USDA Natural Resources
Conservation Service

# Ecological site F134XY002MO
# Deep Loess 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.


**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): 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 Mesic Loess/Glacial Till 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 Hardwood Mesic Forest.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Quercus (rubra, alba, velutina) / Acer barbatum / Asimina triloba Forest (CEGL004069).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This Ecological Site occurs in the Crowley's Ridge Subsection, and in the Benton Loess Woodland/Forest Hills Land Type Association of the Ozark Outer Border Subsection.

## Ecological site concept

Deep Loess 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 Deep Loess Exposed Backslope Woodland ecological site. These sites are common in Scott county, Missouri, and on the easternmost uplands of Crowley's Ridge in Stoddard county, Missouri. Soils are very deep, with no rooting restrictions. The reference plant community is forest dominated by northern red oak, white oak, and tulip poplar, with minor amounts of sugar maple, a well-developed understory and a rich herbaceous ground flora.

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Fagus grandifolia*<br>(2) *Liriodendron tulipifera* |
| Shrub | (1) *Asimina triloba*<br>(2) *Aesculus pavia* |
| Herbaceous | (1) *Sanguinaria canadensis*<br>(2) *Trillium* |

## Physiographic features

This site is on upland backslopes, with slopes of 15 -35%. 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 adjacent figure (adapted from Butler, 1985) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “1” on the figure, on lower backslopes with northerly to easterly exposures. Deep Loess Exposed Backslope Woodland sites are on the corresponding southerly to westerly exposures. Upper slopes and summits within the area are in the Deep Loess Upland Woodland ecological site. Fragipan Upland Woodland sites, labeled “2” on the figure, are closely associated with the Deep Loess sites.

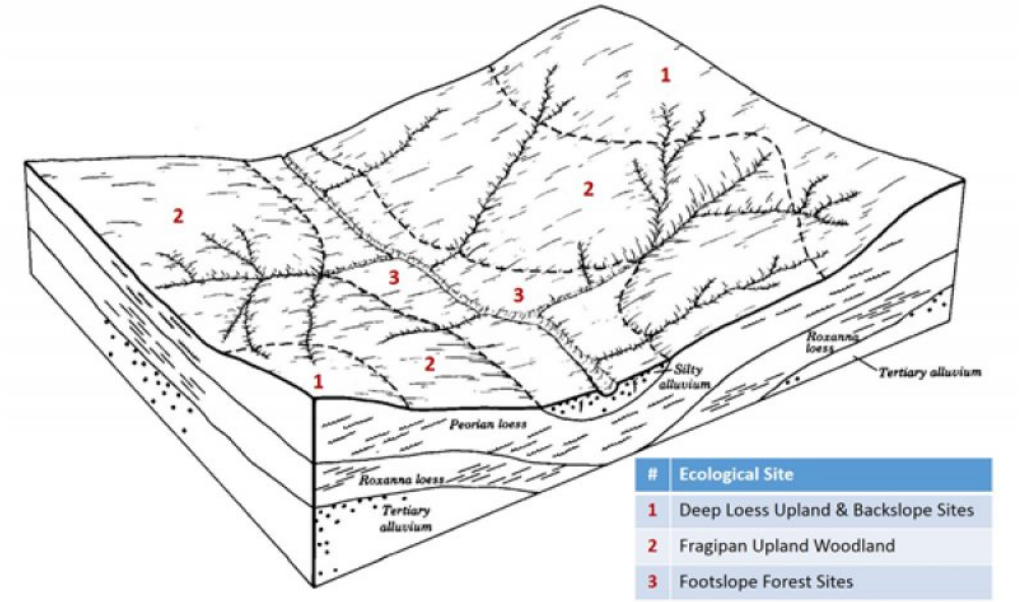


**Figure 2. Typical landscape relationships for this ecologica**

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Hill |
| Flooding frequency | None |
| Ponding frequency | None |
| Slope | 15–35% |
| 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) | 164-168 days |
| Freeze-free period (characteristic range) | 193-196 days |

| | |
|---|---|
| Precipitation total (characteristic range) | 1,194 mm |
| Frost-free period (actual range) | 162-170 days |
| Freeze-free period (actual range) | 192-197 days |
| Precipitation total (actual range) | 1,194 mm |
| Frost-free period (average) | 166 days |
| Freeze-free period (average) | 195 days |
| Precipitation total (average) | 1,194 mm |

## Climate stations used

- (1) CAPE GIRARDEAU MUNI AP [USW00003935], Chaffee, MO
- (2) ADVANCE 1 S [USW00093825], Advance, MO

## Influencing water features

## Soil features

These soils have no major rooting restriction. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is loess. The soils have silt loam surface horizons. Subsoils are silt loam to silty clay loam. These soils are not affected by seasonal wetness. Soil series associated with this site include Memphis.
The accompanying picture of the Memphis series shows a dark grayish brown silt loam surface horizon to about 18 cm overlying the brown silt loam to silty clay loam subsoil. Pale silt coats on structural prism faces can be seen below one meter in this picture. Picture courtesy of Kevin Godsey and Dan Childress; scale is in centimeters.

**Figure 9. Memphis series**

**Table 4. Representative soil features**

| | |
|---|---|
| Surface texture | (1) Silt loam |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Moderately slow |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 20.32–22.86 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) | 4.5–6 |
| Subsurface fragment volume <=3" (Depth not specified) | 0% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

# Ecological dynamics

# State and transition model

**Ecosystem states**

1. Mesic Loess/Glacial Till Forest

2. dry-Mesic Loess/Glacial Till Woodland

**State 1 submodel, plant communities**

1.1. Sugar Maple-Black Maple-Basswood-Red Oak/Hornbeam Forest

**State 2 submodel, plant communities**

2.1. Sugar Maple-Black Maple-Basswood-Red Oak/Hornbeam Forest

# State 1
# Mesic Loess/Glacial Till Forest

# Community 1.1
# Sugar Maple-Black Maple-Basswood-Red Oak/Hornbeam Forest

**Figure 10. Hart Creek Conservation Area, MDC, Boone Co.**

## State 2
## dry-Mesic Loess/Glacial Till Woodland

## Community 2.1
## Sugar Maple-Black Maple-Basswood-Red Oak/Hornbeam Forest

## 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** | | | | | | | |
| northern red oak | QURU | *Quercus rubra* | Native | – | – | – | – |
| sugar maple | ACSA3 | *Acer saccharum* | Native | – | – | – | – |
| black maple | ACNI5 | *Acer nigrum* | Native | – | – | – | – |
| American basswood | TIAM | *Tilia americana* | Native | – | – | – | – |

**Table 6. Community 1.1 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) |
|---|---|---|---|---|---|
| **Shrub/Subshrub** | | | | | |
| hophornbeam | OSVI | *Ostrya virginiana* | Native | – | – |

**Table 7. 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 | *Quercus alba* | Native | – | – | – | – |
| shagbark hickory | CAOV2 | *Carya ovata* | Native | – | – | – | – |

**Table 8. Community 2.1 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) |
|---|---|---|---|---|---|
| **Grass/grass-like (Graminoids)** | | | | | |
| Pennsylvania sedge | CAPE6 | *Carex pensylvanica* | Native | – | – |

## Other references

Butler, E. Rex. 1985. Soil Survey of Stoddard County, Missouri. U.S. Dept. of Agric. Soil Conservation Service.

## 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 | 05/21/2025 |
| Approved by | Matthew Duvall |
| 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:**

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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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:**

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