USDA Natural Resources
Conservation Service

Ecological site F116BY029MO
Sandy/Gravelly Floodplain Forest

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Accessed: 04/26/2024

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): 116B–Springfield Plain

The Springfield Plain is in the western part of the Ozark Uplift. It is primarily a smooth plateau with some dissection along streams. Elevation is about 1,000 feet in the north to over 1,700 feet in the east along the Burlington Escarpment adjacent to the Ozark Highlands. The underlying bedrock is mainly Mississippian-aged limestone, with areas of shale on lower slopes and structural benches, and intermittent Pennsylvanian-aged sandstone deposits on the plateau surface.

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 (Missouri Department of Conservation, 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 Betula nigra - Platanus occidentalis Forest

(CEGL002086).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily within the following Land Type Association:
James River Oak Savanna/Woodland Low Hills
Shoal Creek Oak Savanna/Woodland Low Hills
Spring River Prairie/Savanna Dissected Plain
Upper Sac River Oak Savanna/Woodland Low Hills

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/Gravelly Floodplain Forests occur in floodplains throughout the central and southern Springfield Plain. Soils are very gravelly, and subject to flooding. The reference plant community is forest dominated by sycamore and eastern cottonwood.

Associated sites

F116BY003MO	**Chert Upland Woodland** Chert Upland Woodlands, and other upland ecological sites with high coarse fragment content, are upslope.
F116BY004MO	**Low-Base Chert Upland Woodland** Low-base Chert Upland Woodlands, and other upland ecological sites with high coarse fragment content, are upslope.
F116BY016MO	**Dry Footslope Woodland** Dry Footslope Woodlands and other terrace and footslope ecological sites are often adjacent in higher positions.

Similar sites

F116BY017MO	**Gravelly/Loamy Upland Drainageway Woodland** Gravelly Upland Drainageway Woodlands are on smaller drainageways with shorter duration flooding. Species composition is usually more diverse with more upland type of tree species.

Table 1. Dominant plant species

Tree	(1) *Platanus occidentalis* (2) *Populus deltoides*
Shrub	(1) *Salix interior*
Herbaceous	(1) *Laportea canadensis*

Physiographic features

This site is on low floodplains with slopes of 0 to 3 percent. This ecological site is generally on the lowest floodplain directly adjacent to the stream channel, but also occurs along abandoned channels farther from the active stream channel. The site receives some runoff from higher floodplains, stream terraces and uplands. This site is subject to frequent flooding.

The following figure (adapted from Aldrich and Meinert, 1994) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. The site is within the area labeled as “4” on the figure, on floodplains of watersheds dominated by Chert or Low-base Chert ecological sites. In many areas the Dry Footslope Woodland site, labeled “3”, is directly upslope.

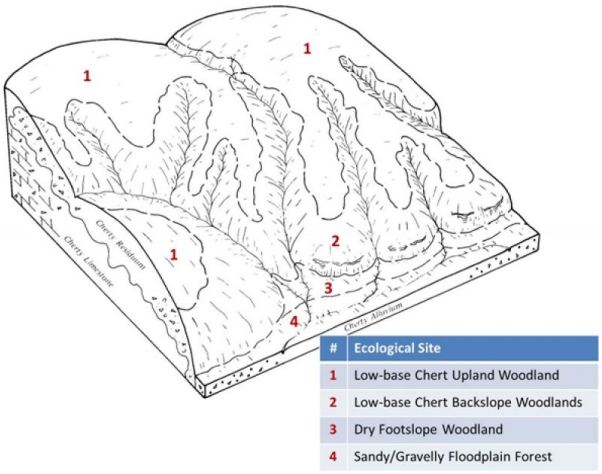


Figure 2. Landscape relationships for this ecological site.

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	60 in
Aspect	Aspect is not a significant factor

Climatic features

The Springfield Plain 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 Springfield Plain experiences few regional differences in climates. The average annual precipitation in this area is 41 to 45 inches. Snow falls nearly every winter, but the snow cover lasts for only a few days. The average annual temperature is about 55 to 58 degrees F. The lower temperatures occur at the higher elevations. Mean July maximum temperatures have a range of only one or two degrees across the area.
Mean annual precipitation varies along a west to east 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)	142-152 days
Freeze-free period (characteristic range)	181-188 days
Precipitation total (characteristic range)	46-47 in
Frost-free period (actual range)	141-160 days
Freeze-free period (actual range)	180-190 days
Precipitation total (actual range)	46-48 in
Frost-free period (average)	148 days
Freeze-free period (average)	185 days
Precipitation total (average)	47 in

Climate stations used

- (1) SPRINGFIELD [USW00013995], Springfield, MO
- (2) CASSVILLE RANGER STN [USC00231383], Cassville, MO
- (3) MT VERNON M U SW CTR [USC00235862], Mount Vernon, MO
- (4) NEOSHO [USC00235976], Neosho, MO

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. Streambeds are typically incised into the surrounding floodplain by as much as 10 feet.

Soil features

These soils have low plant-available water capacity, due to an abundance of coarse fragments. They were formed under forest vegetation, with periodic depositional flood events. Organic matter content is variable. Parent material is alluvium. They have sandy loam, loam or silt loam surface horizons that are gravelly to very gravelly in places, and sandy or loamy subsoils that are skeletal. They are not affected by seasonal wetness. Soil series associated with this site include Cedargap and Pinerun.

The accompanying picture of the Cedargap series shows the abundant gravel and cobble content that characterizes these skeletal soils. Scale is in feet. Picture courtesy of John Preston, NRCS.

Figure 9. Cedargap series

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Very gravelly sandy loam (2) Gravelly loam (3) Silt loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	72 in
Surface fragment cover <=3"	0–75%
Surface fragment cover >3"	0–2%
Available water capacity (0-40in)	2–5 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	20–75%
Subsurface fragment volume >3" (Depth not specified)	0–5%

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.

Flooding of Sandy/Gravelly Floodplain Forests typically occurs annually and at least once every three years. Cherty gravel and sandy sediments, originating from the predominance of cherty limestone and sandstone strata in the surrounding uplands, make up a significant portion of the alluvium in most Springfield Plain floodplains. These materials are normally deposited near the stream where fast-moving waters can carry and release them. Gravel bar succession to forest is dominated by flood tolerant, pioneer tree species such as sycamore, eastern cottonwood and willow. Young stands of these species stabilize the floodplain gravel bars, and continue to trap coarse-textured floodwater sediments.

Sandy/Gravelly 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, finer sediments accumulate on the forest floor, and a dense ground flora of grasses and nettles develops.

Over time, the local stream may down-cut into the floodplain or meander away from the site, thereby altering the flooding regime. The lower frequency of floods and slower floodwaters results in deposition of loamy sediments. Ultimately, shade tolerant elm, ash, and hackberry will accumulate in the understory and the forest may succeed to a Loamy Floodplain Forest ecological site dominated by these species. However, catastrophic floods will often partially or completely knock down the early successional species and regenerate the ecological site. Consequently, this site is typically a mosaic of early to late successional floodplain forest.

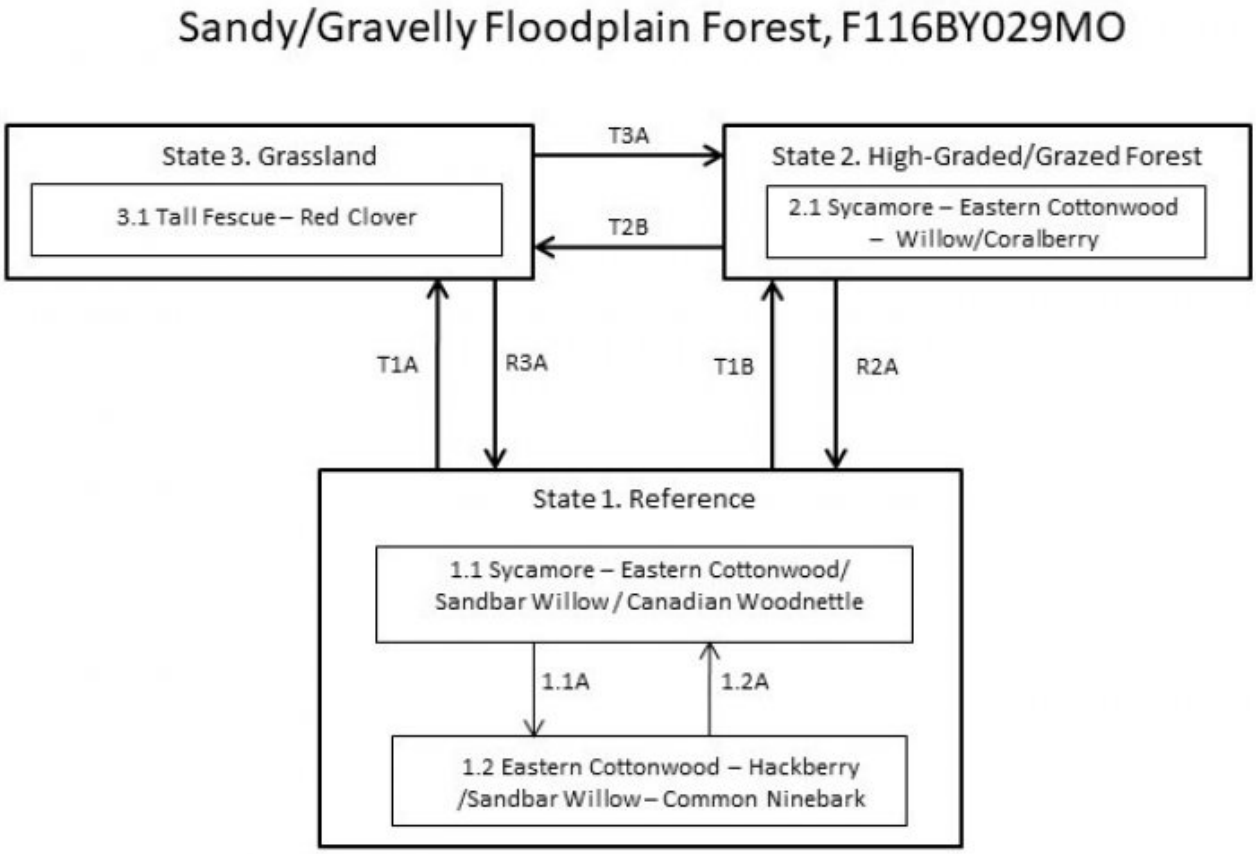
Today many Sandy/Gravelly Floodplain Forests in this region have been cleared and converted to agriculture and are often cleared right up to the bank. In such cases, severe flooding may cause stream bank erosion and complete loss of this ecological site. Grazing by domestic livestock in the remaining strips of forest, can also kill trees and remove the ground cover, resulting in de-stabilization and potential loss of this ecological site as well.

Remaining remnants still exist along many streams. 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, T2B	Clearing; grassland planting; prescribed grazing; grassland management
T1B	Poorly planned harvests (high grading); uncontrolled grazing
T3A	Uncontrolled grazing; woody invasion (20-40 years)
R2A	Grazing exclusion; access control; tree planting; forest stand improvement
R3A	Tree planting; long term succession (60-80 years)
1.1A	Flooding disturbance
1.2A	No flooding disturbance

Figure 10. State and Transition Model for this ecological site.

State 1

Reference

Sandy/Gravelly Floodplain Forests are dominated by mature sycamore and cottonwood. While these species can occur together, sycamores tend to dominate the smaller, higher energy streams with more gravel, while cottonwoods are more dominant on larger rivers with less gravel. 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 sands and gravels, and have a sparse understory. Mature forests have a more stable surface with a dense ground flora of wildrye and woodnettle. Dense tangles of vines can also occur, especially associated with canopy gaps. Slippery elm, green ash and hackberry also succeed into the canopy gaps.

Community 1.1
Sycamore – Eastern Cottonwood/Sandbar Willow/Canadian Woodnettle

Forest overstory. The Overstory Species list is based on field reconnaissance as well as commonly occurring species listed in Nelson 2010; names and symbols are from USDA PLANTS database.

Forest understory. The Understory Species list is based on field reconnaissance as well as commonly occurring species listed in Nelson 2010; names and symbols are from USDA PLANTS database.

Community 1.2
Eastern Cottonwood - Hackberry/Sandbar Willow - Common Ninebark

Pathway 1.1A
Community 1.1 to 1.2

Disturbance by frequent and high-velocity flooding will knock down trees and open bare soil to sunlight, allowing for tree seedling development and a community shift.

Pathway 1.2A
Community 1.2 to 1.1

Lack of high-velocity flood deposition and scour events, or other catastrophic events such as high winds and ice storms, for prolonged periods of 30 years or more, will allow the gradual shift to phase 1.1A.

State 2
High-Graded/Grazed Forest

Sandy/Gravelly Floodplain Forests subjected to repeated, high-graded timber harvests and domestic grazing transition to this state. This state exhibits an over-abundance of less desirable tree species, and weedy understory species such as buckbrush. The vegetation offers little nutritional value for cattle, and excessive stocking damages tree boles, degrades understory species composition, destabilizes stream banks and results in soil compaction and accelerated erosion and runoff during flood events. Restoration of the floodplain forest can be facilitated by exclusion of cattle coupled with tree planting.

Dominant resource concerns

- Ephemeral gully erosion
- Bank erosion from streams, shorelines, or water conveyance channels
- Nutrients transported to surface water
- Sediment transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates
- Aquatic habitat for fish and other organisms

Community 2.1
Sycamore – Eastern Cottonwood – Willow/Coralberry

This forest has been high-graded from occasional timber harvest. It has a two-tiered structure, with a 70 to 90 percent canopy closure. Canopy gaps from timber harvest allow for patches of dense shrubs and tree saplings. Grazing by domestic livestock can damage trees, remove the ground cover, and destabilize streambanks. The reference state can be restored with exclusion of grazing accompanied by tree planting and forest stand improvement.

State 3
Grassland

Conversion of Sandy/Gravelly Floodplain Forests to planted, non-native pasture species such as tall fescue has been common in the Ozark highlands. Frequent flooding and low available water capacity make non-native pastures difficult to maintain in a healthy, productive state on this ecological site.

Dominant resource concerns

- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

Community 3.1
Tall Fescue - Red Clover

This is an herbaceous community that is typically dominated by tall fescue. Various other grass and forb species are typically present, in various amounts. Shrub and pioneer tree species such as willow, sycamore and cottonwood typically invade sites that are not regularly managed.

Transition T1B
State 1 to 2

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

Transition T1A
State 1 to 3

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

Restoration pathway R2A
State 2 to 1

This site can be restored if cattle are excluded from the forest, timber harvesting is discontinued and forest 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 grassland species or annual crops.

Restoration pathway R3A
State 3 to 1

This site can be restored if grassland management and grazing are terminated and tree planting is implemented along with extended rotations and forest stand improvement.

Transition T3A
State 3 to 2

Uncontrolled grazing; woody invasion (20-40 years)

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
river birch	BENI	*Betula nigra*	Native	–	5–20	–	–
American sycamore	PLOC	*Platanus occidentalis*	Native	–	5–20	–	–
eastern cottonwood	PODE3	*Populus deltoides*	Native	–	5–20	–	–
black willow	SANI	*Salix nigra*	Native	–	5–20	–	–
American elm	ULAM	*Ulmus americana*	Native	–	5–20	–	–
common hackberry	CEOC	*Celtis occidentalis*	Native	–	5–20	–	–
silver maple	ACSA2	*Acer saccharinum*	Native	–	5–20	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
hairy wildrye	ELVI	*Elymus villosus*	Native	–	5–20
scouringrush horsetail	EQHY	*Equisetum hyemale*	Native	–	5–20
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	5–20
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	5–20
Forb/Herb					
American bellflower	CAAM18	*Campanulastrum americanum*	Native	–	5–20
blue mistflower	COCO13	*Conoclinium coelestinum*	Native	–	5–20
Canadian honewort	CRCA9	*Cryptotaenia canadensis*	Native	–	5–20
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	–	5–20
Canadian clearweed	PIPU2	*Pilea pumila*	Native	–	5–20
browneyed Susan	RUTR2	*Rudbeckia triloba*	Native	–	5–20
giant goldenrod	SOGI	*Solidago gigantea*	Native	–	5–20
stinging nettle	URDI	*Urtica dioica*	Native	–	5–20
white crownbeard	VEVI3	*Verbesina virginica*	Native	–	5–20
Shrub/Subshrub					
sandbar willow	SAIN3	*Salix interior*	Native	–	5–10
peachleaf willow	SAAM2	*Salix amygdaloides*	Native	–	5–10
stiff dogwood	COFO	*Cornus foemina*	Native	–	5–10
Tree					
boxelder	ACNE2	*Acer negundo*	Native	–	5–10
Ohio buckeye	AEGL	*Aesculus glabra*	Native	–	5–10
Vine/Liana					
heartleaf peppervine	AMCO2	*Ampelopsis cordata*	Native	–	5–20
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	5–20
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	–	5–20
riverbank grape	VIRI	*Vitis riparia*	Native	–	5–20
frost grape	VIVU	*Vitis vulpina*	Native	–	5–20

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 treefrog, and southern leopard frog.

Other information

Forestry (NRCS 2002; 2014)
Management: Field measured site index values average 90 for sycamore. Timber management opportunities are generally good. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. Maintain adequate riparian buffer areas.

Limitations: Wetness from flooding – short duration; coarse fragments in profile; disturbing the surface excessively in harvesting operations and building roads increases soil losses, which may leave a greater amount of coarse fragments on the surface. Tree planting is difficult during spring flooding periods. Mechanical tree planting may be limited due to coarse fragments on surface.

Inventory data references

Potential Reference Sites: Sandy/Gravelly Floodplain Forest

No quality reference sites are known to exist

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Contributors

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Approval

Nels Barrett, 10/07/2020

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	09/29/2020
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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

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5. **Number of gullies and erosion associated with gullies:**

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

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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:**
