USDA Natural Resources Conservation Service

Ecological site F115XB024MO
Loamy Terrace Forest

Accessed: 05/19/2024

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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 115X–Central Mississippi Valley Wooded Slopes

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. Elevation ranges from about 320 feet along the Mississippi River near Cape Girardeau in the south to about 1,020 feet on the highest ridges near Hillsboro, MO 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.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to a 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 Mixed Hardwood Mesic Bottomland Forest.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to an Acer saccharum - Quercus rubra - Carya cordiformis / Asimina triloba Forest (CEGL002060).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily in several Land Type Associations of the Outer Ozark Border Subsection.

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”.

Loamy Terrace Forests (green areas on the map) are scattered throughout the Missouri River watershed portion of the MLRA, and in adjacent areas. Soils are very deep and loamy, and are subject to flooding. The reference plant community is forest with an overstory dominated by a variety of trees including sugar maple, northern red oak, bitternut hickory, bur oak, American elm, black walnut and Kentucky coffee tree, an understory dominated by

pawpaw, spicebush, Ohio buckeye and leatherwood, and a rich herbaceous ground flora.

Associated sites

F115XB023MO	**Wet Footslope Forest** Wet Footslope Forests are upslope.
F115XB031MO	**Loamy Floodplain Forest** Loamy Floodplain Forests and other floodplain ecological sites are downslope.

Similar sites

F115XB023MO	**Wet Footslope Forest** Wet Footslope Forests are upslope.

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Quercus rubra*
Shrub	(1) *Asimina triloba*
Herbaceous	(1) *Asarum canadense*

Physiographic features

This site is on low stream terraces and high floodplains (floodplain steps), with slopes of 0 to 5 percent. The site generates some runoff to adjacent lower floodplain sites, and receives some runoff from higher stream terraces and uplands. This site is subject to rare to occasional flooding. Scour is uncommon in these flood events, and deposition is minimal, so ecological processes more closely resemble those of stream terrace systems.

The following figure (adapted from Skaer, 2004) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the floodplain and stream terrace systems of major tributaries of the Missouri and Mississippi rivers. This site is within the area labeled as “4” on the figure, and is typically adjacent to but on higher positions than floodplain ecological sites such as the Loamy Floodplain Forest (labeled “5” on the figure).

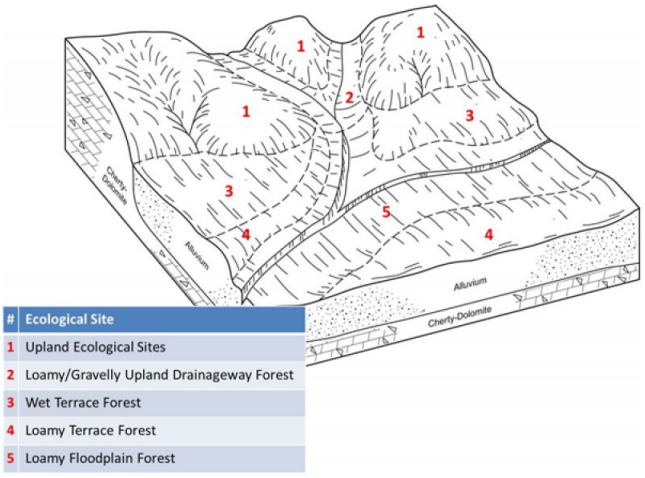


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Flood-plain step
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Rare to occasional

Ponding frequency	None
Slope	0–5%
Water table depth	127–152 cm
Aspect	Aspect is not a significant factor

Climatic features

The Central Mississippi Valley Wooded Slopes, Western Part 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 Central Mississippi Valley Wooded Slopes, Western Part 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 diagonally crossing the MLRA from northwest to southeast. Both mean annual temperature and precipitation exhibit gradients along this line.

The average annual precipitation in most of this area is 38 to 48 inches. The average annual temperature is 53 to 57 degrees F. Mean January minimum temperature follows the northwest-to-southeast 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 the same gradient as temperature. 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. Snowfall is common in winter.

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. 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; accessed June 2012

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 (average)	174 days
Freeze-free period (average)	198 days

Precipitation total (average)	1,143 mm

Climate stations used

- (1) NEW FRANKLIN 1W [USC00236012], Franklin, MO
- (2) VICHY ROLLA NATIONAL AP [USW00013997], Vichy, MO
- (3) FULTON [USC00233079], Fulton, MO
- (4) UNION [USC00238515], Union, MO

Influencing water features

This ecological site is typically associated with, but not adjacent to, a perennial stream. This site is subject to rare to occasional flooding. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Constructed levees, often accompanied by stream channelization, have altered the hydrology and flooding dynamics in many places and may indicate an altered state.

The site generates some runoff to adjacent lower floodplain sites, and receives some runoff from higher stream terraces and uplands.

Soil features

These soils have no rooting restriction. They were formed under forest vegetation, and have thin, light-colored surface horizons. Parent material is alluvium. They have silt loam, sandy loam or loam surface horizons, and loamy subsoils with argillic horizons that may be skeletal with depth. They are not affected by seasonal wetness. Soil series associated with this site include Cedargap, Horsecreek, Jemerson, Razort, and Wiota.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Sandy loam (3) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	183 cm
Surface fragment cover <=3"	0–6%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	15.24–22.86 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–35%
Subsurface fragment volume >3" (Depth not specified)	0–1%

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.

Loamy Terrace Forests are on relatively stable former floodplain positions. These rarely flooded terraces occur above occasionally flooded high floodplains on well drained, loamy soils and riverfront forests on lower, more frequently flooded areas. The reference plant community is dominated by a wide variety of deciduous hardwood tree species including sugar maple, northern red oak, bitternut hickory, bur oak, American elm, black walnut and Kentucky coffee tree. Trees are generally large and tall forming a dense, closed canopy.

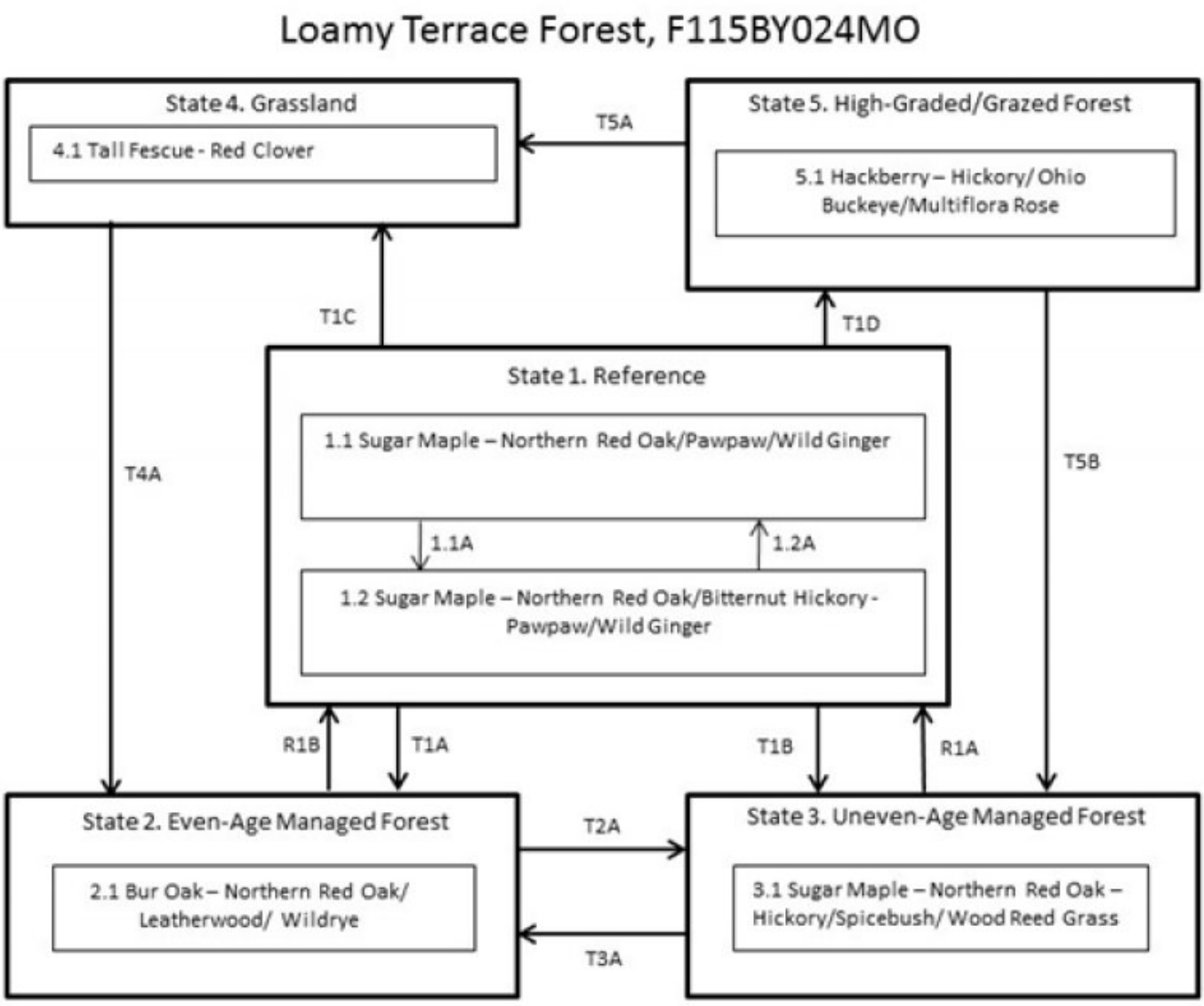
Both historically and today, these forests are structurally and compositionally diverse, with occasional tree-fall gaps and natural mortality providing opportunities for regeneration of overstory species. The understory is also complex, with multiple layers of shade tolerant species such as pawpaw, spicebush, Ohio buckeye and leatherwood. Grape vines, greenbrier, and Virginia creeper are also present along with a diverse array of ground flora species that carpets the forest floor.

Today, the rich, loamy Loamy Terrace Forests are largely converted to pasture and hayland. Where they do still occur, they often occur as a rather narrow band of forest traversing the riverfront forest or stream edge. These bands of forest play an important role as a source of food and shelter for migrating birds. In addition, they are very important in stream bank stabilization. Most sites have suffered from extensive hydrological alterations (ditches, levees, etc.).

Uncontrolled grazing by domestic livestock in these remaining strips 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 productive 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



Code	Activity/Event/Process
T1A	Harvesting; even-aged management
T1B	Harvesting; uneven-age management
T1C, T5A	Clearing; pasture planting
T1D	High-grade harvesting; uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management; thinning
T4A, T5A	Tree planting; long-term succession; no grazing
T5B	Uneven-age management; tree planting; no grazing

Code	Activity/Event/Process
1.1A	No disturbance (10+ years)
1.2A	Disturbance (fire, wind, ice) 3-5 years

Code	Activity/Event/Process
R1A	Extended rotations; forest stand improvement
R1B	Uneven-age mgt, extended rotations; forest stand improvement

Figure 7. State and transition diagram for this ecological s

State 1

Reference

The reference state was dominated by northern red oak and sugar maple including a wide variety of other deciduous hardwood tree species. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or occurred along with infrequent flooding. Long disturbance-free periods allowed an increase in more shade tolerant species such as bitternut hickory and sugar maple. Two community phases are recognized in this state, with shifts between phases based on disturbance frequency. The reference state is rare today. Some 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). Many reference sites have been managed for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) forests.

Community 1.1
Sugar Maple – Northern Red Oak/Pawpaw/Wild Ginger

This phase is dominated by northern red oak and sugar maple including a wide variety of other deciduous hardwood tree species. Periodic disturbances from fire, wind or occurred along with infrequent flooding.

Community 1.2
Sugar Maple – Northern Red Oak/Bitternut Hickory - Pawpaw/Wild Ginger

This phase has long disturbance-free periods allowing an increase in more shade tolerant species such as bitternut hickory and sugar maple.

State 2
Even-Age Managed Forest

These former forests are now rather dense, with an under developed understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) forests.

Community 2.1
Bur Oak – Northern Red Oak/ Leatherwood/ Wildrye

This is an even-aged forest management phase. Logging activities are removing higher volumes of white oak causing a decrease in white oak in the canopy and an increase in northern red oak and bur oak. Large group, shelterwood or clearcut harvests create a more uniform age class structure throughout the canopy layer while also opening up the understory and allowing more sunlight to reach the forest floor.

State 3
Uneven-Age Managed Forest

Uneven-Age Managed forests can resemble the reference state but are denser. The biggest differences are tree age, most being only 50 to 90 years old, and canopy closure. Composition is also likely altered from the reference state depending on tree selection during harvest. In addition, without a regular 15 to 20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species such as bitternut hickory and sugar maple and northern red oak will become less dominant.

Community 3.1
Sugar Maple – Northern Red Oak – Hickory/Spicebush/ Wood Reed Grass

This is an uneven-aged forest management phase. Selective logging activities are removing higher volumes of white oak causing a decrease in white oak in the canopy and an increase in northern red oak, hickory and sugar maple. Densities numbers, especially more shade tolerant species, are increasing in the lower size-class levels.

State 4
Grassland

Conversion of forests to planted, non-native pasture species such as tall fescue has been common in this region. If grazing and active pasture management is discontinued, the site will eventually transition, over time, to State 2 (Even-Age).

Community 4.1
Tall Fescue - Red Clover

This phase is well managed grassland, composed of non-native cool season grasses and legumes. Grazing and haying is occurring. The effects of long-term liming on soil pH, and calcium and magnesium content, is most evident in this phase. Studies show that these soils have higher pH and higher base status in soil horizons as much as two feet below the surface, relative to poorly managed grassland and to woodland communities (where liming is not practiced).

State 5
High-Graded/Grazed Woodland

Forested sites subjected to repeated, high-graded timber harvests and uncontrolled domestic grazing transition to this 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 vegetation offers little nutritional value for cattle, and excessive stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Exclusion of livestock from sites in this state coupled with uneven-age management techniques will cause a transition to State 3 (Uneven-Age).

Community 5.1
Hackberry – Hickory/ Ohio Buckeye/Multiflora Rose

This is the only phase in this state at this time. See the corresponding state narrative for details.

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
sugar maple	ACSA3	*Acer saccharum*	Native	–	–	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	–	–	–
bitternut hickory	CACO15	*Carya cordiformis*	Native	–	–	–	–
Kentucky coffeetree	GYDI	*Gymnocladus dioicus*	Native	–	–	–	–
white oak	QUAL	*Quercus alba*	Native	–	–	–	–
American elm	ULAM	*Ulmus americana*	Native	–	–	–	–
slippery elm	ULRU	*Ulmus rubra*	Native	–	–	–	–
white ash	FRAM2	*Fraxinus americana*	Native	–	–	–	–
Tree Fern							
black walnut	JUNI	*Juglans nigra*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
eastern star sedge	CARA8	*Carex radiata*	Native	–	–
sweet woodreed	CIAR2	*Cinna arundinacea*	Native	–	–
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	–
Forb/Herb					
pale touch-me-not	IMPA	*Impatiens pallida*	Native	–	–
eastern waterleaf	HYVI	*Hydrophyllum virginianum*	Native	–	–
Canadian wildginger	ASCA	*Asarum canadense*	Native	–	–
green dragon	ARDR3	*Arisaema dracontium*	Native	–	–
white fawnlily	ERAL9	*Erythronium albidum*	Native	–	–
Virginia bluebells	MEVI3	*Mertensia virginica*	Native	–	–
Greek valerian	PORE2	*Polemonium reptans*	Native	–	–
calico aster	SYLAL7	*Symphyotrichum lateriflorum var. lateriflorum*	Native	–	–
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	–	–
nodding wakerobin	TRFL6	*Trillium flexipes*	Native	–	–
Shrub/Subshrub					
burningbush	EUAT5	*Euonymus atropurpureus*	Native	–	–
northern spicebush	LIBE3	*Lindera benzoin*	Native	–	–
Tree					
Ohio buckeye	AEGL	*Aesculus glabra*	Native	–	–
American hornbeam	CACA18	*Carpinus caroliniana*	Native	–	–
pawpaw	ASTR	*Asimina triloba*	Native	–	–
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	–

Animal community

Wildlife (MDC 2006):

Moist conditions with abundant coarse woody debris make this type of ecological site important for many herptiles.

Ephemeral pools provide important amphibian breeding habitat.

Periodic inundation and 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.

Other information

Forestry (NRCS 2002, 2014):

Management: Field measured site index values are 66 for black oak and chinkapin oak and 58 for northern red oak. Timber management opportunities are 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. Where possible, favor white oak, black walnut, northern red oak, and bitternut hickory. Maintain adequate riparian buffer areas.

Limitations: No major limitations or restrictions. Occasional periods of seasonal wetness; Use of equipment may be restricted in spring and other excessively wet periods. Equipment use when wet may compact soil and damage tree roots. Tree planting may be difficult during spring flooding periods.

Inventory data references

Loamy Terrace Forest – Potential Reference – F115BY024MO

Plot DABOCA_JK03 – Razort soil
Located in Daniel Boone CA, Warren County, MO
Latitude: 38.774908
Longitude: -91.36802

Plot SHNAMB01 – Razort soil
Located in Shaw Nature Reserve, MOBOT, Franklin County, MO
Latitude: 38.459512
Longitude: -90.820003

Other references

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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/

Contributors

Fred Young
Doug Wallace

Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support in the development of this ecological site.

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	
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):**

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

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

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

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

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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:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**