USDA Natural Resources
Conservation Service

Ecological site F116CY004MO
Igneous Protected Backslope Forest

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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.

MLRA notes

Major Land Resource Area (MLRA): 116C–St. Francois Knobs and Basins

The St Francois Knobs and Basins is the structural center of the Ozark Dome. Elevation ranges from about 450 feet along the rivers in the southern part of the area, to 1,772 feet on the summit of Taum Sauk Mountain, the highest point in Missouri. Prominent features of this MLRA are the Precambrian igneous knobs and hills that rise conspicuously to various elevations, interspersed with smooth-floored basins and valleys overlying dolomite and sandstone. Ecological Sites defined for this MLRA are associated with the igneous parent materials, either in knob or basin positions. Areas influenced primarily by dolomite and/or sandstone are included in ecological sites within MLRA 116A (Ozark Highlands).

Classification relationships

Terrestrial Natural Community Type (Nelson, 2010):
The reference state for this ecological site is most similar to a Dry-Mesic Igneous Forest.

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 Oak-Hickory Forest.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Quercus alba - Quercus rubra - Carya (alba, ovata) / Cornus florida Acid Forest (CEGL002067).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs primarily within the St. Francois Igneous Glade/Oak Forest Knobs Land Type Association.

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”.

Igneous Protected Backslope Forests occupy the northerly and easterly aspects of steep, dissected slopes, and are mapped in complex with the Igneous Exposed Backslope Woodland ecological site. These sites occur throughout the area, and on outlying igneous knobs in adjacent counties. Soils are deep, with abundant volcanic rock fragments, and are low in bases. These sites are often downslope from Dry Igneous Upland Woodland ecological sites, which have root-restricting bedrock in the upper part of the soil profile, as do the upslope Shallow Igneous Knob Glade sites. Vegetation of the reference state is forest dominated by white oak and northern red oak, a structurally diverse understory and a rich herbaceous ground flora.

Associated sites

F116CY002MO	**Igneous Upland Woodland** Igneous Upland Woodlands are typically upslope from Igneous Protected Backslope Forests, and are less sloping.
F116CY005MO	**Dry Igneous Protected Backslope Woodland** Igneous Protected Backslope Woodlands are typically upslope from Igneous Protected Backslope Forests, and have root-restricting bedrock within the soil profile.
F116CY010MO	**Igneous Exposed Backslope Woodland** Igneous Exposed Backslope Woodlands are on south and west facing slopes, and are mapped in a complex with this ecological site.

Similar sites

F116CY002MO	**Igneous Upland Woodland** Igneous Upland Woodlands are typically upslope from Igneous Protected Backslope Forests, and are less sloping. Overstory species composition may be similar.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus rubra*
Shrub	(1) *Cornus florida*
Herbaceous	(1) *Podophyllum peltatum* (2) *Desmodium nudiflorum*

Physiographic features

This site is on upland backslopes with slopes of 15 to 45 percent. It is on protected aspects (north, northeast, and east), which receive significantly less solar radiation than the exposed aspects. The site receives runoff from upslope summit and shoulder sites, and generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Simmons et al., 2006) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the igneous uplands. The site is within the area labeled “4”, on the lower, steeper backslope positions.

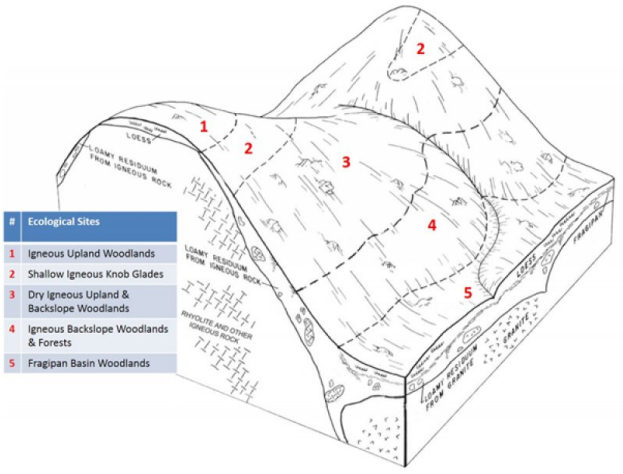


Figure 1. Major ecological sites of the igneous uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hillslope
Flooding frequency	None
Ponding frequency	None
Elevation	600–1,600 ft
Slope	15–45%
Water table depth	26–60 in
Aspect	NW, N, NE, E

Climatic features

The St. Francois Knobs and Basins have 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 St. Francois Knobs and Basins experience few regional differences in climates. The average annual precipitation in this area is 42 to 46 inches. The average annual temperature is about 54 to 56 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 somewhat along a west to east gradient. The rainfall is fairly evenly distributed throughout the year. Snow falls nearly every winter, but the snow cover lasts for only a few days.

During years when precipitation is normal, moisture is stored in the soil profile 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. For example, air drainage at night may produce temperatures several degrees lower in the basin and floodplain ecological sites downslope from this ecological site. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in basins and valleys. Nearby Glade ecological sites may have higher daytime temperatures due to bare rock and higher reflectivity of these un-vegetated surfaces. Slope orientation is an important topographic influence on climate. The protected (north- and east-facing) slopes that characterize this ecological site are regularly cooler and moister than nearby ecological sites on summits and on exposed slopes. Finally, the climate within closed-canopy forest communities is measurably different from the climate of open-canopy communities within this ecological site, and from open-canopy woodlands on nearby ecological sites.

References:
University of Missouri Climate Center - http://climate.missouri.edu/climate.php;

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Table 3. Representative climatic features

Frost-free period (average)	183 days
Freeze-free period (average)	154 days

Precipitation total (average)	48 in

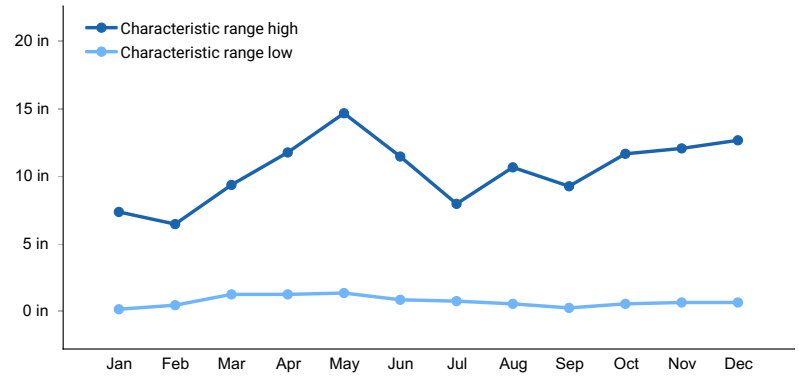


Figure 2. Monthly precipitation range

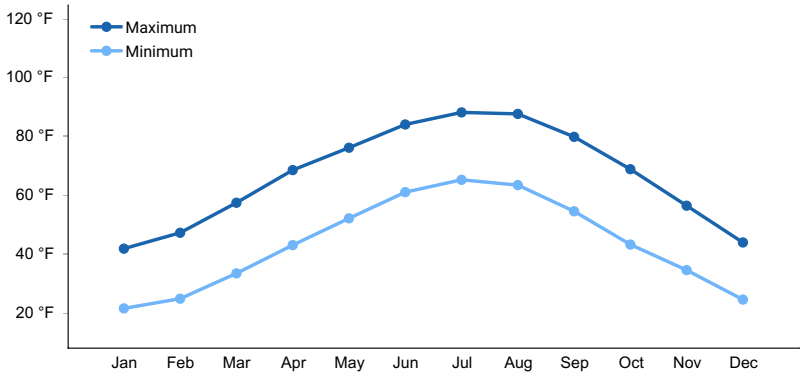


Figure 3. Monthly average minimum and maximum temperature

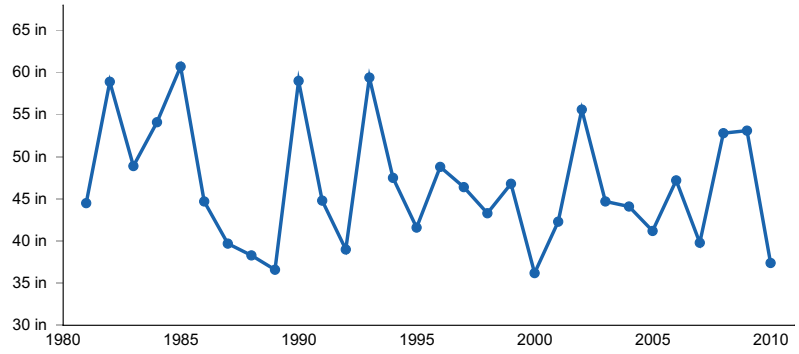


Figure 4. Annual precipitation pattern

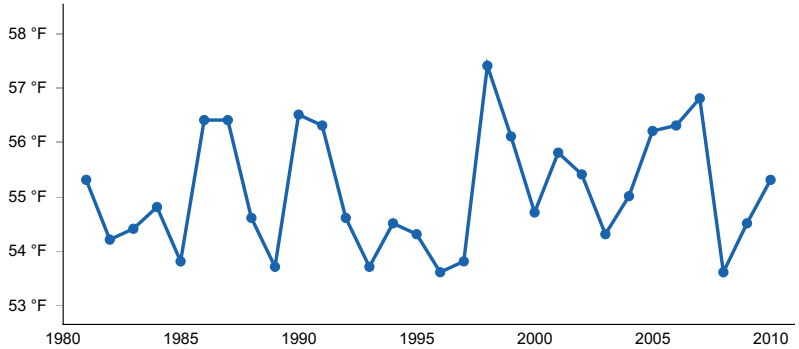


Figure 5. Annual average temperature pattern

Climate stations used

- (1) FARMINGTON [USC00232809], Farmington, MO

- (2) FREDERICKTOWN [USC00233038], Fredericktown, MO
- (3) ARCADIA [USC00230224], Arcadia, MO

Influencing water features

This ecological site is not influenced by wetland or riparian water features. This site generates runoff to adjacent, downslope ecological sites. The water features of this upland ecological site include evapotranspiration, surface runoff, and drainage. Each water balance component fluctuates to varying extents from year-to-year. Evapotranspiration remains the most constant. Precipitation and drainage are highly variable between years. Seasonal variability differs for each water component. Precipitation generally occurs as single day events. Evapotranspiration is lowest in the winter and peaks in the summer. Water stored as ice and snow decreases drainage and surface runoff rates throughout the winter and increases these fluxes in the spring. The surface runoff pulse is greatly influenced by extreme events. Conversion to high intensity land uses tends to increase runoff, but also decreases evapotranspiration. Depending on the situation, this might increase groundwater discharge, and decrease baseflow in receiving streams.

Soil features

These soils have acidic subsoils that are low in bases. Some soils have a fragipan rooting barrier at about 24 inches. Bedrock is generally below 60 inches, but is as shallow as 40 inches in places. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is slope alluvium over residuum weathered from acid igneous rock such as granite and diorite. They have gravelly to very gravelly and cobbly silt loam surface horizons, and subsoils with moderate to high amounts of volcanic gravel and cobbles. They are not affected by seasonal wetness. Soil series associated with this site include Frenchmill, Hassler, Killarney, and Mudlick.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–diorite (2) Residuum–diorite
Surface texture	(1) Cobbly silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderate
Soil depth	24–72 in
Surface fragment cover <=3"	5–27%
Surface fragment cover >3"	12–32%
Available water capacity (0-40in)	4–7 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	3.5–6
Subsurface fragment volume <=3" (Depth not specified)	10–30%
Subsurface fragment volume >3" (Depth not specified)	12–25%

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.

Among the igneous knobs, Igneous Protected Backslope Forests occur in the most protected landscape positions on lower, steep slopes. Igneous Protected Backslope Forests have a well-developed forest canopy (70 to 90 feet tall and 90 to 100 percent canopy cover) dominated by white oak and northern red oak, a structurally diverse understory and an abundant forest ground flora. While the upland knobs and woodlands had an estimated fire frequency of 3 to 5 years, these igneous forests likely burned less frequently (estimated 10 to 25 years) and with lower intensity.

Historically, grazing by large native herbivores, such as bison, elk, and white-tailed deer, kept understory conditions more open. In addition, these forests were subject to occasional disturbances from wind and ice, which periodically opened the canopy up by knocking over trees or breaking substantial branches of canopy trees. Such canopy disturbances allowed more light to reach the ground and favor reproduction of the dominant oak species.

Today, these communities have undergone repeated timber harvest and some domestic grazing. Most existing occurrences have a younger (50 to 80 years) canopy layer whose composition may have been altered by timber harvesting practices. An increase in hickory over historic conditions is common. The absence of periodic fire would have allowed more shade-tolerant tree species, such as red maple or hickory to increase in abundance.

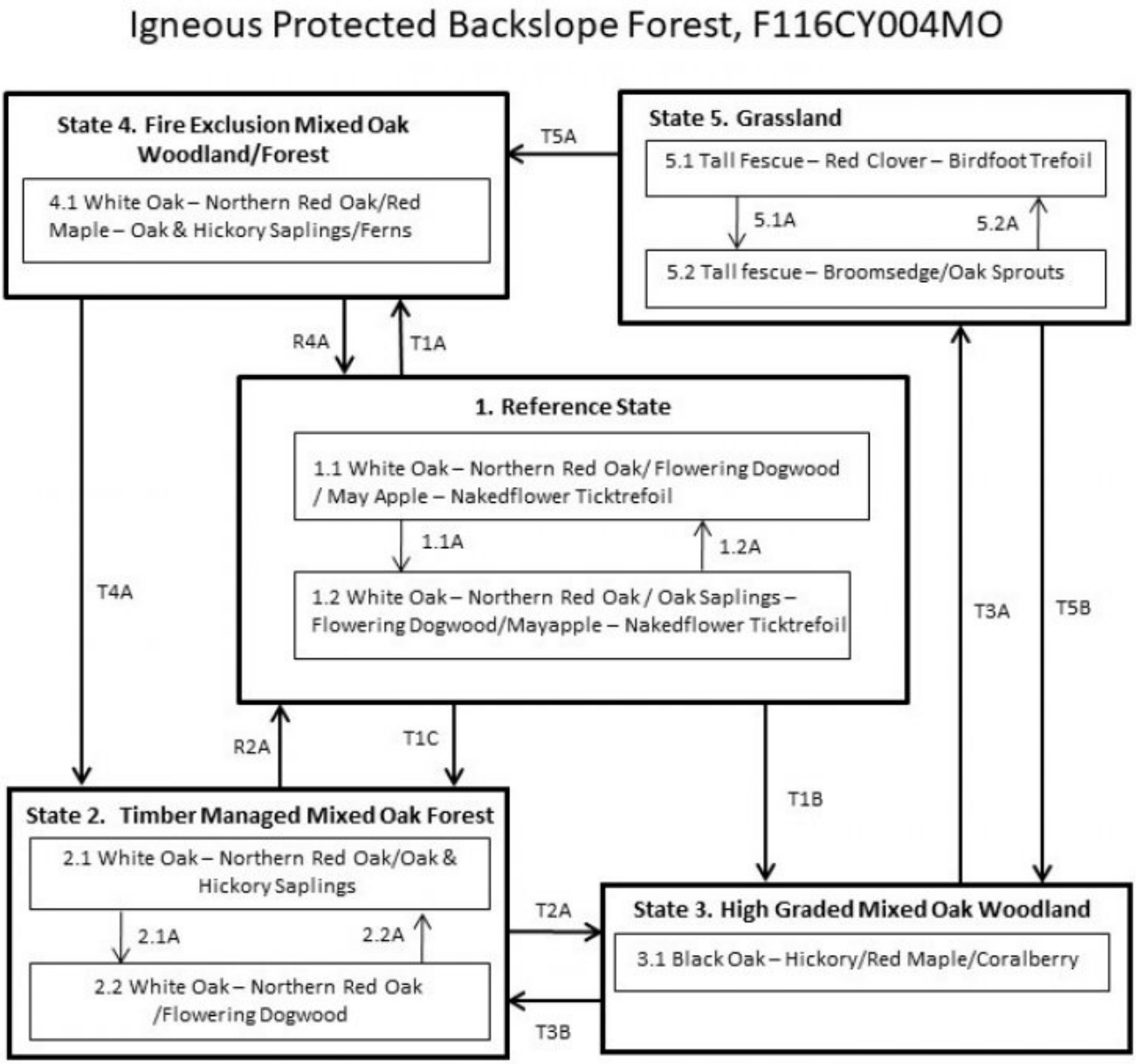
Uncontrolled domestic grazing has also diminished the diversity and cover of woodland ground flora species, and has often introduced weedy species such as gooseberry, coralberry, poison ivy and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and erosion related to grazing can lower site productivity.

Igneous Protected Backslope Forests are relatively productive timber sites. Timber harvest in this region typically is done using single-tree selection, and often results in removal of the most productive trees, or high-grading of the stand. This can result in poorer quality timber and a shift in species composition away from more valuable oak species. Carefully planned single tree selection or the creation of group openings can help regenerate more desirable oak species and increase vigor on the residual trees. Clear-cutting results in dense, even-aged stands of primarily oak. This may be most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands, the ground flora diversity can be shaded out and productivity of the stand may suffer.

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 sites in the region. Control of woody species will be more difficult. Protected aspect 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. While having protected sites in a burn unit is acceptable, targeting them solely for woodland 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.

State and transition model



Code	Event/Process
T1A	Fire suppression
T1B, T2A, T5B	Logging – high grading; some grazing
T3A	Clearing; grassland seeding; grassland management
T1C, T4A, 2.2A	Managed forest harvesting; fire suppression
1.1A	Fire-free interval 25+ years
1.2A	Fire interval 10-25 years
2.1A	20-30 years of limited logging disturbance
5.1A	Over grazing; no fertilization
5.2A	Brush management; grassland seeding; grassland management
R2A, R4A	Selective thinning and prescribed fire interval 10-25 years
T3B	Logging cessation; selective thinning
T5A	Cessation of grazing & haying; native tree, forb and grass planting

Figure 6. State and transition diagram for this ecological site

State 1

Reference

The historical reference state for this ecological site was old growth oak forest. This state was dominated by white oak, northern red oak, with occasional black oak, and shortleaf pine. Periodic disturbances from fire, wind and ice maintained the reference 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 sites are rare today. Most of these sites have been subject to repeated, high-graded timber harvest (State 3). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora (State 4). Relatively few igneous forests have been managed effectively for timber harvest (State 2), resulting in either even-age or uneven-age forests.

Community 1.1
White Oak-Northern Red Oak/ Flowering Dogwood / Mayapple – Naked Ticktrefoil

Forest overstory. Canopy cover ranges from 60 to 80 percent. White oak and northern red oak dominate with scattered black oak and black gum. Shortleaf pine occurs on some sites. The Overstory Species list is based commonly occurring species listed in Nelson (2010).

Forest understory. Two understory layers are present - 20 to 40 foot tall small tree layer and a rich native forb ground layer with scattered shrubs. The Understory Species list is based commonly occurring species listed in Nelson (2010).

Dominant plant species

- white oak (*Quercus alba*), tree
- northern red oak (*Quercus rubra*), tree
- black oak (*Quercus velutina*), tree
- mockernut hickory (*Carya tomentosa*), tree
- pignut hickory (*Carya glabra*), tree
- blackgum (*Nyssa sylvatica*), tree
- shortleaf pine (*Pinus echinata*), tree
- red maple (*Acer rubrum*), tree
- red hickory (*Carya ovalis*), tree
- flowering dogwood (*Cornus florida*), tree
- American witchhazel (*Hamamelis virginiana*), shrub
- fragrant sumac (*Rhus aromatica*), shrub
- Blue Ridge blueberry (*Vaccinium pallidum*), shrub
- silky dogwood (*Cornus amomum*), shrub
- common serviceberry (*Amelanchier arborea*), shrub
- eastern redbud (*Cercis canadensis*), shrub
- ribbed sedge (*Carex virescens*), grass
- slender woodland sedge (*Carex digitalis*), grass
- fuzzy wuzzy sedge (*Carex hirsutella*), grass
- parasol sedge (*Carex umbellata*), grass
- northern panicgrass (*Dichanthelium boreale*), grass
- slimflower muhly (*Muhlenbergia tenuiflora*), grass
- Bosc's panicgrass (*Dichanthelium boscii*), grass
- mayapple (*Podophyllum peltatum*), other herbaceous
- nakedflower ticktrefoil (*Desmodium nudiflorum*), other herbaceous
- Virginia snakeroot (*Aristolochia serpentaria*), other herbaceous
- Dillenius' ticktrefoil (*Desmodium glabellum*), other herbaceous
- feathery false lily of the valley (*Maianthemum racemosum*), other herbaceous
- eastern beebalm (*Monarda bradburiana*), other herbaceous
- largeflower bellwort (*Uvularia grandiflora*), other herbaceous
- rattlesnake fern (*Botrychium virginianum*), other herbaceous
- Christmas fern (*Polystichum acrostichoides*), other herbaceous
- American ginseng (*Panax quinquefolius*), other herbaceous

Community 1.2
White Oak-Northern Red Oak / Oak Saplings – Flowering Dogwood/May Apple – Naked Ticktrefoil

Pathway P1.1A
Community 1.1 to 1.2

Fire-free interval 25+ years

Pathway P1.2A
Community 1.2 to 1.1

Fire interval 10-25 years

State 2
Timber Managed Mixed Oak Forest

Periodic timber management, along with the absence of fire, will maintain this state. Continued exclusion of prescribed without a regular 15 to 20 year harvest re-entry into these stands, will slowly create an increase in more shade tolerant species. White oak will become less dominant and mid-story species such as flowering dogwood and hickory will become more dominate and cause a transition to community phase 2.2.

Community 2.1
White Oak-Northern Red Oak/Oak &Hickory Saplings

Community 2.2
White Oak-Northern Red Oak/Flowering Dogwood

Pathway P2.1A
Community 2.1 to 2.2

20-30 years of limited logging disturbance

Pathway P2.2A
Community 2.2 to 2.1

Managed forest harvesting; fire suppression

State 3
High Graded Mixed Oak Woodland

This state is subjected to repeated, high-graded timber harvests resulting in a significant reduction in white oak densities. Fire cessation has also occurred. This state exhibits an over-abundance of black oak and hickory and other less desirable tree species, and weedy understory species such as coralberry, gooseberry, poison ivy and Virginia creeper. The canopy is somewhat open. Some intermittent uncontrolled domestic livestock grazing may also occur further degrading the site. Proper forest management techniques can cause a transition to State 4.

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates

Community 3.1
High Graded Mixed Oak Woodland

State 4
Fire Excluded Mixed Oak Forest

This state is dominated by white oak and northern red oak. They can form relatively even-age stands, dating to when fire suppression became the dominant management characteristic on the site. This stage can occur relatively quickly (20 to 25 years). Canopy closures can approach 80 to 90 percent with decreasing ground flora. Without active management or long term presence of fire, woody species will continue to encroach into these woodlands. Once established, these woody species can quickly fill the forest system. Most occurrences of this state today are dense and shady with a greatly diminished ground flora. Some logging typically occurs. They are excellent wildlife sites. Removal of the younger understory, opening the upper canopy, and the application of periodic prescribed fire (10 to 25 years) has proven to be effective management tools in restoring the stage back to the reference state.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates

Community 4.1
White Oak-Red Oak/Red Maple-Oak & Hickory Saplings/Ferns

State 5
Grassland

Conversion of forested sites to planted, non-native grassland species such as tall fescue is a stage that is primarily associated with upper slope positions of this ecological site. If active grassland management is discontinued, the site will eventually transition to Phase 5.2 with an increase in broomsedge and oak sprouts. Return to the reference state from this state may be impossible requiring a very long term series of management options and stages. Many species may need to be eventually planted or reseeded to restore the system. Studies on Ozark woodlands indicate that conversion to grassland may result in soil loss from the clearing process and from erosion before the grassland is well established. Long-term grassland management results in higher soil pH levels and higher levels of calcium and magnesium from pasture liming. These effects may extend a foot or more into the soil profile. The effects of liming are more evident in phase 5.1 (Tall fescue – red clover).

Community 5.1
Tall Fescue - Red Clover - Birdsfoot Trefoil

Community 5.2
Tall fescue-Broomsedge/Oak Sprouts

Dominant resource concerns

- Sheet and rill erosion
- Ephemeral gully erosion
- Nutrients transported to surface water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates
- Feed and forage imbalance

Pathway P5.1A
Community 5.1 to 5.2

Over grazing; no fertilization

Pathway P5.2A
Community 5.2 to 5.1

Brush management; grassland seeding; grassland management

Transition T1C
State 1 to 2

Managed forest harvesting; fire suppression

Transition T1B
State 1 to 3

Logging – high grading; some grazing

Transition T1A
State 1 to 4

Fire suppression; some logging

Restoration pathway R2A
State 2 to 1

Selective thinning and prescribed fire interval 10-25 years

Transition T2A
State 2 to 3

Logging – high grading; some grazing

Transition T3B
State 3 to 2

High grade logging cessation; selective thinning

Transition T3A
State 3 to 5

Clearing; grassland seeding; grassland management

Restoration pathway R4A
State 4 to 1

Selective thinning and prescribed fire interval 10-25 years

Transition T4A
State 4 to 2

Managed forest harvesting; fire suppression

Transition T5B
State 5 to 3

Logging – high grading; some grazing

Transition T5A
State 5 to 4

Cessation of grazing & haying; native tree, forb and grass planting; extended rotations

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
white oak	QUAL	*Quercus alba*	Native	–	20–40	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	20–40	–	–
black oak	QUVE	*Quercus velutina*	Native	–	10–20	–	–
pignut hickory	CAGL8	*Carya glabra*	Native	–	5–20	–	–
blackgum	NYSY	*Nyssa sylvatica*	Native	–	10–20	–	–
mockernut hickory	CATO6	*Carya tomentosa*	Native	–	10–20	–	–
shortleaf pine	PIEC2	*Pinus echinata*	Native	–	0–5	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
ribbed sedge	CAVI4	*Carex virescens*	Native	–	5–10
Forb/Herb					
nakedflower ticktrefoil	DENU4	*Desmodium nudiflorum*	Native	–	5–10
black bugbane	ACRAR	*Actaea racemosa var. racemosa*	Native	–	5–10
Virginia snakeroot	ARSE3	*Aristolochia serpentaria*	Native	–	5–10
largeflower bellwort	UVGR	*Uvularia grandiflora*	Native	–	5–10
toadshade	TRSE2	*Trillium sessile*	Native	–	5–10
Virginia springbeauty	CLVI3	*Claytonia virginica*	Native	–	5–10
white fawnlily	ERAL9	*Erythronium albidum*	Native	–	5–10
shining bedstraw	GACO3	*Galium concinnum*	Native	–	5–10
mayapple	POPE	*Podophyllum peltatum*	Native	–	5–10
Fern/fern ally					
Christmas fern	POAC4	*Polystichum acrostichoides*	Native	–	0–5
rattlesnake fern	BOVI	*Botrychium virginianum*	Native	–	0–5
Shrub/Subshrub					
fragrant sumac	RHAR4	*Rhus aromatica*	Native	–	10–30
lowbush blueberry	VAAN	*Vaccinium angustifolium*	Native	–	5–20
American witchhazel	HAVI4	*Hamamelis virginiana*	Native	–	5–20
Tree					
flowering dogwood	COFL2	*Cornus florida*	Native	–	10–20
red maple	ACRU	*Acer rubrum*	Native	–	10–20
common serviceberry	AMAR3	*Amelanchier arborea*	Native	–	10–20

Table 7. Community 2.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
post oak	QUST	*Quercus stellata*	Native	–	–	–	–
blackjack oak	QUMA3	*Quercus marilandica*	Native	–	–	–	–
black oak	QUVE	*Quercus velutina*	Native	–	–	–	–
black hickory	CATE9	*Carya texana*	Native	–	–	–	–

Table 8. Community 2.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Shrub/Subshrub					
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	–

Animal community

Wildlife (MDC 2006)
Wild turkey, white-tailed deer, and eastern gray squirrel depend on hard and soft mast food sources and are typical upland game species of this type.

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

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

Other information

Forestry (NRCS 2002; 2014)
Management: Field measured site index values range from 53 for northern red oak and 55 for white oak. Timber management opportunities are generally 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. Using prescribed fire as a management tool could have a negative impact on timber quality and should be used with caution on a site if timber management is the primary objective.

Limitations: Large amounts of coarse fragments throughout profile; bedrock or a restrictive root layer may be within 60 inches. Surface stones and rocks are problems for efficient and safe equipment operation and will make equipment use somewhat difficult. Disturbing the surface excessively in harvesting operations and building roads increases soil losses, which leaves a greater amount of coarse fragments on the surface. Hand planting or direct seeding may be necessary. Seedling mortality due to low available water capacity may be high. Mulching or providing shade can improve seedling survival. Mechanical tree planting will be limited. Erosion is a hazard when slopes exceed 15 percent. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

Inventory data references

Potential Reference Sites: Igneous Protected Backslope Forest

Plot PROGO01 – Frenchmill soil
Located in Prairie Hollow Gorge NA, Shannon County, MO

Latitude: 37.183006
Longitude: -91.26307

Plot HUMOCA01 – Killarney soil
Located in Hughes Mountain CA, Washington County, MO
Latitude: 37.808996
Longitude: -90.712814

Plot MIMONA01 – Frenchmill soil
Located in Mill Mountain NA, Shannon County, MO
Latitude: 37.126799
Longitude: -91.18348484

Other references

Batek, M.J., A.J. Rebertus, W.A. Schroeder, T.L. Haithcoat, E. Compas, and R.P. Guyette. 1999. Reconstruction of early nineteenth-century vegetation and fire regimes in the Missouri Ozarks. Journal of Biogeography 26:397-412.

Conant, R. T., K. Paustian, and E. T. Elliott. 2001. Grassland management and conversion into grassland: effects on soil carbon. Ecological Applications, 11(2). pp. 343–355

Frost, C., 1996. Pre-settlement Fire Frequency Regimes of the United States: A First Approximation. Pages 70-81, Proceedings of the 20nd Tall Timbers Fire Ecology Conference: Fire in Ecosystem Management: Shifting the Paradigm from Suppression to Prescription. Tall Timbers Research Station, Tallahassee, FL.

Guyette, R.P. and B.E. Cutter. 1991. Tree-ring analysis of fire history of a post oak savanna in the Missouri Ozarks. Natural Areas Journal 11: 93-99.

Harlan, J.D., T.A. Nigh and W.A. Schroeder. 2001. The Missouri original General Land Office survey notes project. University of Missouri, Columbia.

Ladd, D. 1991. Reexamination of the role of fire in Missouri oak woodlands. Pp. 67-80 in G.V. Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Missouri Natural Heritage Inventory Database. 2013. Woodland element occurrence records. Missouri Department of Conservation. Jefferson City, Missouri.

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

National Vegetation Classification System Vegetation Association. 2010. http://www.natureserve.org/prodServices/ecomapping.jsp

Natural Resources Conservation Service. 2002. Woodland Suitability Groups. Missouri FOTG, Section II, Soil Interpretations and Reports. 30 pgs.

Natural Resources Conservation Service. Site Index Reports. Accessed May 2014. https://esi.sc.egov.usda.gov/ESI_Forestland/pgFSWelcome.aspx

Nelson, P. W. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Conservation, Jefferson City, Missouri. 550 p.

Nigh, T. A., and W. A. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri. 212 p.

Schellberg, J., B. Möseler, W. Kühbauch and A. Rademacher. 1999. Long-term effects of fertilizer on soil nutrient concentration, yield, forage quality and floristic composition of a hay meadow in the Eifel Mountains, Germany. Grass and Forage Science, 54: 195–207.

Schoolcraft, H.R. 1821. Journal of a tour into the interior of Missouri and Arkansas from Potosi, or Mine a Burton, in Missouri territory, in a southwest direction, toward the Rocky Mountains: performed in the years 1818 and 1819. Richard Phillips and Company, London.

Simmons, M., J. D. Childress, K. Godsey, and R. Taylor. 2006. Soil Survey of Reynolds County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. 682 pgs.

Yatskievych, George A. 1999/2006/2013. Flora of Missouri. Missouri Dept. of Conservation in cooperation with Missouri Botanical Garden Press, Volumes 1-3.

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Approval

Nels Barrett, 9/24/2020

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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)	
Contact for lead author	
Date	09/10/2020
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

   _____

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

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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:**
