USDA Natural Resources Conservation Service

Ecological site F134XY016MO
Gravelly Exposed Backslope Woodland

Last updated: 3/20/2025
Accessed: 05/13/2025

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 Dry-Mesic Chert 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 Oak Woodland.

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 Exposed Backslope Woodlands are within the green areas on the map (Missouri portion only; distributions farther south are currently under review). They occupy the southerly and westerly aspects of steep, dissected slopes, and are mapped in complex with the Gravelly Protected Backslope Forest 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 woodland with an overstory dominated by white oak, along with occasional southern red oak, and a ground flora of native grasses and forbs.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus velutina*
Shrub	(1) *Rhus aromatica*
Herbaceous	(1) *Bromus pubescens* (2) *Helianthus*

Physiographic features

This site is on upland backslopes, with slopes of 15 to 45%. It is on exposed aspects (south, southwest, and west), which receive significantly more solar radiation than the protected 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	15–45%
Aspect	S, SW, W

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

Climate stations used

- (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"	25–30%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	10.16 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)	4.5–5.5
Subsurface fragment volume <=3" (Depth not specified)	40–50%
Subsurface fragment volume >3" (Depth not specified)	2–4%

Ecological dynamics

In this region dominated by historic fire-prone prairies, savannas and open woodlands, Alfic Chert Protected Backslope Woodlands occur in relatively 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 Exposed Backslope Woodlands 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 protected aspects (Alfic Chert Protected Backslope Forests), which forms a complex with the Exposed Backslope Forests. These two ecological sites intergrade on neutral, northwest and southeast exposures.

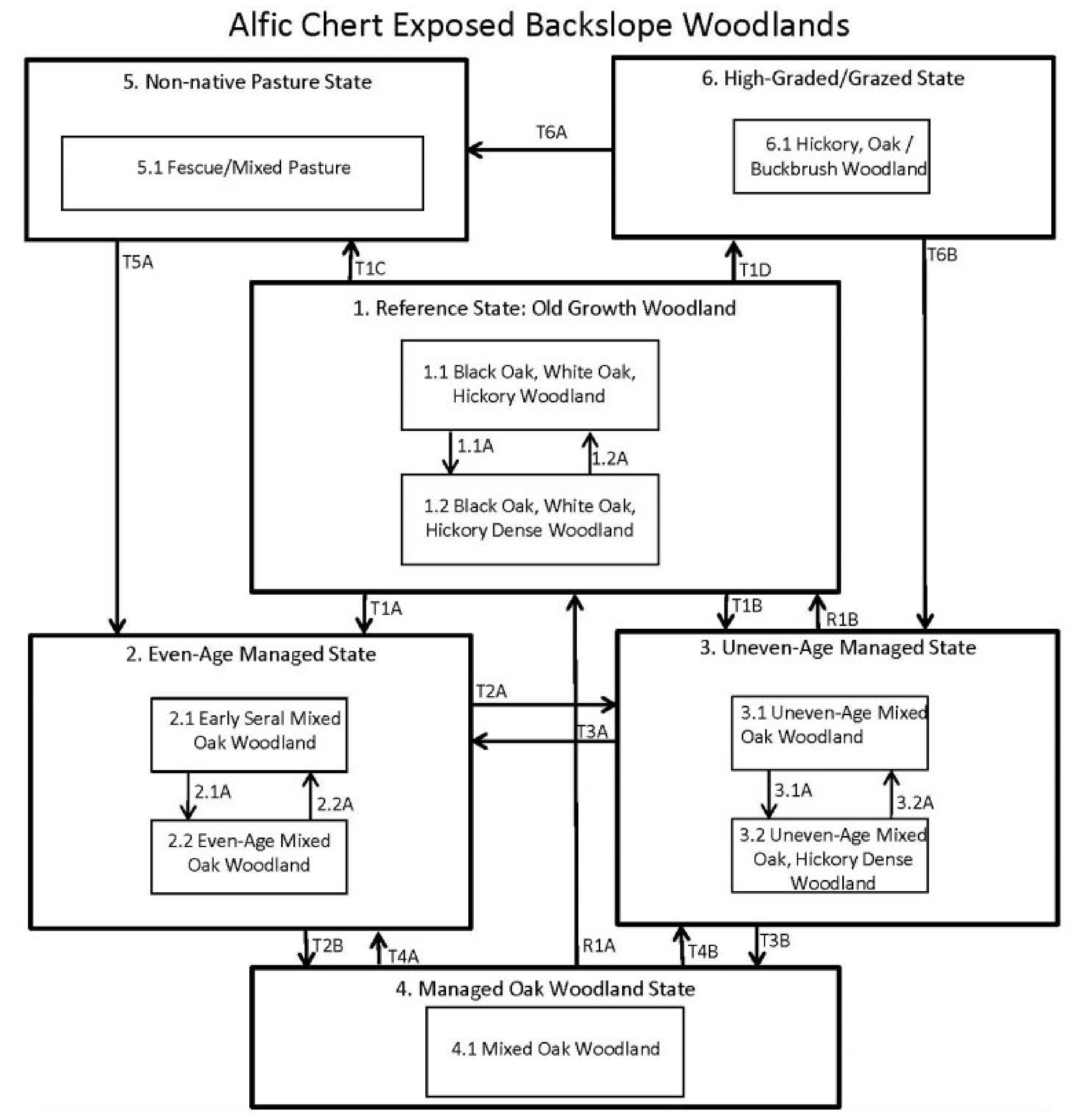
The south and west facing slopes of the Alfic Chert Exposed Backslope Woodlands have an open woodland structure with 70-80% canopy closure, a sparse subcanopy layer and an abundant woodland ground flora. Canopy tree species tolerant of drought and fire, such as black oak and post oak, share dominance with white oak. Historically, grazing by native herbivores and periodic fires kept understory conditions more open. In addition, Alfic Chert Exposed Backslope Woodlands 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, sub-canopy and woody understory layers are better developed. The diversity and cover of woodland ground flora has diminished in the more shaded conditions. Domestic grazing has also diminished the diversity and cover of forest 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 Exposed Backslope Woodlands are 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 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 also play a beneficial role in the management of this ecological site. While woodland restoration using fire is a viable option, the higher productivity of these sites makes it more challenging than on the other woodland sites in the region. Control of woody species will be more difficult. Excellent woodland restoration on these steep exposed aspects has been achieved.

State and transition model



Code	Practice
T1A	Even-aged mgt (clear cut, seed tree, shelterwood)
T1B	Fire suppression; uneven-age mgt (single tree or group selection)
T2B, T3B	Prescribed fire; thinning
T1C, T6A	Clearing & pasture planting
T1D	Poorly planned harvest & grazing
T2A, T4B	Uneven-age mgt
T3A, T4A	Even-age mgt
T5A	Tree planting; long-term succession
T6B	Uneven-age mgt; tree planting
R1A	Prescribed fire & extended rotations
R1B	Uneven-age mgt, extended rotations

Code	Practice
1.1A, 2.1A, 3.1A	No disturbance (10+ yrs)
1.2A	Disturbance (fire, wind, ice) < 10 yrs
2.2A	Even-age mgt.
3.2A	Uneven-age mgt.

Figure 8. Alfic Chert Exposed Backslope Woodlands

State 1
Reference State: Old Growth Woodland

The historical reference state for this Ecological Site was old growth oak woodland. The Old Growth Woodland was dominated by black oak, post oak and white oak. Maximum tree age was likely 150-300 years. Periodic disturbances from fire, wind or ice 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 Old Growth Woodland state, with shifts between phases based on disturbance frequency. Old Growth Woodlands are very rare today. Many sites have been converted to non-native pasture (State #5). Others have been subject to repeated, high-graded timber harvest coupled with domestic livestock grazing (State #6). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Many Old Growth Woodlands have been managed effectively for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) woodlands.

Community 1.1
Black Oak, White Oak, Hickory Woodland

Due to their high productivity, Black Oak, White Oak, Hickory Woodlands resemble forests structurally. However, the southern and western exposure limits tree density and provides enough light for woodland ground flora species to persist. The tree canopy is dominated by a mix of black, post and white oak, and the understory is relatively open with scattered oak and sassafras saplings. This woodland community has a two-tiered structure, and a canopy that is 60-80 feet tall with 60-80% closure. Historically, these exposed slopes likely burned every 5-10 years, so ground flora cover was greater than 75%. During long, fire-free intervals the density of trees and saplings increased, as did fire-intolerant tree species such as hickory. Over time, these gradual species changes and increased density result in a community phase transition to the Mixed Oak, Hickory Dense Woodland (Community Pathway 1.1A to Community Phase 1.2 on the State & Transition Diagram). Unlike the forest communities on protected slopes, the persistence of oak as a dominant canopy species is not threatened on the exposed slopes.

Community 1.2
Mixed Oak, Hickory Dense Woodland

Due to their high productivity, Mixed Oak, Hickory Dense Woodlands resemble forests structurally. However, the southern and western exposure limits tree density and provides enough light for woodland ground flora species to persist. The tree canopy is dominated by a dense mix of black, post and white oak, and hickory species. The understory is relatively dense, with scattered hickory, oak and sassafras saplings. This woodland community has a multi-tiered structure, and a canopy that is 60-80 feet tall with 80-100% closure. The dense canopy closure has suppressed the ground flora in this community. Historically, these exposed slopes likely burned every 5-10 years, which helped to maintain a more open canopy, increased the ground flora cover, and enabled more oak regeneration. However, unlike the forest communities on protected slopes, the persistence of oak as a dominant canopy species is not threatened on the exposed slopes. Over time, these gradual species changes and decreased density result in a community phase transition to the Mixed Oak Woodland (Community Pathway 1.2A to Community Phase 1.1 on the State & Transition Diagram).

Pathway 1.1A
Community 1.1 to 1.2

This pathway is a gradual transition that results from extended, disturbance-free periods of roughly 50 years or longer.

Pathway 1.2A
Community 1.2 to 1.1

This pathway results from ecological disturbances such as fire, ice storms, or violent wind storms. Historically, native grazers such as bison provided disturbance events as well.

State 2

Even-Aged Managed State

This state starts with a sequence of early seral mixed oak woodlands, which mature over time. These woodlands tend to be rather dense, with a depauperate understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. However, in the absence of fire, the diversity and cover of the ground flora is still diminished. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) woodlands. Prescribed fire without extensive timber harvest will, over time, cause a transition to Managed Oak Woodlands (state 4).

Community 2.1
Early Seral Mixed Oak Woodland

This woodland community has a simple, dense, single-tiered structure, with canopy height that varies with age, and 100% canopy closure. The understory and ground flora is depauperate. Thinning can increase overall tree vigor and improve understory diversity. However, in the absence of fire, the diversity and cover of the ground flora is still diminished. If the community is not subject to disturbance, it will mature over time and transition into a Even-Age Mixed Oak Woodland community (Community Pathway 2.1A to Community Phase 2.2 on the State & Transition Diagram).

Community 2.2
Even-Age Mixed Oak Woodland

This woodland community has a single-tiered structure, with canopy height that varies with age, and 80-100% canopy closure. The understory and ground flora is depauperate. Thinning can increase overall tree vigor and improve understory diversity. However, in the absence of fire, the diversity and cover of the ground flora is still diminished. Clearcutting or catastrophic disturbance will cause a transition to the Early Seral Mixed Oak Woodland community (Community Pathway 2.2A to Community Phase 2.1 on the State & Transition Diagram).

Pathway 2.1A
Community 2.1 to 2.2

This pathway is a gradual transition that results from limited disturbance for 60-90 years.

Pathway 2.2A
Community 2.2 to 2.1

This pathway typically results from even-age forestry management techniques such as clear-cutting. It can also result from catastrophic events such as severe ice or wind storms.

State 3
Uneven-Age Managed State

Uneven-Age Managed Woodlands resemble their Reference State (Old Growth Woodlands). The biggest difference is tree age, most being only 50-90 years old. Composition is also likely altered from the reference state depending on tree selection during harvest. In addition, without a regular 15-20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species and white oak will become less dominant. Uneven Age Managed Woodland is also dense because of fire suppression, but less so than the Even-Age Managed state. Consequently, the woodland ground flora is less suppressed and structural diversity is better maintained. Without periodic disturbance, stem density and fire intolerant species, like hickory, increase in abundance.

Community 3.1
Uneven-Age Mixed Oak Woodland

This woodland community has a multi-tiered structure, and 60-90% canopy closure. If the community is not subject to disturbance, it will mature over time and transition into an Uneven-Age Mixed Oak, Hickory Dense Woodland community (Community Pathway 3.1A to Community Phase 3.2 on the State & Transition Diagram).

Community 3.2
Uneven-Age Mixed Oak, Hickory Dense Woodland

This woodland community has a multi-tiered structure, and 80-100% canopy closure. If the community is subject to periodic selective timber harvest or other patchy disturbance events, it will transition into an Uneven-Age Mixed Oak Woodland community (Community Pathway 3.2A to Community Phase 3.1 on the State & Transition Diagram).

Pathway 3.1A
Community 3.1 to 3.2

This pathway is a gradual transition that results from extended, disturbance-free periods of roughly 50 years or longer.

Pathway 3.2A
Community 3.2 to 3.1

This pathway typically results from uneven-age forestry management techniques such as selective cutting, with a 15 year rotation and a maximum timber tree age of 120 years.

State 4
Managed Oak Woodland State

The Managed Oak Woodland State results from managing woodland communities in States 2 or 3 with prescribed fire, over time. This state resembles the reference state, with younger maximum tree ages and lower ground flora diversity.

Community 4.1
Mixed Oak Woodland

This woodland community has a single to two-tiered structure, and 70-90% canopy closure.

State 5
Non-native Pasture State

Type conversion of woodlands to planted, non-native pasture species such as tall fescue has been common in this area. Steep slopes, abundant surface fragments, low organic matter contents and soil acidity make non-native pastures difficult to maintain in a healthy, productive state on this ecological site. If grazing and active pasture management are discontinued, the site will eventually transition to State 2 (Even-Age). Timber Stand Improvement practices can hasten this process.

Community 5.1
Fescue / Mixed Pasture

This is an herbaceous community that is typically dominated by tall fescue. Various other grass and forb species are typically present, in various amounts. Shrub and pioneer tree species such as eastern redcedar and black locust typically invade sites that are not regularly managed.

State 6
High-Graded/Grazed State

Timbered sites subjected to repeated, high-graded timber harvests and domestic grazing transition to this State. This state exhibits an over-abundance of hickory and other less desirable tree species, and weedy understory species such as buckbrush, gooseberry, poison ivy and Virginia creeper. The vegetation offers little nutritional value for cattle, and excessive stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Exclusion of cattle from sites in this state coupled with uneven-age management techniques will cause a transition to State 3 (Uneven-Age).

Community 6.1
Hickory, Oak / Buckbrush Woodland

This woodland community has a multi-tiered structure, with irregular, variable canopy closure.

Transition T1A
State 1 to 2

This transition typically results from even-age timber management practices, such as clear-cut, seed tree or shelterwood harvest.

Transition T1B
State 1 to 3

This transition typically results from uneven-age timber management practices, such as single tree or group selection harvest.

Restoration pathway R1B
State 1 to 3

This restoration pathway generally requires uneven-age timber management practices, such as single tree or group selection harvest, with extended rotations that allow mature trees to exceed ages of about 150 years. Prescribed fire is part of the restoration process. Mechanical thinning may be necessary in dense woodlands.

Restoration pathway R1A
State 1 to 4

This restoration pathway generally requires uneven-age timber management practices, such as single tree or group selection harvest, with extended rotations that allow mature trees to exceed ages of about 150 years. Prescribed fire is part of the restoration process.

Transition T1C
State 1 to 5

This transition is the result of clearing the woodland community and planting pasture species. Soil erosion can be extensive in this process, along with loss of organic matter. Liming and fertilizing associated with pasture management typically raises the soil pH and increases the cation concentration (such as calcium and magnesium) of the upper soil horizons.

Transition T1D
State 1 to 6

This transition is the result of poorly planned timber harvest techniques such as high-grading, accompanied by unmanaged cattle grazing. Soil erosion and compaction often result from cattle grazing after the understory has been damaged.

Transition T2A
State 2 to 3

This transition typically results from uneven-age timber management practices, such as single tree or group selection harvest.

Transition T2B
State 2 to 4

This transition is the result of the systematic application of prescribed fire. Mechanical thinning may also be used.

Transition T3A
State 3 to 2

This transition typically results from even-age timber management practices, such as clear-cut, seed tree or shelterwood harvest.

Transition T3B
State 3 to 4

This transition is the result of the systematic application of prescribed fire. Mechanical thinning may also be used.

Transition T4A
State 4 to 2

This transition typically results from even-age timber management practices, such as clear-cut, seed tree or shelterwood harvest.

Transition T4B
State 4 to 3

This transition typically results from uneven-age timber management practices, such as single tree or group selection harvest.

Transition T5A
State 5 to 2

This transition results from the cessation of cattle grazing and associated pasture management such as mowing and brush-hogging. Herbicide application, tree planting and timber stand improvement techniques can speed up this otherwise very lengthy transition.

Transition T6B
State 6 to 3

This transition typically results from uneven-age timber management practices, such as single tree or group selection harvest. Tree planting, mechanical thinning and other timber stand improvement techniques may be helpful to decrease the transition time.

Transition T6A
State 6 to 5

This transition is the result of clearing the woodland communities and planting pasture species. Soil erosion can be extensive in this process, along with loss of organic matter. Liming and fertilizing associated with pasture management typically raises the soil pH and increases the cation concentration (such as calcium and magnesium) of the upper soil horizons.

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							
shortleaf pine	PIEC2	*Pinus echinata*	–	–	–	–	–
scarlet oak	QUCO2	*Quercus coccinea*	–	–	–	–	–
white oak	QUAL	*Quercus alba*	Native	–	–	–	–
post oak	QUST	*Quercus stellata*	Native	–	–	–	–
black oak	QUVE	*Quercus velutina*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Bosc's panicgrass	DIBO2	*Dichanthelium boscii*	–	–	–
hairy woodland brome	BRPU6	*Bromus pubescens*	–	–	–
whitetinge sedge	CAAL25	*Carex albicans*	–	–	–
little bluestem	SCSC	*Schizachyrium scoparium*	–	–	–
little bluestem	SCSC	*Schizachyrium scoparium*	Native	–	–
Forb/Herb					
elmleaf goldenrod	SOUL2	*Solidago ulmifolia*	–	–	–
American hogpeanut	AMBR2	*Amphicarpaea bracteata*	–	–	–
smooth small-leaf ticktrefoil	DEMA2	*Desmodium marilandicum*	–	–	–
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	–	–	–
Arkansas bedstraw	GAAR4	*Galium arkansanum*	–	–	–
feathery false lily of the valley	MARA7	*Maianthemum racemosum*	–	–	–
eastern beebalm	MOBR2	*Monarda bradburiana*	–	–	–
rue anemone	THTH2	*Thalictrum thalictroides*	–	–	–
manyray aster	SYAN2	*Symphyotrichum anomalum*	–	–	–
American ipecac	GIST5	*Gillenia stipulata*	–	–	–
spotted geranium	GEMA	*Geranium maculatum*	–	–	–
hairy sunflower	HEHI2	*Helianthus hirsutus*	–	–	–
fourleaf milkweed	ASQU	*Asclepias quadrifolia*	–	–	–
bristly buttercup	RAHI	*Ranunculus hispidus*	–	–	–
fire pink	SIVI4	*Silene virginica*	–	–	–
Shrub/Subshrub					
leadplant	AMCA6	*Amorpha canescens*	–	–	–
Blue Ridge blueberry	VAPA4	*Vaccinium pallidum*	–	–	–
fragrant sumac	RHAR4	*Rhus aromatica*	–	–	–
Vine/Liana					
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	–	–	–
summer grape	VIAE	*Vitis aestivalis*	–	–	–

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	05/13/2025
Approved by	Matthew Duvall
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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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):**

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:**