

Ecological site F116AY036MO

Wet Upland Drainageway Forest

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 116A–Ozark Highland

The Ozark Highland 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.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010): The reference state for this ecological site is most similar to a Wet-Mesic Bottomland Forest. Missouri Department of Conservation Forest and Woodland Communities (MDC, 2006): The reference state for this ecological site is most similar to a Wet Bottomland Forest. National Vegetation Classification System Vegetation Association (NatureServe, 2010): The reference state for this ecological site is most similar to a *Quercus macrocarpa* – *Quercus shumardii* – *Carya cordiformis* / *Chasmanthium latifolium* Forest (CEGL004544). Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002): This ecological site is widespread across the Ozark Highlands Section.

Ecological site concept

NOTE: This is a “provisional” Ecological Site Description (ESD) that is under development. It contains basic ecological information that can be used for conservation planning, application and land management. After additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”. Wet Upland Drainageway Forests are widely distributed throughout the Ozark Highland. Soils are loamy to clayey and wet, and are subject to flooding. The reference plant community is forest with an overstory dominated by a wide variety of trees including pin oak, bur oak, shellbark hickory, swamp white oak, Shumard oak, and American elm, an understory dominated by American hornbeam, northern spicebush, and Ohio buckeye and a rich herbaceous ground flora.

Associated sites

F116AY016MO	Chert Dolomite Protected Backslope Forest Chert Dolomite Protected Backslope Forests, and other upland ecological sites, are upslope.
F116AY018MO	Loamy Dolomite Upland Woodland Loamy Dolomite Upland Woodlands, and other upland ecological sites, are upslope.
F116AY048MO	Chert Dolomite Exposed Backslope Woodland Chert Dolomite Exposed Backslope Woodlands, and other upland ecological sites, are upslope.

Similar sites

F116AY036MO	Wet Upland Drainageway Forest Wet Upland Drainageway Forest has no similar sites.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus palustris</i> (2) <i>Quercus macrocarpa</i>
Shrub	(1) <i>Vitis</i>
Herbaceous	(1) <i>Impatiens capensis</i> (2) <i>Carex</i>

Physiographic features

This site is in narrow drainageways in the uplands, with slopes of 1 to 5 percent. The site receives runoff from adjacent upland sites. Most areas are subject to frequent, brief flooding.

The following figure (adapted from Larsen, 2002) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “3” on the figure. Wet Upland Drainageway forest sites are associated with a variety of upland sites, such as the Chert Dolomite and Loamy Dolomite sites shown here.

Figure 1. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Slope	0 – 10 %
Aspect	Aspect is not a significant factor

Climatic features

The Ozark Highland has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce abundant amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over the region, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

The Ozark Highland experiences regional differences in climates, but these differences do not have obvious geographic boundaries. Regional climates grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line crossing the MLRA from northwest to southeast.

The average annual precipitation in almost all of this area is 38 to 45 inches. Snow falls nearly every winter, but the snow cover lasts for only a few days. The average annual temperature is about 53 to 60 degrees F. The lower temperatures occur at the higher elevations in the western part of the MLRA. Mean January minimum temperature follows a stronger north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the MLRA. Mean July maximum temperatures have a range of only two or three degrees across the area.

Mean annual precipitation varies along a northwest to southeast gradient. Seasonal climatic variations are more complex. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages three to four times greater than January precipitation. Most of the rainfall occurs as high-intensity, convective thunderstorms in summer.

During years when precipitation comes in a fairly normal manner, moisture is stored in the top layers of the soil during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Drought directly affects plant and animal life by limiting water supplies, especially at times of high temperatures and high evaporation rates.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. In regions of appreciable relief, for example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Deep sinkholes often have a microclimate significantly cooler, moister, and shadier than surrounding surfaces, a phenomenon that may result in a strikingly different ecology. Higher daytime temperatures of bare rock surfaces and higher reflectivity of these unvegetated surfaces may create distinctive environmental niches such as glades and cliffs.

Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier than adjacent north- and-east-facing slopes. Finally, the climate within a canopied forest is measurably different from the climate of a more open grassland or savanna areas.

Source: University of Missouri Climate Center - <http://climate.missouri.edu/climate.php>; Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - <http://soils.usda.gov/survey/geography/mlra/>

Table 3 Representative climatic features

Frost-free period (characteristic range)	140-160 days
Freeze-free period (characteristic range)	180-190 days
Precipitation total (characteristic range)	1,170-1,190 mm
Frost-free period (actual range)	140-160 days
Freeze-free period (actual range)	180-190 days
Precipitation total (actual range)	1,170-1,190 mm
Frost-free period (average)	150 days
Freeze-free period (average)	180 days
Precipitation total (average)	1,190 mm

- (1) WEST PLAINS [USC00238880], West Plains, MO
- (2) GALENA [USC00233094], Galena, MO
- (3) LICKING 4N [USC00234919], Licking, MO

Influencing water features

This ecological site is influenced by a seasonal high water table, which is typically near the surface in late fall through spring, receding in the summer and contains first- and second-order streams, which originate from headslope positions at the upper reaches of the units, and are fed from smaller headslopes in the adjacent uplands. These streams are ephemeral in most years, with flow in the late fall, winter, and spring months, generally disappearing in the summer, or reduced to isolated pools in the lower reaches. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short-duration flooding is common in many areas.

This site is in the SLOPE wetlands class of the Hydrogeomorphic (HGM) classification system (Brinson, 1993), and are Emergent Palustrine wetlands (Cowardin et al., 1979). SLOPE wetlands are found in stream headwaters, slope toes, or at outcrops of low conductivity soil or rock layers. In a stream network, they are found on stream corridor reaches upstream of higher order RIVERINE reaches.

Soil features

These soils have no rooting restriction. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is alluvium. They have loamy surface horizons, and loamy to clayey subsoils. They are affected by a seasonal high water table during the spring months. Soil series associated with this site include Batcave, Baylock, Deible, Falaya, Farewell, Freeburg, Gabriel, Hartville, Higdon, Lostpond, Moniteau, Racoon, Tanglenook, and Westerville.

The accompanying picture of the Deible series shows a clayey subsoil with dull gray colors, indicating seasonal wetness. Scale is in centimeters. Picture courtesy of John Preston, NRCS.

Figure 8. Deible series

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam
Family particle size	(1) Clayey
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Very slow to slow
Soil depth	180 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified

Available water capacity (0-101.6cm)	10.16 – 15.24 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	5.2 – 7.3
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

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 Upland Drainageway Forests have loamy to clayey soil textures and are seasonally wet, limiting the density of trees, creating a more open forest structure. Historically, these forests were dominated by a wide variety of deciduous hardwood tree species, tolerant of seasonally wet conditions. These included pin oak, bur oak, shellbark hickory, swamp white oak, Shumard oak and American elm. Both historically and today, these forests are structurally and compositionally diverse, with occasional tree fall gaps and natural mortality providing opportunities for regeneration of overstory species.

Today many upland drainageways have been cleared and converted to agriculture. Where they still occur, they are denser and their composition is usually altered. However, these areas of forest still play an important role as a source of food and shelter for wildlife. In addition, they are very important in channel stabilization.

Uncontrolled grazing by domestic livestock in these remaining areas of forest damages and kills smaller trees and removes the ground cover. Carefully planned timber harvests can be tolerated on these sites, but high grading of the timber will ultimately degrade the sites. Re-establishment of these riparian forests is important for stream quality and stream health, and as critical habitat for migratory birds. Planting of later successional species on the appropriate landscape position and soils has proven to be an effective means for restoration.

A State and Transition Diagram follows. 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 and transition model

Figure 9. State and transition diagram for this ecological site

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height M	Canopy Cover (%)	Diameter Cm	Basal Area (square M/hectare)
Tree							
pin oak	QUPA2	Quercus palustris	Native	–	–	–	–
slippery elm	ULRU	Ulmus rubra	Native	–	–	–	–
eastern cottonwood	PODE3	Populus deltoides	Native	–	–	–	–
bitternut hickory	CACO15	Carya cordiformis	Native	–	–	–	–
pecan	CAIL2	Carya illinoensis	Native	–	–	–	–
shellbark hickory	CALA21	Carya laciniosa	Native	–	–	–	–
sugarberry	CELA	Celtis laevigata	Native	–	–	–	–
green ash	FRPE	Fraxinus pennsylvanica	Native	–	–	–	–
swamp white oak	QUBI	Quercus bicolor	Native	–	–	–	–
bur oak	QUMA2	Quercus macrocarpa	Native	–	–	–	–
Shumard's oak	QUSH	Quercus shumardii	Native	–	–	–	–

Table 7. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (m)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Indian woodoats	CHLA5	Chasmanthium latifolium	Native	–	–
soft fox sedge	CACO13	Carex conjuncta	Native	–	–
Gray's sedge	CAGR5	Carex grayi	Native	–	–
false hop sedge	CALU3	Carex lupuliformis	Native	–	–
hop sedge	CALU4	Carex lupulina	Native	–	–
Muskingum sedge	CAMU9	Carex muskingumensis	Native	–	–
squarrose sedge	CASQ2	Carex squarrosa	Native	–	–
sweet woodreed	CIAR2	Cinna arundinacea	Native	–	–
fowl mannagrass	GLST	Glyceria striata	Native	–	–
woodland muhly	MUSY	Muhlenbergia sylvatica	Native	–	–
whitegrass	LEVI2	Leersia virginica	Native	–	–
Forb/Herb					
starry rosinweed	SIAS2	Silphium asteriscus	Native	–	–
hairy skullcap	SCEL	Scutellaria elliptica	Native	–	–
bearded shorthusk	BRER2	Brachyelytrum erectum	Native	–	–
hepatica	HENO2	Hepatica nobilis	Native	–	–
fewflower ticktrefoil	DEPA7	Desmodium pauciflorum	Native	–	–
panicledleaf ticktrefoil	DEPA6	Desmodium paniculatum	Native	–	–

Canadian lousewort	PECA	<i>Pedicularis canadensis</i>	Native	–	–
blisterwort	RARE2	<i>Ranunculus recurvatus</i>	Native	–	–
dotted smartweed	POPU5	<i>Polygonum punctatum</i>	Native	–	–
watercress	NAOF	<i>Nasturtium officinale</i>	Native	–	–
devil's beggartick	BIFR	<i>Bidens frondosa</i>	Native	–	–
Alabama supplejack	BESC	<i>Berchemia scandens</i>	Native	–	–
smallspike false nettle	BOCY	<i>Boehmeria cylindrica</i>	Native	–	–
jewelweed	IMCA	<i>Impatiens capensis</i>	Native	–	–
pale touch-me-not	IMPA	<i>Impatiens pallida</i>	Native	–	–
cutleaf coneflower	RULA3	<i>Rudbeckia laciniata</i>	Native	–	–
calico aster	SYLAA	<i>Symphyotrichum lateriflorum</i> var. <i>angustifolium</i>	Native	–	–
wingstem	VEAL	<i>Verbesina alternifolia</i>	Native	–	–
foxglove beardtongue	PEDI	<i>Penstemon digitalis</i>	Native	–	–
Canadian clearweed	PIPU2	<i>Pilea pumila</i>	Native	–	–
bristly buttercup	RAHI	<i>Ranunculus hispidus</i>	Native	–	–
limestone wild petunia	RUST2	<i>Ruellia strepens</i>	Native	–	–
blue skullcap	SCLA2	<i>Scutellaria lateriflora</i>	Native	–	–
giant goldenrod	SOGI	<i>Solidago gigantea</i>	Native	–	–
Fern/fern ally					
sensitive fern	ONSE	<i>Onoclea sensibilis</i>	Native	–	–
rattlesnake fern	BOVI	<i>Botrychium virginianum</i>	Native	–	–
Christmas fern	POAC4	<i>Polystichum acrostichoides</i>	Native	–	–
Shrub/Subshrub					
common buttonbush	CEOC2	<i>Cephalanthus occidentalis</i>	Native	–	–
American bladdernut	STTR	<i>Staphylea trifolia</i>	Native	–	–
gray dogwood	CORA6	<i>Cornus racemosa</i>	Native	–	–
Tree					
Ohio buckeye	AEGL	<i>Aesculus glabra</i>	Native	–	–
American hornbeam	CACA18	<i>Carpinus caroliniana</i>	Native	–	–
possumhaw	ILDE	<i>Ilex decidua</i>	Native	–	–
Vine/Liana					
eastern poison ivy	TORA2	<i>Toxicodendron radicans</i>	Native	–	–
heartleaf peppervine	AMCO2	<i>Ampelopsis cordata</i>	Native	–	–
trumpet creeper	CARA2	<i>Campsis radicans</i>	Native	–	–
riverbank grape	VIRI	<i>Vitis riparia</i>	Native	–	–
frost grape	VIVU	<i>Vitis vulpina</i>	Native	–	–

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Animal community

Wildlife (MDC 2006): Ephemeral pools provide important amphibian breeding habitat. Bird species associated with these sites include Indigo Bunting, Willow Flycatcher, Yellow Warbler, Red-headed Woodpecker, Eastern Wood-Pewee, Great Crested Flycatcher, Tree Swallow, Orchard Oriole, and Baltimore Oriole. Reptile and amphibian species associated with these sites include tiger salamander, small-mouthed salamander, midland brown snake, gray treefrog, plains leopard frog, southern leopard frog, and western chorus frog.

Other information

Forestry (NRCS 2002; 2014): Management: Field measured site index values range from 55 to 70. On the wettest sites, timber management opportunities may be limited. Use seed-tree, group selection, or clear cutting regeneration methods. Harvest favoring reproduction of the less-shade tolerant species such as pin oak, swamp white oak and bur oak, sycamore, and cottonwood. Maintain adequate riparian buffer areas. Limitations: Wetness from flooding; 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.

Inventory data references

Potential Reference Sites: Wet Upland Drainageway Forest Plot CURINP03 - Batcave soil Located in Current River NPS, Shannon County, MO Latitude: 37.120929 Longitude: -91.177394 Plot ROCRCA01 – Batcave soil Located in Rocky Creek CA, Shannon County, MO Latitude: 37.170924 Longitude: - -91.204562 Plot CHCRNC01 – Batcave soil Located in Chilton Creek TNC, Carter County, MO Latitude: 37.075494 Longitude: -91.064007

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Contributors

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Approval

Nels Barrett, 9/24/2020

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	09/20/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover (%) and depth (in):

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):

16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability:
