USDA Natural Resources Conservation Service

Ecological site F109XY004MO
Loamy Upland Drainageway Woodland

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.

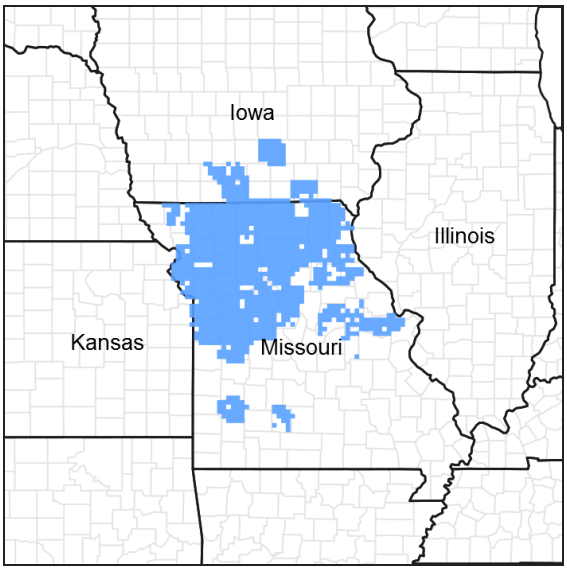


Figure 1. Mapped extent

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): 109X–Iowa and Missouri Heavy Till Plain

The Iowa and Missouri Heavy Till Plain (area outlined in red on the map) is an area of rolling hills interspersed with interfluve divides and alluvial valleys. Elevation ranges from about 660 feet along the lower reaches of rivers, to about 980 feet on stable interfluve summits in southern Iowa. Relief is about 80 to 160 feet between major streams and adjacent interfluve summits. Most of the till plain drains south to the Missouri River via the Grand and Chariton River systems, but the northeastern portion drains southeast to the Mississippi River. Loess caps the pre-Illinoisan aged till on interfluves, whereas the till is exposed on side slopes. Mississippian aged limestone and Pennsylvanian aged sandstone and shale crop out on lower slopes in some areas.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to a 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 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 a Fraxinus pennsylvanica - Ulmus americana - Celtis laevigata / Ilex decidua Forest (CEGL002427).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs in many Land Type Associations, primarily within the following Subsections:
Chariton River Hills
Grand River Hills
Loess Hills
Outer Ozark Border

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. As additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Loamy Upland Drainageway Woodlands are within the green areas on the map. They are widely distributed throughout the MLRA and adjacent areas. Soils are loamy, and are subject to flooding. The reference plant community is woodland with an overstory dominated by white oak and black oak, and a ground flora of native grasses and forbs.

Associated sites

F109XY007MO	**Till Upland Woodland** Till Upland Woodlands are upslope, on upland shoulders and backslopes.
F109XY009MO	**Till Protected Backslope Forest** Till Protected Backslope Woodlands upslope, on steep upland backslopes with northern to eastern aspects.
F109XY022MO	**Till Exposed Backslope Woodland** Till Exposed Backslope Woodlands are upslope, on steep upland backslopes with southern to western aspects.

Similar sites

F109XY019MO	**Loess High Terrace Woodland** Loess High Terrace Woodlands have similar overstory and understory compositions and are associated with river valleys but not in the immediate floodplain.

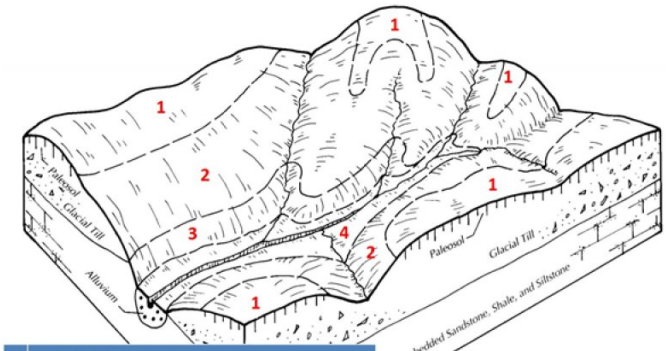
Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus velutina*
Shrub	(1) *Rhus aromatica*
Herbaceous	(1) *Elymus virginicus* (2) *Carex pensylvanica*

Physiographic features

This site is in narrow drainageways in the uplands, with slopes of 0 to 5%. The site receives runoff from adjacent upland sites. Most areas are subject to frequent, brief flooding.

The following figure (adapted from Benham, 1995) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the uplands. The site is within the area labeled “4”, and is typically downslope from steep woodland and forest ecological sites.



#	Ecological Site
1	Till Upland Woodland
2	Till Backslope Woodland/Forest
3	Interbedded Sedimentary Backslope Woodland/Forest
4	Loamy Upland Drainageway Woodland

Figure 2. Landscape relationships for this ecological site

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Slope	1–5%
Water table depth	30–183 cm
Aspect	Aspect is not a significant factor

Climatic features

The Iowa and Missouri Heavy Till Plain MLRA 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.

This MLRA experiences small regional differences in climates that grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line from north to south. Both mean annual temperature and precipitation exhibit fairly minor gradients along this line.

Mean January minimum temperature follows the north-to-south gradient. However, mean July maximum temperature shows hardly any geographic variation in the region. Mean July maximum temperatures have a range of only two to three degrees across the region.
Mean annual precipitation varies along the same gradient as temperature – lower annual precipitation in the north, higher in the south. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages four to five times greater than January precipitation.

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 influences ecological communities by limiting water supplies, especially at times of high temperatures and high evaporation rates. Drought indirectly affects ecological communities by increasing plant and animal susceptibility to the probability and severity of fire. Frequent fires encourage the development of grass/forb dominated communities and understories.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. 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. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier, supporting more grass dominated communities than adjacent north- and-east-facing slopes that are cooler and moister that support more woody dominated communities. Finally, the cooler microclimate within a canopied forest is measurably different from the climate of a more open and warmer grassland or savanna area.

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 (average)	158 days
Freeze-free period (average)	182 days
Precipitation total (average)	1,067 mm

Climate stations used

- (1) KEOSAUQUA [USC00134389], Keosauqua, IA
- (2) MEMPHIS [USC00235492], Memphis, MO
- (3) UNIONVILLE [USC00238523], Unionville, MO
- (4) CHARITON 1 E [USC00131394], Chariton, IA
- (5) SALISBURY [USC00237514], Salisbury, MO
- (6) LEON 6 ESE [USC00134758], Garden Grove, IA
- (7) BETHANY [USC00230608], Bethany, MO
- (8) KEARNEY 3E [USC00234382], Kearney, MO

Influencing water features

This ecological site contains first-order streams, which originate from headslope positions at the upper reaches of the units, and are fed from smaller headslopes in the adjacent uplands. The lower reaches of units often contain second-order streams. These streams are ephemeral in most years, with flow in the late fall, winter, and spring months, generally disappearing in the summer, or reduced to isolated pools in the lower reaches. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short-duration flooding is common in many areas. Streambeds are typically incised into the surrounding floodplain by as much as 10 feet.

Soil features

These soils have no rooting restriction. They were formed under a mixture of prairie and woodland vegetation. Parent material is alluvium. They have loam or silt loam surface horizons, and loamy subsoils. These soils are not affected by seasonal wetness. Soil series associated with this site include Dockery, Floris, Klum, Landes, and Nodaway.

The accompanying picture of the Dockery series shows the stratified silt loam alluvium characteristic of these soils. Picture from Baker (1998).

Figure 7. Dockery series

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to well drained
Permeability class	Moderately slow to moderately rapid
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–22.86 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)	5.2–7.3
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.

This ecological site is well-developed woodland dominated by an overstory of white oak, along with occasional red oak and black oak. The canopy is moderately tall (60 to 80 feet) with a 50 to 75 percent canopy closure. Increased light from an open canopy causes a diversity of woodland ground flora species to flourish. 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.

Because of their proximity to prairies, fire played a significant role in the maintenance of these ecological sites which likely burned at least once every 3 to 10 years. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. During fire free intervals, woody understory species increased and the herbaceous understory diminished. The return of fire would open the woodlands up again and stimulate the abundant ground flora.

Loamy Upland Drainageway Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison, elk, and deer. Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees. Grazing by native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and woodland ground flora species.

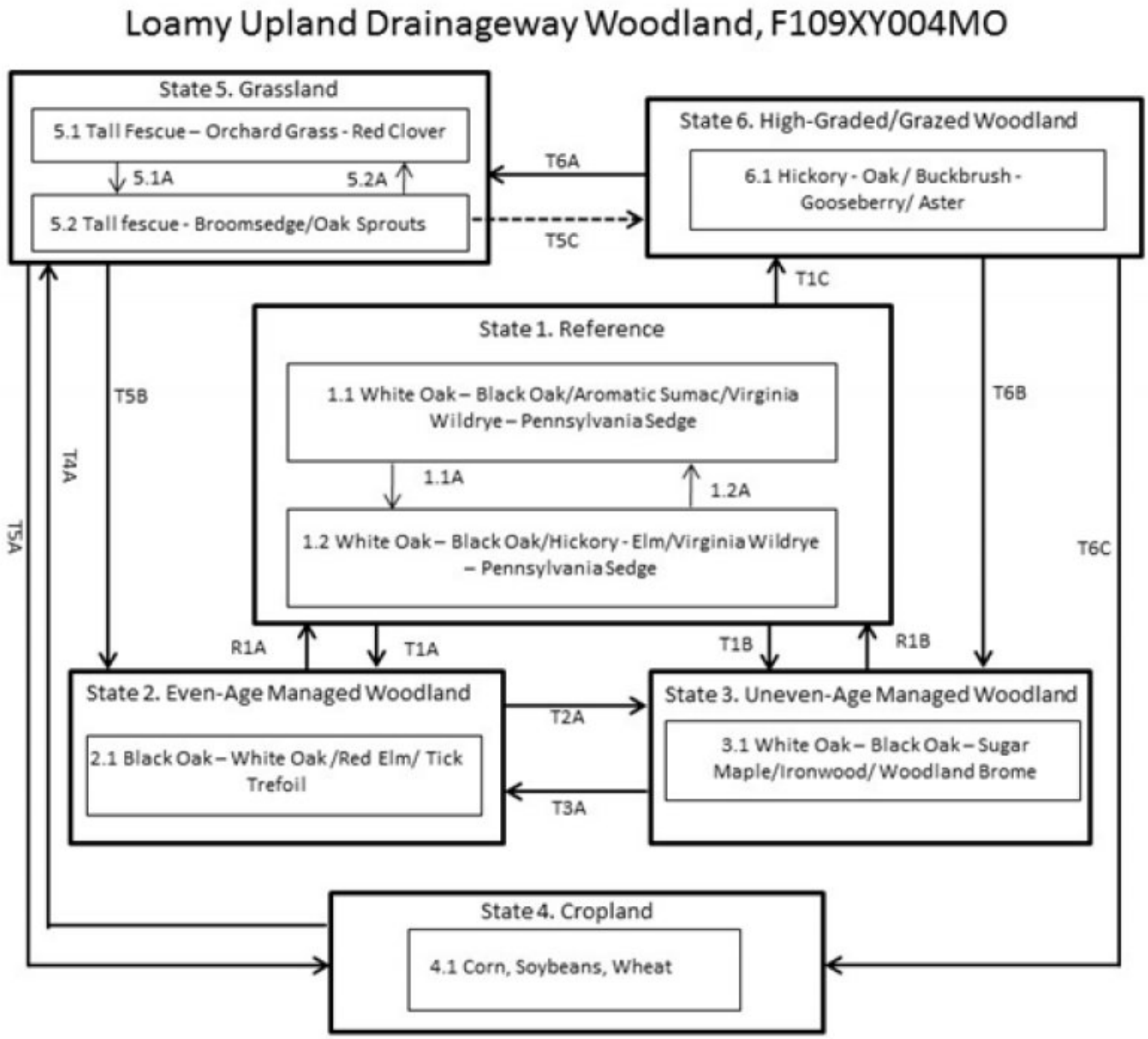
Typically, with the narrow floodplain setting and frequent flooding, many upland drainageway sites still remain. They often occur as a rather narrow band of timber traversing the headwater streams, often in a matrix of upland forest. Occasionally, on wider drainageways, this ecological site is typically cleared and converted to cropland or pasture, with a narrow strip of woodland retained along the stream edge. In such cases, severe flooding may cause stream bank erosion and complete loss of this site.

Uncontrolled grazing by domestic livestock in the remaining strips of woodland can also kill trees and remove the ground cover, resulting in de-stabilization and potential loss of this system as well. Some carefully planned timber harvest can be tolerated in this system, but high grading of the timber will degrade the system.

Re-establishment of these riparian drainageway woodlands is important for stream quality and health, as well as for migratory birds. Replanting of these systems has proven to be quite successful, and but species selection needs to pay attention to local soil and moisture conditions.

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	Activity/Process
T1A	Fire suppression; even-aged management
T1B	Fire suppression; uneven-age management
T1C	Poorly planned harvest; uncontrolled grazing
T2A	Uneven-age management; extended rotations
T3A	Even-age management; thinning
T4A	Pasture planting; prescribed grazing
T5A	Tillage; crop rotation
T5B	No grazing; idle - no disturbance >30 years
T5C	Light intermittent grazing; woody growth
T6A	Clearing; pasture planting; prescribed grazing
T6B	Uneven-age management; tree planting
T6C	Clearing; tillage; crop rotation
R1A, R1B	Prescribed fire; extended rotations

Code	Activity/Process
1.1A	No disturbance >10 years
1.2A	Disturbance (fire, wind, ice) < 10 years
5.1A	Over grazing; no fertilization
5.2A	Brush management; prescribed grazing

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 woodland. The woodland was dominated by white oak and black oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from 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 has 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, domestic grazing or clearing and conversion to grassland or cropland.

Community 1.1
White Oak – Black Oak/Aromatic Sumac/Virginia Wildrye – Pennsylvania Sedge

This community phase is very rare today. To maintain this phase fire frequency's of 3 to 10 years are needed.

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

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

Community 1.2
White Oak – Black Oak/Hickory - Elm/Virginia Wildrye – Pennsylvania Sedge

This phase is the result of fire suppression that has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. This phase is also very rare.

State 2
Even-Age Managed Woodland

An even-age managed forest can resemble the reference state. The primary difference is tree age, most being only 50 to 90 years old. Composition is also likely altered from the reference state depending on tree selection during harvests and disturbance activities. Without a regular 15 to 20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species such as sugar maple and white oak will become less dominant. This state can be restored to a reference state by modifying or eliminating timber harvests, extending rotations, incorporating selective thinning, and re-introducing prescribed fire.

Community 2.1
Black Oak – White Oak /Red Elm/ Tick Trefoil

State 3
Uneven-Age Managed Woodland

Due to selective single tree harvesting canopy densities have increased. Composition is likely altered from the Reference State depending on tree selection during harvest. This state will slowly increase in more shade tolerant species and white oak will become less dominant and is also dense because of fire suppression. Without periodic canopy disturbance, stem density and fire intolerant species, like hickory and maple will increase in abundance. This state can be restored to a reference state by modifying or eliminating timber harvests, extending rotations, incorporating selective thinning, and re-introducing prescribed fire.

Community 3.1
White Oak – Black Oak – Sugar Maple/Ironwood/ Woodland Brome

State 4
Cropland

This is a State that exists currently with intensive cropping of corn, soybeans, and wheat occurring. Some

conversion to cool season grassland, especially when commodity prices are high, occurs for a limited period of time before transitioning back to cropland.

Community 4.1
Corn, Soybeans, Wheat

State 5
Grassland

Conversion of other states to non-native cool season species such as tall fescue, orchard grass, and red 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. If oak sprouting is left unchecked and grazing is eliminated or reduced then over time this state will transition to an even-age managed woodland (livestock controlled and woodland management initiated) or to a high-graded/grazed woodland (continued grazing, high graded harvesting, and no woodland management).

Community 5.1
Tall Fescue – Orchard Grass - Red Clover

This phase is well-managed grassland, composed of non-native cool season grasses and legumes. Grazing and haying is occurring. The effects of long-term liming on soil pH, and calcium and magnesium content, is most evident in this phase. Studies show that these soils have higher pH and higher base status in soil horizons as much as two feet below the surface, relative to poorly managed grassland (phase 5.2) and to woodland communities (where liming is not practiced).

Community 5.2
Tall fescue - Broomsedge/Oak Sprouts

This phase is the result of over use, poor grassland and grazing management and lack of adequate nutrient application.

State 6
High Graded/Grazed Woodland

States that were subjected to repeated, high-grading timber harvests and uncontrolled domestic grazing will transition to a High-Graded/Grazed Woodland State. This state exhibits an over-abundance of hickory, elm and other less desirable tree species, and weedy understory species such as buckbrush, gooseberry, poison ivy and Virginia creeper. The existing vegetation offers little nutritional value for cattle, and excessive cattle stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Two common transitions from this state are woody clearing and conversion to state 4, Cropland or removing livestock, limited harvesting, and allowing long term succession to occur to some other woodland state (state 2 or 3).

Community 6.1
Hickory - Oak / Buckbrush - Gooseberry/ Aster

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							
white oak	QUAL	*Quercus alba*	Native	–	40–70	–	–
black oak	QUVE	*Quercus velutina*	Native	–	20–40	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	0–10	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	0–10	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	10–30
parasol sedge	CAUM4	*Carex umbellata*	Native	–	10–20
rock muhly	MUSO	*Muhlenbergia sobolifera*	Native	–	5–20
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	10–20
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	5–20
big bluestem	ANGE	*Andropogon gerardii*	Native	–	5–20
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	5–20
Forb/Herb					
smooth blue aster	SYLAC	*Symphyotrichum laeve var. concinnum*	Native	–	10–30
hairy sunflower	HEHI2	*Helianthus hirsutus*	Native	–	10–30
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	Native	–	5–30
slender lespedeza	LEVI7	*Lespedeza virginica*	Native	–	10–20
eastern beebalm	MOBR2	*Monarda bradburiana*	Native	–	10–20
Canadian blacksnakeroot	SACA15	*Sanicula canadensis*	Native	–	10–20
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	Native	–	10–20
nakedflower ticktrefoil	DENU4	*Desmodium nudiflorum*	Native	–	10–20
eastern purple coneflower	ECPU	*Echinacea purpurea*	Native	–	5–20
bluejacket	TROH	*Tradescantia ohiensis*	Native	–	5–10
Culver's root	VEVI4	*Veronicastrum virginicum*	Native	–	5–10
Shrub/Subshrub					
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	10–30
New Jersey tea	CEAM	*Ceanothus americanus*	Native	–	5–20
American hazelnut	COAM3	*Corylus americana*	Native	–	10–20

Animal community

Wildlife
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.

Oaks provide hard mast; scattered shrubs provide soft mast; native legumes provide high-quality wildlife food; sedges and native cool-season grasses provide green browse; patchy native warm-season grasses provide cover and nesting habitat; and a diversity of forbs provides a diversity and abundance of insects.

Post-burn areas can provide temporary bare-ground – herbaceous cover habitat important for turkey poults and

quail chicks.

Bird species associated with mature communities include Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Eastern Wood-Pewee, Broad-winged Hawk, Great-Crested Flycatcher, Summer Tanager, and Red-eyed Vireo.

Reptile and amphibian species associated with the Loess Upland Woodland include tiger salamander, small-mouthed salamander, ornate box turtle, northern fence lizard, five-lined skink, broad-headed skink, flat-headed snake, and rough earth snake. (MDC, 2006)

Other information

Forestry
Management: Site index values range from 65 to 80. Timber management opportunities are good. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. Where possible, favor white oak, black walnut, northern red oak, and bitternut hickory. Maintain adequate riparian buffer areas.

Limitations: No major limitations or restrictions. Occasional periods of seasonal wetness; 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 may be difficult during spring flooding periods.

Inventory data references

Plot HIHOCA_KS02 – Floris soil (reference)
Located in Hidden Hollow CA, Macon County, MO
Latitude: 39.987638
Longitude: -92.652581

Plot MIHICA03 – Landes soil (reference)
Located in Mineral Hills CA, Putnam County, MO
Latitude: 40.42104
Longitude: -92.96917

Plot THHISP05 – Floris soil (recon – altered state)
Located in Thousand Hills State Park, Adair County, MO
Latitude: 40.15003
Longitude: -92.63337

2 additional recon plots from 2007 Jeremy Kolaks that need soil verification

Other references

Baker, John L. 1998. Soil Survey of Cooper County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

Benham, Ken E. 1995. Soil Survey of Sullivan County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

MDC, 2006. Missouri Forest and Woodland Community Profiles. Missouri Department of Conservation, Jefferson City, Missouri.

NatureServe, 2010. Vegetation Associations of Missouri (revised). NatureServe, St. Paul, Minnesota.

Nelson, Paul W. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

Nigh, Timothy A., & Walter A. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri.

Contributors

Doug Wallace
Fred Young

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:**

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:**