

Ecological Site Description

Calcareous Dolomite Upland Woodland

F116AY009MO

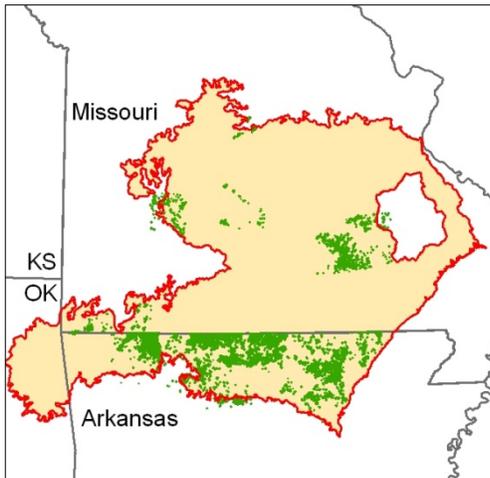
- (*Quercus muehlenbergii* - *Quercus shumardii*/*Rhus aromatica*/*Schizachyrium scoparium* - *Helianthus hirsutus*)
- (chinkapin oak – Shumard oak/aromatic sumac/little bluestem – hairy sunflower)

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 (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.

Calcareous Dolomite Upland Woodlands (green areas on the map) are typically associated with glades on dissected hillslopes of major streams, especially the Current, Pomme de Terre, Black, and Elk rivers. Soils are high in bases, and are moderately deep over dolomite bedrock, with gravelly surfaces.

Physiographic Features

This site is on upland summits, shoulders and backslopes with slopes of 3 to 15 percent. Sites are often downslope from dolomite glades. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

Soil Features

These soils are underlain with dolomite bedrock at 20 to 40 inches. The soils were formed under a mixture of prairie and woodland vegetation, and have dark, organic-rich surface horizons that are

enriched in places by upslope prairie glades. Parent material is slope alluvium over residuum weathered from dolomite, overlying dolomite bedrock. They have gravelly or cobbly silt loam surface layers, with clayey subsoils that have moderate to high amounts of chert and dolomite gravel and cobbles. These soils are base-rich, but do not contain free carbonates. These soils are not affected by seasonal wetness. Soil series associated with this site include Arkana, Blueeye, and Clinkenbeard.

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 somewhat shallow soils of Calcareous Dolomite Upland Woodlands limited the growth of trees and supported an abundance of native grasses and forbs in the understory. Rather short (35 to 50 feet) chinquapin oaks dominated an open overstory, with occasional white ash, blue ash and Shumard oak. Shrubs were scattered within a dense matrix of native grasses and forbs.

Fire played an important role in the maintenance of these systems. It is likely that these ecological sites, along with adjacent glades and woodlands 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. They would have also further limited the growth and dominance of trees, especially eastern redcedar. During fire free intervals, woody species would have increased and the herbaceous understory diminished.

In the long term absence of fire, woody species, especially eastern redcedar have encroached into these ecological sites. Most of these ecological sites today are denser, and shadier with a greatly diminished ground flora. Removal of the younger understory by thinning and the application of prescribed fire have proven to be effective restoration methods. 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.

Calcareous Dolomite Upland Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison, elk, and deer. 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.

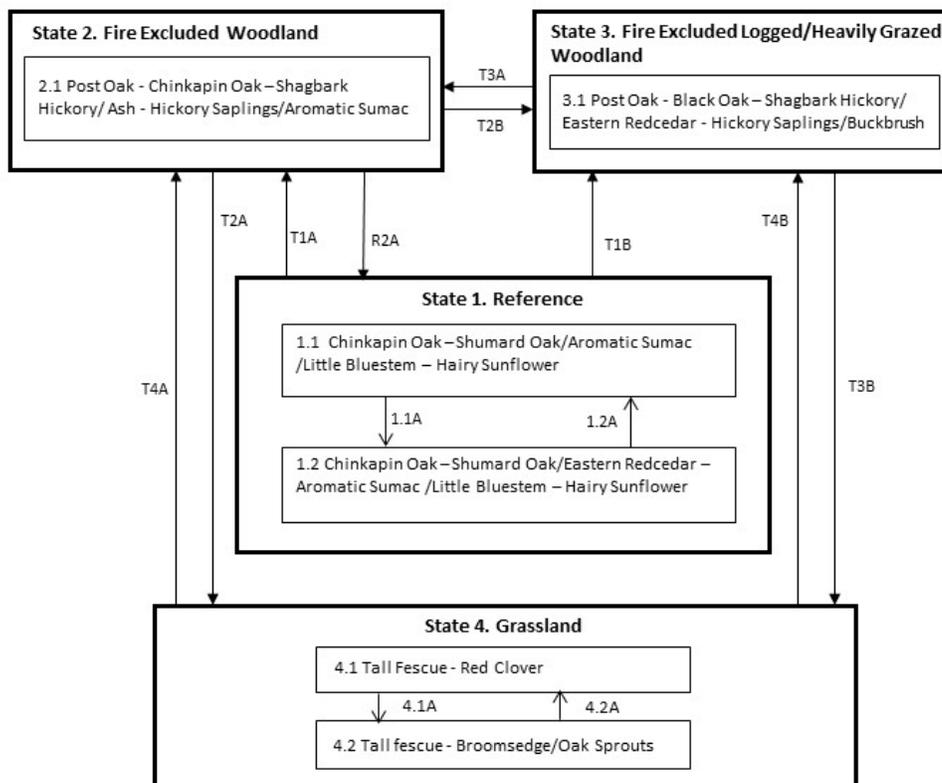
Uncontrolled domestic grazing has also impacted these communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as buckbrush, gooseberry, and Virginia creeper. It also promotes the invasion of eastern redcedar. Grazed sites have a more open understory. In addition, soil compaction and soil erosion related to grazing can be a problem and lower site productivity. These ecological sites are not productive and as a

consequence timber harvesting is limiting. Without some thinning of the stands and application of prescribed fire, the ground flora diversity can be shaded out and diversity of the stand may suffer.

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

Calcareous Dolomite Upland Woodland, F116AY009MO



Code	Event/Activity
T1A	Fire-free interval (20+ years)
T1B	Fire suppression; heavy grazing by livestock; logging
T3A	Livestock removal
T2B	Heavy grazing by livestock; logging
T2A, T3B	Clearing; grassland seeding; grassland management
T4A	Tree planting; long term succession (50+ years); no grazing
T4B	Long term succession (50+ years); light periodic grazing
R2A	Understory removal; prescribed fire
1.1A	Fire-free interval 10-20 years
1.2A	Fire 3-10 year cycle
4.1A	Over grazing; no fertilization
4.2A	Brush management; grassland seeding; grassland management

Ecological States

State 1: Reference

Historically, these woodlands occurred occur on upland summits, shoulders and backslopes. The restricted soil depth, droughty conditions, and native grasses made them susceptible to frequent fires, once every 3 to 5 years. Consequently, fire-tolerant Shumard oak and chinkapin oak dominated the open-canopy overstory. The understory consisted of a dense cover of native grasses and forbs. Tree height was 40 to 50 feet, and canopy closure 40 to 80 percent. During fire-free intervals, eastern red cedar, along with hickories and oak sprouts, increased in abundance and competed with the herbaceous ground flora, creating brushy woodland (community phase 1.2). However, the return of fire would re-open the woodland and promote the ground flora.

State 2: Fire Excluded Woodland

Fire suppression has allowed these previously open woodlands to become dense with less fire-tolerant trees and saplings such as eastern red cedar, black oak, and hickory. The dense, shaded conditions and lack of fire has caused the ground flora to decrease in cover and diversity. Aromatic sumac often forms a dense shrub understory under these conditions. However, many of the original herbaceous species persist as small plantlets or in the seed bank. Consequently, thinning of the woody species and the re-introduction of fire has shown these communities to be exceptionally resilient, and a return, after a period of many years, to the reference condition is possible.

State 3: Fire Excluded/Logged/Heavily Grazed Woodland

In addition to fire exclusion, many of these sites have been subjected to heavy grazing by domestic livestock and periodic logging. Like State 2, these areas are dense and shady with a diminished ground flora. In addition, grazed areas exhibit a lower diversity of native ground flora species and an increased abundance of eastern redcedar and other invasive natives such as buck brush. Like State 2, restoration using thinning and fire is possible, but will take longer and require more effort. Restricting livestock access and eliminating logging will be necessary for successful restoration.

State 4: Grassland

Conversion of other states to non-native cool season species such as tall fescue, orchard grass, and red clover has been common. Occasionally, these pastures will have scattered oaks. Long term uncontrolled grazing can cause significant soil erosion and compaction. A return to the reference state may be impossible, requiring a very long term series of management options. If oak sprouting is left unchecked and grazing is eliminated or reduced then over time this state will transition to a fire excluded woodland or to a high-graded/grazed woodland.

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>	5-10	60
CHINKAPIN OAK	<i>Quercus muehlenbergii</i>	20-40	50
POST OAK	<i>Quercus stellata</i>	10-20	50
SHAGBARK HICKORY	<i>Carya ovata</i>	10-20	50
SHUMARD OAK	<i>Quercus shumardii</i>	10-30	60
BLUE ASH	<i>Fraxinus quadrangulata</i>	10-20	50
WHITE ASH	<i>Fraxinus americana</i>	5-10	50

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height(ft)
AROMATIC SUMAC	<i>Rhus aromatica</i>	10-20	4
AMERICAN HAZELNUT	<i>Corylus americana</i>	10-20	5
DWARF HACKBERRY	<i>Celtis tenuifolia</i>	10-20	5
RED BUD	<i>Cercis canadensis</i>	10-20	12
CAROLINA BUCKTHORN	<i>Rhamnus caroliniana</i>	10-20	6

Forbs

Common Name	Botanical Name	Cover % (low-high)
YELLOW PINPERNEL	<i>Taenidia integerrima</i>	5-20
ORANGE PUCCOON	<i>Lithospermum canescens</i>	5-20
BENT MILK VETCH	<i>Astragalus distortus</i>	5-20
BUTTRFLYWEED	<i>Asclepias tuberosa</i>	5-20
ELM-LEAVED GOLDENROD	<i>Solidago ulmifolia</i>	5-20
POINTED LEAF TICK-TREFOIL	<i>Desmodium glutinosum</i>	5-20
EASTERN BEEBALM	<i>Monarda bradburiana.</i>	5-20
PURPLE CONEFLOWER	<i>Echinacea purpurea</i>	5-20
HAIRY SUNFLOWER	<i>Helianthus hirsutus</i>	10-20
BLAZING STAR	<i>Liatris aspera</i>	5-20

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
SLENDER WOODLAND SEDGE	<i>Carex digitalis</i>	10-20
OVAL-LEAF SEDGE	<i>Carex cephalophora</i>	10-20
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	20-40
WOODLAND BROME	<i>Bromus pubescens</i>	10-20
BOTTLEBRUSH GRASS	<i>Elymus hystrix</i>	10-20
VIRGINIA WILDRYE	<i>Elymus virginicus</i>	10-20

Site Interpretations

Wildlife

- Oaks provide hard mast for wildlife; scattered shrubs provide soft mast.
- Sedges and native grasses provide green browse; native grasses on dry sites 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 Limestone/Dolomite Woodlands include 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 mature Limestone/Dolomite 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:** Site index values range from 50 to 55 for oak. 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 is an effective management. Favor white oak, black oak, chinkapin oak.
- **Limitations:** Coarse fragments occur throughout profile; bedrock is 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.

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.
- 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. 2010. *Missouri Forest and Woodland Community Profiles*. Missouri Department of Conservation, Jefferson City, Missouri.
- 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. 550p.
- Nigh, Timothy A., & Walter A. Schroeder. 2002. *Atlas of Missouri Ecoregions*. Missouri Department of Conservation, Jefferson City, Missouri. 212p.
- 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.