USDA Natural Resources Conservation Service

Ecological site NX118A01Y010
Calcareous Bottomland

Last updated: 1/03/2019
Accessed: 05/12/2025

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): 118A–Arkansas Valley and Ridges, Eastern Part

118A—Arkansas Valley and Ridges, Eastern Part Major Land Resource Area (MLRA) is in Arkansas (75 percent) and Oklahoma (25 percent) encompassing an area of approximately 6,755 square miles (17,510 square kilometers). The towns of Poteau and Sallisaw, OK, and Booneville, Clarksville, Fort Smith, Greenwood, and Ozark, AR, are in the western part. The Arkansas towns of Conway, Morrilton, Russellville, and Searcy are in the eastern section along with a part of Little Rock in the southeast corner. Interstate 40 passes through from east to west and parallels the northern side of the Arkansas River. The Ozark National Forest and the northern fringe of the Ouachita National Forest occur in this area as does Ft. Chaffee, Camp Joseph T. Robinson, and Little Rock Air Force Base (USDA 2006).

Most of 118A is in the Arkansas Valley Section of the Ouachita Province of the Interior Highlands. Long, narrow ridges and high flat-topped mountains capped with sandstone trend northeastward. Crests are narrow and rolling on ridges and broad and flat on mountaintops. The intervening valleys are broad and smooth. Elevation ranges from 300 ft. (90 m) on the lowest valley floors to 2,750 ft. (840 m) on the mountaintops. The Arkansas River is a major inland navigational river. It flows from the northwestern part of the MLRA, at Robert S. Kerr Lake, in Oklahoma to Little Rock in the southeast.

The ridges and valleys of 118A are underlain by slightly folded to level beds of sandstone and shale, respectively.

The area principally consists of the following geologic groups: Savanna, McAlester, Hartshorne sandstone, and the upper and lower Atoka. These are of Pennsylvanian age (formed approximately 300 million years ago). The terrace deposits along the Arkansas River include a complex sequence of unconsolidated gravel, sandy gravel, sands, silty sands, silts, clayey silts, and clays. At least three terrace levels are recognized. The lowest is the youngest.

Classification relationships

This ecological site is found in Major Land Resource Area 118A - the Arkansas Valley and Ridges, Eastern Part. MLRA 118A is located within Land Resource Region N - the East and Central Farming and Forest Region (USDA 2006). In addition, MLRA118A falls within area #37 of EPA Ecoregion Level III - the Arkansas Valley (USEPA 2013). The Calcareous Bottomland ecological site occurs in United States Forest Service Ecoregions -255A – the Prairie Parkland (Subtropical) Province, M222A – the Ozark Broadleaf Forest-Meadow Province, and -251E – the Prairie Parkland (Temperate) Province (Bailey 1995). This ecological site is found primarily in 37b - Arkansas River Floodplain of EPA Ecoregion IV (Woods et. al. 1996).

South-Central Interior Large Floodplain - CES202.705 and

(NatureServe 2017).

Ecological site concept

The Calcareous Bottomlands ecological site occurs on floodplains, natural levees, and stream terraces formed from alluvium of mixed sedimentary geologies within EPA Ecoregion 37b - the Arkansas River Floodplains section of the Arkansas Valley and Ridges major land resource area. Potential natural vegetation is southern floodplain forest. Bottomland hardwood species including *Quercus macrocarpa* (bur oak), *Platanus occidentalis* (American sycamore), Liquidamber styraciflua (sweetgum), Salix spp. (willows), *Populus deltoides* (eastern cottonwood), *Fraxinus pennsylvanica* (green ash), *Carya illinoinensis* (pecan), Celtis occidentalis (hackberry), and Ulmus spp. (elm) were once extensive (Woods, Foti et. Al. 2004). The driest areas may have been dominated by oak-hickory forests. The Calcareous Bottomlands are fertile and have been widely cleared for agriculture – nearly 60 percent of the ecological site has been converted to row crops and 20 percent to pasture and hayland. Forest remains in the most frequently flooded areas. Their fertility and extensive use for agriculture distinguishes these sites from the Loamy Bottomlands. They are drier than the Poorly to Somewhat Poorly Drained Bottomland and Terraces and the Somewhat Poorly Drained Calcareous Bottomlands.

Associated sites

NX118A01Y007	**Seasonally Wet Terraces and Footslopes**

Similar sites

NX118AY011	**Somewhat Poorly Drained Calcareous Bottomland**
F119XY013AR	**Loamy Floodplain**

Table 1. Dominant plant species

Tree	(1) *Ulmus americana* (2) *Celtis laevigata*
Shrub	Not specified
Herbaceous	Not specified

Legacy ID

F118AY010AR

Physiographic features

The Calcareous Bottomlands ecological site occurs on floodplains, natural levees, and stream terraces formed from alluvium of mixed sedimentary geologies within the Arkansas River Floodplains section of the Arkansas Valley and Ridges major land resource area. Elevation ranges from 120 to 180 m (approximately 390 to 590 ft.) and slopes are 0 to 3 percent. Flooding is occasional with a 5 to 50 percent chance of flooding in any year or 5 to 50 times in 100 years (USDA NSSH, 2018). Depth to the seasonal high-water table is 152 cm (60 in).

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	390–585 ft
Slope	0–3%
Water table depth	24–60 in
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation for the Arkansas Ridges and Valley, Eastern Part varies from west to east. In the western one-third of this area, average annual precipitation is 41 to 45 inches (1,040 to 1,145 millimeters). It is 45 to 61 inches (1,145 to 1,550 millimeters) in the eastern two thirds of the area. Most of the rainfall occurs as frontal storms in spring and early summer. Some high-intensity, convective thunderstorms occur in summer. Precipitation occurs as rain and snow in January and February. The average seasonal snowfall is 5 inches (125 millimeters). The average annual temperature is 58 to 62 degrees F (14 to 17 degrees C). The freeze-free period averages 240 days and ranges from 220 to 260 days. It is shortest at the higher elevations on ridges. The moderate precipitation generally is adequate for crops and pasture. In the uplands, water for livestock is obtained from small ponds on individual farms. In the valleys, springs, small ponds, and perennial streams provide water for most uses (USDA 2006).

Data for mean annual precipitation, frost-free and freeze-free periods and monthly precipitation for this ecological site are shown below. The original data used in developing the tables was obtained from the USDA-NRCS National Water & Climate Center (2015) climate information database for 3 weather stations throughout MLRA 118A in proximity to this ecological site. All climate station monthly averages for maximum and minimum temperature and precipitation were then added together and averaged to make this table.

Table 3. Representative climatic features

Frost-free period (characteristic range)	190-199 days
Freeze-free period (characteristic range)	203-220 days
Precipitation total (characteristic range)	46-47 in
Frost-free period (actual range)	189-202 days
Freeze-free period (actual range)	199-225 days
Precipitation total (actual range)	45-47 in
Frost-free period (average)	195 days
Freeze-free period (average)	212 days
Precipitation total (average)	46 in

Climate stations used

- (1) LAKE EUFAULA [USC00344975], Checotah, OK
- (2) WEBBERS FALLS 5 WSW [USC00349445], Webbers Falls, OK
- (3) FT SMITH RGNL AP [USW00013964], Fort Smith, AR

Influencing water features

This site is influenced by flooding during the year.

Soil features

The soil series associated with this site are: Wabbaseka, Severn, Roxana, Redport, Oklared, Norwood, Gallion, Coushatta, and Caspiana. They formed in calcareous alluvium from sedimentary rock. They are deep to very deep and typically do not have a root limiting layer within 203 cm (80 in) of the soil surface. The drainage class is moderately well to well drained with the depth to the seasonal high-water table occurring within 61 to 152 cm (24 to 60 in). The surface texture ranges from fine sandy loam to silty clay loam, while subsoils tend to be loamy. Permeability ranges from very slow to moderately rapid and soils are slightly acid to moderately alkaline with pH ranging from 6.5 to 8.2. Soils data was obtained from the Natural Resources and Conservation Service (NRCS) National Soils Information System database (USDA 2015).

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock
Surface texture	(1) Silt loam (2) Silty clay loam (3) Fine sandy loam (4) Loamy fine sand
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately rapid
Soil depth	80 in
Available water capacity (0-40in)	5.5–8.4 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–1 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.5–8.2
Subsurface fragment volume <=3" (Depth not specified)	1–2%

Ecological dynamics

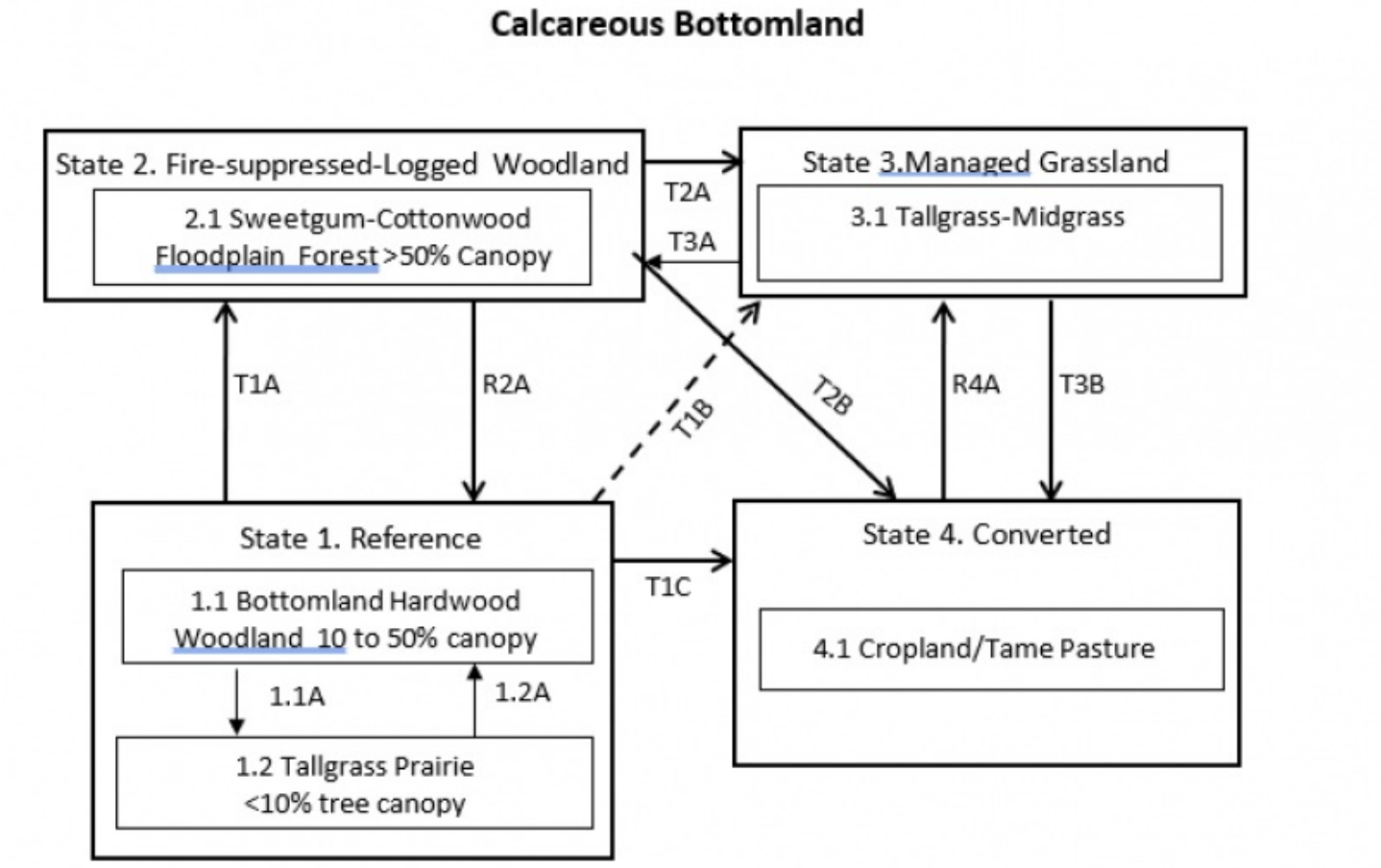
The information in this section including the State and Transition Model (STM) was developed from several sources, including NatureServe's Ecological Systems of the United States (NatureServe 2009), Landfire's Biophysical Settings and Existing Vegetation Type layers (Landfire 2010; Landfire 2013), the Official Soil Series Descriptions (Soil Survey Staff 2018), scientific literature, and ecological site descriptions from adjoining areas. 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.

The Calcareous Bottomlands of the Arkansas Valley and Ridges Eastern Part are on floodplains and stream terraces that may experience frequent flooding. The reference forest is part of the South-Central Interior Large Floodplain system as defined by NatureServe (NatureServe 2009) and the southern floodplain forest (Woods et. al. 2004). Species typical of these bottomland hardwood forests are: Ulmus Americana (American elm), *Celtis laevigata* (sugarberry), *Fraxinus pennsylvanica* (green ash), *Carya illinoinensis* (pecan), and Quercus spp. (oaks). Most areas have been cleared for pastureland, hay land, and cropland. Remaining forest stands most likely have been logged, with desirable species removed.

Both historically and today, these woodlands are structurally and compositionally diverse, with occasional tree fall gaps and natural mortality providing opportunities for regeneration of over story species. Periodic disturbances from flooding, fire, wind or ice as well as grazing by native large herbivores maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species.

Today, nearly 60 percent of the Calcareous Bottomlands have been converted to cropland. Historic rangeland classification is the Loamy Bottomland (Brinlee, 1975). Remaining forests play an important role as a source of food and shelter for migrating birds. In addition, they are very important in stream bank stabilization.
Re-establishment of these woodlands is important for stream quality and stream health, and as critical habitat for migratory birds. Planting of later successional species on the appropriate landscape position and soils and introducing prescribed fire has proven to be an effective means for restoration.

State and transition model



Code	Event/Activity/Process
1.1A	Fire and grazing
1.2A	Fire suppression
T1A	Fire suppression > 20 years; repeated timber harvests
T1B, T2A	Land clearing; brush management; prescribed grazing; prescribed burning
T1C, T2B	Land clearing; conservation tillage; conservation cropping system;
T3A	No fire, no brush management
T3B	Conservation tillage; conservation cropping system or pasture and hayland planting
R4A	Range Planting, Herbaceous Weed Control, Prescribed Grazing; Prescribed Burning. Possibility of return to other plant communities depends on soil integrity and intensive restoration.
R2A	Forest stand improvement; brush management; prescribed fire 3-10 years; herbaceous weed control

The following conservation practices can be found in FOTG-Field Office Technical Guide, Section IV-Practice Standards and Specifications, USDA, Natural Resources Conservation Service, https://efotg.sc.egov.usda.gov/. Click on your county:

Brush management - 314; Conservation tillage – reduced till – 345, no till – 329; Herbaceous weed control – 315; Land clearing – 460; Pasture and hay planting – 512; Prescribed burning – 338; Prescribed grazing - 528; Range Planting - 550

State 1
Reference

The reference state refers to what is presumed to be the historic plant community that existed prior to European settlement. Currently, detailed vegetation field data is lacking for the Calcareous Bottomland ecological site. The structure of the State and Transition model is adapted from surrounding MLRA's and is assumed to be similar to other bottomland ecological sites.

Community 1.1
Bottomland Oak – Hickory Woodland 10 to 50% canopy

Forest and woodlands are dominated by *Quercus phellos* (willow oak) and *Quercus nigra* (water oak). *Carya ovata* (shagbark hickory) is a common associate. A wide variety of other species may be present or dominate including *Liquidambar styraciflua* (sweetgum), *Quercus macrocarpa* (bur oak), Quercus nuttalii (Nuttal oak) and *Carya cordiformis* (bitternut hickory). Ulmus Americana (American elm), *Fraxinus pennsylvanica* (green ash), *Celtis laevigata* (sugarberry), *Platanus occidentalis* (American sycamore), *Diospyros virginiana* (persimmon), *Carya illinoinensis* (pecan), *Nyssa sylvatica* (blackgum), and *Carpinus caroliniana* (ironwood) are also commonly present. *Elymus canadensis* (Canada wildrye) and *Elymus virginicus* (Virginia wildrye) are present as understory grasses that can tolerate the shade. Periodic disturbances from flooding, fire, wind or ice as well as grazing by native large herbivores maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species.

Community 1.2
Tallgrass Prairie <10% tree canopy

Parts of this ecological site were also once prairie, but very few remnants remain. Where prairies still exist, they are dominated by grasses, particularly *Andropogon gerardii* (big bluestem), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass). All prairie communities have been drastically reduced by fire suppression and conversion to agriculture, and few remnants in good condition remain, mostly in the western part of the region.

Pathway 1.1A
Community 1.1 to 1.2

It is assumed that fire and grazing is the control mechanism between the woodland state and the more open prairies.

Pathway 1.2A
Community 1.2 to 1.1

Fire suppression will convert the prairie state to the woodland state.

State 2
Fire-suppressed-Logged Woodland

Composition is altered from the reference state depending on tree selection during harvest. This state will slowly shift to more shade tolerant species. Without periodic canopy disturbance, stem density and fire intolerant species, like hackberry, will increase in abundance.

Community 2.1
Sweetgum-Cottonwood Floodplain Forest >50% Canopy

This state has been subjected to very selective timber harvests. While these forested areas may resemble the reference state, the diversity of tree species has been selectively (removal of oak and walnut) altered. *Platanus occidentalis* (American sycamore), *Liquidambar styraciflua* (sweetgum), Salix spp. (willows), *Populus deltoides* (eastern cottonwood), *Fraxinus pennsylvanica* (green ash) may be the dominant tree species.

State 3
Managed Grassland

In this state, the forest and woodland has been converted to an open grassland dominated by tallgrasses and forbs. However, without proper management, this state may return to a woodland or shrubland.

Community 3.1
Tallgrass-Midgrass

Andropogon gerardii (big bluestem), *Panicum virgatum* (switchgrass), *Sorghastrum nutans* (Indiangrass), *Tripsacum dactyloides* (Eastern gamagrass), and *Spartina pectinata* (prairie cordgrass) are the principal species. *Elymus canadensis* (Canada wildrye) and *Elymus virginicus* (Virginia wildrye) may be present along with Sporobolus spp. (dropseed), *Arundinaria gigantea*n (switchcane), and *Chasmanthium latifolium* (Indian woodoats). Some woody species may be present including *Juglans nigra* (black walnut), *Carya illinoinensis* (pecan), *Ulmus americana* (American elm), and *Fraxinus pennsylvanica* (green ash). Fire is an important aspect in maintaining the health of upland prairies and could be an important factor in managing tallgrass species.

State 4
Converted

Conversion of other states to cropland or pasture has been common.

Community 4.1
Cropland/Tame Pasture

Typical crops grown on this site include soybeans, wheat, alfalfa, cotton, corn, and grain sorghum. Pastures are planted to non-native cool season species such as *Cynodon dactylon* (Bermuda grass) and *Schedonorus arundinaceus* (tall fescue). A return to the reference state may be impossible, requiring a very long-term series of management options and transitions.

Transition T1A
State 1 to 2

It is presumed that in the absence of fire, the woodland and tallgrass dominated vegetation community would transition to a closed canopy forest dominated by trees and shrubs.

Transition T1B
State 1 to 3

This conversion takes place with land clearing, brush management, prescribed grazing, and possibly prescribed fire. Maintenance is required with brush management to prevent trees and shrubs from establishing.

Conservation practices

Brush Management
Prescribed Burning
Land Clearing
Prescribed Grazing

Transition T1C
State 1 to 4

This conversion takes place with land clearing, conservation tillage and then planting of agricultural commodity crops or cool season pasture grasses. Maintenance is required with brush management to prevent trees and shrubs from establishing. Drainage installation might be required depending on the agricultural commodity to be grown.

Conservation practices

Land Clearing
Residue and Tillage Management, No-Till/Strip Till/Direct Seed

Restoration pathway R2A
State 2 to 1

Through intensive chemical brush management, and/or prescribed burning and grazing, the forested state might transition back to a prairie or woodland state dominated by tallgrasses or midgrasses with some trees and shrubs.

Conservation practices

Brush Management
Prescribed Burning
Forest Stand Improvement
Herbaceous Weed Control

Transition T2A

State 2 to 3

This conversion takes place with land clearing, brush management, prescribed grazing, and possibly prescribed fire. Maintenance is required with brush management to prevent trees and shrubs from establishing.

Conservation practices

Brush Management
Prescribed Burning
Land Clearing
Prescribed Grazing

Transition T2B
State 2 to 4

This conversion takes place with land clearing, conservation tillage and then planting of agricultural commodity crops or cool season pasture grasses. Maintenance is required with brush management to prevent trees and shrubs from establishing.

Conservation practices

Brush Management
Land Clearing
Residue and Tillage Management, No-Till/Strip Till/Direct Seed

Transition T3A
State 3 to 2

Fire suppression, cessation of brush management.

Transition T3B
State 3 to 4

This conversion takes place with land clearing, conservation tillage and then planting of agricultural commodity crops or cool season pasture grasses. Maintenance is required with brush management to prevent trees and shrubs from establishing.

Conservation practices

Forage and Biomass Planting
Residue and Tillage Management, No-Till/Strip Till/Direct Seed

Restoration pathway R4A
State 4 to 3

The potential for this converted state to revert to another state varies greatly from site to site. It is dependent upon multiple factors including length of time in production, soil integrity, planned restoration methods, and precipitation patterns. Consult with local conservationists to develop a site-specific restoration plan. Practices that would be implemented include: range planting, herbaceous weed control, prescribed grazing, and prescribed burning. Possibility of return to other plant communities depends on soil integrity and intensive restoration. Conversion back to any semblance of the reference state is unlikely.

Conservation practices

Prescribed Burning

Range Planting
Prescribed Grazing
Herbaceous Weed Control

Additional community tables

Animal community

Numerous animal and bird species utilize this site as habitat. Small mammals, song birds, predators, along with traditional game species such as turkey, bobwhite quail, whitetail deer, mule deer, and others frequent this site. The combination of grasses, forbs, trees and woody shrubs that occur in the presumed historic plant community provide suitable habitat for all the above species, at least at some time during the year. Surface water, in the form of ponds, springs, and flowing streams provide water for species that require daily watering. Many different species move in and out of the site. Predators such as coyotes and bobcats may utilize the site for hunting prey and hiding during the day.

The Plant Preferences by Animal Kind table contained herein provides general guidance as to animal preferences for plant species. It also reveals possible competition between kinds of herbivores for various plants. Grazing preference changes from time to time, especially between seasons, and between animal kinds and classes. Grazing preference does not reflect the ecological status of the plant within the plant community.

Hydrological functions

Calcareous Bottomlands are subject to frequent or occasional overflow from the streams and runoff from hillsides.

Recreational uses

Hunting, Fishing, Camping, Hiking, Bird Watching, Photography, Horseback Riding, etc..

Wood products

Several species of trees are found on this site, but there is seldom any harvesting of wood products other than firewood for cooking, heat and fence posts.

Other products

Fruit from blackberries, grapes, plums, and pecans are harvested.

Other references

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Approval

Nels Barrett, 1/03/2019

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Doug Wallace and Fred Young at Missouri NRCS State office, personal communication and sharing of state and transition models.

Future Ecological Site Development and Testing Plan

Future work to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final correlated document.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff:

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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:**
