

Ecological site F134XY015MO

Gravelly 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): 134X–Southern Mississippi Valley Loess

The Southern Mississippi Valley Loess (outlined in red on the map; northern portion only) is a relatively narrow strip of the coastal plain bordering the Mississippi River valley, that is blanketed with loess. The northern part of this MLRA, discussed here, is locally referred to as Crowley's Ridge. Elevation ranges from about 300 feet on the footslopes to nearly 600 feet on the highest ridges. Loess caps the summits and upper slopes, and Pliocene-aged sand and gravel deposits of the coastal plain influence soils on lower, steeper slopes.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010): The reference state for this ecological site is most similar to a Dry-Mesic Chert 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 Forest. National Vegetation Classification System Vegetation Association (NatureServe, 2010): The reference state for this ecological site is most similar to a *Quercus alba* - *Quercus falcata* - *Quercus velutina* / *Ostrya virginiana* Forest (CEGL004068). Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002): This Ecological Site occurs in the Benton Loess Woodland/Forest Hills Land Type Association of the Ozark Outer Border Subsection.

Ecological site concept

Gravelly Protected Backslope Forests are within the green areas on the map (Missouri portion only; distributions farther south are currently under review). They occupy the northerly and easterly aspects of steep, dissected slopes, and are mapped in complex with the Gravelly Exposed Backslope Woodland ecological site. These sites are not extensive, occurring in a few scattered upland locations in Scott county, Missouri. Soils are very deep, with an abundance of gravel. The reference plant community is forest with an overstory dominated by white oak, with occasional beech and bitternut hickory.

Table 1. Dominant plant species

Tree	(1) <i>Quercus alba</i> (2) <i>Quercus rubra</i>
Shrub	(1) <i>Viburnum rufidulum</i>
Herbaceous	(1) <i>Phlox divaricata</i> (2) <i>Podophyllum peltatum</i>

Physiographic features

This site is on upland backslopes, with slopes of 15 to 45%. 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.

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Slope	20 – 50 %
Aspect	N, NE, E

Climatic features

The Crowley's Ridge subsection of the Southern Mississippi Valley Loess 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 America 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 Crowley's Ridge subsection experiences regional differences in climates, but these differences do not have obvious geographic boundaries or major climatic variations. Regional climates 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 minor gradients along this line. The average annual precipitation in Crowley's Ridge subsection is 48 to 50 inches. The average annual temperature is 53 to 57 degrees F. Mean January minimum temperature follows the north-to-south gradient. Mean July maximum temperatures show little variation across the area.

Mean annual precipitation varies along the same gradient as temperature. The precipitation decreases gradually throughout the summer, except for a moderate increase in midsummer as high-intensity, convective thunderstorms. Minor amounts of snow fall occur nearly every winter, but the snow cover lasts for only a few days.

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 subsection 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. Slope orientation is an important topographic influence on microclimate. 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)	170 days
Freeze-free period (characteristic range)	200 days
Precipitation total (characteristic range)	1,190 mm

Frost-free period (actual range)	170 days
Freeze-free period (actual range)	200 days
Precipitation total (actual range)	1,190 mm
Frost-free period (average)	170 days
Freeze-free period (average)	200 days
Precipitation total (average)	1,190 mm

- (1) CAPE GIRARDEAU MUNI AP [USW00003935], Chaffee, MO

Influencing water features

Soil features

These soils have acidic subsoils that are low in bases. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is coastal plain sediments. They have gravelly loam surface horizons, and skeletal subsoils with high amounts of gravel and cobbles. These soils are not affected by seasonal wetness. Soil series associated with this site include Saffell.

Table 4. Representative soil features

Surface texture	(1) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow
Surface fragment cover <=3"	30 %
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.16 cm

Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	4.5 – 5.5
Subsurface fragment volume <=3" (Depth not specified)	40 – 50 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

In this region dominated by historic fire-prone prairies, savannas and open woodlands, Alfic Chert Protected Backslope Forests occur in the most protected landscape positions on lower, steep slopes in the deeper valleys furthest from the prairie uplands. While the upland prairies and savannas had an estimated fire frequency of 1-3 years, Alfic Chert Protected Backslope Forests burned less frequently (estimated 5-20 years) and with lower intensity.

The composition and structure of the Alfic Chert Backslopes varies in relation to slope aspect. Exposed, south and west facing slopes are more droughty and fire-prone than are the protected north and east facing slopes, which are relatively cool and moist. Consequently, a separate Ecological Site is recognized on the exposed aspects (Alfic Chert Exposed Backslope Woodlands), which forms a complex with the Protected Backslope Forests. These two ecological sites intergrade on neutral, northwest and southeast exposures.

The north and east facing slopes of the Alfic Chert Protected Backslope Forests have a well-developed forest canopy and subcanopy dominated by white oak with an abundant forest ground flora.

Historically, grazing by native herbivores and periodic fires kept understory conditions more open. In addition, Alfic Chert Protected Backslope Forests are subject to occasional disturbances from wind and ice, which periodically open the canopy up by knocking over trees or breaking substantial branches of canopy trees. The role of wind and ice in this region has been apparent during the early 2000s. Such canopy disturbances allow more light to reach the ground and favor reproduction of the dominant oak species.

Today, these communities have either been cleared and converted to pasture, or have undergone repeated timber harvest and domestic grazing. Most existing occurrences have a younger (50-80 years) canopy layer whose composition may have been altered by timber harvesting practices. An increase in hickories over historic conditions is common. In addition, in the absence of fire, the canopy, subcanopy and woody understory layers are better developed. The absence of periodic fire may have allowed more shade-tolerant tree species, such as sugar maple, white ash, or hickories to increase in abundance.

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

Alfic Chert Protective Backslope Forests are productive timber sites in. 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 does occur and 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. Consequently, while having protected aspects in a burn unit is acceptable, targeting them solely for woodland restoration is not advisable.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. 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	<i>Quercus alba</i>	Native	—	—	—	—
northern red oak	QURU	<i>Quercus rubra</i>	Native	—	—	—	—
shagbark hickory	CAOV2	<i>Carya ovata</i>	Native	—	—	—	—
shortleaf pine	PIEC2	<i>Pinus echinata</i>	—	—	—	—	—
red maple	ACRU	<i>Acer rubrum</i>	—	—	—	—	—
sugar maple	ACSA3	<i>Acer saccharum</i>	—	—	—	—	—

Table 7. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (m)	Canopy Cover (%)
Forb/Herb					
toadshade	TRSE2	<i>Trillium sessile</i>	—	—	—
white fawnlily	ERAL9	<i>Erythronium albidum</i>	—	—	—
goldenseal	HYCA	<i>Hydrastis canadensis</i>	—	—	—
Christmas fern	POAC4	<i>Polystichum acrostichoides</i>	—	—	—
mayapple	POPE	<i>Podophyllum peltatum</i>	—	—	—
feathery false lily of the valley	MARA7	<i>Maianthemum racemosum</i>	—	—	—
Virginia springbeauty	CLVI3	<i>Claytonia virginica</i>	—	—	—
Virginia snakeroot	ARSE3	<i>Aristolochia serpentaria</i>	—	—	—
rattlesnake fern	BOVI	<i>Botrychium virginianum</i>	—	—	—
hepatica	HENO2	<i>Hepatica nobilis</i>	—	—	—
lesser yellow lady's slipper	CYPAP4	<i>Cypripedium parviflorum var. parviflorum</i>	—	—	—
largeflower bellwort	UVGR	<i>Uvularia grandiflora</i>	—	—	—
Shrub/Subshrub					
cat greenbrier	SMGL	<i>Smilax glauca</i>	—	—	—
wild blue phlox	PHDI5	<i>Phlox divaricata</i>	—	—	—
flowering dogwood	COFL2	<i>Cornus florida</i>	Native	—	—
common serviceberry	AMAR3	<i>Amelanchier arborea</i>	—	—	—
fragrant sumac	RHAR4	<i>Rhus aromatica</i>	—	—	—
Tree					
hophornbeam	OSVI	<i>Ostrya virginiana</i>	—	—	—
blackgum	NYSY	<i>Nyssa sylvatica</i>	—	—	—
Vine/Liana					

summer grape	VIAE	<i>Vitis aestivalis</i>	–	–	–
Virginia creeper	PAQU2	<i>Parthenocissus quinquefolia</i>	–	–	–

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height M	Canopy Cover (%)	Diameter Cm	Basal Area (square M/hectare)
Tree							
white oak	QUAL	<i>Quercus alba</i>	Native	–	–	–	–
post oak	QUST	<i>Quercus stellata</i>	Native	–	–	–	–
black oak	QUVE	<i>Quercus velutina</i>	Native	–	–	–	–

Table 11. Community 2.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (m)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
little bluestem	SCSC	<i>Schizachyrium scoparium</i>	Native	–	–

Table 12. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 15. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 16. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 17. Community 6.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Contributors

Fred Young

Approval

Matthew Duvall, 3/20/2025

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	09/22/2026
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:
