USDA Natural Resources Conservation Service

Ecological site F115XB015MO
Sandy/Loamy Floodplain Forest

Accessed: 05/03/2024

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 Riverfront Forest.

Missouri Department of Conservation Forest and Woodland Communities (MDC, 2006):
The reference state for this ecological site is most similar to a Riverfront Bottomland Forest.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Populus deltoides - Salix nigra Forest (CEGL002018).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs throughout the following Subsections:
Missouri River Alluvial Plain
Mississippi River Alluvial Plain

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”.

Sandy/Loamy Floodplain Forests (green areas on the map) are on the Missouri River and Mississippi River floodplains, primarily adjacent to the current river channel. Sites are commonly adjacent to the Clayey Floodplain Forest ecological sites. Soils are very deep, and are sandy to very fine sandy loam throughout. The reference plant

community is forest dominated by black willow, eastern cottonwood, hackberry, river birch, sycamore, silver maple, and American elm.

Associated sites

F115XB031MO	**Loamy Floodplain Forest** Loamy Floodplain Forests sometimes form a complex with this ecological site.
F115XB041MO	**Clayey Floodplain Forest** Clayey Floodplain Forests are commonly adjacent to Sandy/Loamy Floodplain Forests, farther away from the main channel.
R115XB042MO	**Ponded Floodplain Prairie** Ponded Floodplain Prairies are in the lower former channel areas the have high seasonal water tables with some ponding.

Similar sites

F115XB015MO	**Sandy/Loamy Floodplain Forest** Sandy/Loamy Floodplain Forests have no similar sites.

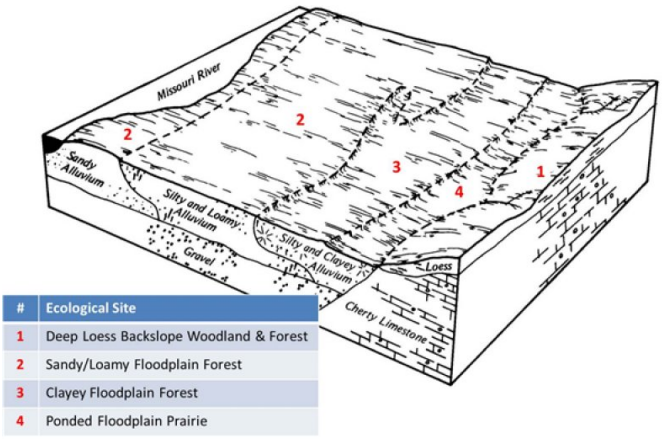
Table 1. Dominant plant species

Tree	(1) *Populus deltoides* (2) *Celtis occidentalis*
Shrub	(1) *Salix*
Herbaceous	(1) *Elymus*

Physiographic features

This site is on the Missouri and Mississippi River floodplains, with slopes of less than 2 percent. Most areas are adjacent or close to the current river channel. Areas not protected by levees are subject to frequent flooding.

The accompanying figure (adapted from Horn, 1992) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites of the Missouri River floodplain. This site is within the area labeled as “2” on the figure, and is typically adjacent to the current channel of the Missouri and Mississippi rivers. These sites are commonly adjacent to Clayey Floodplain sites (labeled “3”). The dashed lines within the Sandy/Loamy Floodplain Forest area indicate the various soils included in this ecological site.



#	Ecological Site
1	Deep Loess Backslope Woodland & Forest
2	Sandy/Loamy Floodplain Forest
3	Clayey Floodplain Forest
4	Ponded Floodplain Prairie

Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Flood plain

Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Slope	0–3%
Water table depth	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)	175 days
Freeze-free period (average)	197 days
Precipitation total (average)	1,118 mm

Climate stations used

- (1) BOONVILLE [USC00230817], Boonville, MO
- (2) ALTON MELVIN PRICE L&D [USC00110137], West Alton, IL
- (3) KASKASKIA RVR NAV LOCK [USC00114629], Ellis Grove, IL

Influencing water features

This ecological site is typically in natural levee positions directly adjacent to a perennial stream. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short- to medium- duration flooding is common in many areas, particularly during spring and early summer storm events. Constructed levees, often accompanied by stream channelization, have altered the hydrology and flooding dynamics in many places.

This site is in the RIVERINE wetlands class of the Hydrogeomorphic (HGM) classification system (Brinson, 1993). The stream hydrograph drives the inflows and outflows of RIVERINE wetlands. Water moves into floodplain wetlands as surface water during flood stage, or as groundwater exchange from the stream channel to the floodplain during high flow stages. As the flood stage recedes, surface and groundwater return to the channel. The direction of movement is horizontal. The direction is also bi-directional in the lateral axis across the floodplain, but is uni-directional on the longitudinal axis parallel to the valley as water flows downhill along the valley gradient.

Soil features

These soils are very deep and coarse-textured throughout, with moderate to low plant-available water capacity. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is alluvium. They have very fine sandy loam to fine sand surface layers, with calcareous subsurface layers that range from very fine sandy loam to sand. These soils are not affected by seasonal wetness. Soil series associated with this site include Blake, Buckney, Carr, Dozaville, Eudora, Grable, Haynie, Hodge, Kenmoor, Landes, Lowmo, Peers, Rocher, Sarpy, Treloar, and Ware.

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Loam (3) Silt loam
Family particle size	(1) Sandy
Drainage class	Moderately well drained to excessively drained
Permeability class	Slow to moderately rapid
Soil depth	183 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.54–15.24 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)	5.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

The Missouri and Mississippi rivers are a very dynamic system with frequent flooding and multiple braided channels shifting back and forth across the floodplain. Loamy, coarse loamy and sandy deposits of sediment were common, occurring along the floodplains with the sandy materials the youngest and most recently deposited substrate in this matrix. This ecological site is located on former streamside areas where frequent swift currents dumped the heavier sandy sediment load next to the river. It is normally surrounded by Loamy or Clayey Floodplain Forests on slightly lower areas.

Flooding of Sandy/Loamy Floodplain Forest occurred annually or at least once every 3 years. Sand bar succession to forest is dominated by flood tolerant, pioneer tree species such as willow and cottonwood. Young stands of these species tend to stabilize the riverfront floodplain and continue to accumulate coarse materials. Consequently, many Sandy/Loamy Floodplain Forests tend to be even aged. Young stands are often dense with a sparse understory and ground flora. As the forest matures, canopy gaps provide more light while more fine sediments accumulate on the forest floor, resulting in a dense ground flora of grasses and nettles.

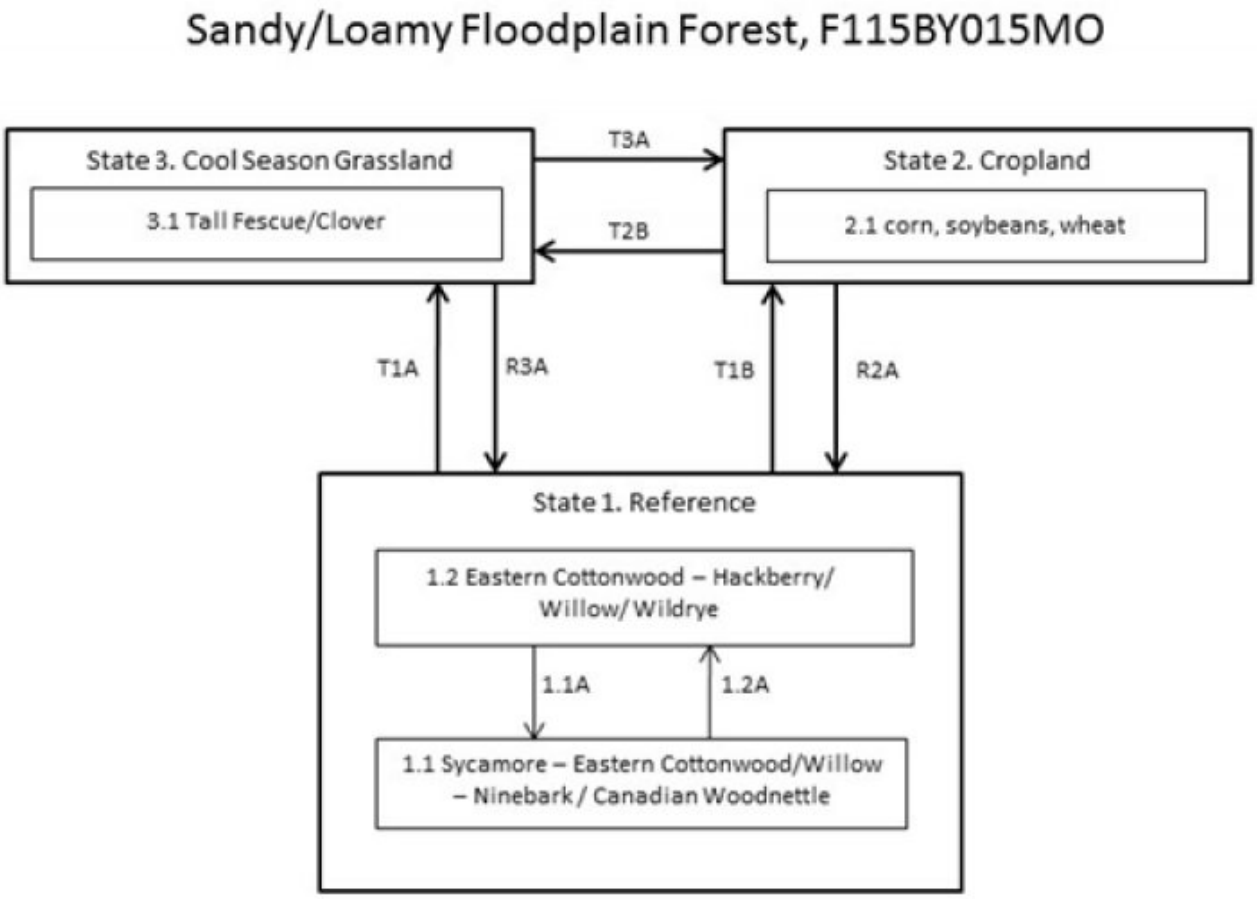
Over the long term, these sites become elevated and isolated and begin to accumulate even more fine sediments. Ultimately, shade tolerant elm, ash, and hackberry will accumulate in the understory and the forest may resemble a Loamy Floodplain Forest dominated by these species. However, catastrophic floods will often partially or completely knock down the early successional species and regenerate this ecological system. Consequently, this ecological site is often made up of a mosaic of early to late successional floodplain sandy and loamy forests.

Today many floodplains of these forests have been cleared and converted to agriculture, often right up to the bank. In such cases, severe flooding may cause stream bank erosion and complete loss of this ecological site.

Remaining remnants still exist along un-leveed areas, within levees and on islands. They often occur as a rather narrow band of trees and shrubs traversing the stream edge. These bands of forest play an important role as a source of food and shelter for migrating birds. In addition, isolated large sycamore and cottonwood trees that rise above the canopy are important nesting sites for bald eagles and herons. Re-establishment of these riparian forests is important for stream quality and health, as well as for migratory birds. Planting of early successional pioneer species on these sites has proven to be quite successful.

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	Event/Activity
T1A	Clearing; pasture planting; prescribed grazing; hayland management
T1B	Clearing; tillage; cropping system
T3A	Tillage; cropping system
T2B	Tillage; pasture planting; prescribed grazing; hayland management
R2A, R3A	Tree planting; long term succession (+50-70 years)
1.1A	Flooding disturbance;
1.2A	No flooding disturbance; sedimentation

Figure 7. State and transition diagram for this ecological s

State 1

Reference

Maximum tree age, historically, was probably about 100 to 150 years. A tall, uneven canopy of 80 to 100 feet tall, with occasional gaps and a closure of 80 to 100 percent is the dominant feature of this ecological site. However, patches of younger, early successional trees and shrubs occur mainly along the flood-prone edges or interior high-water channels of the mature forest. Willows are common in the younger patches and persist along the edges of the mature forest where there is more light. Younger patches tend to occur on recently deposited coarser materials, and have a sparse understory. They are characterized by a sparse to abundant ground cover of grasses and forbs. Shrubs can create a 100 percent cover in places, and tree seedlings of cottonwood are common. Frequent, high-velocity flood events deposit fresh alluvium in places, often derived from stream bank erosion of upstream sites in States 2 or 3. Other places are scoured by these flood events. As the stream meanders farther away from these sites, flooding events decrease in frequency and intensity, and the state will gradually change back into 1.1 phase community. Mature forest phases have a more stable surface with a dense ground flora of wild rye, spike grass and nettles. Dense tangles of vines can also occur, especially associated with canopy gaps. Red elm, green ash and hackberry also succeed into the canopy gaps.

Community 1.1
Eastern Cottonwood – Hackberry/ Willow/ Wildrye

This community phase is characterized by frequent flood events which impact on the canopy structure and species composition. Flood-tolerant species such as sycamore, eastern cottonwood, green ash and hackberry are common.

Forest overstory. The Overstory Species list is based on field surveys and commonly occurring species listed in Nelson (2010).

Forest understory. The Understory Species list is based on field surveys and commonly occurring species listed in Nelson (2010).

Community 1.2
Sycamore – Eastern Cottonwood/Willow – Ninebark / Canadian Woodnettle

Over the long term, this phase becomes elevated and isolated and begins to accumulate more fine sediments. Ultimately, shade tolerant elm, ash, and hackberry will accumulate in the understory and the forest may resemble a Loamy Floodplain Forest dominated by these species.

State 2
Cropland

Conversion of reference states to cropland that is planted to corn, soybeans, or wheat has been common, especially on the more loamy areas. Frequent flooding and scouring can make this cropland state difficult to maintain in a healthy, productive state.

Community 2.1
Corn, Soybeans, Wheat

This is a common phase that exists currently with intensive cropping of corn, soybeans, and wheat occurring. Some conversion to cool season grassland occurs for a limited period of time before transitioning back to cropland.

State 3
Cool Season Grassland

Conversion of reference states to planted, non-native pasture species such as tall fescue has been common. Frequent flooding and areas with lower available water capacity make non-native pastures difficult to maintain in a healthy, productive state on this ecological site.

Community 3.1
Tall Fescue/Clover

This phase is a 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).

Transition T1B
State 1 to 2

This transition is the result of poorly planned, high-grade timber harvest coupled with uncontrolled cattle access and grazing.

Transition T1A
State 1 to 3

This transition is the result of clearing the forest community and planting pasture species or crops.

Restoration pathway R2A
State 2 to 1

The Riverfront Forest can be restored if cattle are excluded from the forest, timber harvest is discontinued and timber stand improvement, including tree planting, is implemented.

Transition T2B
State 2 to 3

This transition is the result of clearing the forest community and planting pasture species or crops.

Restoration pathway R3A
State 3 to 1

The Early Seral Riverfront Forest can be restored if pasture management and grazing are terminated and tree planting is implemented.

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							
river birch	BENI	*Betula nigra*	Native	–	–	–	–
eastern cottonwood	PODE3	*Populus deltoides*	Native	–	–	–	–
green ash	FRPE	*Fraxinus pennsylvanica*	Native	–	–	–	–
black willow	SANI	*Salix nigra*	Native	–	–	–	–
American sycamore	PLOC	*Platanus occidentalis*	Native	–	–	–	–
American elm	ULAM	*Ulmus americana*	Native	–	–	–	–
boxelder	ACNE2	*Acer negundo*	Native	–	–	–	–
common hackberry	CEOC	*Celtis occidentalis*	Native	–	–	–	–
sugarberry	CELA	*Celtis laevigata*	Native	–	–	–	–
silver maple	ACSA2	*Acer saccharinum*	Native	–	–	–	–
red mulberry	MORU2	*Morus rubra*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	–
Muskingum sedge	CAMU9	*Carex muskingumensis*	Native	–	–
whitegrass	LEVI2	*Leersia virginica*	Native	–	–
hairy wildrye	ELVI	*Elymus villosus*	Native	–	–
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	–
scouringrush horsetail	EQHY	*Equisetum hyemale*	Native	–	–
Gray's sedge	CAGR5	*Carex grayi*	Native	–	–
Forb/Herb					
cutleaf coneflower	RULA3	*Rudbeckia laciniata*	Native	–	–
pale touch-me-not	IMPA	*Impatiens pallida*	Native	–	–
swamp smartweed	POHY2	*Polygonum hydropiperoides*	Native	–	–
stinging nettle	URDI	*Urtica dioica*	Native	–	–
calico aster	SYLAA	*Symphyotrichum lateriflorum var. angustifolium*	Native	–	–
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	–	–
blue mistflower	COCO13	*Conoclinium coelestinum*	Native	–	–
browneyed Susan	RUTR2	*Rudbeckia triloba*	Native	–	–
American bellflower	CAAM18	*Campanulastrum americanum*	Native	–	–
Canadian clearweed	PIPU2	*Pilea pumila*	Native	–	–
giant goldenrod	SOGI	*Solidago gigantea*	Native	–	–
lateflowering thoroughwort	EUSE2	*Eupatorium serotinum*	Native	–	–
Shrub/Subshrub					
common ninebark	PHOP	*Physocarpus opulifolius*	Native	–	–
silky dogwood	COOB9	*Cornus obliqua*	Native	–	–
roughleaf dogwood	CODR	*Cornus drummondii*	Native	–	–
Tree					
stiff dogwood	COFO	*Cornus foemina*	Native	–	–
peachleaf willow	SAAM2	*Salix amygdaloides*	Native	–	–
narrowleaf willow	SAEX	*Salix exigua*	Native	–	–
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	–
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	–	–
riverbank grape	VIRI	*Vitis riparia*	Native	–	–
frost grape	VIVU	*Vitis vulpina*	Native	–	–

Animal community

Wildlife (MDC 2006):

Tall emergent sycamores and cottonwoods along with an uneven canopy structure and canopy gaps are important for heron colonies, eagle nesting, Mississippi kites, cerulean warblers and other bird species and are important migratory songbird stopover sites.

Bird species associated with early-successional Floodplain Forests include: White-eyed Vireo, Yellow-breasted

Chat, Common Yellowthroat, Indigo Bunting, Gray Catbird, Willow Flycatcher, Orchard Oriole, and Brown Thrasher.

Birds associated with mid-successional Floodplain Forests include: American Redstart, Northern Parula, and Willow Flycatcher.

Birds associated with late-successional Floodplain Forests include: Great Blue Heron (colonies especially in large sycamores and cottonwoods), Bald Eagle, Belted Kingfisher, Red-shouldered Hawk, Northern Parula, Louisiana Waterthrush, Wood Duck, Hooded Merganser, and Swainson's Warbler (sites with giant cane or dense sapling/brambles in the understory).

Amphibian and reptile species associated with Floodplain Forest include: small-mouthed salamander, central newt, midland brown snake, gray tree frog, and southern leopard frog.

Other information

Forestry (NRCS 2002, 2014):

Management: Field collected site index values average 107 for eastern cottonwood. Soil fertility and available water capacity may be low to moderate. Timber management opportunities are fair to 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. Harvest methods that leave some mature trees to provide shade and soil protection may be desirable. Maintain adequate riparian buffer areas.

Limitations: Seasonal wetness from flooding; sandy profile. The sandy upper layer may hinder the use of wheeled equipment especially when the soil is saturated or very dry. Seedling mortality may occur because of lack of adequate soil moisture during dry periods.

Inventory data references

Sandy/Loamy Floodplain Forest – Potential Reference – F115BY015MO

Plot EABLCA01 – Haynie soil
Located in Eagle Bluffs CA, Boone County, MO
Latitude: 38.830437
Longitude: -92.43298

Plot EABLCA02 - Blake soil
Located in Eagle Bluffs CA, Boone County, MO
Latitude: 38.830852
Longitude: -92.433096

Plot JOISFW01 - Sarpy soil
Located in Johnson Island USFWS, St. Louis County, MO
Latitude: 38.688819
Longitude: -90.642424

Plot PEISCA01 – Sarpy soil
Located in Pelican Island CA, St. Louis County, MO
Latitude: 38.885887
Longitude: -90.328278

Plot PEISCA02 – Blake soil
Located in Pelican Island CA, St. Louis County, MO
Latitude: 38.885471
Longitude: -90.325794

Plot PORBEN01 – Sarpy soil

Located in Portland Bend, Private, Osage County, MO

Plot TAISFW01 – Haynie soil
Located in Tate Island USFWS, Callaway County, MO
Latitude: 38.70584
Longitude: -91.67928

Plot TAISFW02 - Blake soil
Located in Tate Island USFWS, Callaway County, MO
Latitude: 38.706681
Longitude: -91.678875

Plot TAISFW03 - Haynie soil
Located in Tate Island USFWS, Callaway County, MO
Latitude: 38.705496
Longitude: -91.662812

Plot TAISFW04 - Haynie soil
Located in Tate Island USFWS, Callaway County, MO
Latitude: 38.70512
Longitude: -91.65831

Plot TAISFW05 - Blake soil
Located in Tate Island USFWS, Callaway County, MO
Latitude: 38.704994
Longitude: -91.655339

Plot WARIPA01 - Haynie soil
Located in Washington Riverfront Park, Franklin County, MO
Latitude: 38.547571
Longitude: -90.974385

Other references

Brinson, M.M. 1993. A hydrogeomorphic classification for wetlands. Technical Report WRP-DE-4, U.S. Army Corps of Engineers, Engineer Waterways Experiment Station, Vicksburg, MS.

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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):**

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:**