Ecological site F107XB005MO
Talus Footslope Forest

Last updated: 5/21/2020
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): 107X–Iowa and Missouri Deep Loess Hills

The Iowa and Missouri Deep Loess Hills (MLRA 107B) includes the Missouri Alluvial Plain, Loess Hills, Southern Iowa Drift Plain, and Central Dissected Till Plains landform regions (Prior 1991; Nigh and Schroeder 2002). It spans four states (Iowa, 53 percent; Missouri, 32 percent; Nebraska, 12 percent; and Kansas 3 percent), encompassing over 14,000 square miles (Figure 1). The elevation ranges from approximately 1,565 feet above sea level (ASL) on the highest ridges to about 600 feet ASL along the Missouri River near Glasgow in central Missouri. Local relief varies from 10 to 20 feet in the major river floodplains, to 50 to 100 feet in the dissected uplands, and loess bluffs of 200 to 300 feet along the Missouri River. Loess deposits cover most of the area, with deposits reaching a thickness of 65 to 200 feet in the Loess Hills and grading to about 20 feet in the eastern extent of the region. Pre-Illinoian till, deposited more than 500,000 years ago, lies beneath the loess and has experienced extensive erosion and dissection. Pennsylvanian and Cretaceous bedrock, comprised of shale, mudstones, and sandstones, lie beneath the glacial material (USDA-NRCS 2006).

The vegetation in the MLRA has undergone drastic changes over time. Spruce forests dominated the landscape 30,000 to 21,500 years ago. As the last glacial maximum peaked 21,500 to 16,000 years ago, they were replaced with open tundras and parklands. The end of the Pleistocene Epoch saw a warming climate that initially prompted the return of spruce forests, but as the warming continued, spruce trees were replaced by deciduous trees (Baker et al. 1990). Not until approximately 9,000 years ago did the vegetation transition to prairies as climatic conditions continued to warm and subsequently dry. Between 4,000 and 3,000 years ago, oak savannas began intermingling within the prairie landscape, while the more wooded and forested areas maintained a foothold in sheltered areas. This prairie-forest transition ecosystem formed the dominant landscapes until the arrival of European settlers (Baker et al. 1992).

Classification relationships

Major Land Resource Area (MLRA): Iowa and Missouri Deep Loess Hills (107B)

USFS Subregions: Central Dissected Till Plains Section (251C); Loess Hills (251Cb) (Cleland et al. 2007)

U.S. EPA Level IV Ecoregion: Rolling Loess Prairies (47f)

Ecological Systems (National Vegetation Classification System, Nature Serve 2015): Central Interior Calcareous Cliff and Talus (CES202.690)

Missouri Natural Heritage Program (Nelson 2010): Limestone/Dolomite Talus

Plant Associations (National Vegetation Classification System, Nature Serve 2015): Limestone – Dolomite Midwest Talus Vegetation (CEGL002308)

Ecological site concept

Talus Footslope Forests are located within the green areas on the map (Figure 1). They occur on upland footslopes on very steep slopes (14 to 50 percent) and are small in patch size (less than one acre). Soils are Mollisols that are well-drained and deep, formed from clayey-skeletal limestone colluvium with numerous coarse fragments, stones, and boulders.

The historic pre-European settlement vegetation on this site was dominated by a sparse to nearly absent canopy of trees. Northern red oak (Quercus rubra L.) and sugar maple (Acer saccharum Marshall) are characteristic species of this ecological site. The shrub layer is more developed and includes American bladdernut (Staphylea trifolia L.). Herbaceous species typical of an undisturbed plant community associated with this ecological site include northern maindenhair (Adiantum pedatum L.) and great waterleaf (*Hydrophyllum appendiculatum* Michx.) (Nelson 2010; Ladd and Thomas 2015). The primary disturbance factor for this site is unconsolidated material accumulation as a result of weathering, rockfall, and erosion from adjacent cliffs and steeply sloping uplands (Nelson 2010).

Associated sites

F107XB016MO	**Loamy Floodplain Forest** Silty alluvium soils on floodplains adjacent to stream channel including Blake, Danbury, Floris, Gilliam, Grable, Grable variant, Haynie, Haynie variant, Kenridge, Landes, Lossing, McPaul, Modale, Modale variant, Moniteau, Morconick, Motark, Moville, Nodaway, Omadi, Paxico, Ray, Rodney, Scroll, Ticonic, Udifluvents, Udorthents, and Waubonsie
F107XB015MO	**Sandy/Loamy Floodplain Forest** Clayey alluvium soils on floodplains adjacent to stream channel including Albaton, Blencoe, Blend, Leta, Myrick, Onawa, Onawet, Owego, Parkville, Percival, and SansDessein
R107XB002MO	**Deep Loess Upland Prairie** Loess soils on summits and shoulders including Arents, Contrary, Deroin, Higginsville, Knox, Melia, Menfro, Monona, Ponca, Sibley, Strahan, Udarents, Udorthents, and Wakenda
R107XB008MO	**Loamy Footslope Savanna** Loess soils on footslopes including Castana, Colo, Danbury, Ely, Judson, Napier, Nodaway, Olmitz, Udarents, and Udorthents
F107XB004MO	**Deep Loess Protected Backslope Woodland** Loess soils on backslopes including Knox, Marshall, Monona, Udarents, and Udorthents

Table 1. Dominant plant species

Tree	(1) *Quercus rubra* (2) *Acer saccharum*
Shrub	(1) *Staphylea trifolia*
Herbaceous	(1) *Asplenium rhizophyllum* (2) *Impatiens capensis*

Physiographic features

Talus Footslope Forests occur on steep footslopes in deeply dissected valleys of major Rivers (Figure 2). This ecological site ranges in elevation from approximately 800 to 1,100 feet ASL. Slopes range from fourteen to 50 percent and the water table depth occurs from 26 to more than 80 inches. This site does not experience flooding.

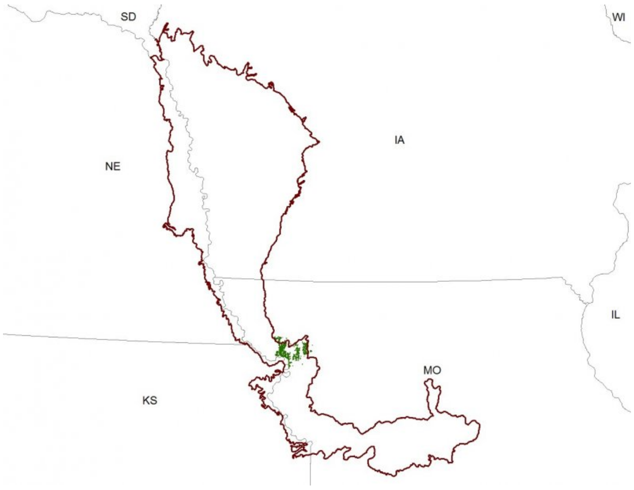


Figure 2. Figure 1. Location of Talus Footslope Forest ecological site within MLRA 107B.

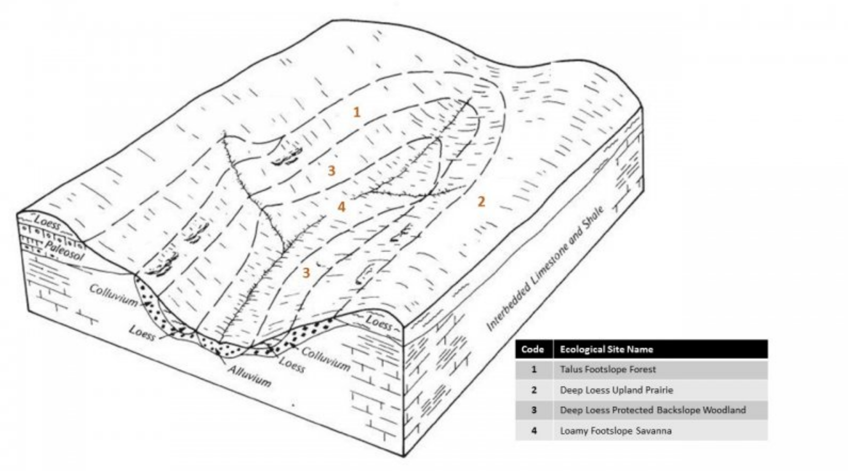


Figure 3. Figure 2. Representative block diagram of Talus Footslope Forest and associated ecological sites.

Table 2. Representative physiographic features

Hillslope profile	(1) Footslope
Slope shape across	(1) Convex
Slope shape up-down	(1) Convex
Landforms	(1) Hillslope
Flooding frequency	None
Ponding frequency	None
Elevation	244–335 m
Slope	14–50%
Water table depth	66–203 cm
Aspect	Aspect is not a significant factor

Climatic features

The Iowa and Missouri Deep Loess Hills falls into two Köppen-Geiger climate classifications (Peel et al. 2007): hot humid continental climate (Dfa) dominates the majority of the MLRA with small portions in the south falling into the humid subtropical climate (Cfa). In winter, dry, cold air masses periodically shift south from Canada. As these air masses collide with humid air, snowfall and rainfall result. In summer, moist, warm air masses from the Gulf of Mexico migrate north, producing significant frontal or convective rains (Decker 2017). Occasionally, high pressure will stagnate over the region, creating extended droughty periods. These periods of drought have historically occurred on 22-year cycles (Stockton and Meko 1983).

The soil temperature regime of MLRA 107B is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 195 days, while the frost-free period is about 166 days (Table 2). The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 32 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 42 and 63°F, respectively.

Climate data and analyses are derived from 30-year average gathered from two National Oceanic and Atmospheric Administration (NOAA) weather stations contained within the range of this ecological site (Table 4).

Table 3. Representative climatic features

Frost-free period (characteristic range)	150-154 days
Freeze-free period (characteristic range)	183-191 days
Precipitation total (characteristic range)	889-940 mm
Frost-free period (actual range)	148-156 days
Freeze-free period (actual range)	181-193 days
Precipitation total (actual range)	889-940 mm
Frost-free period (average)	152 days
Freeze-free period (average)	187 days
Precipitation total (average)	914 mm

Climate stations used

- (1) TROY 3N [USC00148250], Troy, KS
- (2) OREGON [USC00236357], Oregon, MO

Influencing water features

Talus Footslope Forests are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is slow (Hydrologic Group C), and surface runoff is very high. Precipitation infiltrates the soil surface and percolates downward through the horizons unimpeded by any restrictive layer. The Dakota bedrock aquifer in the northern region of this ecological site is typically deep and confined, leaving it generally unaffected by recharge. However, there are surficial aquifers in the Pennsylvanian strata in the southern extent of the ecological site that are shallow and allow some recharge (Prior et al. 2003). Surface runoff contributes some water to downslope ecological sites.

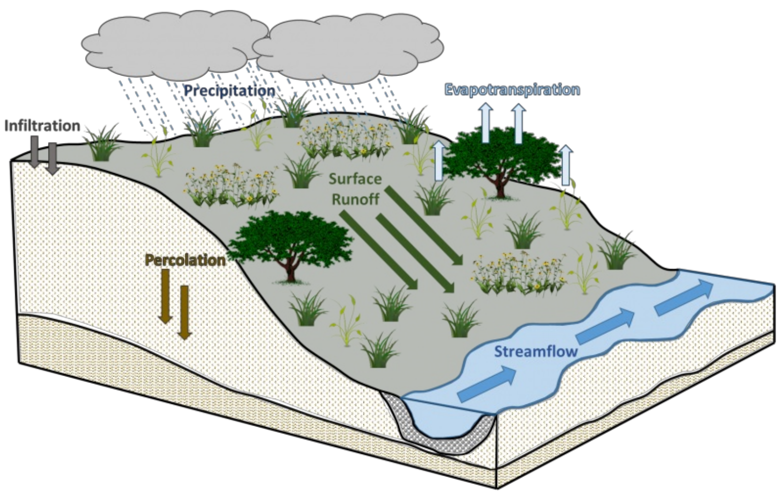


Figure 10. Figure 5. Hydrologic cycling in Talus Footslope Forest ecological

site.

Soil features

Soils of Talus Footslope Forests are in the Mollisol order, further classified as Typic Hapludolls with very slow infiltration and very high runoff potential. The soil series associated with this site includes Brussels. The parent material is clayey-skeletal limestone colluvium, and the soils are well-drained. Soil pH classes are slightly acid to slightly alkaline. No rooting restrictions are noted for the soils of this ecological site.

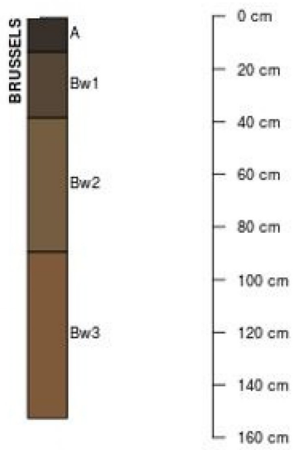


Figure 11. Figure 6. Profile sketches of soil series associated with Talus Footslope Forest.

Table 4. Representative soil features

Parent material	(1) Colluvium–dolomite
Surface texture	(1) Very flaggy silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	51–203 cm
Surface fragment cover >3"	45–50%
Available water capacity (0-101.6cm)	7.62 cm
Calcium carbonate equivalent (0-101.6cm)	1–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.8
Subsurface fragment volume >3" (Depth not specified)	45–55%

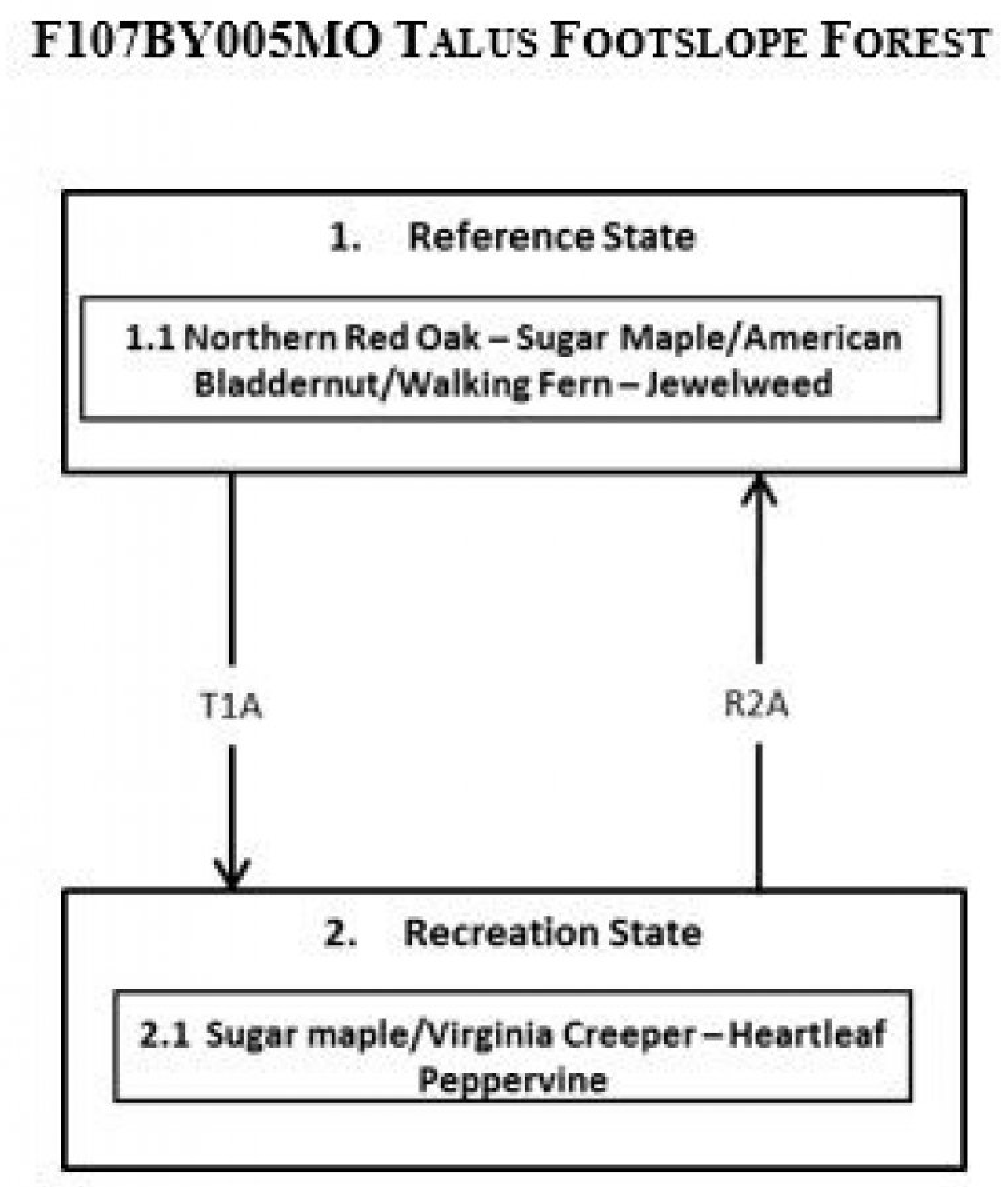
Ecological dynamics

The Loess Hills region lies within the transition zone between the eastern deciduous forests and the Great Plains, with the Missouri River flowing through the middle. The heterogeneous topography of the area results in variable microclimates and fuel matrices that in turn are able to support prairies and savannas to woodlands and forests (Novacek et al. 1985; Nelson 2010). Talus Footslope Forests form an aspect of this vegetative continuum. This ecological site occurs on footslopes adjacent to steep slopes. It is formed from colluvium from the weathering and erosion of rock fragments. The plant community is sparse among the numerous rock fragments, stones, and boulders.

Rock fall from upslope sites is the dominant disturbance factor in Talus Footslope Forests. Secondary disturbances can impact individuals within the plant community and include root disease, windthrow, and ice storms.

Today, Talus Footslope Forests are relatively un-impacted from anthropogenic disturbances due to their isolated and rocky nature. Impacts from unmanaged outdoor recreation (e.g., hiking and rock climbing) may result in alterations to the natural plant community and the rate of rock accumulation (Nelson 2010).

State and transition model



Code	Process
T1A	Unmanaged outdoor recreation
R2A	Managed outdoor recreation

Figure 12. STM

State 1
Reference State

The reference plant community is categorized as an open and sparsely vegetated talus plant community. The single community phase within the reference state is mainly affected by rockfall disturbances from weathered and eroded material upslope from the site. This action can result in selective damage and slumping of woody vegetation. In addition, individual trees can be affected by root rot, strong winds, and ice damage (Nelson 2010).

Dominant plant species

- northern red oak (*Quercus rubra*), tree
- sugar maple (*Acer saccharum*), tree
- American bladdernut (*Staphylea trifolia*), shrub
- walking fern (*Asplenium rhizophyllum*), other herbaceous
- jewelweed (*Impatiens capensis*), other herbaceous

Community 1.1
Northern Red Oak – Sugar Maple/American Bladdernut/Walking Fern – Jewelweed

The tree canopy is absent to sparse in the reference state. If present, the canopy consists of northern red oak and sugar maple, with American basswood (*Tilia americana* L.) and black walnut (*Juglans nigra* L.) close canopy associates. The remaining vegetation covers less than 40 percent of the site. The scattered shrub layer is most commonly populated by American bladdernut, but Virginia creeper (*Parthenocissus quinquefolia* (L.) Planch) and heartleaf peppervine (*Ampelopsis cordata* Michx.) can also occur. The understory is low in species diversity, supporting such species as walking fern, jewelweed, northern maidenhair, Canadian clearweed (*Pilea pumila* (L.) A. Gray), great waterleaf (*Hydrophyllum appendiculatum* Michx.), and mapleleaf goosefoot (*Chenopodium simplex* (Torr.) Raf.). Finally, epilithic mosses, lichens, and fungi can be sparse to numerous on the coarse rock and boulder fragments (Nelson 2010).

Dominant plant species

- northern red oak (*Quercus rubra*), tree
- sugar maple (*Acer saccharum*), tree
- American bladdernut (*Staphylea trifolia*), shrub
- walking fern (*Asplenium rhizophyllum*), other herbaceous
- jewelweed (*Impatiens capensis*), other herbaceous

State 2
Recreation State

Outdoor recreation can have negative impacts on soil, vegetation, wildlife, and water resources when left unmanaged. Hiking trail-related impacts tend to display a linear corridor of disturbance, causing the most harm to endangered species or sensitive plant populations, but these disturbances can extend significantly further into natural landscapes (Tyser and Worley 1992; Monz et al. 2009). Climbing-related impacts have been found to trample sensitive talus plant communities. Repeated tramplings can lead to changes in community composition and a reduction of species diversity and cover (McMillan and Larson 2002; Muller et al. 2004; Holzman 2013).

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- Virginia creeper (*Parthenocissus quinquefolia*), other herbaceous
- heartleaf peppervine (*Ampelopsis cordata*), other herbaceous

Community 2.1
Sugar Maple/Virginia Creeper – Heartleaf Peppervine

This community phase represents the impacts from unmanaged hiking and technical rock climbing in and around the site. The limited tree component exhibits an increase in sugar maples, as this species can respond quicker to disturbances than northern red oak (Tirmenstein 1991). The shrub component is simplified to disturbance tolerant species such as Virginia creeper and heartleaf peppervine, and the herbaceous and epilithic understory become virtually non-existent.

Transition T1A
State 1 to 2

Unmanaged outdoor recreation transitions the site to the recreation state (2).

Restoration pathway R2A
State 2 to 1

Managed outdoor recreation transitions this site to the reference state (1).

Additional community tables

Animal community

Wildlife

Compositional diversity and cool, moist conditions make this an important habitat for many bird and amphibian species.

This upland forest type adds species diversity and coarse woody debris loads making it very important for a number of songbirds and amphibians.

These forests can provide good “old-growth” conditions with large diameter trees and snags and downed, dead wood.

Land snails in Missouri utilize the moist leaf litter habitat of this community type, especially where associated with limestone or dolomite talus and outcrops on toe slopes and contact zones with creek valley bottoms.

Bird species associated with late-successional sites include Wood Thrush, Hooded Warbler, Acadian Flycatcher, Kentucky Warbler, Pileated Woodpecker, Northern Parula, Louisiana Water thrush (near streams), Cerulean Warbler (large trees near streams), and Barred Owl (near streams).

Reptile and amphibian species associated with these forests include: ringed salamander, spotted salamander, marbled salamander, central newt, four-toed salamander, western slimy salamander, western worm snake, northern red- bellied snake, pickerel frog, and wood frog.

Other information

Forestry
Management: Site index values are can be highly variable, ranging from 47 to 70. Productivity can be high, especially on protected slopes. Limited timber management opportunities may exist because of access issues. Where access is not a problem, uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are options that can be used. These sites are valuable for wildlife purposes and watershed protection. Large rock fragments and boulders increase windthrow hazards. Avoid constructing harvesting trails and landing sites in these areas.

Limitations: Surface rock and boulders; slumping and rock movements. Surface rocks and boulders are problems for efficient and safe equipment operation. Machine planting and mechanical site preparation is not recommended. Surface rock and boulders may interfere with equipment operation. Boulders may cause breakage of timber when harvesting. Rock and boulder movement may create hazardous site working conditions.

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in ecological site description.

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Approval

Chris Tecklenburg, 5/21/2020

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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)	Lisa Kluesner, Ecologist
Contact for lead author	
Date	05/18/2024
Approved by	Chris Tecklenburg
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:**