USDA Natural Resources Conservation Service

Ecological site F116AY039MO
Loamy Floodplain Step Forest

Last updated: 9/24/2020
Accessed: 05/07/2024

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.

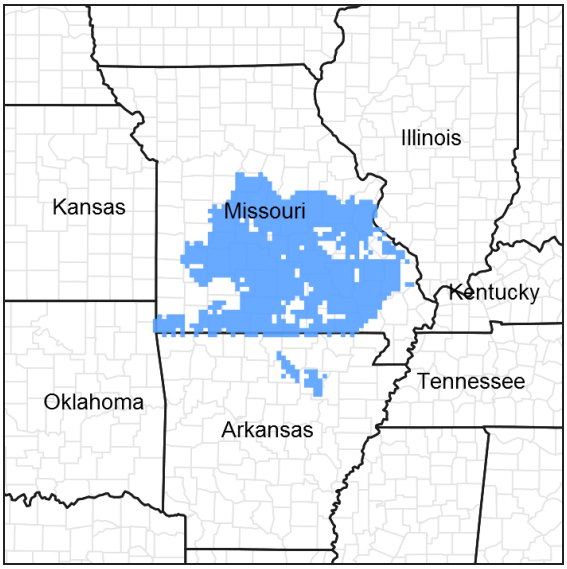


Figure 1. Mapped extent

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): 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 Mississipian 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 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 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”.

Loamy Floodplain Step Forests occur along most major streams throughout the Ozark Highland. 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, northern spicebush, Ohio buckeye and eastern leatherwood and a rich herbaceous ground flora.

Associated sites

F116AY011MO	**Chert Upland Woodland** Chert Upland Woodlands, and other upland and backslope ecological sites, are upslope.
F116AY034MO	**Loamy Terrace Forest** Loamy Terrace Forests are upslope.
F116AY035MO	**Wet Terrace Forest** Wet Terrace Forests are upslope.
F116AY042MO	**Sandy/Gravelly Floodplain Forest** Sandy/Gravelly Floodplain Forests and other floodplain ecological sites are downslope.

Similar sites

F116AY034MO	**Loamy Terrace Forest** Loamy Terrace Forests are upslope and experience less flooding.

Table 1. Dominant plant species

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

Physiographic features

This site is on high floodplains (floodplain steps), with slopes of 0 to 3 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 occasional flooding.

The following figure (adapted from Holbrook and Childress, 2006) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “5” on the figure. Loamy Floodplain Step Forest sites are typically below Terrace Forest sites, labeled “2” and “3”. The Floodplain Step Forest sites are slightly above the Floodplain Forest sites, which are adjacent to the active stream channel.

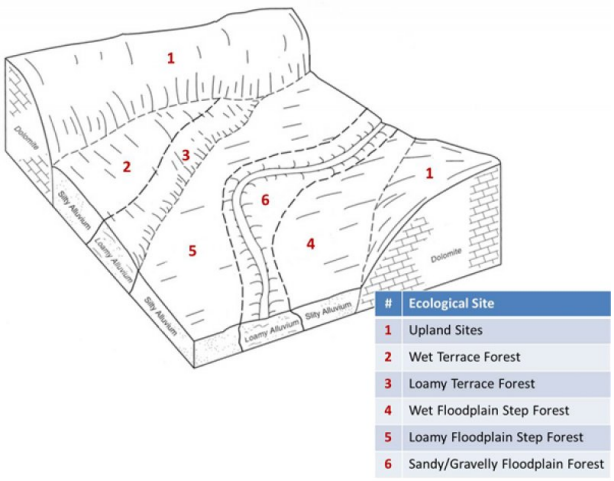


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Flood-plain step
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Slope	0–3%
Water table depth	69–152 cm
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)	148-157 days
Freeze-free period (characteristic range)	176-192 days
Precipitation total (characteristic range)	1,168-1,270 mm
Frost-free period (actual range)	141-163 days
Freeze-free period (actual range)	169-193 days
Precipitation total (actual range)	1,143-1,270 mm
Frost-free period (average)	153 days
Freeze-free period (average)	182 days
Precipitation total (average)	1,219 mm

Climate stations used

- (1) CALICO ROCK 2 WSW [USC00031132], Calico Rock, AR
- (2) DONIPHAN [USC00232289], Doniphan, MO
- (3) FREEDOM [USC00233043], Linn, MO
- (4) TAHLEQUAH [USC00348677], Tahlequah, OK
- (5) LICKING 4N [USC00234919], Licking, MO

Influencing water features

This ecological site is typically on high floodplains (floodplain steps). Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short- to medium- duration flooding is not uncommon 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 may be incised into the surrounding floodplain by as much as 10 feet may be a sign of an alternative state. In most areas the water table has a minimal effect on the vegetative community.

Soil features

These soils have no rooting restriction. They were formed under forest vegetation, with periodic depositional flood events. Organic matter content is variable. Parent material is alluvium. They have silt loam, sandy loam or loam surface horizons, and loamy subsoils lacking argillic horizons that may be skeletal with depth. They are not affected by seasonal wetness. Soil series associated with this site include Gladden, Haymond, Hontas, Huzzah, Jamesfin, Kaintuck, Possumtrot, Racket, Sturkie, and Woolly.

The accompanying picture of the Gladden series shows the brown loamy alluvium characteristic of these soils. Gravel content increases in the lower horizons of the Gladden soils. Scale is in inches. Photo credit, NRCS

Figure 9. Gladden series

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loam (2) Silt loam (3) Sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to somewhat excessively drained
Permeability class	Moderately slow to moderate
Soil depth	183 cm
Surface fragment cover <=3"	0–12%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–20.32 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)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–10%

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.

Historically, Loamy Floodplain Step Forests in the Ozarks were on relatively stable floodplain positions that flooded approximately once every 3 to 5 years. It is likely that the hydrology of these streams has altered since pre-settlement because of changes in land use. Current flooding is likely more frequent. Historically these forests were structurally and compositionally diverse, with occasional tree fall gaps caused by flooding and natural mortality providing opportunities for regeneration of overstory species. The understory was also complex, with multiple layers of shade-tolerant species such as pawpaw, northern spicebush, Ohio buckeye and eastern leatherwood. Grape vine, greenbriar, and trumpet creeper climb into canopy gaps, and a diverse array of ground flora species carpet the forest floor.

Today, existing forests are 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 coffeetree. However, mortality and gaps formed from flood damaged trees are likely more abundant than historically, and the presence of more flood-tolerant trees such as sycamore, eastern cottonwood, green ash and hackberry may be elevated.

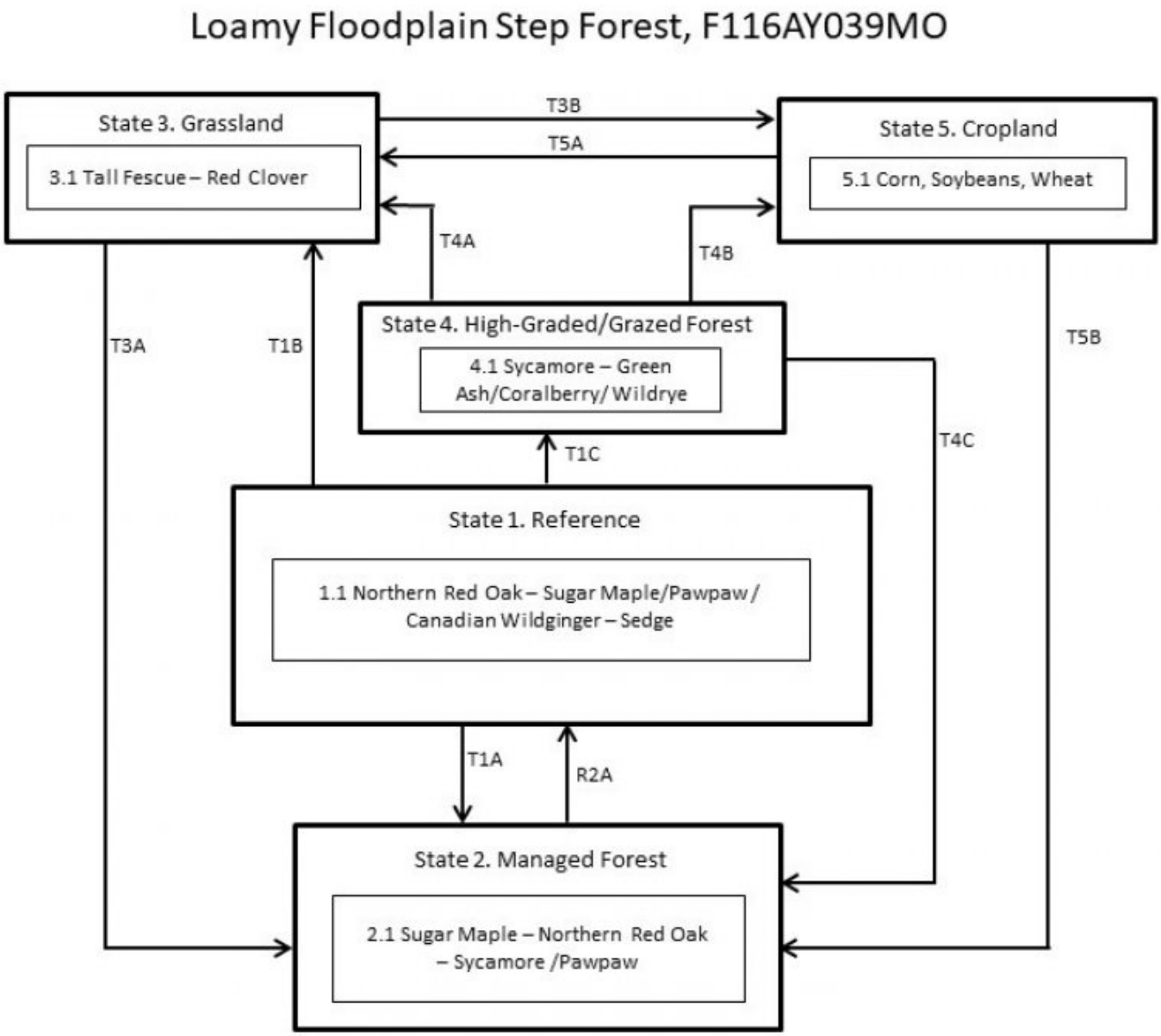
The productive Loamy Floodplain Step Forest sites have regularly been converted to pasture and occasionally, cropland. The remaining forests often occur as a narrow band traversing the riverfront forest or stream edge. These bands of forest play an important role as a source of food and shelter for migrating birds. In addition, they are very important for streambank stabilization, capturing sediment and mitigating scour during flood events.

Uncontrolled grazing by domestic livestock in the remaining strips of forest can kill trees and remove the ground cover, resulting in de-stabilization and degradation of this ecological site. Carefully planned timber harvest can be tolerated by this system, but high-grading of the timber will also degrade the system.

Re-establishment of these forests is important for stream quality and health, as well as for migratory birds. Planting of late-successional species on the appropriate landscape position and soils 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	Uneven-age timber management
T1B, T4A	Clearing; pasture planting; prescribed grazing
T5A	Pasture planting; prescribed grazing
T1C	Poorly planned harvest (high-grading); uncontrolled grazing
T3B	Tillage; conservation cropping system
T4B	Clearing ; tillage; conservation cropping system
T3A, T5B	Tree planting; long-term succession (+30-50 years); forest stand improvement; access control
T4C	Forest stand improvement; access control
R2A	Forest stand improvement; long term succession (+10-20 years)

Figure 10. Landscape relationships for this ecological site.

State 1

Reference

Historically, Loamy Floodplain Step Forests in the Ozarks were on relatively stable floodplain positions that flooded approximately once every 3-5 years. This state was dominated by a variety of mesic species such as sugar maple, northern red oak, and bitternut hickory. The understory was complex, with multiple layers of shade-tolerant species. A highly diverse ground flora was also present.

Dominant plant species

- northern red oak (*Quercus rubra*), tree
- sugar maple (*Acer saccharum*), tree
- pawpaw (*Asimina triloba*), shrub
- sedge (*Carex*), grass
- Canadian wildginger (*Asarum canadense*), other herbaceous

Community 1.1
Northern Red Oak – Sugar Maple/Pawpaw / Canadian Wildginger – Sedge

Forest overstory. Forest 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. Forest 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.

State 2
Managed Forest

Where this state remains, it has often been subjected to selective timber harvest; rarely are they managed with an even-aged timber management system. While these patches may closely resemble the reference state, the diversity of tree species has been selectively (removal of oak and walnut) altered. In addition, a change to more frequent, higher-intensity floods on the modern landscape likely creates more frequent canopy gaps, and introduces more flood-tolerant species such as sycamore, eastern cottonwood, green ash or hackberry. Limiting timber harvest may allow a return to the reference state where hydrologic regimes are least altered.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- northern red oak (*Quercus rubra*), tree
- American sycamore (*Platanus occidentalis*), tree
- pawpaw (*Asimina triloba*), shrub

Community 2.1
Sugar Maple – Northern Red Oak – Sycamore /Pawpaw

State 3
Grassland

This ecological site has been converted to non-native grasslands of tall fescue and red clover. This state frequently transitions to a cropland state especially when commodity prices are high. A return to a near-reference state from this state is not recommended. Transitioning to a Managed Forest state is possible through long-term commitments of time and money.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- red clover (*Trifolium pratense*), other herbaceous

Community 3.1
Tall Fescue/Red Clover

State 4
High Graded/ Grazed Forest

This state is subjected to uncontrolled grazing and high-graded timber harvests. The grazing will open up the understory and remove much of the diverse ground flora. This can lead to erosion of the topsoil during floods. Grazed units also often undergo timber harvest removing a wide variety of outstanding hardwood trees, further diminishing the structural and compositional diversity. A return to the near-reference state will require a long-term commitment including the elimination of grazing, planting of trees and perhaps shrub and herbaceous species, and very limited targeted timber harvests and thinning.

Dominant plant species

- American sycamore (*Platanus occidentalis*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- coralberry (*Symphoricarpos orbiculatus*), shrub
- wildrye (*Elymus*), grass

Community 4.1
Sycamore – Green Ash/Coralberry/ Wildrye

State 5
Cropland

Some areas of this ecological site have been converted to row crop agriculture. They often transition to a grassland state. A return to the near-reference state is not practical from this state. Transitioning to a Managed Forest state is possible through long-term commitments of time and money.

Dominant plant species

- wheat (*Triticum*), grass
- corn (*Zea mays*), grass
- soybean (*Glycine max*), other herbaceous

Community 5.1
Corn, Soybeans, Wheat

Transition T1A
State 1 to 2

This transition occurs when the natural flood regime of the area is altered. It also occurs during uneven-age timber management.

Transition T1B
State 1 to 3

This transition is where clearing and pasture planting has occurred.

Transition T1C
State 1 to 4

This transition occurs when there has been a poorly planned harvest and grazing within the area.

Transition T1D
State 1 to 5

This transition occurs when there has been clearing of the area for row crop management.

Restoration pathway R2A
State 2 to 1

Forest stand improvement; long term succession (+10-20 years)

Transition T3A
State 3 to 2

This transition occurs when there is fescue eradication, tree planting and weed control done in the area.

Transition T3B
State 3 to 5

This transition occurs when there has been clearing of the area for row crop management.

Transition T4C
State 4 to 2

This transition occurs when there is tree planting with long-term succession and uneven-age management.

Transition T4A
State 4 to 3

This transition is where clearing and pasture planting has occurred.

Transition T4B
State 4 to 5

This transition occurs when there has been clearing of the area for row crop management.

Transition T5B
State 5 to 2

This transition occurs when there is tree planting with long-term succession and uneven-age management.

Transition T5A
State 5 to 3

This transition is where clearing and pasture planting has occurred.

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							
American sycamore	PLOC	*Platanus occidentalis*	Native	–	–	–	–
bitternut hickory	CACO15	*Carya cordiformis*	Native	–	–	–	–
slippery elm	ULRU	*Ulmus rubra*	Native	–	–	–	–
bur oak	QUMA2	*Quercus macrocarpa*	Native	–	–	–	–
common hackberry	CEOC	*Celtis occidentalis*	Native	–	–	–	–
white ash	FRAM2	*Fraxinus americana*	Native	–	–	–	–
American elm	ULAM	*Ulmus americana*	Native	–	–	–	–
boxelder	ACNE2	*Acer negundo*	Native	–	–	–	–
sugarberry	CELA	*Celtis laevigata*	Native	–	–	–	–
Shumard's oak	QUSH	*Quercus shumardii*	Native	–	–	–	–
green ash	FRPE	*Fraxinus pennsylvanica*	Native	–	–	–	–
black walnut	JUNI	*Juglans nigra*	Native	–	–	–	–
Kentucky coffeetree	GYDI	*Gymnocladus dioicus*	Native	–	–	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	–	–	–
white oak	QUAL	*Quercus alba*	Native	–	–	–	–
red mulberry	MORU2	*Morus rubra*	Native	–	–	–	–
Ohio buckeye	AEGL	*Aesculus glabra*	Native	–	–	–	–
northern red oak	QURU	*Quercus 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	–	–
eastern woodland sedge	CABL	*Carex blanda*	Native	–	–
giant cane	ARGI	*Arundinaria gigantea*	Native	–	–
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	–
whitegrass	LEVI2	*Leersia virginica*	Native	–	–
James' sedge	CAJA2	*Carex jamesii*	Native	–	–
eastern star sedge	CARA8	*Carex radiata*	Native	–	–
woodland bluegrass	POSY	*Poa sylvestris*	Native	–	–
parasol sedge	CAUM4	*Carex umbellata*	Native	–	–
eastern woodland sedge	CABL	*Carex blanda*	Native	–	–
Bosc's panicgrass	DIBO2	*Dichanthelium boscii*	Native	–	–
Forb/Herb					
obovate beakgrain	DIOB3	*Diarrhena obovata*	Native	–	–
common blue violet	VISO	*Viola sororia*	Native	–	–
yellow passionflower	PALU2	*Passiflora lutea*	Native	–	–
cutleaf toothwort	CACO26	*Cardamine concatenata*	Native	–	–

common yellow oxalis	OXST	*Oxalis stricta*	Native	–	–
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	–
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	–	–
goldenseal	HYCA	*Hydrastis canadensis*	Native	–	–
jumpseed	POVI2	*Polygonum virginianum*	Native	–	–
wingstem	VEAL	*Verbesina alternifolia*	Native	–	–
striped cream violet	VIST3	*Viola striata*	Native	–	–
pinnate prairie coneflower	RAPI	*Ratibida pinnata*	Native	–	–
cutleaf coneflower	RULA3	*Rudbeckia laciniata*	Native	–	–
Canadian clearweed	PIPU2	*Pilea pumila*	Native	–	–
bottomland aster	SYON2	*Symphyotrichum ontarionis*	Native	–	–
wild blue phlox	PHDI5	*Phlox divaricata*	Native	–	–
eastern false rue anemone	ENBI	*Enemion biternatum*	Native	–	–
Canadian honewort	CRCA9	*Cryptotaenia canadensis*	Native	–	–
early meadow-rue	THDI	*Thalictrum dioicum*	Native	–	–
white avens	GECA7	*Geum canadense*	Native	–	–
eastern waterleaf	HYVI	*Hydrophyllum virginianum*	Native	–	–
lateflowering thoroughwort	EUSE2	*Eupatorium serotinum*	Native	–	–
biannual lettuce	LALU	*Lactuca ludoviciana*	Native	–	–
Canadian wildginger	ASCA	*Asarum canadense*	Native	–	–
Shrub/Subshrub					
pawpaw	ASTR	*Asimina triloba*	Native	–	–
northern spicebush	LIBE3	*Lindera benzoin*	Native	–	–
eastern leatherwood	DIPA9	*Dirca palustris*	Native	–	–
American black elderberry	SANIC4	*Sambucus nigra ssp. canadensis*	Native	–	–
Carolina buckthorn	FRCA13	*Frangula caroliniana*	Native	–	–
Tree					
American hornbeam	CACA18	*Carpinus caroliniana*	Native	–	–
Ohio buckeye	AEGL	*Aesculus glabra*	Native	–	–
common persimmon	DIVI5	*Diospyros virginiana*	Native	–	–
flowering dogwood	COFL2	*Cornus florida*	Native	–	–
Vine/Liana					
saw greenbrier	SMBO2	*Smilax bona-nox*	Native	–	–
grape	VITIS	*Vitis*	Native	–	–

Animal community

Wildlife (MDC 2006):

Wild turkey, white-tailed deer, and eastern gray squirrel depend on hard and soft mast food sources and are typical upland game species of this type.

Birds associated with mid-successional stages include Whip-poor-will and Wood Thrush while birds associated with late-successional stages include Worm-eating warbler, Whip-poor-will, Great Crested Flycatcher, Ovenbird, Pileated Woodpecker, Wood Thrush, Red-eyed Vireo, Northern Parula, Louisiana Waterthrush (near streams), and Broad-winged Hawk.

Reptile and amphibian species associated with mature forests include: ringed salamander, spotted salamander, marbled salamander, central newt, long-tailed salamander, dark-sided salamander, southern red-backed salamander, three-toed box turtle, western worm snake, western earth snake, and American toad.

Other information

Forestry (NRCS 2002, 2015):

Management: Site index values range from 70 for oak to 105 for sycamore. Timber management opportunities are good to excellent. 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 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: Wetness from flooding – short duration and/or high water table; 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 is difficult during spring flooding periods. Seedling mortality may be high due to excess wetness. Ridging the soil and planting on the ridges may increase survival.

Inventory data references

Potential Reference Sites: Loamy Floodplain Step Forest

Plot ELPOFS03 - Racket soil
Located in Eleven Point Area, MTNF, USFS, Oregon County, MO
Latitude: 36.701491
Longitude: -91.200254

Plot ELPOFS04 - Sturkie soil
Located in Eleven Point Area, MTNF, USFS, Oregon County, MO
Latitude: 36.698865
Longitude: -91.198174

Plot ELPOFS07 - Possumtrot soil
Located in Eleven Point Area, MTNF, USFS, Oregon County, MO
Latitude: 36.65377
Longitude: -91.184939

Plot HAMMCA_KS01 - Kaintuck soil
Located in Bradley A. Hammer CA, Wayne County, MO
Latitude: 36.962979
Longitude: -90.564741

Plot SHNAMB03 – Possumtrot soil
Located in Shaw Nature Reserve, MOBOT, Franklin County, MO
Latitude: 38.461561
Longitude: -90.813753

Plot SHNAMB04 – Kaintuck soil
Located in Shaw Nature Reserve, MOBOT, Franklin County, MO
Latitude: 38.455193
Longitude: -90.820495

Plot CURINP06 - Possumtrot soil
Located in Current River Area, Ozark National Scenic Riverways, NPS, Carter County, MO
Latitude: 37.087539
Longitude: -91.063635

Plot WOWOCA01 - Racket soil
Located in Woodson K. Woods CA, Phelps and Crawford Counties, MO
Latitude: 37.967013
Longitude: -91.521568

Other references

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Approval

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Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support during this project.

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	05/07/2024
Approved by	Nels Barrett
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:**