

Ecological Site Description

Low-Base Interbedded Sedimentary Upland Woodland

F116BY019MO

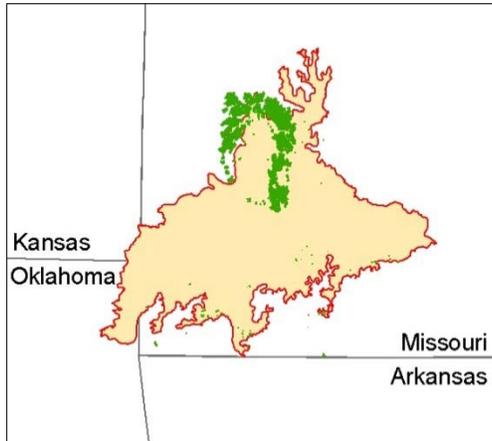
- (*Quercus stellata* - *Quercus velutina*/*Rhus aromatica*/*Andropogon scoparius* - *Helianthus hirsutus*)
- (post oak – black oak/fragrant sumac/little bluestem – hairy sunflower)

An Ecological Site Description (ESD) is a reference document of ecological knowledge regarding a particular land area (ecological site). An ESD describes ecological potential and ecosystem dynamics of land areas and their potential management. Ecological sites are linked to soil survey map unit components, which allows for mapping of ecological sites. *(NOTE: This is a “provisional” ESD, and is subject to change. It contains basic ecological information sufficient for conservation planning and land management in Missouri. After additional information is developed and reviewed, a “Correlated” ESD will be published and will be available via the Web Soil Survey <http://websoilsurvey.nrcs.usda.gov> .)*

Major Land Resource Area: 116B – Springfield Plain

Introduction

The Springfield Plain (area outlined in red on the map) is in the western part of the Ozark Uplift. It is primarily a smooth plateau with some dissection along streams. Elevation is about 1,000 feet in the north to over 1,700 feet in the east along the Burlington Escarpment adjacent to the Ozark Highlands. The underlying bedrock is mainly Mississippian-aged limestone, with areas of shale on lower slopes and structural benches, and intermittent Pennsylvanian-aged sandstone deposits on the plateau surface.

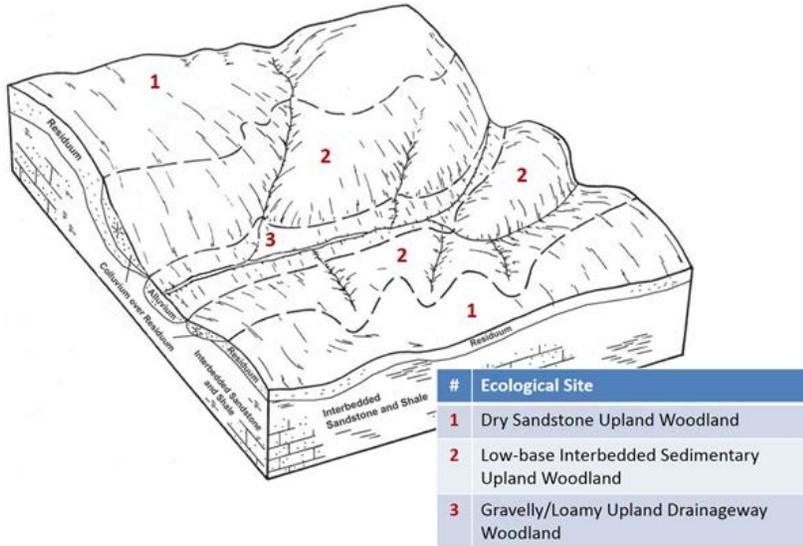


Low-base Interbedded Sedimentary Upland Woodlands (green areas on the map) occur typically on lower hillslopes where shale is near the surface, in the northern part of the Springfield Plain along the Sac River and its tributaries. Soils are typically moderately deep to deep over shale bedrock, acidic, and low in bases such as

calcium. Soil acidity is an important factor affecting the distribution of both tree and ground flora species and their growth. As a soil profile approaches or arrives at lower levels of pH, exchangeable aluminum comes into solution and can directly impact plant growth and composition. Soils having low concentrations of calcium and containing few calcium bearing minerals along with increased levels of aluminum may also be vulnerable to base depletion by timber harvesting, plant uptake, and leaching.

Physiographic Features

This site is on upland summit crests, shoulders and backslopes with slopes of 3 to 20 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.



The adjacent figure (adapted from Henderson, 2004) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled as “2”, and is generally downslope from Dry Sandstone Upland Woodland sites, labeled “1”.

Soil Features

These soils are underlain by interbedded sedimentary bedrock between 40 and 60 inches. These soils have acidic subsoils that are low in bases. The soils were

formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is slope alluvium over residuum derived from sandstone, mudstone, limestone and shale. They have gravelly loam surface horizons, and clayey subsoils with varying amounts of shale and sandstone fragments. These soils are not affected by seasonal wetness. Soil series associated with this site include Cliquot.

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 woodland dominated by an overstory of post oak and black oak. The somewhat shallow soils of Low-base Interbedded Sedimentary Upland Woodlands limit the growth of trees, but support an abundance of native grasses and forbs in the understory. Historically, fire tolerant post oak along with black oak and occasional hickories dominated an open canopy.

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.

Fire played an important role in the maintenance of these sites. It is likely that these ecological sites burned at least once every 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.

In the long term absence of fire, woody species, such as eastern red cedar, hickory, black oak, and within its range, pine, encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels, greatly diminishing ground flora. Opening the canopy, removing the younger understory and applying prescribed fire have proven to be effective restoration means.

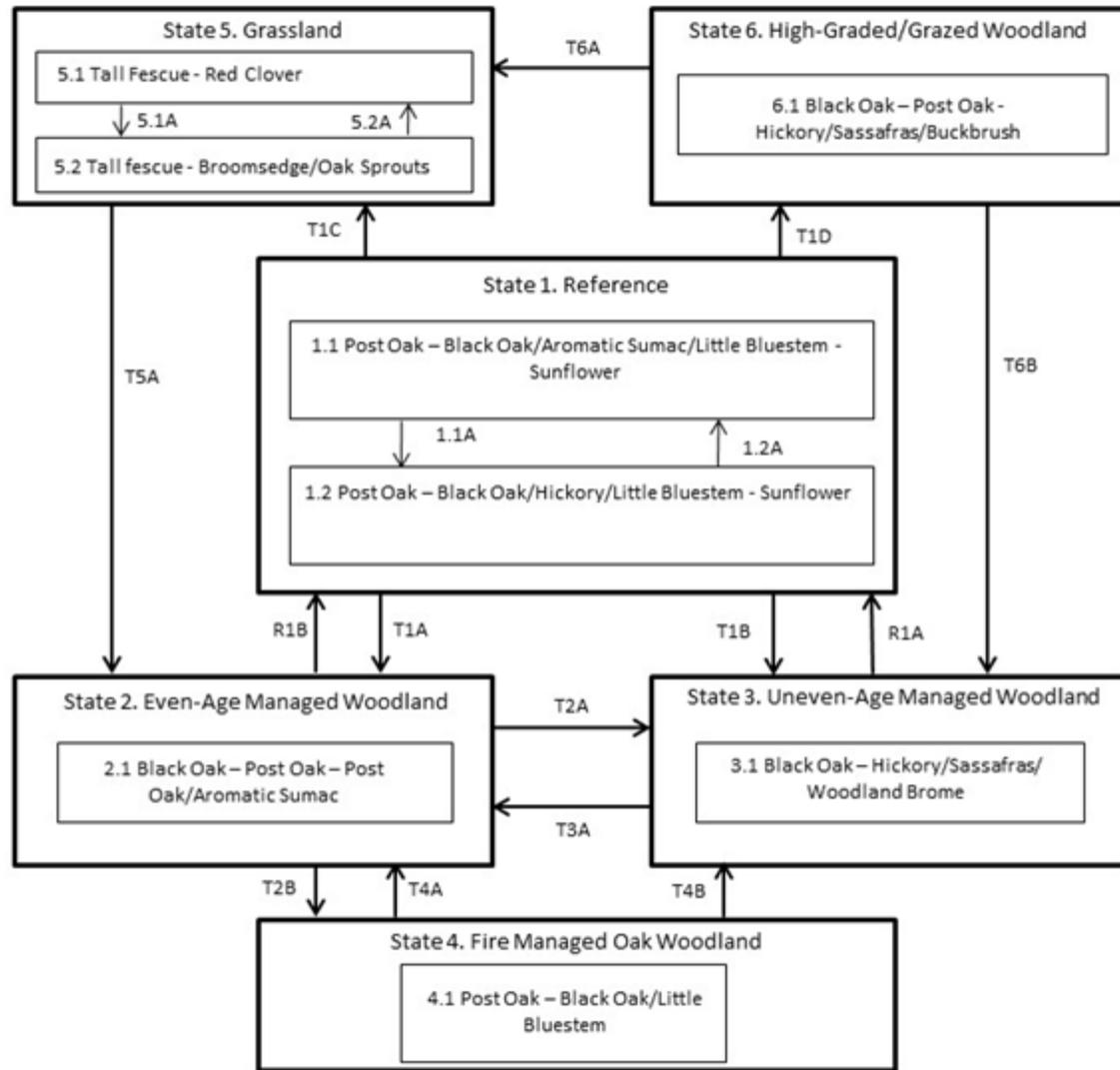
Uncontrolled domestic grazing has also impacted Low-base Interbedded Sedimentary Upland Woodland communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as buckbrush, gooseberry, and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and soil erosion from grazing can be a problem and lower site productivity.

Managed areas show an exceptional resiliency with the removal of the younger understory by thinning and the application of prescribed fire. Characteristic (see list below) 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. This type of management can provide limited timber products, wildlife habitat, and potential native forage.

A State and Transition Diagram is depicted in Figure 1. 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 is likely to change as knowledge increases.

Figure 1: State and Transition Diagram

Low-Base Interbedded Sedimentary Upland Woodland, F116BY019MO



Code	Event/Process
T1A	Even-aged management
T1B	Fire suppression; uneven-age management
T2B	Prescribed fire; thinning; grazing management
T1C, T6A	Clearing & pasture planting
T1D	Poorly planned harvest & uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T5A	Tree planting; long-term succession; no grazing
T6B	Uneven-age management; no grazing
T4A	Uneven-age management; no grazing
T4B	Even-age management; no grazing

Code	Event/Process
1.1A	No disturbance (10+ yrs)
1.2A	Disturbance (fire, wind, ice) < 10 yrs
5.1A	Over grazing; no fertilization
5.2A	Brush management; grassland seeding; grassland management

Code	Event/Process
R1A	Prescribed fire & extended rotations
R1B	Uneven-age mgt, extended rotations

Ecological States

State 1: Reference

The historical reference state for this ecological site was old growth woodland. This stage was dominated by post oak and black oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species. Two community phases are recognized in the reference state, with shifts between phases based on disturbance frequency. Reference states are very rare today. Many sites have been converted to non-native pasture (State 5). Others have been subject to repeated, high-graded timber harvest coupled with domestic livestock grazing (State 6). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Many reference states have been managed for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) woodlands.

State 2: Even-Age Managed

This state starts with a sequence of early seral mixed oak woodlands, which mature over time. These woodlands tend to be rather dense, with an underdeveloped understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. However, in the absence of fire, the diversity and cover of the ground flora is still diminished. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) woodlands. Prescribed fire without extensive timber harvest will, over time, cause a transition to Managed Oak Woodlands (State 4).

State 3: Uneven-Age Managed

Uneven-Age Managed Woodlands resemble their reference state. The biggest difference is tree age, most being only 50 to 90 years old. Composition is also likely altered from the reference state depending on tree selection during harvest. In addition, without a regular 15 to 20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species and white oak will become less dominant. Uneven Age Managed Woodland is also dense because of fire suppression, but less so than the Even-Age Managed state. Consequently, the woodland ground flora is less suppressed and structural diversity is better maintained. Without periodic disturbance, stem density and fire intolerant species, like hickory, increase in abundance.

State 4: Fire Managed Oak Woodland

The Fire Managed Oak Woodland state results from managing woodland communities in states 2 or 3 with prescribed fire. This state resembles the reference state, with younger maximum tree ages and lower ground flora diversity.

State 5: Non-native Pasture

Type conversion of woodlands to planted, non-native pasture species such as tall fescue has been common in the Springfield plateau. Steep slopes, abundant surface fragments, low organic matter contents and soil acidity make non-native pastures difficult to maintain in a healthy, productive state on this ecological site. If grazing and active pasture management is discontinued, the site will eventually transition to State 2 (*Even-Age Managed*). Timber Stand Improvement practices can hasten this process.

State 6: High-Graded/Grazed

Wooded sites subjected to repeated, high-graded timber harvests and domestic grazing transition to this State. This state exhibits an over-abundance of hickory and other less desirable tree species, and weedy understory species such as buckbrush, gooseberry, poison ivy and Virginia creeper. 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. Exclusion of cattle from sites in this state coupled with uneven-age management techniques will cause a transition to State 3 (*Uneven-Age Managed*).

Reference State Plant Community

Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WHITE OAK	<i>Quercus alba</i>	5-10	50
BLACK OAK	<i>Quercus velutina</i>	20-40	60
BLACKJACK OAK	<i>Quercus marilandica</i>	5-20	40
BLACK HICKORY	<i>Carya texana</i>	5-10	40
SHAGBARK HICKORY	<i>Carya ovata</i>	5-10	50
POST OAK	<i>Quercus stellata</i>	30-50	50

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
HAZELNUT	<i>Corylus americana</i>	10-20	4
FRAGRANT SUMAC	<i>Rhus aromatica</i>	10-30	3
NEW JERSEY TEA	<i>Ceanothus americanus</i>	5-20	3

Forbs

Common Name	Botanical Name	Cover % (low-high)
ELM-LEAFED GOLDENROD	<i>Solidago ulmifolia</i>	10-20
HAIRY SUNFLOWER	<i>Helianthus hirsutus</i>	10-20
SMOOTH BLUE ASTER	<i>Symphyotrichum laeve</i>	10-20
PURPLE CONEFLOWER	<i>Echinacea purpurea</i>	10-20
YELLOW PIMPERNEL	<i>Taenidia integerrima</i>	10-20
SLENDER LESPEDEZA	<i>Lespedeza virginica</i>	10-20
WILD QUININE	<i>Parthenium integrifolium</i>	10-20
BUTTERFLY WEED	<i>Asclepias tuberosa</i>	10-20
ROUGH GOLDENROD	<i>Solidago rugosa</i>	10-20
SCURFY PEA	<i>Psoraleidium tenuiflorum</i>	10-20

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
WOODLAND BROME	<i>Bromus pubescens</i>	5-20
BIG BLUESTEM	<i>Andropogon gerardii</i>	5-20
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	20-40
PENNSYLVANIA SEDGE	<i>Carex pensylvanica</i>	5-20
SIDEOATS GRAMA	<i>Bouteloua curtipendula</i>	5-20
ROCK MUHLY	<i>Muhlenbergia sobolifera</i>	5-20

Site Interpretations

Wildlife

- 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; patchy 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.
- Reptiles and amphibians associated with Post Oak Woodlands include ornate box turtle, northern fence lizard, five-lined skink, coal skink, broad-headed skink, six-lined racerunner, western slender glass lizard, prairie ring-necked snake, flat-headed snake, rough earth snake, red milk snake, western pygmy rattlesnake, and timber rattlesnake.

Forestry

- **Management:** Estimated site index values for oak range from 50 to 60. Timber management opportunities are fair. 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 or small group selection cuttings of ½ to 1 acre 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:** Coarse fragments in upper portion of soil profile; Clay subsoil; Restrict activities to dry periods or surfaced areas. Seedling mortality may be high during the summer because of lack of adequate soil moisture, especially on south facing slopes. Erosion is a hazard when slopes exceed 15 percent. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

Glossary

Backslope – a hillslope profile position that forms the steepest and generally linear, middle portion of the slope.

Backswamp – marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces

Calcareous – the presence of calcium carbonate in the soil parent material within the rooting zone; relatively alkaline

Claypan – a dense, compact, slowly permeable layer in the subsoil having much higher clay content than the overlying material

Chert – hard, extremely dense or compact crystalline sedimentary rock, consisting dominantly of interlocking crystals of quartz

Cliff – a significant vertical, or near vertical, rock exposure

Dolomite – a type of sedimentary rock that is a carbonate mineral composed of calcium magnesium carbonate

Drainageway – the upper most reach of a stream channel system characterized by little meandering

Dry – a site where soil moisture is limiting during the growing season; low available water capacity

Dune – a low mound, ridge, bank or hill of loose, wind-blown sand

Exposed – steep, south and west-facing slopes, which are warmer and drier than other slope aspects

Flatwoods – a type of woodland that occurs on soils with a root restricting subsoil layer within 20 to 30 inches, resulting in very slow runoff and ponding that remains saturated for most of the winter and early spring months but dries out and becomes very dry in the summer months; plants that grow there must be adapted to both conditions

Floodplain – the nearly level plain that borders a stream and is subject to inundation under flood-stage conditions

Footslope – a hillslope position at the base of a slope where hillslope sediment (colluvium) accumulates

Forest – a vegetative community dominated by trees forming a closed canopy and interspersed with shade-tolerant understory species

Fragipan – a dense, brittle subsoil horizon that is extremely hard and compact when dry

Glade – open, rocky, barren vegetative community dominated by drought-adapted forbs and grasses, typically with scattered, stunted woody plants

Igneous – bedrock formed by cooling and solidification of magma. Granite and rhyolite are typical igneous bedrocks in Missouri

Limestone – a type of sedimentary rock composed largely of calcium carbonate

Loess – material transported and deposited by wind and consisting predominantly of silt-size particles

Loamy – soil material containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay

Marsh – a type of wetland that is dominated by herbaceous rather than woody plant species

Moist – a site that is moderately well to well drained and has high available water capacity, resulting in a well-balanced supply of moisture (neither too dry nor too wet).

Mudstone – blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are approximately equal

Natric – a soil horizon that displays a blocky, columnar, or prismatic structure and has a subhorizon with an exchangeable-sodium saturation of over 15%

Outwash – stratified sediments of sand and gravel removed or “washed out” from a glacier by melt-water streams

Prairie – a vegetative community dominated by perennial grasses and forbs with scattered shrubs and very few trees

Protected – steep, north- and east-facing slopes, which are cooler and moister than other slope aspects

Residuum - unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place

Riser – a component of terraces and flood-plain steps consisting of the steep side slope; the escarpment

Riverfront – a vegetative community in the floodplain immediately adjacent and generally parallel to a river or stream channel

River hills – a geographic area characterized by thick, dissected loess deposits, formed immediately adjacent to the edges of the Missouri and Mississippi River floodplains

Sandy – a coarse-sized soil containing a large mixture of sand and gravels and a somewhat smaller proportion of silts and clays with excessive drainage

Sandstone – a sedimentary rock containing dominantly sand-size particles

Savanna – grasslands interspersed with open-grown scattered trees, groupings of trees, and shrubs

Shale – a sedimentary rock formed from clay, silty clay, or silty clay loam deposits and having the tendency to split into thin layers

Shallow – a site with bedrock within 20 inches of the surface

Shoulder – the slope profile position that forms the convex surface near the top of a hill slope; it comprises the transition zone from summit to backslope

Sinkhole – a closed, circular or elliptical depression, commonly funnel-shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock or by collapse of underlying caves within bedrock

Summit – the top or highest area of a hillslope

Swale –shallow, closed depressions irregularly spaced across a floodplain or terrace with an irregularly undulating surface.

Swamp – an area of low, saturated ground, intermittently or permanently covered with water, and predominantly vegetated by shrubs and trees.

Talus – rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope.

Terrace – a step-like surface, bordering a valley floor that represents the former position of a flood plain

Till – dominantly unsorted and unstratified soil material deposited directly by a glacier

Upland – a general term for the higher ground of a region, in contrast with a low-lying, adjacent land such as a valley or floodplain

Wet – a somewhat poorly, poorly or very poorly drained site that has an oversupply of moisture during the growing season

Woodland – a highly variable vegetative community with a canopy of trees ranging from 30 to 100 percent closure with a sparse midstory and a dense ground flora of grasses, sedges and forbs

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.
- Batek, M.J., A.J. Rebertus, W.A. Schroeder, T.L. Haithcoat, E. Compas, and R.P. Guyette. 1999. Reconstruction of early nineteenth-century vegetation and fire regimes in the Missouri Ozarks. *Journal of Biogeography* 26:397-412.
- Harlan, J.D., T.A. Nigh and W.A. Schroeder. 2001. The Missouri original General Land Office survey notes project. University of Missouri, Columbia.
- Henderson, Richard L. 2004. Soil Survey of Cedar County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.
- Ladd, D. 1991. Reexamination of the role of fire in Missouri oak woodlands. Pp. 67-80 in G.V. Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.
- Missouri Department of Conservation. 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
- NatureServe. 2010. Vegetation Associations of Missouri (revised). NatureServe, St. Paul, Minnesota.

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

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

Schoolcraft, H.R. 1821. *Journal of a tour into the interior of Missouri and Arkansas from Potosi, or Mine a Burton, in Missouri territory, in a southwest direction, toward the Rocky Mountains: performed in the years 1818 and 1819*. Richard Phillips and Company, London.