

Ecological Site Description

Dry Igneous Upland Woodland

F116CY003MO

- (*Quercus stellata* - *Quercus rubra*/*Rhus aromatic*/*Danthonia spicata* - *Schizachyrium scoparium*)
- (post oak – northern red oak/aromatic sumac/poverty oat grass – little bluestem)

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: 116C – St. Francois Knobs and Basins

Introduction

The St Francois Knobs and Basins (area outlined in red on the map) is the structural center of the Ozark Dome. Elevation ranges from about 450 feet along the rivers in the southern part of the area, to 1,772 feet on the summit of Taum Sauk Mountain, the highest point in Missouri. Prominent features of this MLRA are the Precambrian igneous knobs and hills that rise conspicuously to various elevations, interspersed with smooth-floored basins and valleys overlying dolomite and sandstone. Ecological Sites defined for this MLRA are associated with the igneous parent materials, either in knob or basin positions. Areas influenced primarily by dolomite and/or sandstone are included in ecological sites within MLRA 116A (Ozark Highlands).

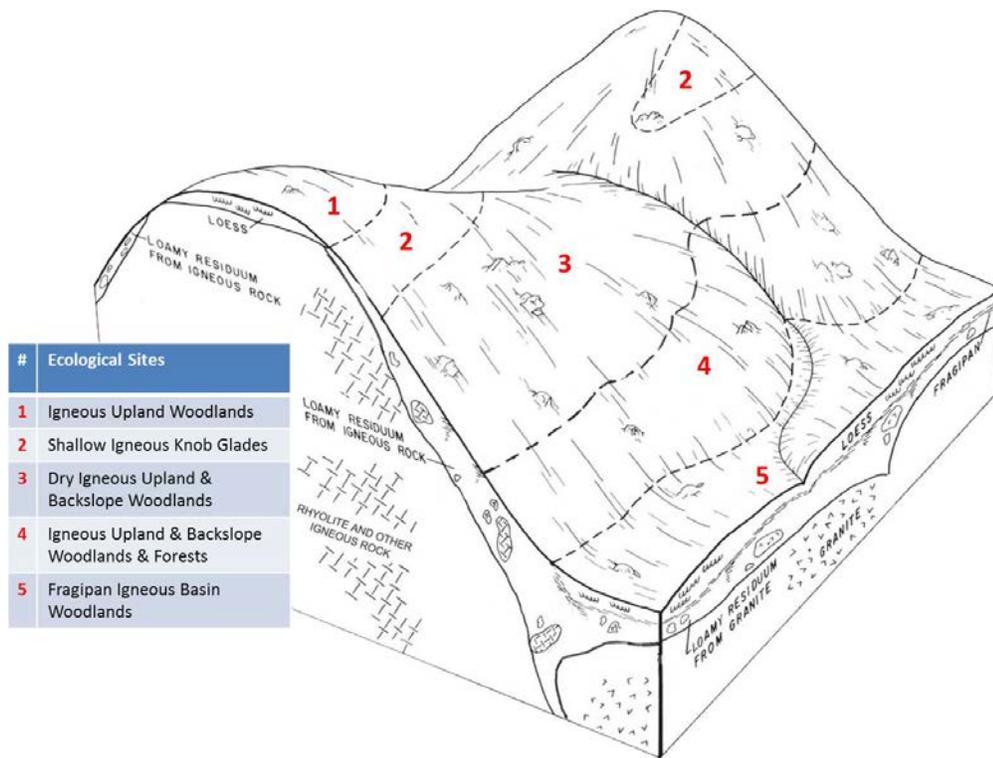


Dry Igneous Upland Woodlands (green areas on the map) occur throughout the MLRA, and on outlying igneous knobs in adjacent counties. Soils are moderately deep, often with abundant volcanic rock fragments, and are low in bases. These sites are often adjacent to both Igneous Upland Woodland and Shallow Igneous Knob Glade ecological sites, and in places are mapped in complex with them. Igneous Upland Woodland sites do not have root-restricting bedrock in the upper part of the soil profile, whereas Shallow Igneous Knob Glade sites are shallow to bedrock and are interspersed with rock outcrop. Vegetation of the reference state is woodland dominated by short, open-grown post oak mixed with scattered northern red, blackjack and black oaks.

Physiographic Features

This site is on upland summit crests, shoulders and backslopes with slopes of 3 to 15 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Simmons et al., 2006) shows the typical landscape position of



this ecological site, and landscape relationships among the major ecological sites in the igneous uplands. The site is within the area labeled “3”, generally upslope from steeper, backslope ecological sites.

Soil Features

These soils have rhyolitic volcanic bedrock at 20 to 40 inches, and 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 and residuum weathered from acid igneous rock such as rhyolite. Some areas on summit crests have loess in the upper part. They have loam surface horizons that range to very gravelly and cobbly, and typically have skeletal subsoils with high amounts of volcanic gravel and cobbles. These soils are not affected by seasonal wetness. Soil series associated with this site include Irondale and Knobtop.

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.

Dry Igneous Upland Woodlands are dominated by short (30 to 50 feet) open grown post oak, with scattered northern red, blackjack and black oaks and shortleaf pine. Canopy closure varies with aspect and the soil depth range within the soil component. This creates conditions from open 30 to 50 percent canopy on the most exposed positions and shallower soil ranges, to a more closed 50 to 80 percent canopy on protected positions and the deeper soil depth ranges for this soil component. The understory is open with a dense ground flora of native grasses and forbs.

The somewhat shallow soils and upland landscape position of Dry Igneous Upland Woodlands limits the growth of trees and supports an abundance of native grasses and forbs in the understory. Fire played an important role in the maintenance of these systems as well. It is likely that these ecological sites, along with adjacent knobs burned at least once every 5 years. These periodic fires would have kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs.

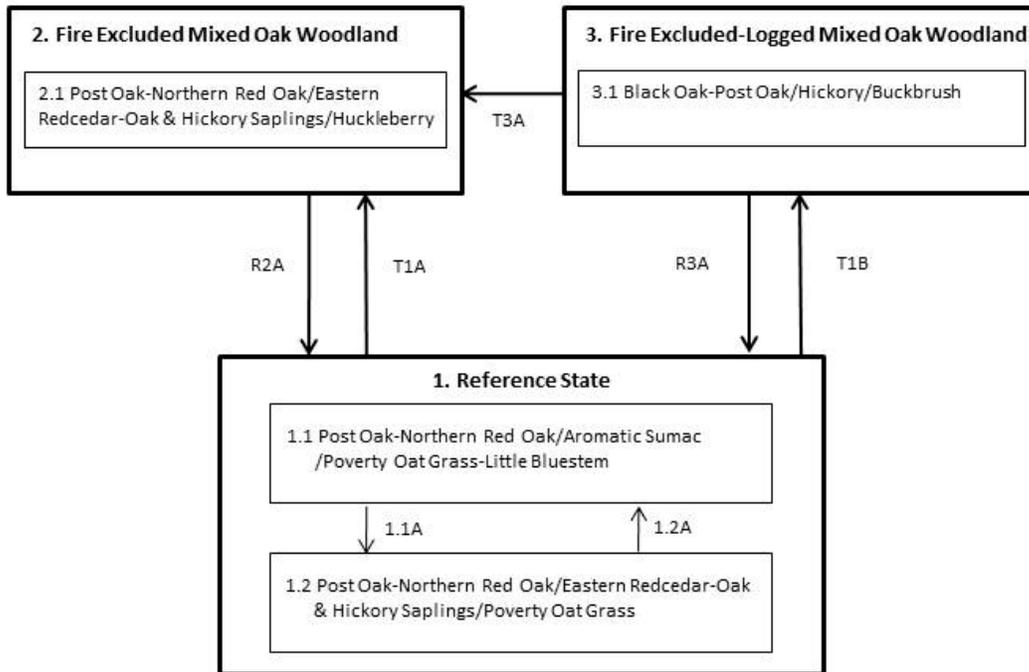
These sites were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores. Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees. Grazing by native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and sun-loving ground flora species.

In the long term absence of fire, woody species have encroached into these woodlands. Once established, these woodies can quickly increase in density. Most of these sites today are dense and shady with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective management tools.

Currently, domestic grazing is absent or very limited on these sites due to lack of water, access issues, and high amounts of acorns on the ground in the fall that are detrimental to cattle. Timber harvesting also occurs but is restricted on these sites because of the lower site productivity. Where deeper soil depths range for this soil component, occasional oaks are harvested. They are excellent wildlife sites.

Figure 1: State and Transition Diagram

Dry Igneous Upland Woodland, F116CY003MO



Code	Event/Process
T1A, T3A	Fire suppression > 20 years
T1B	Fire suppression & logging
R2A	Thinning & prescribed fire
R3A	Prescribed fire
1.1A	Fire-free interval 10-15 years
1.2A	Fire interval 3-5 years

Ecological States

State 1 - Reference The reference state was old growth woodland dominated by short (30 to 50 feet) open grown post oak, with scattered blackjack, northern red and black oaks and an occasional shortleaf pine. Canopy closure varies with aspect and soil depth from open 30 to 50 percent canopy on most exposed positions, shallower soils, to more closed 50 to 80 percent canopy on more protected positions with deeper soil profiles. The understory is open with a dense ground flora of native grasses and forbs.



Fire played an important role in the maintenance of these state as well. It is likely that these ecological sites, along with adjacent knobs burned at least once every 5 years. These periodic fires would have kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. Soil fertility and site productivity is low. Two community phases are recognized in the Old Growth Woodland state, with shifts between phases based on disturbance frequency. Old Growth Woodlands are very rare today.

State 2 - Fire Excluded Mixed Oak Woodland

This state is dominated by post and northern red oaks. They can form relatively even-age stands, dating to when fire suppression became the dominant management characteristic on the site. This stage can occur relatively quickly (10 to 20 years). Canopy closures can approach 50 to 70 percent with little or no ground flora. Without active management or long term presence of fire, woody species will encroach into these woodlands. Once established, these woodies can quickly fill the woodland system. Most occurrences of this state today are dense, and shady with a greatly diminished ground flora. Removal of the younger understory, opening the upper canopy, and the application of prescribed fire has proven to be effective management tools. Timber harvesting is very limited on these sites because of the poor quality and tree size. They are excellent wildlife sites.



State 3 - Fire Excluded-Logged Mixed Oak Woodland

In the long term absence of fire, woody species have encroached into this woodland state. Once established, these woody species will quickly fill the woodland system. Removal of the younger understory and the application of prescribed fire have proven to be effective management tools.

Timber harvesting is very limited on these sites because of the poor quality and tree size. This state, while of limited timber value, experienced occasional harvesting (high grading) of northern red oak and white oak that has reduced the densities of these species causing an increase in black oak and blackjack oak.

Reference State Plant Community

Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
POST OAK	<i>Quercus stellata</i>	20-40	40
BLACK OAK	<i>Quercus velutina</i>	5-20	50
NORTHERN RED OAK	<i>Quercus rubra</i>	10-30	50
BLACK HICKORY	<i>Carya texana</i>	10-20	40
BLACKJACK OAK	<i>Quercus marilandica</i>	5-20	30
SHORTLEAF PINE	<i>Pinus echinata</i>	5-20	50
SHAGBARK HICKORY	<i>Carya ovata</i>	5-20	40
EASTERN REDCEDAR	<i>Juniperus virginiana</i>	0-5	30

Understory Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
SASSAFRAS	<i>Sassafras albidum</i>	0-5	20
DOWNY SERVICEBERRY	<i>Amelanchier arborea</i>	0-5	10

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WINGED ELM	<i>Ulmus alata</i>	5-20	6
AROMATIC SUMAC	<i>Rhus aromatica</i>	10-30	5
LOW BUSH BLUEBERRY	<i>Vaccinium angustifolium</i>	5-20	3

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
CYPRESS PANIC GRASS	<i>Panicum dichotomum</i>	5-10
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	5-20
ROCK MUHLY	<i>Muhlenbergia sobolifera</i>	5-10
WHITETINGE SEDGE	<i>Carex albicans</i>	5-10
RUBBED SEDGE	<i>Carex virescens</i>	5-10
FUZZY SEDGE	<i>Carex hirsutella</i>	5-10
POVERTY OAT GRASS	<i>Danthonia spicata</i>	5-20
INDIANGRASS	<i>Sorghastrum nutans</i>	5-10

Forbs

Common Name	Botanical Name	Cover % (low-high)
NAKED FLOWER TICKTREFOIL	<i>Desmodium nudiflorum</i>	5-10
VIOLET BUSH CLOVER	<i>Lespedeza frutescens</i>	5-10
BIRDFOOT VIOLET	<i>Viola pedata</i>	5-10
ELM-LEAF SOLIDAGO	<i>Solidago ulmifolia</i>	5-10
LICORICE BEDSTRAW	<i>Galium circaezans</i>	5-10
DOWNY RAGGED GOLDENROD	<i>Solidago petiolaris</i>	5-10
PERPLEXED TICKTREFOIL	<i>Desmodium perplexum</i>	5-10
MANYRAY ASTER	<i>Symphyotrichum anomalum</i>	5-10
TRAILING BUSH CLOVER	<i>Lespedeza procumbens</i>	5-10
ST. ANDREW'S CROSS	<i>Hypericum hypericoides</i>	5-10
HAIRY SUNFLOWER	<i>Helianthus hirsutus</i>	5-10
SKY BLUE ASTER	<i>Symphyotrichum oolentangiense</i>	5-10
WILD QUININE	<i>Parthenium integrifolium</i>	5-10
STIFF COREOPSIS	<i>Coreopsis palmata</i>	5-10

Site Interpretations

Wildlife

- Oaks on this site provide abundant 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 and herbaceous cover habitat is important for turkey poults and quail chicks.
- Birds species associated with this site are Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Summer Tanager, Eastern Wood-Pewee, Whip-poor-will, Chuck-will's widow, and Red-eyed Vireo.
- Reptiles and amphibians associated with this ecological site 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: Field measured site index values range from 47 for black oak and 52 for shortleaf pine. 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. Using prescribed fire as a management tool could have a negative impact on timber quality, and should be used with caution on a particular site if timber management is the primary objective. Favor northern red oak, post oak, black oak, and shortleaf pine.
- Limitations: Large amounts of coarse fragments throughout profile; bedrock may be within 60 inches. Surface stones and rocks are problems for efficient and safe equipment operation and will make equipment use somewhat difficult. Disturbing the surface excessively in harvesting operations and building roads increases soil losses, which leaves a greater amount of coarse fragments on the surface. Hand planting or direct seeding may be necessary. Seedling mortality due to low available water capacity may be high. Mulching or providing shade can improve seedling survival. Mechanical tree planting will be limited. 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.

Supporting Information

Associated Sites

Site ID	Narrative
F116CY002MO	Igneous Upland Woodlands are often upslope from Dry Igneous Upland Woodlands, but are intermingled in other areas and mapped as a complex.
F116CY005MO	Igneous Protected Backslope Woodlands are typically downslope from Dry Igneous Upland Woodlands, and are steeper.
R116CY006MO	Shallow Igneous Knob Glades have shallow soils with significant amounts of bedrock outcrop. These two ecological sites are typically intermingled, and mapped as a complex.
F116CY011MO	Dry Igneous Exposed Backslope Woodlands are typically downslope from Dry Igneous Upland Woodlands, and are steeper.

Similar Sites

Site ID	Narrative
F116CY011MO	Dry Igneous Exposed Backslope Woodlands are typically downslope from Dry Igneous Upland Woodlands, and are steeper.

Relationship to Other Established Classifications

Atlas of Missouri Ecoregions (Nigh and Schroeder, 2002):

This Ecological Site occurs primarily within the following Land Type Association:

OZ10a St. Francois Igneous Glade/Oak Forest Knobs

Terrestrial Natural Community Type (Nelson, 2010):

The Reference State for this Ecological Site is most similar to: Dry Igneous Woodlands

National Vegetation Classification System Vegetation Association (NatureServe, 2010):

The Reference State for this Ecological Site is most similar to: (CEGL005029) *Quercus velutina* - (*Quercus ellipsoidalis*) - *Quercus alba* / *Deschampsia flexuosa* Woodland

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 created by cooling and crystallization of magma forming igneous rock. 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 80 percent closure with a sparse midstory and a dense ground flora of grasses, sedges and forbs

References

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

National Vegetation Classification System Vegetation Association. 2010.
<http://www.natureserve.org/prodServices/ecomapping.jsp>

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.

Simmons, M., J. D. Childress, K. Godsey, & R. Taylor. 2006. Soil Survey of Reynolds County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.