Ecological Site Description

Wet Footslope Forest F115BY023MO

- *(Quercus macrocarpa - Quercus shumardii/Ilex decidua/Chasmanthium latifolium)*
- (bur oak – Shumard oak/possum haw/river oats)

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-Illinoisan-aged till plain. Elevations range from 320 feet along the Mississippi River near Cape Girardeau in the south to about 1,020 feet on the highest ridges near Hillsboro in the east. Local relief varies from 10 to 20 feet in the major river floodplains, to 50 to 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.

Wet Footslope Forests (green areas on the map) are mainly in the western part of the MLRA south of the Missouri River, although a few scattered areas are in the southern part in the Missouri River watershed. Soils are very deep, with silt loam surface horizons, loamy to clayey subsoils and seasonal high water tables.

Physiographic Features

This site is on footslopes with slopes of 2 to 9 percent. The site receives runoff from adjacent upland sites. This site does not flood.

Soil Features

These soils have no rooting restriction. The soils were formed under forest vegetation, and have thin, light-colored surface horizons. Parent material is colluvium. They have silt loam surface

horizons, and clayey subsoils. They are affected by a seasonal high water table during the spring months. Soil series associated with this site include McGirk.

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.

Wet Footslope Forests in the Ozark Border are on lower slope colluvium positions. The historic reference plant community is dominated by a wide variety of deciduous hardwood tree species, tolerant of seasonally wet conditions including bur oak, Shumard oak, swamp white oak, American elm, black cherry. Trees are generally large and tall forming a dense, closed canopy. These forests are structurally and compositionally diverse, with occasional tree-fall gaps and natural mortality providing opportunities for regeneration of overstory species. The understory is also complex, with multiple layers of shade tolerant species such as blue beech, spicebush, and Ohio buckeye. Grape vines, greenbriar, and trumpet creeper are also present along with a diverse array of ground flora species that carpets the forest floor.

In this region of historic fire-prone savannas and woodlands, Wet Footslope Forests occur in the most protected landscape positions on lower, concave slopes distant from the fire prone uplands. While the upland woodlands had an estimated fire frequency of 3 to 5 years, these sites burned much less frequently (estimated 10-25 years) and with lower intensity. Wet Footslope Forests are also subject to occasional disturbances from wind and ice, which periodically open the canopy up by knocking over trees or breaking substantial branches of canopy trees. Such canopy disturbances allow more light to reach the ground and favor reproduction of the dominant oak 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.

Uncontrolled domestic grazing has also diminished the diversity and cover of woodland ground flora species, and has often introduced weedy species such as gooseberry, buckbrush, poison ivy and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and erosion related to grazing can lower site productivity.

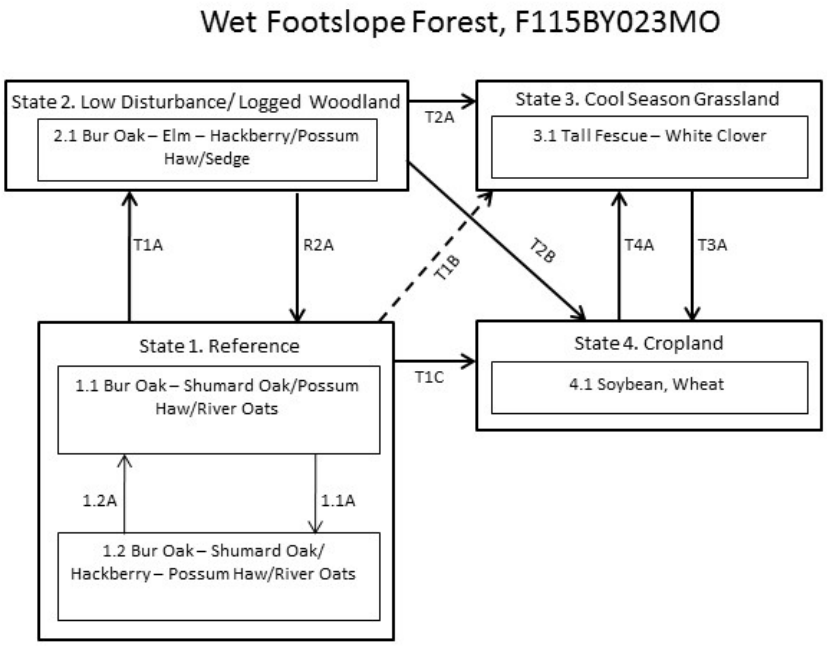
Wet Footslope Forests are productive timber sites. Timber harvest in this region typically is done using single-tree selection, and often results in removal of the most productive trees, or high-grading of the stand. This can result in poorer quality timber and a shift in species composition away from more valuable oak species. Carefully planned single tree selection or the creation of 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 and woodland sites in the region. Control of woody species will be more difficult. Footslope 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 these sites 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



Code	Event/Activity/Process
T1A	Lack of disturbance events > 20 years; repeated timber harvests
T3A	Tillage; conservation cropping system
T1B,T2A	Woody removal; tillage; vegetative seeding; grassland management
T1C, T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding ; grassland management
1.1A	Lack of disturbance events 10+ years
1.2A	Disturbance events 2-5 years
R2A	Forest stand improvement; prescribed fire 3-10 years

Ecological States

State 1: Reference
The historical reference state for this ecological site was old growth oak forest. The forest was dominated by Shumard oak and bur oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from flooding, fire, wind or ice as well as grazing by native large herbivores 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 very rare today. Fire suppression and altered drainage have resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Most reference states are currently altered because of timber harvesting, clearing and conversion to grassland or cropland.

State 2: Low Disturbance/ Logged Forest
Composition is altered from the reference state depending on tree selection during harvest. This state will slowly increase in more shade tolerant species and swamp white oak and bur oak will become less dominant. Without periodic canopy disturbance, stem density and fire intolerant species, like hackberry, will increase in abundance. Some periodic grazing may be occurring.

State 3: Cool Season Grassland
Conversion of other states to non-native cool season species such as tall fescue, orchard grass, and white 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 and transitions.

State 4: Cropland
This is a state that exists currently with intensive cropping of soybeans and wheat. Some conversion to cool season hay land occurs, but when commodity prices are high, these states transition back to cropland.

Reference State Plant Community
Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
BUR OAK	*Quercus macrocarpa*	20-40	80
GREEN ASH	*Fraxinus pennsylvanica*	10-20	80
SWAMP WHITE OAK	*Quercus bicolor*	10-20	70
HACKBERRY	*Celtis occidentalis*	10-20	80
SHELLBARK HICKORY	*Carya lacinosa*	10-20	70
SLIPPERY ELM	*Ulmus rubra*	10-20	60
SYCAMORE	*Platanus occidentalis*	10-20	90
PIN OAK	*Quercus palustris*	10-20	70
SHUMARD OAK	*Quercus shumardii*	20-40	90
PECAN	*Carya illinoensis*	10-20	70

Understory Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
OHIO BUCKEYE	*Aesculus glabra*	10-20	40
BLUE BEECH	*Carpinus caroliniana*	10-20	20

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
POSSUM HAW	*Ilex decidua*	10-20	8
SPICE BUSH	*Lindera benzoin*	10-20	6

Vines

Common Name	Botanical Name	Cover % (low-high)
RACCOON GRAPE	*Ampelopsis cordata*	10-20
FOX GRAPE	*Vitis vulpina*	10-20
GREENBRIAR	*Smilax glauca*	10-20

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
RIVER OATS	*Chasmanthium latifolium*	10-20
HOP SEDGE	*Carex lupulina*	5-10
WOOD REED GRASS	*Cinna arundinacea*	5-10

Forbs

Common Name	Botanical Name	Cover % (low-high)
PALE TOUCH-ME-NOT	*Impatiens pallida*	5-20
FALSE NETTLE	*Boehmeria cylindrica*	5-20
CLEARWEED	*Pilea pumila*	5-20
WHITE WOODLAND ASTER	*Aster lateriflorus*	5-20
WOOD NETTLE	*Laportea canadensis*	5-20
WATERLEAF	*Hydrophyllum virginianum*	5-20
HISPID BUTTERCUP	*Ranunculus hispidus*	5-20
SKULLCAP	*Scutellaria nervosa*	5-20

Site Interpretations

Wildlife

- Moist conditions with abundant coarse woody debris make this type of ecological site important for many herptiles. Ephemeral pools provide important amphibian breeding habitat.
- Acorns provide important habitat and food for migrating ducks (especially mallards) and breeding ducks including wood ducks and hooded mergansers.
- Tall emergent trees along with an uneven canopy structure and canopy gaps are important for heron colonies, eagle nesting, Mississippi kites, cerulean warblers and other bird species.
- Birds associated with late-successional to mature forests are Wood Duck, Hooded Merganser, Barred Owl, Cerulean Warbler, Yellow-throated Warbler, Prothonotary Warbler, Pileated Woodpecker, Yellow-throated Vireo, Brown Creeper, and Yellow-crowned Night Heron.

- Reptiles and amphibians associated with ecological site include: small-mouthed salamander, central newt, midland brown snake, gray treefrog, northern spring peeper, Blanchard's cricket frog, southern leopard frog, western painted turtle, and red-eared slider.

Forestry

- Management: Field collected site index values average 52 for white oak. On the wettest sites, timber management opportunities may be limited. Management of these groups is often difficult because of the great variation in species, age, stocking levels and seasonal wetness. Use seed-tree, group selection, or clear cutting regeneration methods.

- Limitations: Seasonal high water table. Use of equipment may be restricted in spring and other excessively wet periods. Restrict activities to dry periods or surfaced areas. Equipment use when wet may compact soil and damage tree roots. Unsurfaced roads and traffic areas tend to be slippery and form ruts easily. Access to forests is easiest during periods in late summer or winter when soils are frozen or dry. Planting is extremely difficult during spring periods. Seedling mortality may be high due to excess wetness. Unsurfaced roads and skid trails may be impassable during rainy periods.

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

Natural Resources Conservation Service. 2002. Woodland Suitability Groups. Missouri FOTG, Section II, Soil Interpretations and Reports. 30 pgs.

Natural Resources Conservation Service. Site Index Reports. Accessed May 2014. https://esi.sc.egov.usda.gov/ESI_Forestland/pgFSWelcome.aspx

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.

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