USDA Natural Resources
Conservation Service

Ecological site F116BY014MO
Wet Terrace Woodland

Last updated: 10/06/2020
Accessed: 05/18/2024

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 Wet-Mesic Bottomland Woodland.

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

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to 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 within the following Land Type Associations:
Little Sac River Oak Savanna/Woodland Low Hills
Lockwood Smooth Prairie Plain
James 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”.

Wet Terrace Woodlands occur on stream terraces in Jasper and Greene counties. They are not extensive. Soils are very deep and loamy, with a high water table in the Spring months. The reference plant community is woodland dominated by a variety of trees, including bur oak, shellbark hickory, swamp white oak, and sycamore.

Associated sites

F116BY002MO	**Loamy Floodplain Forest** Loamy Floodplain Forests and other floodplain ecological sites are downslope.
F116BY006MO	**Chert Limestone Upland Woodland** Chert Limestone Upland Woodlands and other upland ecological sites are upslope.
F116BY015MO	**Loamy Terrace Woodland** Loamy Terrace Woodlands are often adjacent, where soils are well drained.

Similar sites

F116BY015MO	**Loamy Terrace Woodland** Loamy Terrace Woodlands are often adjacent, but soils are better drained. Species composition reflects drier site conditions.

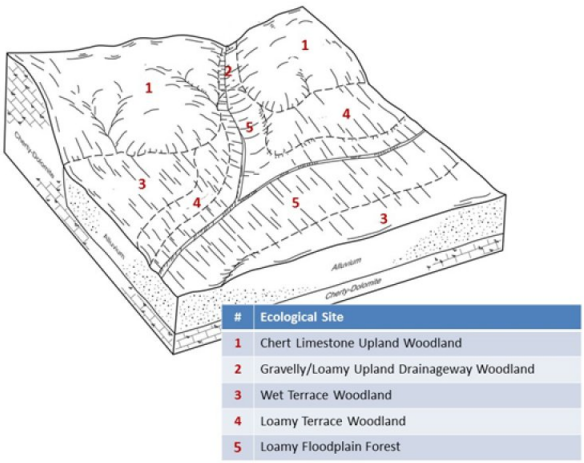
Table 1. Dominant plant species

Tree	(1) *Quercus macrocarpa* (2) *Quercus bicolor*
Shrub	(1) *Ilex decidua*
Herbaceous	(1) *Carex*

Physiographic features

This site is on stream terraces with slopes of 1 to 8 percent. Some areas are on footslopes. The site receives runoff from adjacent upland sites. Some areas are subject to early-spring flooding, but these flood events do not have a major impact on ecological processes, which most closely resemble those of stream terrace systems.

The following figure (adapted from Kichler & Henderson, 1999) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. This site is within the area labeled “3”, and is typically on stream terraces above the level of the active floodplain, labeled “5”, and adjacent to the uplands, labeled “1”. Footslopes are also included in the ecological site, and are often closely associated with stream terrace positions. In some areas a high floodplain or “step” is present, directly below the Wet Terrace site, labeled on the figure as “4”.



#	Ecological Site
1	Chert Limestone Upland Woodland
2	Gravelly/Loamy Upland Drainageway Woodland
3	Wet Terrace Woodland
4	Loamy Terrace Woodland
5	Loamy Floodplain Forest

Figure 2. Landscape relationships for this ecological site

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Flood-plain step
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Slope	1–8%
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)	150-162 days
Freeze-free period (characteristic range)	184-194 days
Precipitation total (characteristic range)	1,143-1,168 mm
Frost-free period (actual range)	145-162 days
Freeze-free period (actual range)	181-196 days
Precipitation total (actual range)	1,143-1,168 mm
Frost-free period (average)	155 days
Freeze-free period (average)	189 days
Precipitation total (average)	1,168 mm

Climate stations used

- (1) CARTHAGE [USC00231356], Carthage, MO
- (2) MT VERNON M U SW CTR [USC00235862], Mount Vernon, MO
- (3) SPRINGFIELD [USW00013995], Springfield, MO

Influencing water features

This ecological site 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.

This ecological site is on stream terraces and floodplain steps of perennial streams. They are not adjacent to the current stream channel. Areas on floodplain steps are subject to flooding, typically of short duration and low intensity. Constructed levees, often accompanied by stream channelization, have altered the flooding dynamics in many places.

These sites are 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. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is alluvium. They have silt loam surface horizons, and loamy subsoils. They are affected by a seasonal high water table during the spring months. Soil series associated with this site include Higdon and McCune.

The accompanying picture of the McCune series shows a thin silt loam surface horizon over a light-colored leached layer called an albic horizon. Below two feet in the picture is the grayish brown silty clay loam subsoil. Picture from Peer (2004).

Figure 9. McCune series

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained
Permeability class	Slow
Soil depth	183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	17.78–20.32 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)	4.5–6.5
Subsurface fragment volume <=3" (Depth not specified)	0–12%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

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 Woodlands in the Springfield Plain are on low footslopes and relatively stable former floodplain

positions that rarely flood. They often are in a complex at the same level with Loamy Terrace Woodlands. Woodlands are distinguished from forest, by their relatively open understory, and the presence of sun-loving ground flora species. Characteristic plants in the ground flora can be used to gauge the restoration potential of a stand along with remnant open-grown old-age trees, and tree height growth.

The reference plant community is dominated by a wide variety of deciduous hardwood tree species, tolerant of seasonally wet conditions including bur oak, shellbark hickory, swamp white oak, and sycamore. Trees are generally large and tall forming an open canopy.

Both historically and today, these woodlands are structurally and compositionally diverse, with occasional tree fall gaps and natural mortality providing opportunities for regeneration of overstory species. In addition, fire played a key role in keeping the canopy and understory open, with a dense ground flora of wet tolerant grasses, sedges and asters.

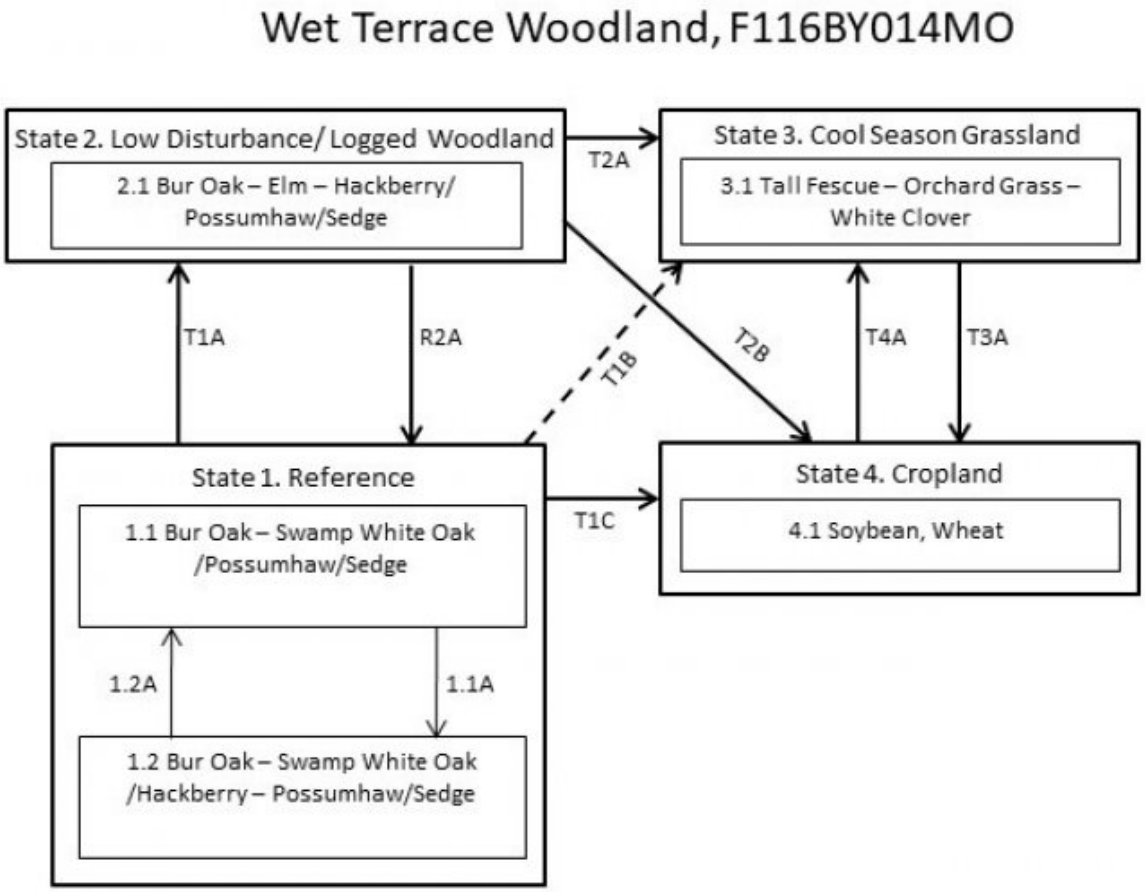
Today, the Wet Terrace Woodlands are largely converted to pasture and cropland. Where they do still occur, they often occur as a rather narrow band of forest traversing the riverfront forest or stream edge. They are regularly denser in the absence of fire, and their composition is usually altered. These bands of remaining 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.

Uncontrolled grazing by domestic livestock in these remaining areas of woodland 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 woodlands 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 and introducing prescribed fire has proven to be an effective means for restoration.

A State and Transition Diagram follows. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

State and transition model



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

Figure 10. State and transition diagram for this ecological site

State 1

Reference

The historical reference state for this ecological site was old growth oak woodland. The woodland was dominated by swamp white oak and bur oak. 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. Most reference states are currently altered because of timber harvesting, clearing and conversion to grassland or cropland. Fire suppression and altered flooding regimes have resulted in increased canopy density, which has affected the abundance and diversity of ground flora.

Community 1.1
Bur Oak – Swamp White Oak /Possumhaw/Sedge

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

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

Community 1.2
Bur Oak – Swamp White Oak /Hackberry – Possumhaw/Sedge

Pathway P1.1A
Community 1.1 to 1.2

Lack of disturbance events 10+ years

Pathway P1.2A
Community 1.2 to 1.1

Disturbance events every 2-5 years

State 2
Low Disturbance/ Logged Woodland

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.

Dominant resource concerns

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

Community 2.1
Bur Oak – Elm – Hackberry/Possumhaw/Sedge

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.

Dominant resource concerns

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

Community 3.1
Tall Fescue – Orchard Grass – White Clover

State 4
Cropland

This is a state that exists currently with intensive cropping of soybeans and wheat occurring. Some conversion to cool season hayland occurs, especially when commodity prices are high, for a limited period of time before transitioning back to cropland.

Dominant resource concerns

- Ephemeral gully erosion
- Seasonal high water table
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Community 4.1
Soybean, Wheat

Transition T1A
State 1 to 2

Lack of fire and flooding disturbance events > 20 years; timber harvesting

Transition T1B
State 1 to 3

Woody removal; tillage; vegetative seeding; grassland management

Transition T1C
State 1 to 4

Woody removal; tillage; conservation cropping system; water management

Restoration pathway R2A
State 2 to 1

Forest stand improvement; prescribed fire 5 to 10 years

Transition T2A
State 2 to 3

Woody removal; tillage; conservation cropping system; water management

Transition T2B
State 2 to 4

Woody removal; tillage; conservation cropping system; water management

Transition T3A
State 3 to 4

Tillage; conservation cropping system; water management

Transition T4A
State 4 to 3

Vegetative seeding ; grassland management

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							
pecan	CAIL2	*Carya illinoinensis*	Native	–	5–20	–	–
swamp white oak	QUBI	*Quercus bicolor*	Native	–	5–20	–	–
bur oak	QUMA2	*Quercus macrocarpa*	Native	–	5–20	–	–
slippery elm	ULRU	*Ulmus rubra*	Native	–	5–20	–	–
common hackberry	CEOC	*Celtis occidentalis*	Native	–	5–20	–	–
green ash	FRPE	*Fraxinus pennsylvanica*	Native	–	5–20	–	–
swamp white oak	QUBI	*Quercus bicolor*	Native	–	5–20	–	–
shellbark hickory	CALA21	*Carya laciniosa*	Native	–	5–20	–	–
bitternut hickory	CACO15	*Carya cordiformis*	Native	–	5–20	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
shoreline sedge	CAHY3	*Carex hyalinolepis*	Native	–	5–10
prairie cordgrass	SPPE	*Spartina pectinata*	Native	–	5–10
squarrose sedge	CASQ2	*Carex squarrosa*	Native	–	5–10
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	5–10
sweet woodreed	CIAR2	*Cinna arundinacea*	Native	–	5–10
soft fox sedge	CACO13	*Carex conjuncta*	Native	–	5–10
Gray's sedge	CAGR5	*Carex grayi*	Native	–	5–10
hop sedge	CALU4	*Carex lupulina*	Native	–	5–10
Muskingum sedge	CAMU9	*Carex muskingumensis*	Native	–	5–10
Frank's sedge	CAFR3	*Carex frankii*	Native	–	5–10
Forb/Herb					
sawtooth sunflower	HEGR4	*Helianthus grosseserratus*	Native	–	5–20
giant ironweed	VEGI	*Vernonia gigantea*	Native	–	5–20
smallspike false nettle	BOCY	*Boehmeria cylindrica*	Native	–	5–20
jewelweed	IMCA	*Impatiens capensis*	Native	–	5–20
pale touch-me-not	IMPA	*Impatiens pallida*	Native	–	5–20
swamp verbena	VEHA2	*Verbena hastata*	Native	–	5–20
Canadian woodnettle	LACA3	*Laportea canadensis*	Native	–	5–20
foxglove beardtongue	PEDI	*Penstemon digitalis*	Native	–	5–20
Canadian clearweed	PIPU2	*Pilea pumila*	Native	–	5–20
cutleaf coneflower	RULA3	*Rudbeckia laciniata*	Native	–	5–20
giant goldenrod	SOGI	*Solidago gigantea*	Native	–	5–20
calico aster	SYLAA	*Symphyotrichum lateriflorum var. angustifolium*	Native	–	5–20
wingstem	VEAL	*Verbesina alternifolia*	Native	–	5–20
Shrub/Subshrub					
possumhaw	ILDE	*Ilex decidua*	Native	–	5–10
common buttonbush	CEOC2	*Cephalanthus occidentalis*	Native	–	5–10
American hornbeam	CACA18	*Carpinus caroliniana*	Native	–	5–10

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 woodlands 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 tree frog, northern spring peeper, Blanchard’s cricket frog, southern leopard frog, western painted turtle, and red-eared slider.

Other information

Forestry (NRCS 2002; 2014)
Management: Estimated site index values range from 50 to 70 for oak. On the wettest sites, timber management opportunities may be limited. Maintain adequate riparian buffer areas.

Limitations: Wetness from rare flooding; high seasonal 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

Potential Reference Sites: Wet Terrace Woodland

No quality reference sites are known to exist

Other references

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Contributors

Fred Young
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Approval

Nels Barrett, 10/06/2020

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	09/24/2020
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):**

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:**