

## *Ecological Site Description*

### **Alfic Chert Protected Backslope Forest**

**F115BY011MO**

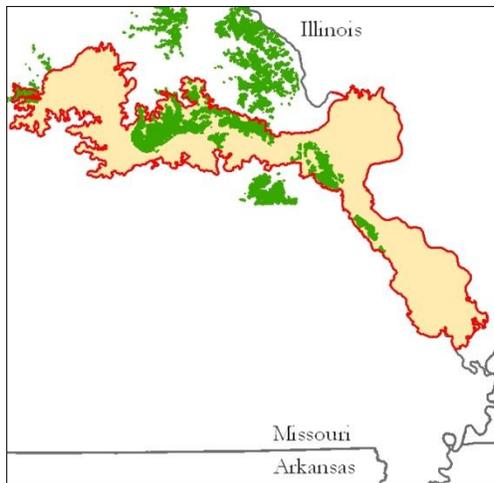
- (*Quercus alba* - *Quercus rubra* /*Cornus florida* /*Asplenium platyneuron* - *Podophyllum peltatum*)
- (white oak – northern red oak/flowering dogwood/Christmas fern – May apple)

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:** 115B – Central Mississippi Valley Wooded Slopes, Western Part

### **Introduction**

The Central Mississippi Valley Wooded Slopes, Western Part (area outlined in red on the map) consists mainly of the deeply dissected, loess-covered hills bordering the Missouri and Mississippi Rivers as well as the floodplains and terraces of these rivers. It wraps around the northeast corner



of the Ozark Uplift, and constitutes the southern border of the Pre-Illinoian-aged till plain. Elevation ranges from about 320 feet along the Mississippi River near Cape Girardeau in the south to about 1,020 feet on the highest ridges near Hillsboro, MO in the east. Local relief varies from 10-20 feet in the major river floodplains, to 50-100 feet in the dissected uplands, with bluffs of 200 to 350 feet along the Mississippi and Missouri Rivers. Underlying bedrock is mainly Ordovician-aged dolomite and sandstone, with Mississippian-aged limestone north of the Missouri River.

Alfic Chert Protected Backslope Forests are within the green areas on the map. They occupy the northerly and easterly aspects of steep, dissected slopes, and are mapped in complex with the Alfic Chert Exposed Backslope Woodland ecological site. The Alfic Chert Backslope ecological sites are typically associated with Mississippian-aged limestone, but also occur in Ordovician-aged dolomite. Loess ecological sites are typically upslope. Areas of Limestone/Dolomite Glade/Woodlands are commonly associated with these sites. Soils are typically very deep, with an abundance of chert fragments.

### **Physiographic Features**

This site is on upland backslopes with slopes of 15 to 70%. It is on protected aspects (north, northeast, and east), which receive significantly less solar radiation than the exposed aspects. The

site receives runoff from upslope summit and shoulder sites, and generates runoff to adjacent, downslope ecological sites. This site does not flood.

### **Soil Features**

These soils have no rooting restriction, and subsoils are not low in bases. A few areas have dolomite or limestone bedrock below 40 inches. The soils were formed under forest vegetation, and have thin, light-colored surface horizons. Parent material is slope alluvium over residuum weathered from limestone and dolomite. They have gravelly or very gravelly silt loam surface horizons, and skeletal subsoils with high amounts of chert gravel and cobbles. They are not affected by seasonal wetness. Soil series associated with this site include Beemont, Goss, and Rueter.

### **Ecological Dynamics**

*The 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 vegetational communities. Not all scenarios or plants are included. Key indicator plants, animals and ecological processes are described to help inform land management decisions.*

Alfic Chert Protected Backslope Forests occur in the most protected landscape positions on lower, steep slopes in the deeper valleys furthest from the prairie uplands. While the overstory is dominated by white oak, red oak and black gum can also be common. This forest community has a multi-tiered structure, and a canopy that is 75-100 feet tall with 80-100 % closure. The sub-canopy and understory are well developed, with flowering dogwood as a dominant understory tree and saplings.

While the upland prairies and savannas had an estimated fire frequency of 1-3 years, Alfic Chert Protected Backslope Forests burned less frequently (estimated 10-20 years) and with lower intensity. The composition and structure of the Alfic Chert Backslopes varies in relation to slope aspect. Exposed, south and west facing slopes are doughtier and more fire-prone than are the protected north and east facing slopes, which are relatively cool and moist. These two ecological sites intergrade on neutral, northwest and southeast exposures. The north and west facing slopes of the Alfic Chert Protected Backslope Forests have a well-developed forest canopy and subcanopy dominated by white oak with an abundant forest ground flora.

Historically, grazing by native large herbivores and periodic fires kept understory conditions more open. In addition, these ecological types were subject to occasional disturbances from wind and ice, which opened the canopy up by knocking over trees or breaking substantial branches of canopy trees.

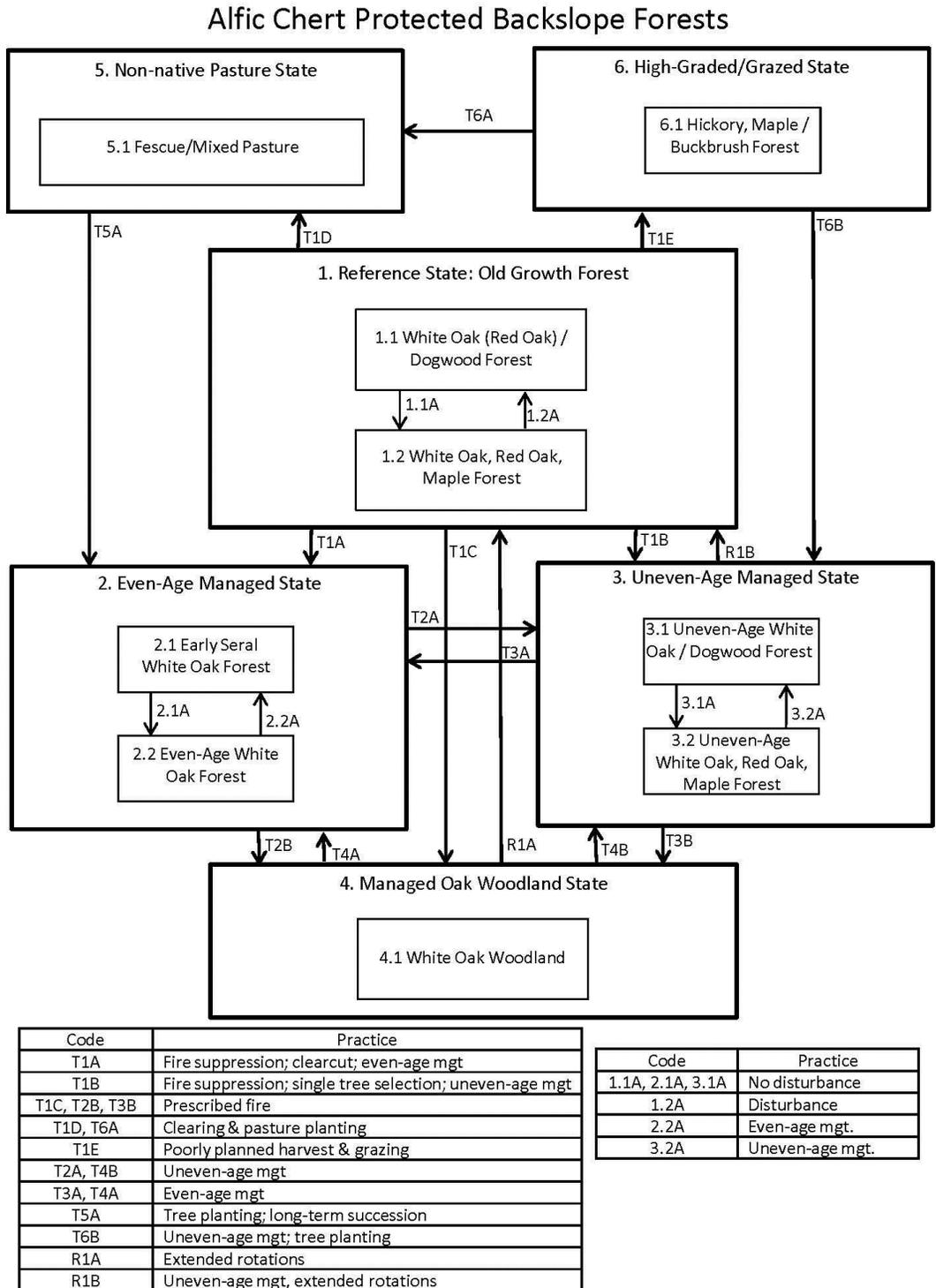
Today, these communities have been cleared and converted to pasture, or have undergone repeated timber harvest and domestic grazing. Most existing occurrences have a younger (50-80 years) canopy layer whose composition has been altered by timber harvesting practices. An increase in hickories over historic conditions is common. In addition, in the absence of fire, the canopy, sub-canopy and woody understory layers are better developed. The absence of periodic fire has allowed more shade-tolerant tree species, such as sugar maple, white ash, or hickories to increase in abundance.

Uncontrolled domestic grazing has diminished the diversity and cover of woodland ground flora species, and has introduced weedy species such as gooseberry, buckbrush, poison ivy and Virginia creeper created a more open understory and increased soil compaction.

Alfic Chert Protective Backslope Forests are productive sites. Carefully planned single tree selection or the creation of small group openings can help regenerate more desirable oak species and increase vigor on the residual trees. Clear-cutting does occur and results in dense, even-aged stands of primarily oak. This may be most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands, the ground flora diversity can be shaded out and productivity of the stand may suffer.

Prescribed fire can play a beneficial but limited role in the management of this ecological site. The higher productivity of these sites makes it more challenging than on other forest sites in the region. Protected aspect forests did evolve with some fire, but their composition often reflects more closed, forested conditions, with fewer woodland ground flora species that can respond to fire. Consequently, while having protected aspects in a burn unit is acceptable, targeting them solely for woodland restoration is not advisable.

**Figure 1: State and transition diagram**



## Ecological States

*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.*

### **State 1: Old Growth Forest (Reference State)**

The Old Growth Forest was dominated by white oak. Maximum tree age was likely 150-300 years. Periodic disturbances from fire, wind or ice maintained the dominance of white oak by opening up the canopy and allowing more light for white oak reproduction. Long disturbance-free periods allowed an increase in more shade tolerant species such as red oak and sugar maple. Two community phases are recognized in the Old Growth Forest state, with shifts between phases based on disturbance frequency.

Old Growth Forests 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 Old Growth Forests have been managed for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) forests.

#### *White Oak (Northern Red Oak) / Dogwood Forest - Community Phase 1.1*

This community is one of the more productive upland forests in the MLRA. While the overstory is dominated by white oak, red oak and black gum can also be common. This forest community has a multi-tiered structure, and a canopy that is 75-100 feet tall with 80-100 % closure. The sub-canopy and understory are well developed, with flowering dogwood as a dominant understory tree and sapling. A moderate abundance of shade tolerant forest generalists, such as May apple, Christmas fern, tick trefoil and white snakeroot, cover the ground.

Periodic disturbances, including fire, ice and wind create canopy gaps, allowing white oak to successfully reproduce and enter the canopy. In the absence of disturbance, more shade tolerant species such as red oak, sugar maple, hickory, white ash and others increase in importance and add structural diversity to the system. In addition, more shade-loving forest shrub (e.g., spicebush) and herbaceous (e.g., bloodroot) species also increase. Over time, these gradual species changes result in a community phase transition to the White Oak, Red Oak, Maple Forest (Community Pathway 1.1A to Community Phase 1.2 on the State & Transition Diagram). Long-term catastrophic disturbances may have replaced the entire canopy every 300 or more years, allowing the oaks to once again regain prominence.

#### *White Oak, Northern Red Oak, Maple Forest - Community Phase 1.2*

This community is one of the more productive upland forests in the MLRA. The overstory is a mixture of white oak and more shade tolerant species such as northern red oak, sugar maple, hickory, white ash and others. This forest community has a multi-tiered structure, and a canopy that is 75-100 feet tall with 90-100 % closure. An abundance of shade tolerant forest generalists, such as May apple, Christmas fern, tick trefoil and white snakeroot, cover the ground. In addition, more shade-loving forest shrub (e.g., spicebush) and herbaceous (e.g., bloodroot) species are common. Periodic disturbances, including fire, ice and wind create canopy gaps, allowing white oak to

successfully reproduce and enter the canopy. Over time, these disturbance events result in a community phase transition to the White Oak (Red Oak / Dogwood Forest (Community Pathway 1.2A to Community Phase 1.1 on the State & Transition Diagram).

### **State 2: Even-Age Managed**

This state starts with a sequence of early seral white oak forests, which mature over time. These forests tend to be rather dense, with an under developed understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. 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 forests resemble their Reference State (Old Growth Forests). The biggest difference is tree age, most being only 50-90 years old. Composition is also likely altered from the reference state depending on tree selection during harvest. In addition, without a regular 15-20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species and white oak will become less dominant.

### **State 4: Managed Oak Woodland**

The Managed Oak Woodland State results from managing forest communities on protected aspects in States 1, 2 or 3 with prescribed fire, over time. This condition likely existed historically during extremely droughty times. However, woodland management on protected slopes will be challenging because of the productivity of the tree species on these sites. While inclusion of protected aspects in a woodland management unit is acceptable, singling out these historically forested sites for woodland management is undesirable.

### **State 5: Non-native Pasture State**

Type conversion of forests to planted, non-native pasture species such as tall fescue has been common in this MLRA. Steep slopes, abundant surface fragments, low organic matter contents and soil acidity make non-native pastures challenging 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).

### **State 6: High-Graded/Grazed**

Timbered 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 livestock from sites in this state coupled with uneven-age management techniques will cause a transition to State 3 (Uneven-Age).

**Reference State Plant Community**

## Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WHITE OAK	<i>Quercus alba</i>	50-80	90
NORTHERN RED OAK	<i>Quercus rubra</i>	30-50	100
MOCKERNUT HICKORY	<i>Carya alba</i>	20-30	80
SHAGBARK HICKORY	<i>Carya ovata</i>	20-30	80
RED MAPLE	<i>Acer rubrum</i>	5-20	70
SUGAR MAPLE	<i>Acer saccharum</i>	5-20	80

## Understory Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
FLOWERING DOGWOOD	<i>Cornus florida</i>	20-30	40
BLACKGUM	<i>Nyssa sylvatica</i>	10-20	60
EASTERN HOPHORNBEAM	<i>Ostrya virginiana</i>	10-20	30

## Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
JUNEBERRY	<i>Amelanchier arborea</i>	10-20	12
FRAGRANT SUMAC	<i>Rhus aromatica</i>	10-20	3
LOW BUSH BLUEBERRY	<i>Vaccinium pallidum</i>	20-30	2

## Vines

Common Name	Botanical Name	Cover % (low-high)
VIRGINIA CREEPER	<i>Parthenocissus quinquefolia</i>	10-20
CAT GREENBRIER	<i>Smilax glauca</i>	10-20
SUMMER GRAPE	<i>Vitis aestivalis</i>	10-20

## Ferns

Common Name	Botanical Name	Cover % (low-high)
RATTLESNAKE FERN	<i>Botrychium virginianum</i>	5-20
CHRISTMAS FERN	<i>Polystichum acrostichoides</i>	5-20

## Forbs

Common Name	Botanical Name	Cover % (low-high)
VIRGINIA-SNAKEROOT	<i>Aristolochia serpentaria</i>	10-20
VIRGINIA SPRINGBEAUTY	<i>Claytonia virginica</i>	20-40
LESSER YELLOW LADY'S SLIPPER	<i>Cypripedium parviflorum var. parviflorum</i>	0-5
WHITE DOG'S TOOTH VIOLET	<i>Erythronium albidum</i>	10-20
HEPATIC	<i>Hepatica nobilis</i>	10-20
GOLDEN SEAL	<i>Hydrastis canadensis</i>	10-20
FEATHERY FALSE SOLOMON'S-SEAL	<i>Maianthemum racemosum</i>	10-20
WILD BLUE PHLOX	<i>Phlox divaricata</i>	20-30
MAYAPPLE	<i>Podophyllum peltatum</i>	20-30
TOAD SHADE	<i>Trillium sessile</i>	10-20
BELLWORT	<i>Uvularia grandiflora</i>	10-20

## Grasses and sedges

Common Name	Botanical Name
Typically <5% cover	n/a

**Site Interpretations****Wildlife Species**

- 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.
- Bird species associated with early-successional community stages are Prairie Warbler, Field Sparrow, Brown Thrasher, Blue-winged Warbler, White-eyed Vireo, Blue-gray Gnatcatcher, Yellow-breasted Chat, Indigo Bunting, and Eastern Towhee. Birds associated with mid-successional stages include Whip-poor-will and Wood Thrush while birds associated with late-successional stages include Worm-eating warbler, Whip-poor-will, Great Crested Flycatcher, Ovenbird, Pileated Woodpecker, Wood Thrush, Red-eyed Vireo, Northern Parula, Louisiana Waterthrush (near streams), and Broad-winged Hawk.
- Reptile and amphibian species associated with mature forests include: ringed salamander, spotted salamander, marbled salamander, central newt, long-tailed salamander, dark-sided salamander, southern red-backed salamander, three-toed box turtle, western worm snake, western earth snake, and American toad.

**Supporting Information***Relationship to Other Established Classifications:*

## Relationship to Missouri Ecological Classification System:

This Ecological Site encompasses the following Ecological Land Type Phases:

- Alfic Chert Protected Backslopes, Dry Gravelly
- Alfic Chert Protected Backslopes, Dry Clayey

## Terrestrial Natural Community Type (Nelson, 2010):

The Reference State for this Ecological Site is most similar to a Dry-Mesic Chert Forest.

## Missouri Department of Conservation Forest and Woodland Communities (MDC, 2006):

The Reference State for this Ecological Site is most similar to White Oak Forest.

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

The Reference State for this Ecological Site is most similar to *Quercus alba* - *Quercus rubra* - *Carya* (*alba*, *ovata*) / *Cornus florida* Acid Forest (White Oak – Northern Red Oak – Hickory (Mockernut, Shagbark) / Flowering Dogwood Acid Forest).

**Glossary**

*Alfic* – soil that has a clay-dominated subsoil (argillic horizon) with moderate to high amounts of bases such as calcium, and were typically formed under woody vegetation.

*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).

*Mollic* – soil that has a thick, dark surface horizon and was typically formed under prairie vegetation

*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

*Pinery* – a vegetative community within the historic pine range in Missouri that has shortleaf pine as a significant tree species

*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

*Ultic* – soil that has a clay-dominated subsoil (argillic horizon) with low amounts of bases such as calcium, and were typically formed under woody vegetation

*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

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

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.