USDA Natural Resources Conservation Service

Ecological site PX135B01X006
Droughty Upland

Last updated: 9/22/2023
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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): 135B–Cretaceous Western Coastal Plain

This MLRA is about 3,970 square miles (10,290 square kilometers) and is in Arkansas and Oklahoma.

This MLRA is in the West Gulf Coastal Plain Section of the Coastal Plain Province of the Atlantic Plain. The MLRA has nearly level to moderately sloping hillslopes, stream terraces, and flood plains. Clay, marl, and chalk underlie valley floors and side slopes or crests of ridges. The soils that formed in these parent materials are highly erodible and contribute to gully formation. Elevation ranges from 260 to 570 feet (80 to 170 meters). Some lower and higher areas are on valley floors and crests of ridges, respectively.

Cretaceous marine sediments underlie most of this MLRA. Geologic members of the Lower Cretaceous Period include a basal member of gravel and conglomerate rocks. Geologic members of the Upper Cretaceous Period formed from clay marls, thin limestones, sandy marls, and fine grained sands. Other formations consist of crystalline limestone, chalk, marly chalk, or a combination of these materials. Some of the formations contain fossils.

The MLRA has a thermic soil temperature regime and an ustic soil moisture regime. The dominant soil orders are Inceptisols and Alfisols. Entisols and Vertisols are less extensive. The soils have smectitic or mixed mineralogy.

Ecological site concept

The Droughty Upland Ecological Site is on hillslopes of hills and on marine terraces. Slope ranges from 2 to 17 percent, and elevation ranges from 150 to 830 feet (40 to 250 meters). The soils formed in residuum from sandstone. The soils are deep or very deep, are well drained, and have a moderate permeability class. The surface texture is commonly gravelly sandy loam. Rock fragments, less than 3 inches (7.62 cm) in diameter, are greater than 40 percent by volume in the particle-size control section.

Associated sites

PX135B01Y004	**Loamy Upland** This site is on hillslopes of hills, interfluves, and paleoterraces. This ecological site is different from the Droughty Upland Ecological Site by having minimal rock fragments by volume in the particle size control section and an argillic horizon within 25 inches (62 cm) of the soil surface.

Similar sites

PX135B01Y005	**Limestone Upland** This site is on hills along hillslopes. Limestone dominates this site. This ecological site is different from the Droughty Upland Ecological Site by the presence of limestone.

Table 1. Dominant plant species

Tree	(1) *Quercus* (2) *Pinus taeda*
Shrub	(1) *Rhus* (2) *Cornus*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Sorghastrum nutans*

Legacy ID

F135BY006AR

Physiographic features

This ecological site is on hillslopes of hills or on marine terraces. Slope ranges from 2 to 17 percent, and elevation ranges from 150 to 830 feet (45 to 250 meters). The runoff class is low or medium. The site is not subject to ponding or flooding.

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope (2) Marine terrace
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	46–253 m
Slope	2–17%
Aspect	Aspect is not a significant factor

Climatic features

Hot summers, cool winters, and mild spring and fall temperatures are typical for the ecological site. The mean annual precipitation is 51 inches. The average frost-free period is 193 days, and the average freeze-free period is 217 days. The highest precipitation occurs in May (6.2 inches), and the lowest occurs in August (2.8 inches). Precipitation varies greatly across this ecological site and increases from west to east. The warmest month of the year is August (94°F average high), and the coolest is January (29°F average low). Thunderstorms and heat waves are common and occur frequently during the summer months.

Occasionally, catastrophic storm events, such as tornados, ice storms, floods, and hailstorms, will occur. According to the Oklahoma Water Resource Board, drought occurs every 5 to 10 years (Oklahoma Water Resources Board, 2022). The EPA predicts droughts will become more severe throughout Arkansas due to longer periods without rain and an increase in very hot days (EPA, 2016).

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center athttp://www.wcc.nrcs.usda.gov/. The Antlers, Hugo, Idabel, De Queen, Nashville, and Arkadelphia climate stations provided general climate data. Site-specific climate data is available through the National Weather Service.

Table 3. Representative climatic features

Frost-free period (characteristic range)	187-200 days
Freeze-free period (characteristic range)	211-223 days
Precipitation total (characteristic range)	1,219-1,372 mm
Frost-free period (actual range)	184-202 days
Freeze-free period (actual range)	204-226 days

Precipitation total (actual range)	1,194-1,397 mm
Frost-free period (average)	193 days
Freeze-free period (average)	217 days
Precipitation total (average)	1,295 mm

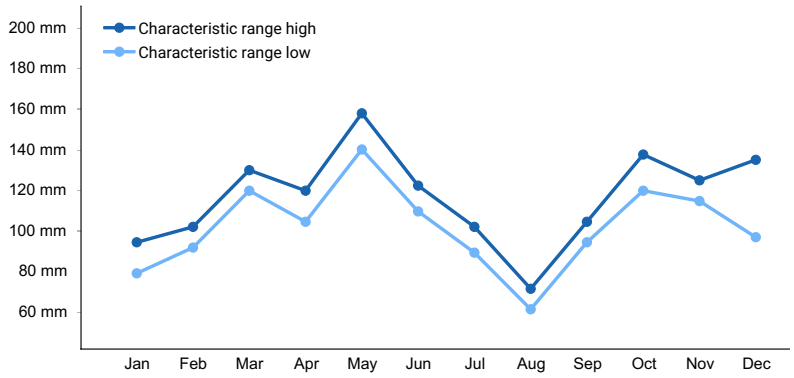


Figure 1. Monthly precipitation range

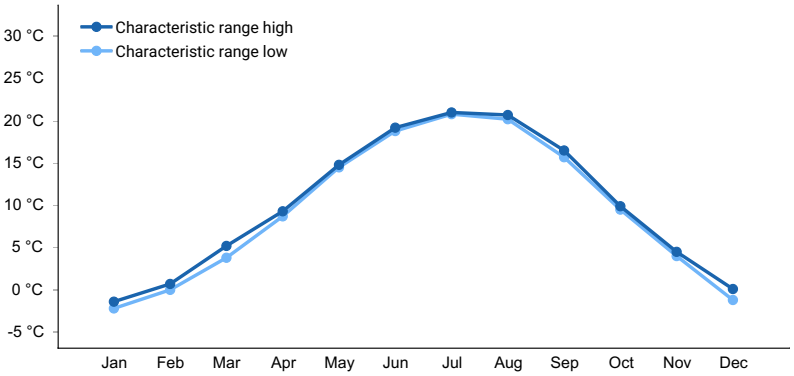


Figure 2. Monthly minimum temperature range

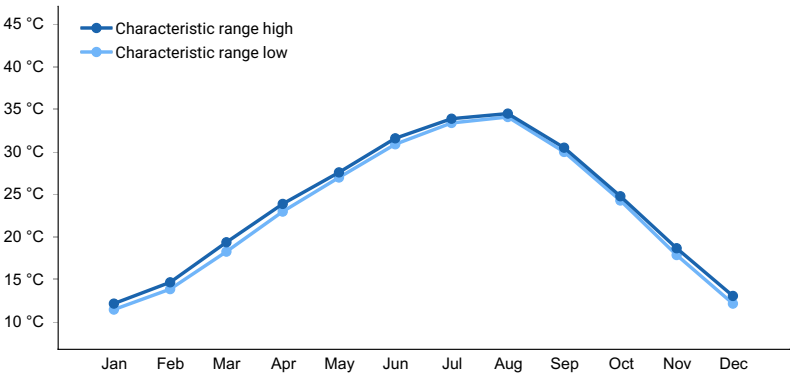


Figure 3. Monthly maximum temperature range

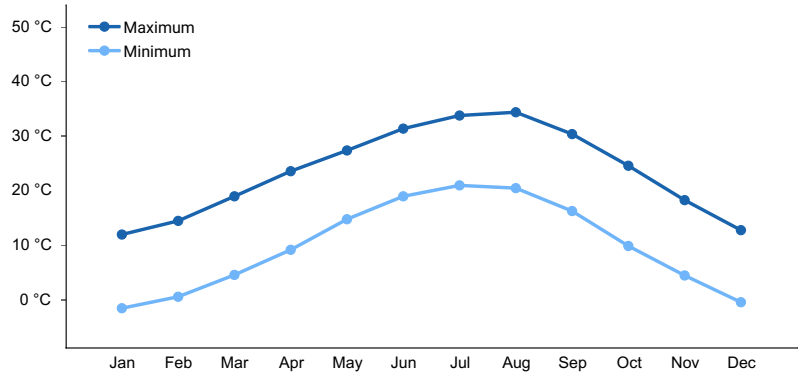


Figure 4. Monthly average minimum and maximum temperature

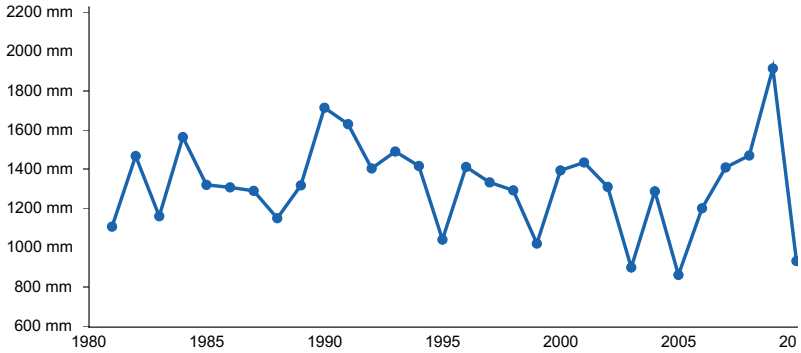


Figure 5. Annual precipitation pattern

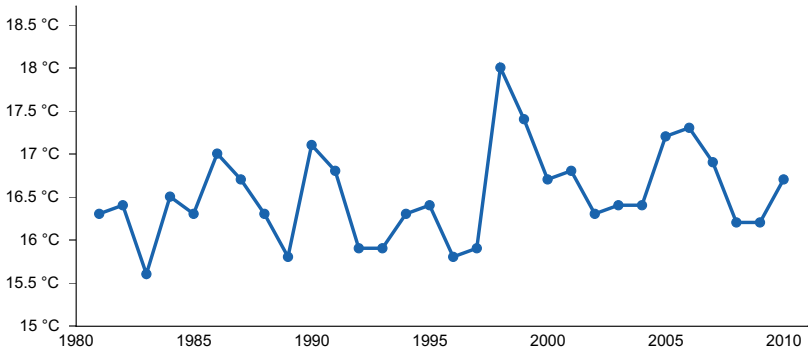


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ANTLERS [USC00340256], Antlers, OK
- (2) HUGO [USC00344384], Hugo, OK
- (3) IDABEL [USC00344451], Broken Bow, OK
- (4) DEQUEEN [USC00031948], De Queen, AR
- (5) NASHVILLE [USC00035112], Nashville, AR
- (6) ARKADELPHIA 2 N [USC00030220], Arkadelphia, AR

Influencing water features

Water features do not significantly influence this ecological site.

Wetland description

Wetlands do not significantly influence this ecological site.

Soil features

The soils associated with this ecological site formed in residuum from sandstone. The soils are deep or very deep, are well drained, and have a moderate permeability class. The surface texture is commonly gravelly or very gravelly sandy loam, and there is a large amount of gravel on the soil surface. Gravel is also common throughout the soil profile and increases (by volume) with depth.

The soil series associated with this site are the Peanutrock and Saffell Series.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone (2) Marine deposits
Surface texture	(1) Gravelly sandy loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	102–203 cm
Surface fragment cover <=3"	28–30%
Surface fragment cover >3"	0–2%
Available water capacity (Depth not specified)	5.97–14.48 cm
Soil reaction (1:1 water) (Depth not specified)	4.5–5.5
Subsurface fragment volume <=3" (Depth not specified)	40–42%
Subsurface fragment volume >3" (Depth not specified)	3–10%

Ecological dynamics

The Reference State for this ecological site consists of a hardwood forest characterized by a hardwood species overstory and an herbaceous forest floor. Overstory hardwood species include oak and hickory (Eldredge, 1937). Softwood species, such as loblolly pine and shortleaf pine, are also on similar upland sites. Native grass species, such as big bluestem, switchgrass, little bluestem, and Indiangrass, are common (Owen, 1858).

Fire significantly influences this ecological site. Historically, the average fire-return interval was likely between 3 and 25 years (Guyette and Spetich, 2003; Hallgren et al., 2012). Some of these wildfires occurred naturally through lightning strikes, but human activities probably caused most of these fires (DeSantis et al., 2010). Native species evolved with and responded well to fire, gaining an advantage over other plant species (Spetich and He, 2008; Engle and Bidwell, 2001). Fires on similar upland ecological sites today likely have moderate to low severity due to forested conditions and reduced amounts of ground vegetation (Carey, 1992).

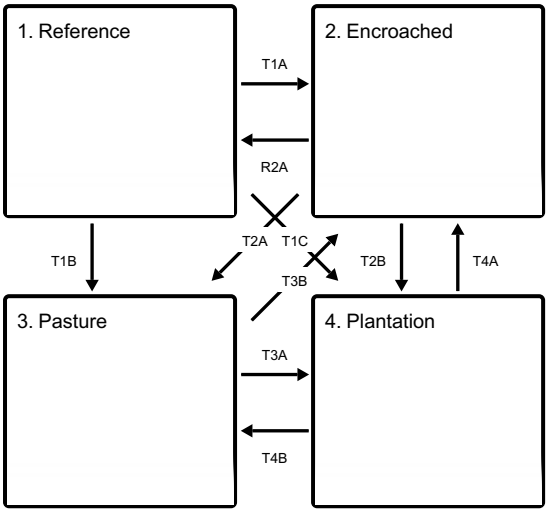
Historically, grazing animals, such as elk and bison, were present in the Reference State of this ecological site (Heikens, 2007). As fencing and livestock husbandry practices replaced herds of bison, elk, and deer, the ecological dynamics of this site shifted (Kohl et al., 2013). Changes to the ecological dynamics were commonly proportional to the season and intensity of livestock grazing and accelerated through a combination of drought and overgrazing (Angerer et al., 2016). For example, palatable grasses and forbs repeatedly grazed by livestock become weak and can die, and less desirable vegetation may replace preferable species (Smith, 1940).

Climate-related events, such as hailstorms, tornados, thunderstorms, and extreme precipitation, occur on this site. Hailstorms can reduce canopy size, increase litter deposition, and increase tree bark removal. When paired with other disturbances such as fire, the effects on tree species are much greater than in areas not affected by the hailstorm (Gower et al., 2015). Tornados can change plant community compositions throughout ecosystems, favoring hardwoods and eliminating softwoods (Liu et al., 1997). Lightning storms greatly affect ecosystems. Lightning storms generally occur during summer months but can occur during any season. If a fire starts with a lightning strike, the effects on the ecosystem vary depending on the season (Hiers et al., 2000). According to the Oklahoma Water Resource Board, drought occurs every 5 to 10 years (OWRB, 2022).

Because of sparse data availability, the state-and-transition model created for this site only explored basic principles and included only a small number of species. Further data collection from this ecological site would provide a greater understanding of ecological form and function and of resource consumption and distribution.

State and transition model

Ecosystem states



T1A - Absence of fire or alternative brush management, woody species encroachment.

T1B - Tree removal, mechanical and chemical woody vegetation suppression, tillage, introduce annual or perennial forage species.

T1C - Tree removal, brush management, plantation tree establishment and management.

R2A - Tree thinning, brush management, prescribed fire, and grazing.

T2A - Tree removal, mechanical and chemical woody vegetation suppression, tillage, introduce annual or perennial forage species.

T2B - Woody species removal, plantation tree planting, prescribed fire.

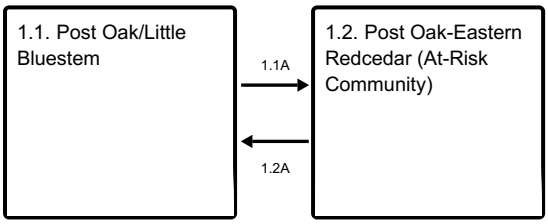
T3B - Lack of management or abandonment.

T3A - Forage species suppression, brush management, plantation tree establishment and management.

T4A - Lack of management or abandonment.

T4B - Woody species removal, prescribed fire, seeding, and grazing.

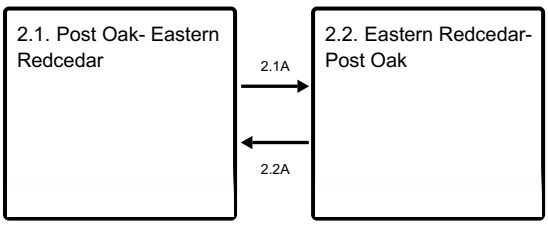
State 1 submodel, plant communities



1.1A - Absence of fire and natural regeneration over time

1.2A - Wildfire or other disturbance that reduces woody canopy

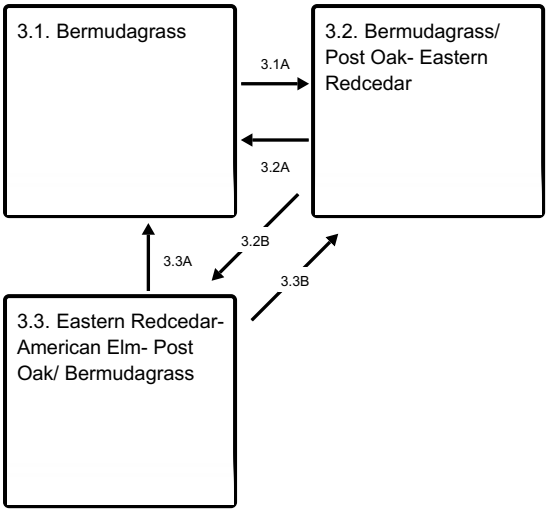
State 2 submodel, plant communities



2.1A - Fire suppression.

2.2A - Fire, mechanical tree removal.

State 3 submodel, plant communities



3.1A - Fire Suppression

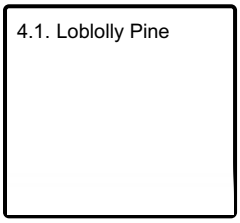
3.2A - Tree Removal, Brush Management

3.2B - Fire Suppression

3.3A - Tree Removal, Brush Management

3.3B - Tree Removal, Brush Management

State 4 submodel, plant communities



State 1
Reference

The Reference State represents the natural range of variability for the ecological site without major human influence. The main drivers for community pathways within the Reference State are fire frequency intervals between 3 and 25 years (Guyette and Spetich, 2003; Hallgren et al., 2012), climate effects (decadal scale), insect or disease presence or establishment, and wildlife grazing or browsing. Fire is the main feedback mechanism within this state, and fire-tolerant species dominate the ecological site. Fire intervals suppress herbaceous vegetation growth; wildlife grazing or browsing reduces the amount of herbaceous vegetation available. Reduced grass availability lessens fire intensity and causes wildlife migration.

Characteristics and indicators. The Reference State consists of a hardwood forest characterized by a mixed hardwood overstory and an herbaceous forest floor. Hardwood species include oak and hickory (Eldredge, 1937). Softwood species, such as loblolly pine and shortleaf pine, are also on similar upland sites. Native grass species, such as big bluestem, switchgrass, little bluestem, and Indiangrass, are common (Arkansas Geological Survey, 2005).

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- loblolly pine (*Pinus taeda*), tree
- shortleaf pine (*Pinus echinata*), tree
- sumac (*Rhus*), shrub
- dogwood (*Cornus*), shrub
- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium*), grass

- Indiangrass (*Sorghastrum*), grass
- switchgrass (*Panicum virgatum*), grass

Community 1.1
Post Oak/Little Bluestem

Oak trees and warm-season, perennial tallgrasses dominate this community phase. Dominant grasses are little bluestem, big bluestem, Indiangrass, and switchgrass. Common trees include post oak, blackjack oak, white oak, and red oak.

Community 1.2
Post Oak-Eastern Redcedar (At-Risk Community)

This community phase has a moderately closed canopy and an understory of tallgrasses and midgrasses. The absence of fire allows post oak, blackjack oak, and eastern redcedar densities to increase. Competition due to the increased canopy cover leads to a reduction in the herbaceous understory cover.

Pathway 1.1A
Community 1.1 to 1.2

The main drivers for this community pathway are the absence of fire and the natural regeneration of woody species. Excessive grazing pressure may also accompany this transition.

Pathway 1.2A
Community 1.2 to 1.1

The main drivers for this community pathway are periodic wildfires that reduce the size and number of trees and shrubs. This community phase may follow years of above-average herbaceous production, resulting in more fine fuels. Drought and outbreaks of insects, diseases, or both may also contribute to a reduction in woody canopy cover.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Encroached

Tree species and a closed canopy dominate the Encroached State. The main drivers for community pathways within the Encroached State are the absence of wildfire, seed dispersal by wildlife, climate effects (decadal scale), and canopy density. The main feedback mechanism for community pathways in this state is the dominance of tree species. Tree species shade and outcompete herbaceous species and shorter woody species. Less ground cover reduces fire risk. Tree species take control of nutrient and water cycling.

Characteristics and indicators. The Encroached State consists of many tree species (oak, eastern redcedar, hickory, beech) and significant canopy closure. Time, fire, and tree density determine community phases and species abundance or variation. The woody canopy cover increases, and the Encroached State develops. The denser canopy intercepts most of the precipitation and changes the hydrology of the site. Understory species likely have less available water for growth and must compete with extensive woody plant root systems (Zou et al., 2018).

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- beech (*Fagus*), tree

Community 2.1
Post Oak- Eastern Redcedar

This community phase consists of oak, hickory, beech, and eastern redcedar. An increase in canopy cover causes a reduction in herbaceous species. Eastern redcedar trees become more abundant.

Community 2.2
Eastern Redcedar- Post Oak

Eastern redcedar dominates this community phase. Oak, hickory, and beech trees may be present. Oak, hickory, and beech trees experience reduced vigor and reproductive capacity due to shading and competition from eastern redcedar.

Pathway 2.1A
Community 2.1 to 2.2

The absence of wildfire is the main driver for this community pathway and contributes to natural regeneration and increased tree and shrub cover.

Pathway 2.2A
Community 2.2 to 2.1

The main driver for this community pathway is a reduced canopy cover. As canopy cover decreases, the amount of sunlight reaching the ground increases, and understory vegetation increases. Denser ground vegetation can lead to fires that control woody vegetation. This community is present when the canopy cover is between 25 to 50 percent. Excessive fire and mechanical removal of trees can contribute to the reduction in canopy cover.

State 3
Pasture

The Pasture State consists of introduced herbaceous species planted to maximize livestock forage production. The main drivers for community pathways within the Pasture State are the mechanical disturbance of the soil and seed planting, climate effects (decadal scale), seed dispersal, and wildlife and livestock grazing or browsing. The main feedback mechanism for community pathways in this state is the use of mechanical equipment or chemicals to manipulate the site. Wildlife and livestock grazing or browsing reduces the amount of available forage. Fertilizer inputs and brush management are essential for maintaining high productivity.

Characteristics and indicators. The Pasture State consists of species grown for specific management goals, mainly livestock grazing. Common pasture species include clover, tall fescue, ryegrass, small grains, vetches, peas, lespedeza, alfalfa, Bermudagrass, bahiagrass, dallisgrass, Johnsongrass, crabgrass, millet, big bluestem, little bluestem, Indiangrass, eastern gamagrass, and switchgrass (UAES, 2022). The quality and quantity of forbs, grasses, and legume species within this state depend on the level of management inputs (seeding, weed management, nutrient inputs, and land use). Both warm-season and cool-season grasses grow in the Pasture State.

Dominant plant species

- Bermudagrass (*Cynodon*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- bahiagrass (*Paspalum notatum*), grass

Community 3.1
Bermudagrass

This community phase consists of grass and forb species planted to maximize production for grazing livestock.

Community 3.2

Bermudagrass/ Post Oak- Eastern Redcedar

This community phase consists of grass and forb species planted to maximize production for grazing livestock. Inadequate pasture maintenance allows the growth of tree species, such as eastern redcedar. Generally, eastern redcedar first starts growing along fence lines and areas under electric utility wires.

Community 3.3
Eastern Redcedar- American Elm- Post Oak/ Bermudagrass

This community phase consists of grass and forb species planted to maximize production for grazing livestock. Inadequate pasture maintenance over time allows the growth of woody species, such as eastern redcedar, oak, and American elm. These woody species encroach on the pasture and dominate significant areas of land and resources previously used by palatable forage species.

Pathway 3.1A
Community 3.1 to 3.2

The main drivers for this community pathway are the absence of fire, seed dispersal by wildlife, and natural regeneration.

Pathway 3.2A
Community 3.2 to 3.1

The main driver for this community pathway is the removal or reduction of woody vegetation.

Pathway 3.2B
Community 3.2 to 3.3

The main drivers for this community pathway are the absence of fire, seed dispersal by wildlife, and natural regeneration.

Pathway 3.3A
Community 3.3 to 3.1

The main driver for this community pathway is the removal or reduction of woody vegetation.

Pathway 3.3B
Community 3.3 to 3.2

The main driver for this community pathway is the removal or reduction of woody vegetation.

State 4
Plantation

The Plantation State consists of merchantable trees planted to maximize timber production and wood volume. Common species in timber plantations include loblolly pine and oak. Community phases differ by timber type (softwood or hardwood) and harvest method. The main drivers for community pathways in the Plantation State are prescribed fire, pest management, vegetation management, and canopy density. The main feedback mechanism for community pathways in this state is timber harvesting. Cultivated tree species dominate this ecological site and shade other vegetation. Timber management reduces competition with other species and assists the growth of desirable timber species.

Characteristics and indicators. The Plantation State consists of trees planted and managed to maximize merchantable timber production. Loblolly pine is the most common species for planting, but hardwood trees are also prevalent. Community phases differ by tree type (softwood or hardwood), timber harvest method, and reforesting practices.

Dominant plant species

- loblolly pine (*Pinus taeda*), tree
- oak (*Quercus*), tree

Community 4.1
Loblolly Pine

This community phase consists of loblolly pine planted to maximize timber production.

Dominant plant species

- loblolly pine (*Pinus taeda*), tree

Transition T1A
State 1 to 2

The main triggers for this transition are the absence of fire and excessive grazing pressure, both of which allow woody seedlings to grow and outcompete herbaceous vegetation. The main slow variable for this transition is increased competition for sunlight, nutrients, and moisture resources. Increased overstory competition reduces the vigor and reproductive capacity of the herbaceous understory. The main threshold for this transition is a shift in nutrient cycling (from grass and leaf dominance to leaf and needle dominance). Increased woody canopy cover alters hydrologic cycles, potentially reducing runoff and infiltration and increasing precipitation interception by woody species.

Transition T1B
State 1 to 3

The main triggers for this transition are tree removal, mechanical and chemical suppression of woody vegetation, tillage, and the introduction of annual or perennial forage species. The main slow variables for this transition are increased production and management of forage species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in type and frequency of disturbance.

Conservation practices

Brush Management
Prescribed Burning
Land Clearing
Prescribed Grazing

Transition T1C
State 1 to 4

The main triggers for this transition are the removal of native trees, mechanical and chemical suppression of woody vegetation, and the introduction of plantation tree species. The main slow variables for this transition are increased production and management of introduced species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in type and frequency of disturbance.

Restoration pathway R2A
State 2 to 1

Restoration efforts for this pathway begin with the mechanical and chemical treatment of undesirable woody vegetation and seeding of native species. A grazing management plan and the reintroduction of historical disturbance regimes must accompany these initial treatments. Returning to a historical fire interval through prescribed burning helps to suppress woody vegetation and manage invasive species.

Conservation practices

Brush Management
Prescribed Burning

Transition T2A
State 2 to 3

The main triggers for this transition are tree removal, mechanical and chemical suppression of woody vegetation, tillage, and the introduction of annual or perennial forage species. The main slow variables for this transition are increased production and management of forage species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in type and frequency of disturbance.

Conservation practices

Brush Management
Prescribed Burning
Land Clearing
Prescribed Grazing

Transition T2B
State 2 to 4

The main triggers for this transition are the removal of native trees, mechanical and chemical suppression of woody vegetation, and the introduction of plantation tree species. The main slow variables for this transition are increased production and management of introduced species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in type and frequency of disturbance.

Transition T3B
State 3 to 2

The main trigger for this transition is a lack of management or abandonment. The main slow variables for this transition are increased establishment and increased size of woody species. The main threshold for this transition is woody species dominance. Woody species dominate ecological processes by shading other species and increasing competition for soil moisture, nutrients, and sunlight. Woody species dominance reduces the vigor and reproductive capacity of herbaceous species in the understory.

Transition T3A
State 3 to 4

The main triggers for this transition are the removal and suppression of forage species, mechanical and chemical suppression of woody vegetation, and the introduction and management of plantation tree species. The main slow variables for this transition are the increased production and management of plantation species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in kind and frequency of disturbance.

Transition T4A
State 4 to 2

The main trigger for this transition is a lack of management or abandonment. The main slow variables for this transition are the increased establishment and increased size of woody species. The main threshold for this transition is woody species dominance. Woody species dominate ecological processes by shading other species and increasing competition for soil moisture, nutrients, and sunlight. Woody species dominance reduces the vigor and reproductive capacity of herbaceous species in the understory.

Transition T4B
State 4 to 3

The main triggers for this transition are tree removal, mechanical and chemical suppression of woody vegetation, tillage, and the introduction of annual or perennial forage species. The main slow variables for this transition are increased production and management of forage species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in type and frequency of disturbance.

Additional community tables

Animal community

Major wildlife species in this MLRA include whitetail deer, coyote, armadillo, bobcat, beaver, raccoon, skunk, mink, cottontail rabbit, turkey, and mourning dove. Fish species include channel catfish, flathead catfish, white bass, largemouth bass, black bass, and bluegill.

Hydrological functions

The following are estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 11.6%; ground water, 6.6%
Livestock—surface water, 1.9%; ground water, 2.4%
Irrigation—surface water, 0.0%; ground water, 1.2%
Other—surface water, 70.3%; ground water, 6.1%

Total withdrawals average 82 million gallons per day (310 million liters per day). About 16 percent is from ground-water sources, and the remaining 84 percent is from surface-water sources. Precipitation and perennial streams are important water sources in this MLRA. Ponds provide water for livestock and local recreation opportunities. A few large reservoirs are available for recreational use. Surface-water uses include industrial production, cooling for thermoelectric power plants, and public water supply for some communities.

The principal sources of ground water in this MLRA are bedrock aquifers, including the Antlers Aquifer in Oklahoma and the Nacatoch Aquifer in Arkansas. Ground-water use in this MLRA is primarily for public supply. Most rural landowners also rely on bedrock aquifers for domestic water use. The ground water is soft to hard in Arkansas and very hard in Oklahoma.

Recreational uses

In this MLRA, mountain biking, camping, fishing, hiking, horseback riding, hunting, mineral prospecting, nature viewing, off-highway vehicle riding, and water activities are available where permitted on public land and where allowed on private land.

Wood products

Public and private timberland cover large areas throughout this MLRA. Loblolly pine is the most popular species to harvest and provides timber for lumber, pulpwood, posts, and poles. Hardwood species provide timber for lumber, flooring, and pulpwood.

Other products

Poultry production is a major industry throughout the MLRA. Small grains and hay are major crops. Sand, gravel, clay, bauxite, gypsum, and petroleum deposits are industrially significant.

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	05/18/2024
Approved by	Bryan Christensen
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:**