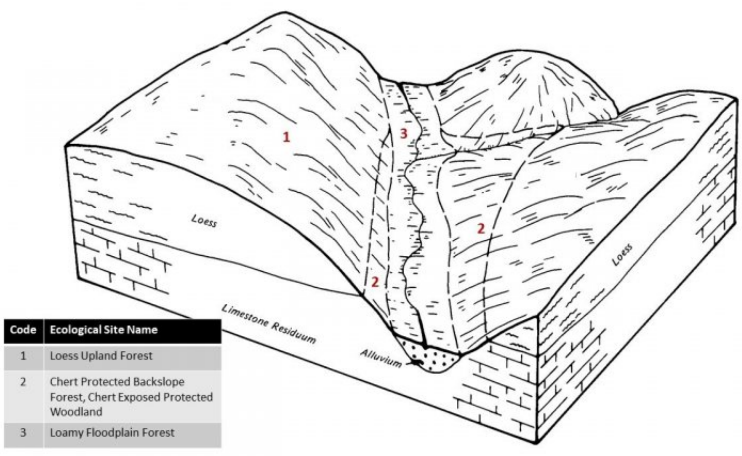


Figure 2. Representative block diagram of Chert Exposed Backslope Woodland and associated ecological sites.

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope
Slope shape across	(1) Convex
Slope shape up-down	(1) Convex
Landforms	(1) Upland
Runoff class	High
Elevation	800–1,200 ft
Slope	18–70%
Water table depth	80 in
Aspect	W, NW, S, SW

Climatic features

The Central Mississippi Valley Wooded Slopes, Northern Part falls into the humid subtropical (Cfa) and hot-summer humid continental climate (Dfa) Köppen-Geiger climate classifications (Peel et al. 2007). The two main factors that drive the climate of the MLRA are latitude and weather systems. Latitude, and the subsequent reflection of solar input, determines air temperatures and seasonal variations. Solar energy varies across the seasons, with summer receiving three to four times as much energy as opposed to winter. Weather systems (air masses and cyclonic storms) are responsible for daily fluctuations of weather conditions. High-pressure systems are responsible for settled weather patterns where sun and clear skies dominate. In fall, winter, and spring, the polar jet stream is responsible for the creation and movement of low-pressure systems. The clouds, winds, and precipitation associated with a low-pressure system regularly follow high-pressure systems every few days (Angel n.d.).

The soil temperature regime of LRU 115XC is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 190 days, while the frost-free period is about 168 days. The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 41 inches, which includes rainfall plus the water equivalent from snowfall. The average annual low and high temperatures are 44 and 64°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	170 days
Freeze-free period (characteristic range)	182 days
Precipitation total (characteristic range)	39-41 in

Frost-free period (actual range)	170 days
Freeze-free period (actual range)	182 days
Precipitation total (actual range)	39-41 in
Frost-free period (average)	170 days
Freeze-free period (average)	182 days
Precipitation total (average)	40 in

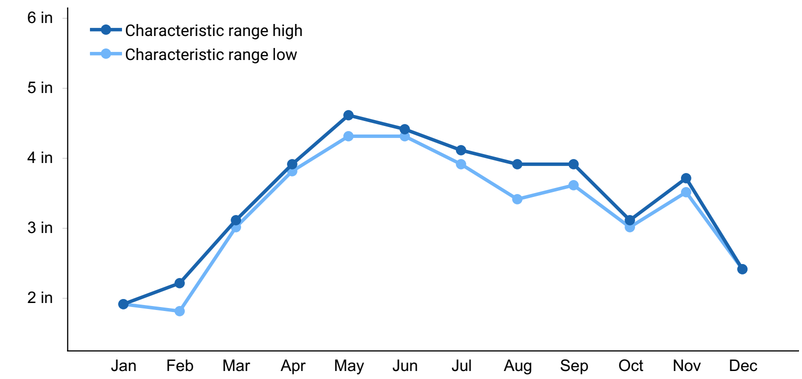


Figure 3. Monthly precipitation range

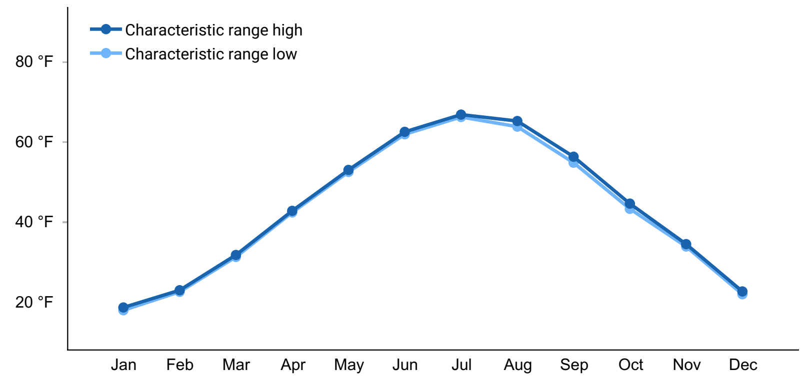


Figure 4. Monthly minimum temperature range

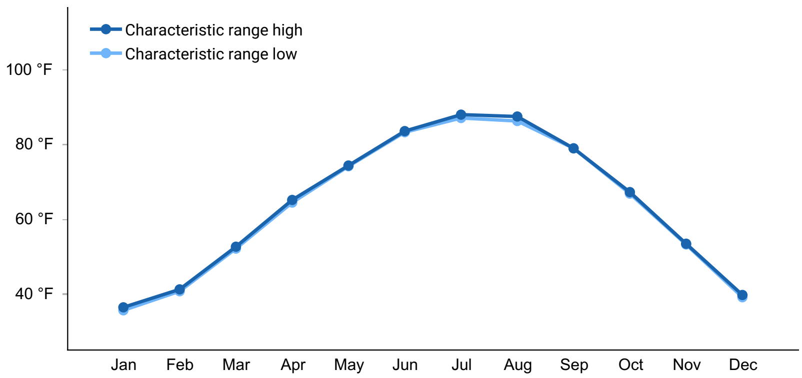


Figure 5. Monthly maximum temperature range

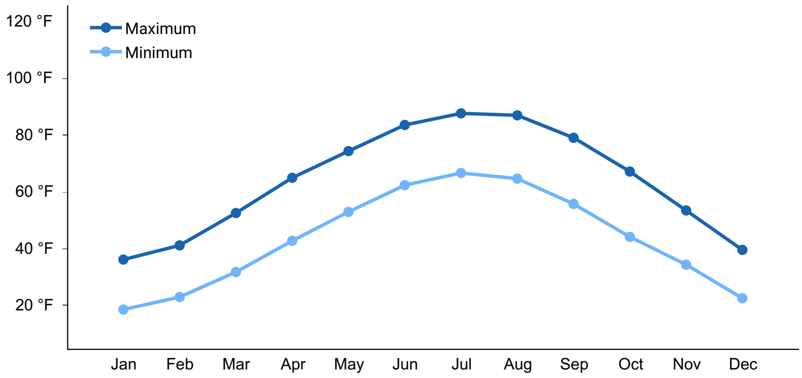


Figure 6. Monthly average minimum and maximum temperature

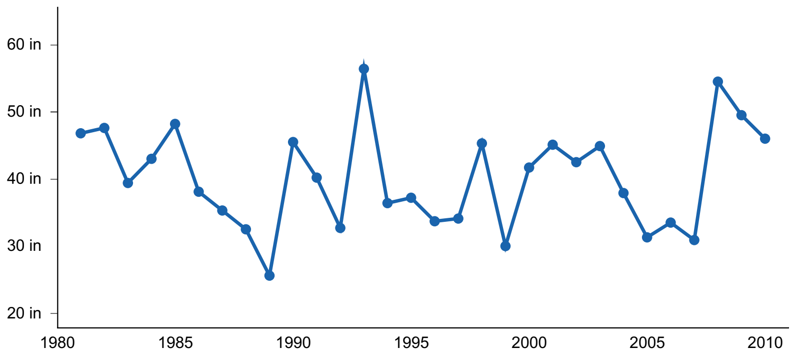


Figure 7. Annual precipitation pattern

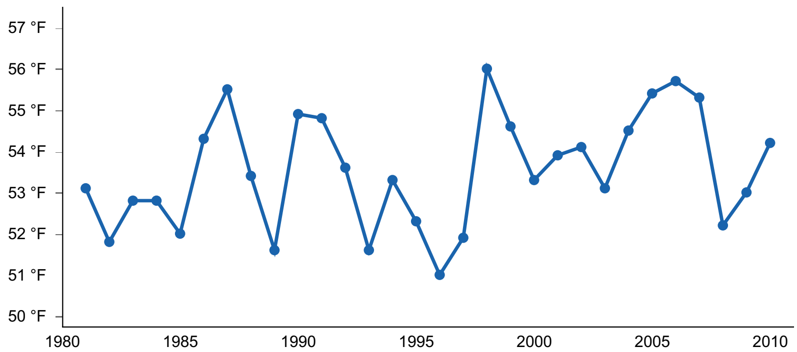


Figure 8. Annual average temperature pattern

Climate stations used

- (1) PITTSFIELD #2 [USC00116837], Pittsfield, IL
- (2) CLARKSVILLE L&D 24 [USC00231640], Clarksville, MO

Influencing water features

Chert Exposed 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 (Hydrologic Group B), and surface runoff is high. Surface runoff contributes some water to downslope ecological sites.

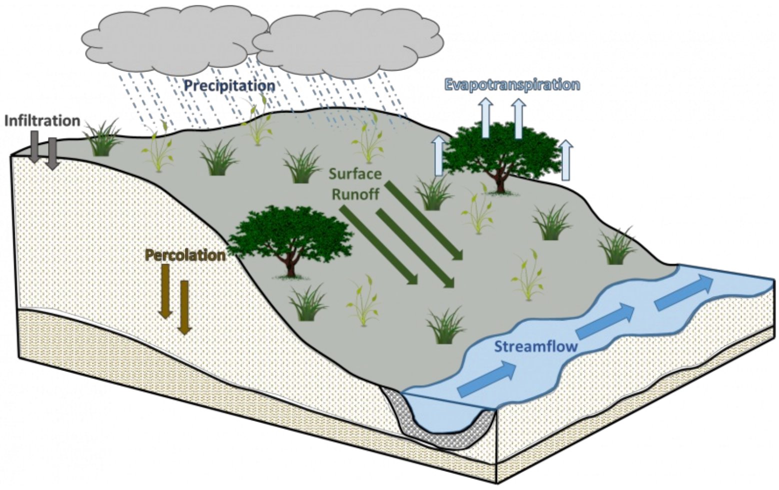


Figure 9. Hydrologic cycling in Chert Exposed Backslope Woodland ecological site.

Soil features

Soils of Chert Exposed Backslope Woodlands are in the Alfisols order, further classified as Typic Paleudalfs with moderate infiltration and high runoff potential. The soil series associated with this site includes Goss. The parent material is residuum weathered from cherty limestone, and the soils are well to somewhat excessively drained and very deep. Soil pH classes are very strongly acid to slightly acid. An abrupt textural change may be noted as a rooting restriction for the soils of this ecological site.

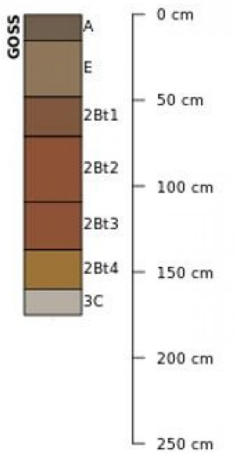


Figure 10. Profile sketches of soil series associated with Chert Exposed Backslope Woodland.

Table 4. Representative soil features

Parent material	(1) Residuum–chert
Surface texture	(1) Gravelly silt loam
Family particle size	(1) Clayey-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow
Depth to restrictive layer	80 in
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (Depth not specified)	1 in
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	4.5–6.5
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–14%

Ecological dynamics

The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in a landscape that historically supported upland hardwood forests, lowland mixed forests, and scattered grass and sedge meadows. Chert Exposed Backslope Woodlands form an aspect of this vegetative continuum. This ecological site occurs on south and west facing upland backslopes on well to somewhat excessively drained soils Species characteristic of this ecological site include an open canopy of oak and hickory with herbaceous vegetation.

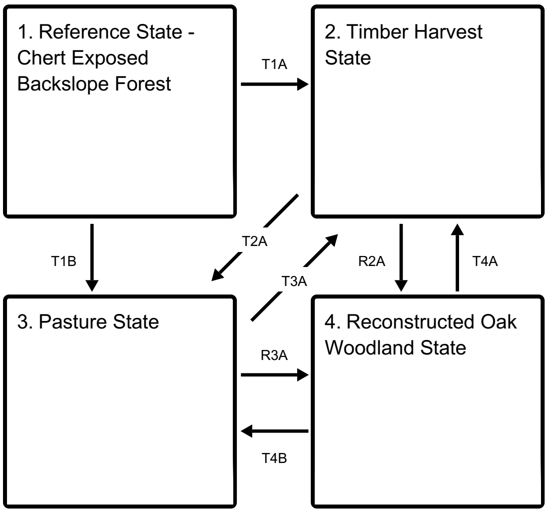
Fire is a critical factor that maintains Chert Exposed Backslope Woodlands. Fire typically consisted of low- to moderate-severity surface fires every 15 to 25 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and bimodal, human ignitions during the spring 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 and storm damage have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the well to somewhat excessively-drained soils have 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 wind and ice storms can vary from minor, patchy effects of individual trees to stand effects that temporarily affect community structure and species richness and diversity (Irland 2000; Peterson 2000). 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).

Today, Chert Exposed Backslope Woodlands have been reduced from their pre-settlement extent. Sites have been subject to repeated timber harvests or have been converted to forage land. A return to the historic plant community may not be possible following extensive land modification, but long-term conservation agriculture or forest reconstruction efforts can help to restore some biotic diversity and ecological function. The state-and-transition model that follows provides a detailed description of each state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

Ecosystem states



T1A - Timber harvesting (with tree planting)

T1B - Cultural treatments are implemented to increase forage quality and yield

T2A - Cultural treatments are implemented to increase forage quality and yield

R2A - Site preparation, tree planting, non-native species control, and native seeding

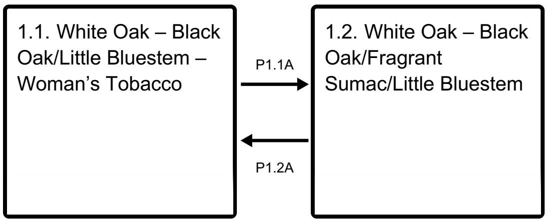
T3A - Timber harvesting (with tree planting)

R3A - Site preparation, tree planting, non-native species control, and native seeding

T4A - Timber harvesting (with tree planting)

T4B - Cultural treatments are implemented to increase forage quality and yield

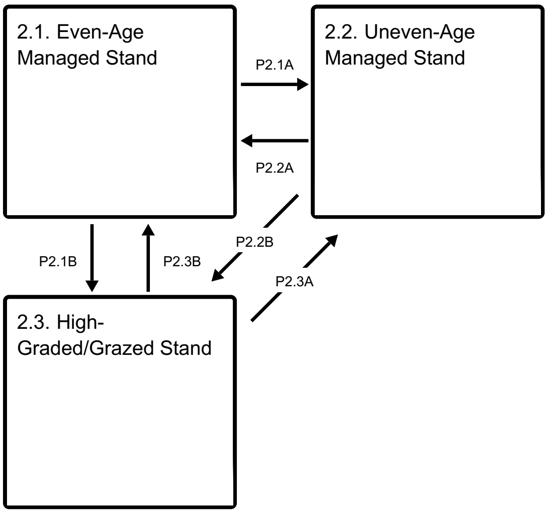
State 1 submodel, plant communities



P1.1A - Increased fire return interval

P1.2A - Replacement fire

State 2 submodel, plant communities



P2.1A - Uneven-aged timber harvests

P2.1B - Implementation of rest-rotational grazing

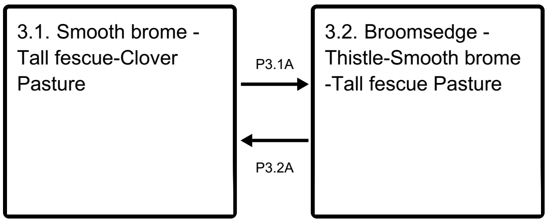
P2.2A - Even-age timber harvests

P2.2B - Selective harvests and cattle grazing

P2.3B - Even-aged timber harvests

P2.3A - Uneven-aged timber harvests

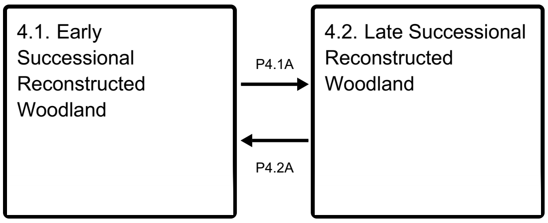
State 3 submodel, plant communities



P3.1A - Grazing; overutilization of forage plants

P3.2A - Grazing; forage-animal balance

State 4 submodel, plant communities



P4.1A - Invasive species control and implementation of disturbance regimes

P4.2A - Drought or improper timing/use of management actions

State 1
Reference State - Chert Exposed Backslope Forest

The reference plant community is categorized as an oak forest, dominated by deciduous trees and shade-tolerant herbaceous vegetation with a large amount of chert gravel in the soil profile. The two community phases within the reference state are dependent on recurring fire intervals. The severity and intensity of fire alters species composition, cover, and extent, while regular fire intervals keep the canopy from succeeding to mesophytic, fire-intolerant species. Drought and catastrophic storm damage have more localized impacts in the reference phases, but do contribute to overall species composition, diversity, cover, and productivity.

Dominant plant species

- white oak (*Quercus alba*), tree
- black oak (*Quercus velutina*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- woman's tobacco (*Antennaria plantaginifolia*), other herbaceous

Community 1.1
White Oak – Black Oak/Little Bluestem – Woman’s Tobacco

Sites in this reference community phase are an open canopy woodland. White oak and black oak are the dominant species, but hickories are common canopy associates. Trees are large (21 to 33-inch DBH), and cover is approximately 80 percent (LANDFIRE 2009). The herbaceous layer is abundant with species such as little bluestem, woman’s tobacco, Pennsylvania sedge (*Carex pensylvanica* Lam.), poverty oatgrass (*Danthonia spicata* (L.) P. Beauv. Ex Roem. & Schult.), and hairy sunflower (*Helianthus hirsutus* Raf.) (Nelson, 2010; NatureServe 2018). Surface fires occurring approximately every 20 years will maintain this phase, but beyond 25 years the community will shift to phase 1.2 (LANDFIRE 2009).

Dominant plant species

- white oak (*Quercus alba*), tree
- black oak (*Quercus velutina*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- woman's tobacco (*Antennaria plantaginifolia*), other herbaceous

Community 1.2
White Oak – Black Oak/Fragrant Sumac/Little Bluestem

Sites in this reference community phase are a closed canopy forest, with white oak and red oak still dominant species. However, under a prolonged fire return interval the red oak may increase and sugar maple (*Acer saccharum* L.) encroaches in the subcanopy. Periodic surface fires will maintain this phase, but replacement fires occurring approximately every 20 years will shift the community back to phase 1.1 (LANDFIRE 2009).

Pathway P1.1A
Community 1.1 to 1.2

Pathway 1.1A – Increased fire return interval.

Pathway P1.2A
Community 1.2 to 1.1

Pathway 1.2A – Replacement fire every 20 years.

State 2
Timber Harvest State

The timber harvest state occurs when the reference state has undergone past and continued heavy logging, and in some cases grazing. Hickories often increase as a result of harvest practices and long-term fire suppression allows the woody understory to become more developed. Additionally, the absence of fire allows shade-tolerant species, such as sugar maple, to increase in abundance.

Dominant plant species

- hybrid hickory (*Carya*), tree
- sugar maple (*Acer saccharum*), tree

Community 2.1
Even-Age Managed Stand

This community phase is characterized by a dense forest with an underdeveloped understory and ground flora as the site has been subject to a clearcut harvest. This removal of all trees from the site not only drastically alters the biotic plant community, but it also increases soil erosion, reduces water retention capacity, alters nutrient cycling, changes the local microclimate, and destabilizes carbon (Lacroix et al. 2016). Continual timber management will maintain this phase.

Community 2.2
Uneven-Age Managed Stand

This community phase may superficially resemble the reference state, however tree age will fall between 50 and 90 years due to selective timber harvests. Periodic timber harvests via single-tree or group selection are conducted with the overall goal of producing three distinct age classes of trees intermingled across a forest stand.

Dominant plant species

- oak (*Quercus*), tree

Community 2.3

High-Graded/Grazed Stand

Sites falling into this community phase represent forests that have been subjected to repeated, high-grade timber harvests and grazing by domestic cattle. This state exhibits an overabundance of hickory and other less desirable tree species as well as a weedy, simplified understory prone to invasion by non-native species (NatureServe 2018). The vegetation offers little nutritional value for cattle, and excessive stocking damages tree boles, degrades understory species composition, and results in soil compaction and accelerated erosion and runoff.

Dominant plant species

- hybrid hickory (*Carya*), tree
- maple (*Acer*), tree

Pathway P2.1A
Community 2.1 to 2.2

Pathway 2.1A – Uneven-age timber management implemented.

Pathway P2.1B
Community 2.1 to 2.3

Pathway 2.1B – High-grading and cattle grazing implemented.

Pathway P2.2A
Community 2.2 to 2.1

Pathway 2.2A – Even-age timber management implemented.

Pathway P2.2B
Community 2.2 to 2.3

Pathway 2.2B – High-grading and cattle grazing implemented.

Pathway P2.3B
Community 2.3 to 2.1

Pathway 2.3B – Cattle removed and even-age timber management implemented.

Pathway P2.3A
Community 2.3 to 2.2

Pathway 2.3A – Cattle removed and uneven-age timber management implemented.

State 3
Pasture State

The pasture state occurs when the reference state is converted to a farming system that emphasizes domestic livestock production known as grassland agriculture. Fire suppression, periodic cultural treatments (e.g., clipping, drainage, soil amendment applications, planting new species and/or cultivars, mechanical harvesting) and grazing by domesticated livestock transition and maintain this state (USDA-NRCS 2003). Early settlers seeded non-native species, such as smooth brome (*Bromus inermis* Leyss.) tall fescue (Festuca arundinacea), and Kentucky bluegrass (*Poa pratensis* L.), to help extend the grazing season (Smith 1998). Over time, as lands were continuously harvested or grazed by herds of cattle, the non-native species were able to spread and expand across the landscape, reducing the native species diversity and ecological function (NatureServe 2018).

Dominant plant species

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

- Kentucky bluegrass (*Poa pratensis*), grass

Community 3.1
Smooth brome -Tall fescue-Clover Pasture

This community is characterized by seeded cool-season grass and forbs. Species will depend upon landowner goals and objectives and may include many different grasses and forbs. Common species include smooth brome (*Bromus inermis*), tall fescue (Festuca arundinacea), Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), red clover (*Trifolium pratense*) and white clover (*Trifolium repens* L.). Management inputs include control of weeds and brush. These sites are managed to ensure a proper forage/animal balance. Plants are not overutilized and have adequate rest and recovery.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- white clover (*Trifolium repens*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous

Community 3.2
Broomsedge -Thistle-Smooth brome -Tall fescue Pasture

Over utilization of the pasture will result in a shift to include more undesirable species such as thistle (Cirsium spp.), broomsedge (*Andropogon virginicus* L.), ironweed (*Vernonia gigantea*), buttercup (Ranunculus spp.), ragweed (Ambrosia spp.) and blackberries (Rubus spp.). Many woody and weed species may be present depending on seed sources and level of soil disturbance. This community reflects an improper forage-to-animal balance which will negatively impact forage productivity and reproduction, soil health, and water quality. Ecological resiliency is compromised under these conditions.

Dominant plant species

- broomsedge bluestem (*Andropogon virginicus*), grass
- crabgrass (*Digitaria*), grass
- tall fescue (*Schedonorus arundinaceus*), grass
- smooth brome (*Bromus inermis*), grass
- thistle (*Cirsium*), other herbaceous
- buttercup (*Ranunculus*), other herbaceous
- ragweed (*Ambrosia*), other herbaceous
- ironweed (*Vernonia*), other herbaceous

Pathway P3.1A
Community 3.1 to 3.2

Grazing of livestock with overutilization of the forage plants.

Pathway P3.2A
Community 3.2 to 3.1

Forage plants are not overutilized and the site has a proper forage-to-animal balance.

State 4
Reconstructed Oak Woodland State

The combination of natural and anthropogenic disturbances occurring today has resulted in numerous forest health issues, and restoration back to the historic reference condition may not be possible. Woodlands are being stressed by non-native diseases and pests, habitat fragmentation, permanent changes in soil hydrology, and overabundant deer populations on top of naturally-occurring disturbances (severe weather and native pests) (Flickinger 2010).

However, these habitats provide multiple ecosystem services including carbon sequestration; clean air and water; soil conservation; biodiversity support; wildlife habitat; timber, fiber, and fuel products; as well as a variety of cultural activities (e.g., hiking, camping, hunting) (Millennium Ecosystem Assessment 2005; Flickinger 2010). Therefore, conservation of forests and woodlands should still be pursued. Woodland reconstructions are an important tool for repairing natural ecological functioning and providing habitat protection for numerous species associated with this site. Therefore, ecological restoration should aim to aid the recovery of degraded, damaged, or destroyed ecosystems. A successful restoration will have the ability to structurally and functionally sustain itself, demonstrate resilience to the ranges of stress and disturbance, and create and maintain positive biotic and abiotic interactions (SER 2002). The reconstructed oak woodland state is the result of a long-term commitment involving a multi-step, adaptive management process.

Dominant plant species

- oak (*Quercus*), tree

Community 4.1
Early Successional Reconstructed Woodland

This community phase represents the early community assembly from forest reconstruction. It is highly dependent on the current condition of the site based on past and current land management actions, invasive species, and proximity to land populated with non-native pests and diseases. Therefore, no two sites will have the same early successional composition. Technical forestry assistance should be sought to develop suitable conservation management plans.

Community 4.2
Late Successional Reconstructed Woodland

Appropriately timed management practices (e.g., prescribed fire, hazardous fuels management, forest stand improvement, continuing integrated pest management) applied to the early successional community phase can help increase the stand maturity, pushing the site into a late successional community phase over time. A late successional reconstructed forest will have an uneven-aged canopy and a well-developed shrub layer and understory.

Pathway P4.1A
Community 4.1 to 4.2

Pathway 4.1A – Application of stand improvement practices in line with a developed management plan.

Pathway P4.2A
Community 4.2 to 4.1

Pathway 4.2A – Reconstruction experiences a setback from extreme weather event or improper timing of management actions.

Transition T1A
State 1 to 2

Transition 1A – Timber harvesting transitions the site to the timber harvest state (2).

Transition T1B
State 1 to 3

Transition 1B – Cultural treatments to enhance forage quality and yield transitions the site to the pasture state (3).

Transition T2A
State 2 to 3

Transition 2A – Cultural treatments to enhance forage quality and yield transitions the site to the pasture state (3).

Restoration pathway R2A
State 2 to 4

Restoration 2A – Site preparation, tree planting, invasive species control, and seeding native species transition this site to the oak woodland state (4).

Transition T3A
State 3 to 2

Transition 3A – Tree planting and timber harvesting will transition the site to the timber harvest state(2).

Restoration pathway R3A
State 3 to 4

Restoration 3A – Site preparation, tree planting, invasive species control, and seeding native species transition this site to the reconstructed oak woodland state (4).

Transition T4A
State 4 to 2

Transition 4A – Fire suppression and removal of active management transitions this site to the fire-suppressed state (2).

Transition T4B
State 4 to 3

Transition 4B – Cultural treatments to enhance forage quality and yield transition the site to the pasture state (3).

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 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 these plots and the sources identified in this ecological site description.

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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)	Lisa Kluesner
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:

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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:**
