

## *Ecological Site Description*

### **Chert Mudstone Upland Woodland**

**F116AY003MO**

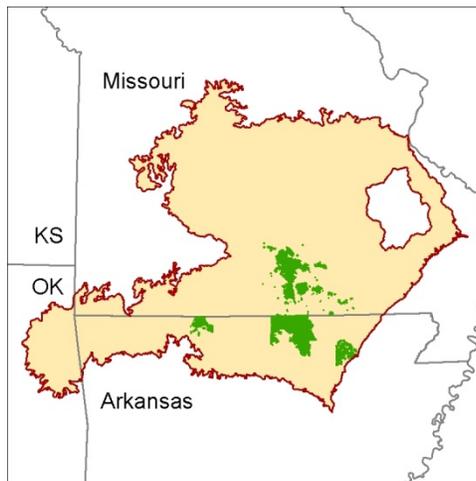
- (*Quercus velutina* - *Quercus coccinea*/*Rhus aromatica*/ *Schizachyrium scoparium*)
- (black oak – scarlet oak/aromatic sumac/little bluestem)

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 (MLRA):** 116A – Ozark Highland

#### **Introduction**

The Ozark Highland (area outlined in red on the map) constitutes the Salem Plateau of the Ozark Uplift. Elevation ranges from about 300 feet on the southeast edge of the Ozark escarpment, to



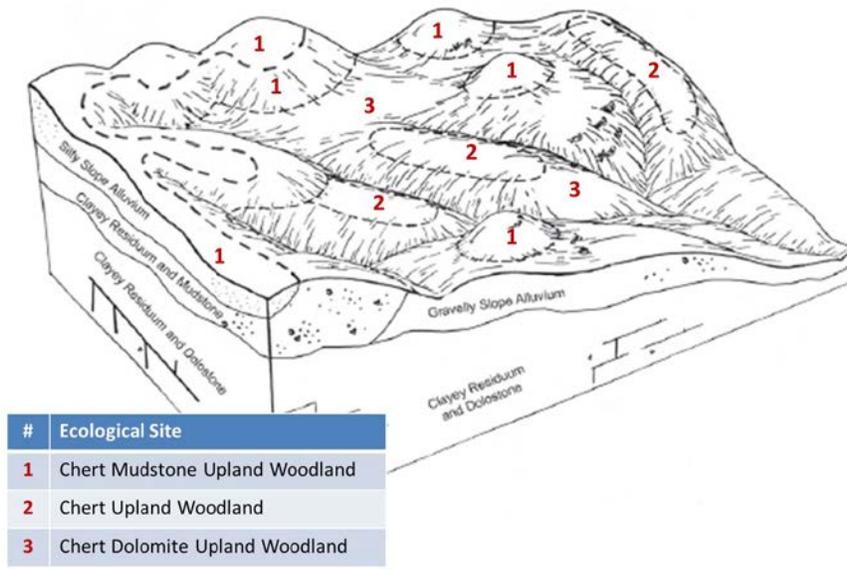
about 1,600 feet in the west, adjacent to the Burlington Escarpment of the Springfield Plateau. The underlying bedrock is mainly horizontally bedded Ordovician-aged dolomites and sandstones that dip gently away from the uplift apex in southeast Missouri. Cambrian dolomites are exposed on deeply dissected hillslopes. In some places, Pennsylvanian and Mississippian sediments overlie the plateau. Relief varies, from the gently rolling central plateau areas to deeply dissected hillslopes associated with drainageways such as the Buffalo, Current, Eleven Point and White Rivers.

Chert Mudstone Upland Woodlands (green areas on the map) occur over distinctive Ordovician mudstones, primarily in south-central and southeastern parts of the MLRA. Soils are typically deep to mudstone, acidic, and low in bases such as calcium, with an abundance of chert fragments in the subsoil.

#### **Physiographic Features**

This site is on upland summit crests, shoulders and backslopes with slopes of 1 to 15 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Vander Veen & Preston, 2006) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “1” on the figure. The dashed lines within the area indicate the various soils



included in this ecological site. Chert Mudstone sites are typically associated with Chert Upland and Chert Dolomite Upland sites, labeled “2” and “3”.

**Soil Features**

These soils have acidic subsoils that are low in bases. Some areas have soft, dense mudstone below 40 inches. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is

slope alluvium over residuum weathered from mudstone. Some areas have a thin surface layer of loess. They have silt loam surface layers that are gravelly to very gravelly in places, with loamy or clayey subsoils that have moderate amounts of chert gravel and cobbles. These soils are not affected by seasonal wetness. Soil series associated with this site include Agnos, Egyptgrove, Gassville, Kenaga and Tick.

**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.*

Historically, Chert Mudstone Upland Woodlands were dominated by drought and fire-tolerant post and blackjack oaks with scattered shortleaf pine. Their landscape position and juxtaposition to prairies likely lead to a high fire frequency (every 1 to 5 years). They ranged from savannas near the prairie edge to open, park-like woodlands farther away. Canopy closure likely varied from 40 to 70 percent and tree height from 50 to 70 feet.

Native prairie grasses dominated the open understory, along with a diverse mix of native legumes, asters, sunflowers and other forbs. Dense thickets of oak sprouts may have occurred during periods of less-frequent fire, but periodic fire would eventually clear them out. Grazing by large native herbivores, such as bison, elk, and deer, also influenced the understory, keeping it more open and structurally diverse.

Today, this community has either been cleared and converted to pasture, or has grown dense in the absence of fire. Most occurrences today exhibit canopy closure of 80 to 100 percent. In addition, the

sub-canopy and understory layers are better developed. Post and scarlet oak share dominance with black oak, black hickory and an occasional white oak. Also, the understory has more saplings. Under these denser, more shaded conditions, the original sun-loving ground flora has diminished in diversity and cover. While some woodland species persist in the ground flora, many have been replaced by more shade-tolerant species.

Uncontrolled domestic grazing has also impacted these communities, further diminishing the diversity of native plants and introducing invasive species that are tolerant of grazing, such as buckbrush, gooseberry, Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and soil erosion related to grazing can lower site productivity.

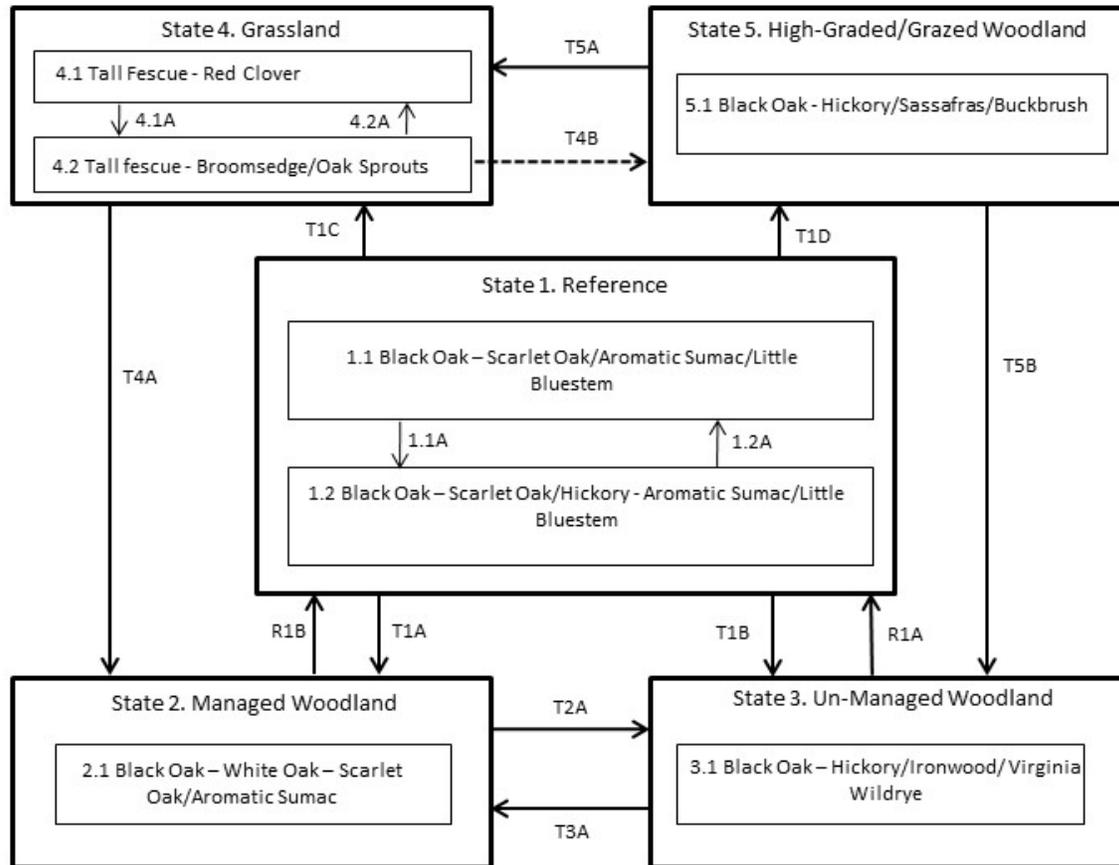
This site has moderate productivity. Logging does occur, and influences the community today. Occasional partial cuts provide sunlight to the woodland floor, stimulating native woodland ground flora. However, in the absence of fire and continual cultural treatments, oaks sprout and grow into a dense stand, again shading out the sun-loving ground flora.

Partial cutting and prescribed fire can restore the more open structure and diversity of ground flora species. Managed areas show an exceptional resiliency. This type of management may provide timber products, wildlife habitat, and potential native forage. 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.

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**

**Chert Mudstone Upland Woodland, F116AY003MO**



Code	Event/Process/Activity
T1A	Even-aged management; prescribed fire
T1B	Fire suppression; uneven-age management
T2B	Prescribed fire; thinning; grazing management
T1C, T6A	Clearing and pasture planting
T1D	Poorly planned harvest & uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T4A	Tree planting; long-term succession; no grazing
T4B	Light intermittent grazing; woody growth
T5B	Uneven-age management; tree planting; livestock exclusion

Code	Event/Process/Activity
1.1A	No disturbance (10+ yrs)
1.2A	Disturbance (fire, wind, ice) < 10 yrs
4.1A	Over grazing; no fertilization
4.2A	Brush management; grassland seeding; grassland management

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

## Ecological States

### State 1: Reference

The historical reference state for this ecological site was old growth, oak woodland. The reference state was dominated by black oak and scarlet 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 rare today. Many sites have been converted to grassland (State 4). Others have been subject to repeated, high-graded timber harvest coupled with uncontrolled domestic livestock grazing (State 5).

### State 2: Managed Woodland

This state can start with a sequence of early seral mixed oak woodlands, which mature over time. These woodlands tend to be rather dense, with a sparse 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.

### State 3: Un-Managed Woodland

This state results from no management. 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. The Un-Managed Woodland state is also denser because of fire suppression. Without periodic disturbance, stem density and fire intolerant species, like sassafras and hickory, increase in abundance.

### State 4: Grassland

Conversion of woodlands to planted, non-native cool season grassland species such as tall fescue is common for this region. Steep slopes, surface fragments, low organic matter contents and soil acidity make grasslands harder to maintain in a healthy, productive state on this ecological site.

Two community phases are recognized in the grassland state, with shifts between phases based on types of management. Poor management will result in a shift to *Community 4.2* that shows an increase in oak sprouting and increases in broomsedge densities.

### State 5: High-Graded/Grazed Woodland

States that were subjected to repeated, high-grading timber harvests and uncontrolled domestic grazing transitioned to a High-Graded, Grazed Woodland 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 existing vegetation offers little nutritional value for cattle, and excessive cattle stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff.

Two common transitions from this state are woody clearing and conversion to State 4, grassland or removing livestock, limited harvesting, and allowing long term succession to occur to some other woodland state.

**Reference State Plant Community****Canopy Trees**

<b>Common Name</b>	<b>Botanical Name</b>	<b>Cover % (low-high)</b>	<b>Canopy Height (ft)</b>
POST OAK	<i>Quercus stellata</i>	5-20	45
BLACK OAK	<i>Quercus velutina</i>	10-40	60
WHITE OAK	<i>Quercus alba</i>	5-10	50
BLACK HICKORY	<i>Carya texana</i>	5-10	40
SCARLET OAK	<i>Quercus coccinea</i>	10-30	60
SHORTLEAF PINE	<i>Pinus echinata</i>	0-10	65

**Shrubs**

<b>Common Name</b>	<b>Botanical Name</b>	<b>Cover % (low-high)</b>	<b>Canopy Height (ft)</b>
NEW JERSEY TEA	<i>Ceanothus americanus</i>	5-20	6
HAZELNUT	<i>Corylus Americana</i>	5-20	5
AROMATIC SUMAC	<i>Rhus aromatica</i>	5-20	4
ST. ANDREW'S CROSS	<i>Hypericum hypericoides</i>	5-20	3

**Grasses and sedges**

<b>Common Name</b>	<b>Botanical Name</b>	<b>Cover % (low-high)</b>
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	5-20
BIG BLUESTEM	<i>Andropogon gerardii</i>	5-20
INDIAN GRASS	<i>Sorghastrum nutans</i>	5-20
VIRGINIA WILDRYE	<i>Elymus virginicus</i>	5-20
SLIMLEAF PANICGRASS	<i>Panicum linearifolium</i>	5-20
PROVERTY OATGRASS	<i>Danthonia spicata</i>	5-20
BROOMSEEDGE	<i>Andropogon virginicus</i>	5-20
FUZZY SEDGE	<i>Carex hirsutella</i>	5-20

**Forbs**

<b>Common Name</b>	<b>Botanical Name</b>	<b>Cover % (low-high)</b>
SMALL LEAVED TICKTREFOIL	<i>Desmodium marilandicum</i>	5-10
PANICLELEAF TICKTREFOIL	<i>Desmodium paniculatum</i>	5-10
TRAILING LESPEDEZA	<i>Lespedeza procumbens</i>	5-10
CREEPING LESPEDEZA	<i>Lespedeza repens</i>	5-10
SLENDER LESPEDEZA	<i>Lespedeza virginica</i>	5-10
SIDE-BEAK PENCIL FLOWER	<i>Stylosanthes biflora</i>	5-10
VIRGINIA GOAT'S RUE	<i>Tephrosia virginiana</i>	5-10
QUEENDEVIL	<i>Hieracium gronovii</i>	5-10
HAIRY SUNFLOWER	<i>Helianthus hirsutus</i>	5-10
ELM-LEAVED SUNFLOWER	<i>Solidago ulmifolia</i>	5-10
HOG PEANUT	<i>Amphicarpeaea bracteata</i>	5-10
FINGER COREOPSIS	<i>Coreopsis palmata</i>	5-10
CALICO ASTER	<i>Symphyotrichum linearifolius</i>	5-10
LATE PURPLE ASTER	<i>Symphyotrichum patens</i>	5-10
FIELD PUSSYTOES	<i>Antennaria parlinii</i>	5-10
YELLOW FALSE GLOVE	<i>Aureolaria grandiflora</i>	5-10
ARROWLEAF VIOLET	<i>Viola sagittata</i>	5-10
HAIRY BEDSTRAW	<i>Galium pilosum</i>	5-10
CREEPING BEDSTRAW	<i>Gillenia stipulata</i>	5-10

## Site Interpretations

### Wildlife

- Numerous native legumes provide high-quality wildlife food.
- Sedges and native cool-season grasses provide green browse; extensive 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 Pine and Pine-Oak Woodlands are Carolina Chickadee, Great Crested Flycatcher, Pine Warbler, White-breasted Nuthatch, Cooper’s Hawk, Yellow-throated Warbler, Summer Tanager, Black-and-white Warbler, and Northern Bobwhite.
- Reptile and amphibian species associated with Pine and Pine-Oak Woodlands include ornate box turtle, northern fence lizard, five-lined skink, broad-headed skink, six-lined racerunner, rough earth snake, and timber rattlesnake.

### Forestry

- **Management:** Site index values range from 47 to 62 for oak and 63 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. Prescribed fire is a useful management tool. Favor post oak, black oak and shortleaf pine.
- **Limitations:** Low to moderate coarse fragments occur soil profile; bedrock may be within 40 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.

## 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

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