USDA Natural Resources
Conservation Service

Ecological site F115XB025MO
Wet Terrace Forest

Accessed: 05/22/2024

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 Wet-Mesic Bottomland Forest.

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

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Quercus macrocarpa – Quercus shumardii – Carya cordiformis / Chasmanthium latifolium Forest (CEGL004544).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily in Land Type Associations of the following Subsections:
Claypan Till Plains
Inner Ozark Border
Outer Ozark Border
Mississippi River 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”.

Wet Terrace Forests (green areas on the map) are widely scattered on secondary stream terraces throughout the MLRA and in adjacent areas. Soils are very deep with loamy to clayey subsoils, have a high water table in the Spring months, and are subject to flooding. The reference plant community is forest with an overstory dominated by a variety of trees including bur oak, Shumard oak, swamp white oak, American elm, and black cherry, an understory dominated by blue beech, spicebush, and Ohio buckeye, and a rich herbaceous ground flora.

Associated sites

F115XB031MO	**Loamy Floodplain Forest** Loamy Floodplain Forests are typically adjacent to but on lower positions than wet terrace ecological sites

Similar sites

F115XB023MO	**Wet Footslope Forest** Wet Footslope Forests have similar species composition but are on higher landscape positions.

Table 1. Dominant plant species

Tree	(1) *Quercus macrocarpa* (2) *Quercus shumardii*
Shrub	(1) *Ilex decidua*
Herbaceous	(1) *Chasmanthium latifolium*

Physiographic features

This site is on low stream terraces and high floodplains (floodplain steps), with slopes of 0 to 9 percent. The site generates some runoff to adjacent lower floodplain sites, and receives some runoff from higher stream terraces and uplands. This site is subject to rare to occasional flooding. Scour is uncommon in these flood events, and deposition is minimal, so ecological processes more closely resemble those of stream terrace systems.

The accompanying figure (adapted from Skaer, 2004) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the floodplain and stream terrace systems of major tributaries of the Missouri and Mississippi rivers. This site is within the area labeled as “3” on the figure, and is typically adjacent to but on higher positions than floodplain ecological sites such as the Loamy Floodplain Forest (labeled “5” on the figure).

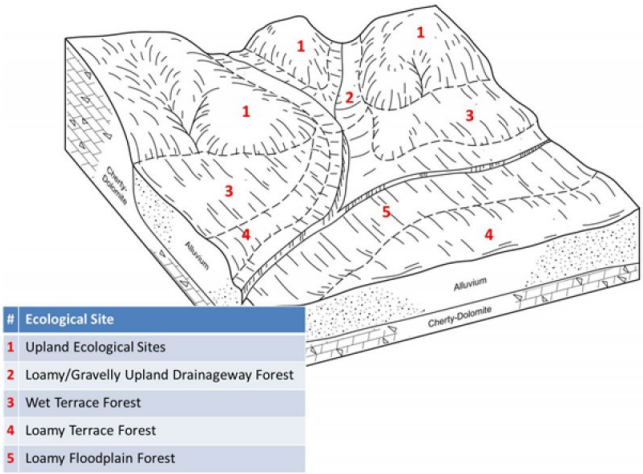


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Flood-plain step

Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Slope	0–9%
Water table depth	15–46 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)	173 days
Freeze-free period (average)	195 days
Precipitation total (average)	1,143 mm

Climate stations used

- (1) CAHOKIA [USC00111160], East Saint Louis, IL
- (2) PERRYVILLE WTP [USC00236641], Perryville, MO
- (3) UNION [USC00238515], Union, MO
- (4) MOBERLY [USC00235671], Moberly, MO
- (5) JEFFERSON CITY WTP [USC00234271], Jefferson City, MO
- (6) NEW FRANKLIN 1W [USC00236012], Franklin, MO

Influencing water features

This ecological site is on stream terraces and floodplain steps of perennial streams. They are not adjacent to the current stream channel. Areas are subject to flooding, typically of short duration and low intensity and is influenced by a seasonal high water table from high groundwater levels. The water table is typically near the surface in late fall through spring, receding in the summer.

Runoff is generated to adjacent lower floodplain sites, and some runoff is received from higher stream terraces and uplands. This site is in the RIVERINE wetlands class of the Hydrogeomorphic (HGM) classification system (Brinson, 1993), and are Forested Palustrine wetlands (Cowardin et al., 1979).

Soil features

These soils have no rooting restriction. They were formed under a mixture of herbaceous wetland and woodland vegetation. Organic matter content is variable. Parent material is alluvium. They have silt loam surface horizons, and loamy or clayey subsoils with argillic horizons. They are affected by a seasonal high water table during the spring months. Soil series associated with this site include Auxvasse, Coland, Colp, Deible, Dunning, Freeburg, Hurst, Moniteau, Raccoon, and Twomile.

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

Figure 7. Deible series

Table 4. Representative soil features

Surface texture	(1) Silt loam
Family particle size	(1) Loamy

Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Very slow to slow
Soil depth	183 cm
Surface fragment cover <=3"	0%
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%
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.

Wet Terrace Forests are on relatively stable former floodplain positions. The reference plant community is dominated by a wide variety of deciduous hardwood tree species, tolerant of seasonally wet conditions including bur oak, Shumard oak, swamp white oak, American elm, black cherry. Trees are generally large and tall forming a dense, closed canopy.

These forests are structurally and compositionally diverse, with occasional tree-fall gaps and natural mortality providing opportunities for regeneration of overstory species. The understory is also complex, with multiple layers of shade tolerant species such as blue beech, spicebush, and Ohio buckeye. Grape vines, greenbriar, and trumpet creeper are also present along with a diverse array of ground flora species that carpets the forest floor.

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

Uncontrolled grazing by domestic livestock in these remaining areas of forest damages and kills smaller trees and removes the ground cover. Carefully planned timber harvests can be tolerated on these sites, but high grading of the timber will ultimately degrade the sites.

Re-establishment of these terrace forests is important for stream quality and stream health, and as critical habitat for migratory birds. Planting of later successional species on the appropriate landscape position and soils has proven to be an effective means for restoration.

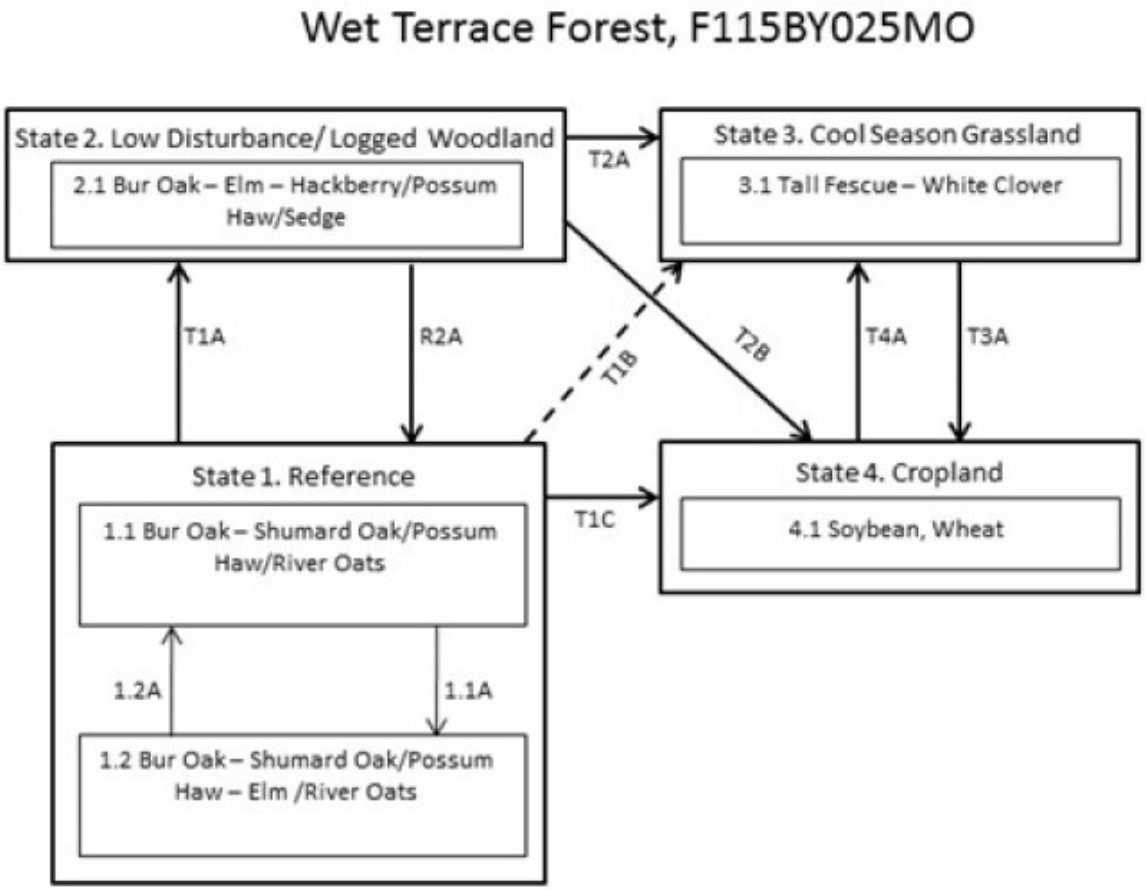
Prescribed fire can play a beneficial but limited role in the management of this ecological site. The higher

productivity of these sites makes it more challenging than on other forest and woodland sites in the region. Control of woody species will be more difficult. Terrace forests did evolve with some fire, but their composition often reflects more closed, forested conditions, with fewer woodland ground flora species that can respond to fire. Consequently, while having these sites in a burn unit is acceptable, targeting them solely for restoration is not advisable.

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.

Ecological Site Correlation Issues and Questions: The Illinois NRCS state office staff has requested the Illinois map units that are unique to Illinois (e.g. Colp) have further field investigation. This would include this ecological site, F115BY025MO.

State and transition model



Code	Event/Activity/Process
T1A	Lack of disturbance events >20 years; repeated timber harvests
T3A	Tillage; conservation cropping system
T1B,T2A	Woody removal; tillage; vegetative seeding; grassland management
T1C, T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding ; grassland management
1.1A	Lack of disturbance events 10+ years
1.2A	Disturbance events 2-5 years
R2A	Forest stand improvement;

Figure 8. State and transition diagram for this ecological s

State 1

Reference

The historical reference state for this ecological site was old growth oak forest. The forest was dominated by a wide variety of deciduous hardwood tree species, tolerant of seasonally wet conditions. Maximum tree age was likely 150 to 300 years. Periodic disturbances from flooding, fire, wind or ice as well as grazing by native large herbivores maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species. Two community phases are recognized in the reference state, with shifts between phases based on disturbance frequency. Reference states are very rare today. Fire suppression and altered drainage have resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Most reference states are currently altered because of timber harvesting, clearing and conversion to grassland or cropland.

Community 1.1
Bur Oak – Shumard Oak/Possum Haw/River Oats

Figure 9. Reference phase - Loamy Terrace Forest at Shaw Nature Reserve, Gray Summit, Missouri; photo credit MDC

This phase is dominated by a wide variety of old growth deciduous hardwood tree species, tolerant of seasonally wet conditions including bur oak, Shumard oak, swamp white oak, American elm, black cherry. Trees are generally large and tall forming a dense, closed canopy.

Forest overstory. Forest Overstory Composition list is based on Nelson (2010) and field surveys.

Forest understory. Forest Understory Composition list is based on Nelson (2010) and field surveys.

Community 1.2
Bur Oak – Shumard Oak/Possum Haw – Elm /River Oats

This phase is similar to phase 1.1 but with lower disturbance frequencies creating a mid-story layer of elm and shellbark hickory.

State 2
Low Disturbance/ Logged Forest

Composition is altered from the reference state depending on tree selection during harvest. This state will slowly increase in more shade tolerant species and swamp white oak and bur oak will become less dominant. Without periodic canopy disturbance, stem density and fire intolerant species, like hackberry, will increase in abundance. Some periodic grazing may be occurring.

Community 2.1
Bur Oak – Elm – Hackberry/Possum Haw/Sedge

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

State 3
Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue, orchard grass, and white clover has been common. Occasionally, these pastures will have scattered oaks. Long term uncontrolled grazing can cause significant soil erosion and compaction. A return to the reference state may be impossible, requiring a very long term series of management options and transitions.

Community 3.1
Tall Fescue – White Clover

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

State 4
Cropland

This is a state that exists currently with intensive cropping of soybeans and wheat. Some conversion to cool season hay land occurs, but when commodity prices are high, these states transition back to cropland.

Community 4.1
Soybean, Wheat

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

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
northern red oak	QURU	*Quercus rubra*	Native	–	–	–	–
green ash	FRPE	*Fraxinus pennsylvanica*	Native	–	–	–	–
pin oak	QUPA2	*Quercus palustris*	Native	–	–	–	–
slippery elm	ULRU	*Ulmus rubra*	Native	–	–	–	–
common hackberry	CEOC	*Celtis occidentalis*	Native	–	–	–	–
American sycamore	PLOC	*Platanus occidentalis*	Native	–	–	–	–
swamp white oak	QUBI	*Quercus bicolor*	Native	–	–	–	–
bur oak	QUMA2	*Quercus macrocarpa*	Native	–	–	–	–
Shumard's oak	QUSH	*Quercus shumardii*	Native	–	–	–	–
bitternut hickory	CACO15	*Carya cordiformis*	Native	–	–	–	–
pecan	CAIL2	*Carya illinoinensis*	Native	–	–	–	–
shellbark hickory	CALA21	*Carya laciniosa*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	–
hop sedge	CALU4	*Carex lupulina*	Native	–	–
Muskingum sedge	CAMU9	*Carex muskingumensis*	Native	–	–
sweet woodreed	CIAR2	*Cinna arundinacea*	Native	–	–
hop sedge	CALU4	*Carex lupulina*	Native	–	–
Forb/Herb					
broadleaf enchanter's nightshade	CILU	*Circaea lutetiana*	Native	–	–
pale touch-me-not	IMPA	*Impatiens pallida*	Native	–	–
foxglove beardtongue	PEDI	*Penstemon digitalis*	Native	–	–
Canadian clearweed	PIPU2	*Pilea pumila*	Native	–	–
limestone wild petunia	RUST2	*Ruellia strepens*	Native	–	–
calico aster	SYLAA	*Symphyotrichum lateriflorum var. angustifolium*	Native	–	–
wingstem	VEAL	*Verbesina alternifolia*	Native	–	–
smallspike false nettle	BOCY	*Boehmeria cylindrica*	Native	–	–
jewelweed	IMCA	*Impatiens capensis*	Native	–	–
clustered blacksnakeroot	SAOD	*Sanicula odorata*	Native	–	–
veiny skullcap	SCNE2	*Scutellaria nervosa*	Native	–	–
bristly buttercup	RAHI	*Ranunculus hispidus*	Native	–	–
cutleaf coneflower	RULA3	*Rudbeckia laciniata*	Native	–	–
Fern/fern ally					
lowland bladderfern	CYPR4	*Cystopteris protrusa*	Native	–	–
Shrub/Subshrub					
possumhaw	ILDE	*Ilex decidua*	Native	–	–
northern spicebush	LIBE3	*Lindera benzoin*	Native	–	–
Tree					
American hornbeam	CACA18	*Carpinus caroliniana*	Native	–	–
Ohio buckeye	AEGL	*Aesculus glabra*	Native	–	–
Vine/Liana					
heartleaf peppervine	AMCO2	*Ampelopsis cordata*	Native	–	–
catbird grape	VIPA7	*Vitis palmata*	Native	–	–
riverbank grape	VIRI	*Vitis riparia*	Native	–	–

Animal community

Wildlife (MDC 2006):

Moist conditions with abundant coarse woody debris make this type of ecological site important for many herptiles. Ephemeral pools provide important amphibian breeding habitat.

Periodic inundation and acorns provide important habitat and food for migrating ducks (especially mallards) and breeding ducks including wood ducks and hooded mergansers.

Tall emergent trees along with an uneven canopy structure and canopy gaps are important for heron colonies, eagle nesting, Mississippi kites, cerulean warblers and other bird species.

Birds associated with late-successional to mature forests are Wood Duck, Hooded Merganser, Barred Owl, Cerulean Warbler, Yellow-throated Warbler, Prothonotary Warbler, Pileated Woodpecker, Yellow-throated Vireo, Brown Creeper, and Yellow-crowned Night Heron.

Reptiles and amphibians associated with ecological site include: small-mouthed salamander, central newt, midland brown snake, gray treefrog, northern spring peeper, Blanchard's cricket frog, southern leopard frog, western painted turtle, and red-eared slider.

Other information

Forestry (NRCS 2002, 2014):

Management: Field collected site index values average 75 for pin oak and 68 for green ash. On the wettest sites, timber management opportunities may be limited. Management of these groups is often difficult because of the great variation in species, age, stocking levels and seasonal wetness. Use seed-tree, group selection, or clear cutting regeneration methods. Harvest favoring reproduction of the less-shade tolerant species such as bur and Shumard oaks, sycamore, and cottonwood. Maintain adequate riparian buffer areas.

Limitations: Wetness from flooding; high water table. Use of equipment may be restricted in spring and other excessively wet periods. Restrict activities to dry periods or surfaced areas. Equipment use when wet may compact soil and damage tree roots. Unsurfaced roads and traffic areas tend to be slippery and form ruts easily. Access to forests is easiest during periods in late summer or winter when soils are frozen or dry. Planting is extremely difficult during spring periods. Seedling mortality may be high due to excess wetness. Unsurfaced roads and skid trails may be impassable during rainy periods.

Inventory data references

Wet Terrace Forest – Potential Reference – F115BY025MO

Plot DIGGCA01 - Moniteau soil
Located in Marshall Diggs CA, Audrain County, MO
Latitude: 39.07874
Longitude: -91.63387

Plot GRCASP_KS01 - Dunning soil
Located in Graham Cave State Park, Montgomery County, MO
Latitude: 38.904991
Longitude: -91.573187

Plot MOCRCA02 – Moniteau soil
Located in Moniteau Creek CA, Howard County, MO
Latitude: 39.106507
Longitude: -92.571108

Plot YOUNCA03 - Freeburg soil
Located in Young CA, Jefferson County, MO
Latitude: 38.434998
Longitude: -90.67406

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:**

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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:**
