

Ecological Site Description

Calcareous Dolomite Protected Backslope Forest

F116AY010MO

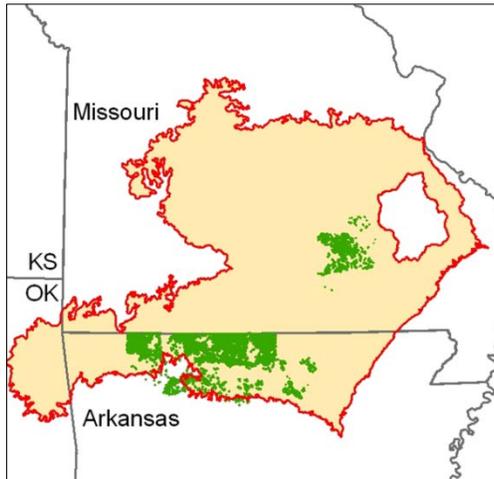
- (*Quercus alba* - *Quercus muhlenbergii*/*Cercis canadensis*/*Elymus virginicus* - *Uvularia grandiflora*)
- (white oak – chinkapin oak/red bud/Virginia wild rye – large flower bellwort)

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: 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.

The Calcareous Dolomite 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 Calcareous Dolomite Exposed Backslope Woodland ecological site. This ecological site is typically associated with glades and occurs primarily on slopes above the Current and Jacks Fork rivers in Shannon County, Missouri and in north-central counties in Arkansas. Soils are high in bases, and are moderately deep over dolomite bedrock, with gravelly surfaces.

Physiographic Features

This site is on backslopes with slopes of 15 to 55 percent. It is on protected aspects (north, northeast, and east), which receive significantly less solar radiation than the exposed aspects. 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.

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.

Calcareous Dolomite Protected Backslope Forests occur in protected landscape positions on steep slopes in the deeper valleys furthest from the prairie and woodland uplands. While the upland woodlands had an estimated fire frequency of 3 to 10 years, Calcareous Dolomite Protected Backslope Forests burned less frequently (estimated 10 to 25 years) and with lower intensity. The historic reference plant community for these forests has a well-developed forest canopy (70 to 80 feet tall and 90 to 100 percent cover) and subcanopy dominated by chinquapin oak and white oak, a structurally diverse understory and an abundant forest ground flora. Inclusions of dolomite woodlands on shallower soil patches are common.

Historically, Calcareous Dolomite Protected Backslope Forests 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 large native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and ground flora species.

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 to 80 years) canopy layer whose composition may have been altered by timber harvesting practices. An increase in hickories over historic conditions is common.

The absence of periodic fire may have allowed more shade-tolerant tree species, such as sugar maple, white ash, or hickories to increase in abundance. 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. Grazed sites also 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 moderately productive. Oak regeneration is typically problematic. Maples, elms, and hickories are often dominant competitors in the understory. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects.

Single tree selection timber harvests are common in this region and often results in removal of the most productive trees (high grading) in the stand leading to poorer quality timber and a shift in species composition away from more valuable oak species. Better planned single tree selection or the creation of group openings can help regenerate and maintain more desirable oak species and increase vigor on the residual trees.

Clearcutting also occurs and results in dense, even-aged stands dominated by 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 and the application of prescribed fire, the ground flora diversity can be shaded out and diversity of the stand may suffer.

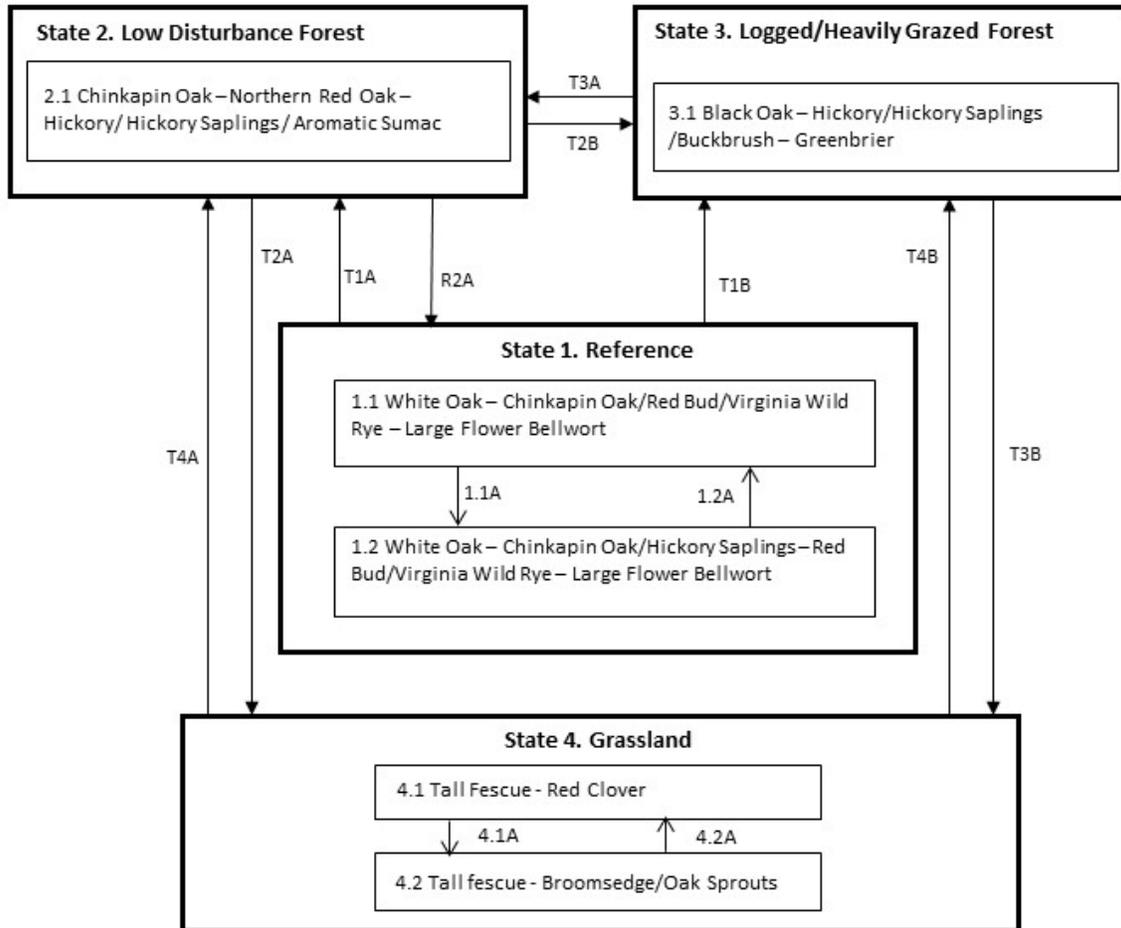
Prescribed fire can play a beneficial but limited role in the management of this ecological site. It has been used successfully to open understory and provide light to the ground for oak regeneration. Protected aspect forests did evolve with some fire, but their composition often reflects more closed, forested conditions, with fewer woodland ground flora species that can respond to fire.

Control of woody species will be more difficult than on poorer woodland sites. Consequently, while having protected aspects in a burn unit is acceptable, targeting them solely for woodland restoration is not advisable.

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 Protected Backslope Forest, F116AY010MO



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	Disturbance-free interval >20 years
1.2A	Disturbance 10-20 year cycle
4.1A	Over grazing; no fertilization
4.2A	Brush management; grassland seeding; grassland management

Ecological States

State 1: Reference

The reference state was dominated by white oak and chinkapin oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the dominance of white and chinkapin 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 northern red oak and sugar maple. Two community phases are recognized in this state, with shifts between phases based on disturbance frequency.

This reference state is uncommon today. Some sites have been converted to grassland (State 4). Others have been subject to repeated, high-graded timber harvest coupled with domestic livestock grazing (State 5). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Many reference sites have been managed for timber harvests.

State 2: Low Disturbance Forest

Lower disturbance levels has allowed these forests to become dense with saplings such as sugar maple, northern red oak, and hickory. The dense, shaded conditions and lack of disturbance has caused the ground flora to decrease in cover and diversity. 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 periodic disturbances 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: Logged/Heavily Grazed Forest

Many of these sites have been subjected to heavy grazing by domestic livestock and periodic logging. These areas are more open 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. 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>	20-40	70
NORTHERN RED OAK	<i>Quercus rubra</i>	10-20	80
MOCKERNUT HICKORY	<i>Carya tomentosa</i>	0-10	60
PIGNUT HICKORY	<i>Carya glabra</i>	0-10	50
SUGAR MAPLE	<i>Acer saccharum</i>	5-10	70
CHINKAPIN OAK	<i>Quercus muhlenbergii</i>	30-50	70
WHITE ASH	<i>Fraxinus americana</i>	10-20	60

Understory Trees/Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
EASTERN REDBUD	<i>Cercis canadensis</i>	10-30	30
AROMATIC SUMAC	<i>Rhus aromatica</i>	5-20	4
CAROLINA BUCKTHORN	<i>Frangula caroliniana</i>	5-20	6
RED MULBERRY	<i>Morus rubra</i>	5-20	30
BLADDERNUT	<i>Staphylea trifolia</i>	5-20	20

Forbs

Common Name	Botanical Name	Cover % (low-high)
LARGE FLOWERED BELLWORT	<i>Uvularia grandiflora</i>	5-10
BLOODROOT	<i>Sanguinaria canadensis</i>	5-10
LARGE FLOWER TICKCLOVER	<i>Desmodium glutinosum</i>	5-10
BLACK SNAKEROOT	<i>Sanicula gregaria</i>	5-10
HOG PEANUT	<i>Amphicarpa brachteata</i>	5-10
SKULLCAP	<i>Scutellaria incana</i>	5-10
LATE FLOWERING THROUGHWORT	<i>Eupatorium serotinum</i>	5-10
BEAKED AGRIMONY	<i>Agrimonia rostulata</i>	5-10
YELLOW PASSIONFLOWER	<i>Passiflora lutea</i>	5-10
ELEPHANT'S FOOT	<i>Elephantopus spp.</i>	5-10
HAIRY SUNFLOWER	<i>Helianthus hirsutus</i>	5-10
VIOLET BUSH CLOVER	<i>Lespedeza violacae</i>	5-10
WHITE AVENS	<i>Geum canadensis</i>	5-10
VIRGINIA SNAKEWORT	<i>Aristolochia serpentaria</i>	5-10

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
HAIRY WOOD CHESS	<i>Bromus purgans</i>	5-10
BOSC'S PANIC GRASS	<i>Panicum boscii</i>	5-10
RIVER OATS	<i>Chasmantheum latifolium</i>	5-10
BLACK EDGE SEDGE	<i>Carex nigromarginata</i>	5-10
ROCK MUHLY	<i>Muhlenbergia sobolifera</i>	5-10
VIRGINIA WILD-RYE	<i>Elymus virginicus</i>	5-10

Site Interpretations

Wildlife

- This forest type contains high structural and compositional diversity important for a number of songbirds and amphibians.

- 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.
- Birds associated with this ecological site 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.

Forestry

- **Management:** Site index estimates range from 50 to 60 for oak. Timber management opportunities are generally good. 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 should be used with caution on a particular site if timber management is the primary objective.
- **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. 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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