# Ecological site F134XY201AL
# Western Loess Terrace - PROVISIONAL

Accessed: 05/16/2024

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

## MLRA notes

Major Land Resource Area (MLRA): 134X–Southern Mississippi Valley Loess

The Southern Mississippi Valley Loess (MLRA 134) extends some 500 miles from the southern tip of Illinois to southern Louisiana. This MLRA occurs in Mississippi (39 percent), Tennessee (23 percent), Louisiana (15 percent), Arkansas (11 percent), Kentucky (9 percent), Missouri (2 percent), and Illinois (1 percent). It makes up about 26,520 square miles. Landscapes consist of highly dissected uplands, level to undulating plains, and broad terraces that are covered with a mantle of loess. Underlying the loess are Tertiary deposits of unconsolidated sand, silt, clay, gravel, and lignite. The soils, mainly Alfisols, formed in the loess mantle. Stream systems of the MLRA typically originate as low-gradient drainageways in the upper reaches that broaden rapidly downstream to wide, level floodplains with highly meandering channels. Alluvial soils, mostly Entisols and Inceptisols, are predominantly silty where loess thickness of the uplands are deepest but grade to loamy textures in watersheds covered by thin loess. Crowley’s Ridge, Macon Ridge, and Lafayette Loess Plains are discontinuous, erosional remnants that run north to south in southeastern Missouri - eastern Arkansas, northeastern Louisiana, and south-central Louisiana, respectively. Elevations range from around 100 feet on terraces in southern Louisiana to over 600 feet on uplands in western Kentucky. The steep, dissected uplands are mainly in hardwood forests while less sloping areas are used for crop, pasture, and forage production (USDA-NRCS, 2006).

This site occurs within a very small area on the oldest, loess-capped terraces of the Western Lowlands Pleistocene Valley Trains (EPA Level IV Ecoregion: 73g; Woods et al., 2004).

## Classification relationships

All or portions of the geographic range of this site falls within a number of ecological/land classifications including:
-NRCS Major Land Resource Area (MLRA) 134 – Southern Mississippi Valley Loess
-NRCS Major Land Resource Area (MLRA) 131A – Southern Mississippi River Alluvium
-Environmental Protection Agency’s Level IV Ecoregion: Western Lowlands Pleistocene Valley Trains: 73g (Woods et al., 2004)
-234A – Southern Mississippi Alluvial Plain section of the USDA Forest Service Ecological Subregion (McNab et al., 2005)
-LANDFIRE Biophysical Setting 4515130 and NatureServe Ecological System CES203.193 Lower Mississippi River Flatwoods, respectively (LANDFIRE, 2008; NatureServe, 2009)
-Upland Forests of Pleistocene Outwash Terraces and Alluvial Fans (Klimas et al., 2012)

## Ecological site concept

The Western Loess Terrace is characterized by deep, well drained soils that formed in a mantle of loess. The deep, loessal soils associated with this site were deposited mainly on the higher and older Pleistocene Valley Train terraces of the Western Lowlands. Slopes range from 0 to 8 percent and extend upwards to 12 percent, locally. Topographic features or landforms of this site include low mounds; narrow, linear ridges, and terrace scarps. These prominent positions on the flat terrace landscape never flood and are not influenced by seasonal wetness. Soils of this site have no root restrictions or limitations. Historically, the high grounds of this site were likely favored by

indigenous people inhabiting the Western Lowlands, and their subsistence and cultural activities would have influenced the surrounding plant communities. Resultantly, a complex mosaic of conditions ranging from deep forest to open woodland to fire-maintained meadows likely existed. Today, this high, well-drained site is favored for construction and building purposes that include private residences, commercial lots, and cemeteries. Some areas remain under agriculture production but few, if any, locations support natural vegetation. The only instances that provide clues as to the natural vegetation of this site are old cemeteries and residential yards where large shade trees have been retained. The historic vegetation of this site likely consisted of species typical of diverse, mixed upland forests. Trees likely grew to large dimensions given the fertile soil – site environment. Species anticipated to respond well on this site include white oak, cherrybark oak, Shumard's oak, black oak, southern red oak, hickory, elm, and ash.

## Associated sites

| | |
|---|---|
| F134XY202AL | **Western Wet Loess Terrace - PROVISIONAL** |
| F134XY206AL | **Western Fragipan Terrace - PROVISIONAL** |
| F134XY209AL | **Western Moderately Wet Terrace - PROVISIONAL** |

## Similar sites

| | |
|---|---|
| F134XY007AL | **Northern Loess Terrace - PROVISIONAL**<br>This site is the eastern counterpart to the Western Loess Terrace site. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | Not specified |
| Herbaceous | Not specified |

## Physiographic features

The Western Loess Terrace ecological site occurs primarily along the southern extent of the Western Lowlands ecoregion, although there are a few instances where the soils of this site have been mapped in adjoining physiographic areas (e.g., Crowley's Ridge).

The Western Lowlands border Crowley's Ridge to the west and extends over a north-south distance of approximately 225 miles from Cape Girardeau, Missouri to the vicinity of Helena, Arkansas (Saucier, 1994). An irregular and sometimes ill-defined boundary of two MLRAs, 134 and 131A, converge within the Lowlands. Soils that formed in loess (considered soils of MLRA 134) mainly occur along the eastern edge of the Lowlands and along the western interface with Crowley's Ridge. However, loessal soils of the terraces often occur in intricate, complex patterns with soils that formed in alluvium and eolian loamy and sandy deposits (i.e., soils of MLRA 131A).

Much of these complexities were borne from past events, generally attributed to various glacial outwash episodes that occurred as a result from cyclical continental glaciation. Tremendous amounts of meltwater streamed through the area forming a highly dendritic network of braided stream channels. A culmination of these events helped to create one of the region's most characteristic landscapes, a series of ancient fluvial terraces sometimes referred to as "valley train" terraces. Each terrace was established at different time intervals with the oldest feature occurring along the western margin of Crowley's Ridge. Proceeding westward, the age of each successive terrace becomes progressively younger, and each terrace is distinguished by a drop of several feet in elevation. The oldest terrace is at least 30 feet higher than the modern floodplain of active streams on the Western Lowlands (Klimas et al., 2012).

Most modern stream systems enter the Lowlands from the Ozark Plateau or arise within the basin (Klimas et al., 2009), including a few minor systems originating on Crowley's Ridge. Some of the ancestral braided streams that had once formed from glacial outwash now supports modern tributaries and local drainageways, which have since formed narrow valleys and floodplains (Saucier, 1994). Another feature of the historic stream braids are a series of swales or what is locally referred to as "slashes". Such features tend to hold water for very long periods throughout the year and are essentially remnant channel braids or scours (T. Foti, personal communication). Superimposed on

this backdrop of complex physiographic features are low ridges, mounds, and relict dunes that are of eolian origin – consisting of loess (e.g., loessal ridges) and sand or sandy loam (e.g., dunes).

The core concepts of this site are primarily associated with the Early Wisconsin Terraces of the Western Lowlands and are defined by deep loessal soils that now comprise topographically diverse landforms of low, linear ridges; knolls; and terrace scarps. The linear and lenticular configuration of many of these soil map units (which are all rises on a tread) suggest former alluvial influences such as ancient natural levees that were formed from the numerous braided outwash channels that traversed and shaped the terraces. Some of the soil delineation patterns even take on the appearance of meander scrolls or ridge and swale topography.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Terrace<br>(2) Rise |
| Elevation | 49–69 m |
| Slope | 0–12% |
| Water table depth | 152 cm |
| Aspect | Aspect is not a significant factor |

## Climatic features

This site falls under the Humid Subtropical Climate Classification (Koppen System). The mean annual precipitation for this site from 1980 through 2010 was approximately 52 inches with a range from 35 to roughly 72 inches. Maximum precipitation occurs in spring (April and May) and late fall (November and December) and typically decreases throughout the summer. Rainfall often occurs as high-intensity, convective thunderstorms during warmer periods but moderate-intensity frontal systems can produce large amounts of rainfall during winter. Snowfall generally occurs in most years but duration is often brief (USDA-NRCS, 2006). The average annual maximum and minimum air temperature is 73 (range 49 to 92) and 51 (range 30 to 71) degrees F, respectively. The average frost free and freeze free periods are 207 and 238 days, respectively.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 207 days |
| Freeze-free period (average) | 238 days |
| Precipitation total (average) | 1,321 mm |

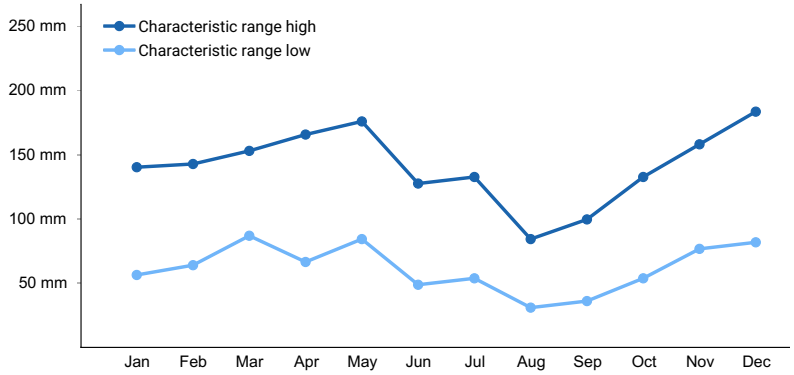


**Figure 1. Monthly precipitation range**

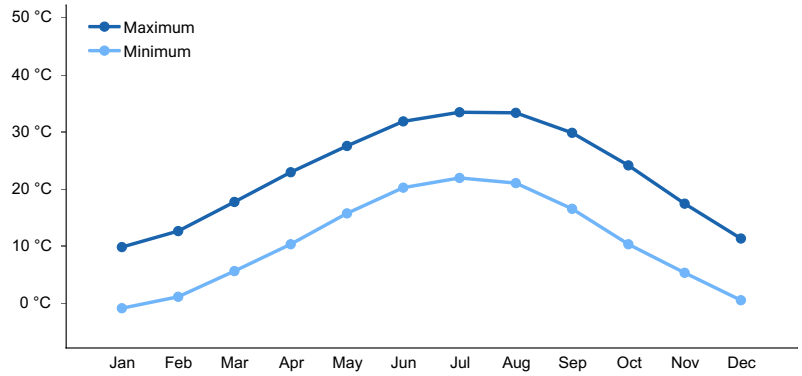


**Figure 2. Monthly average minimum and maximum temperature**

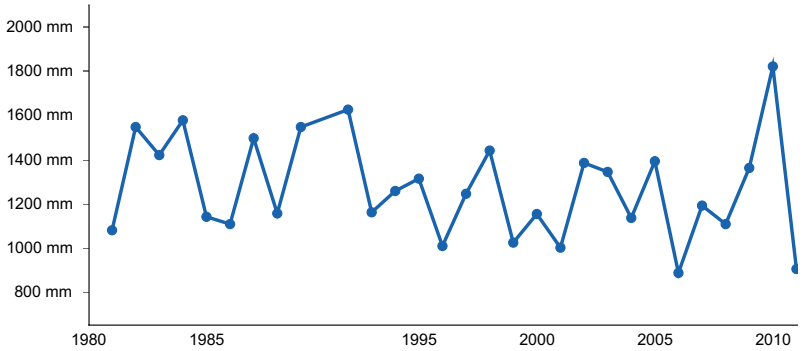


**Figure 3. Annual precipitation pattern**

## Climate stations used

- (1) BRINKLEY [USC00030936], Brinkley, AR
- (2) CLARENDON [USC00031442], Clarendon, AR
- (3) SAINT CHARLES [USC00036376], Clarendon, AR
- (4) MARIANNA 2 S [USC00034638], Marianna, AR
- (5) HELENA [USC00033242], Helena, AR

## Influencing water features

This site is not influence by a hydrologic regime.

## Soil features

Please note that the soils listed in this section of the description may not be all inclusive. There may be additional soils that fit the site's concepts. Additionally, the soils that provisionally form the concepts of this site may occur elsewhere, either within or outside of the MLRA and may or "may not" have the same geomorphic characteristics or support similar vegetation. Some soil map units and soil series included in this "provisional" ecological site were used as a "best fit" for a particular soil – landform catena during a specific era of soil mapping, regardless of the origin of parent material or the location of MLRA boundaries. Therefore, the listed soils may not be typical for MLRA 134 or a specific location, and the associated soil map units may warrant further investigation in a joint ecological site inventory – soil survey project. When utilizing this provisional description, the user is encouraged to verify that the area of interest meets the appropriate ecological site concepts by reviewing the soils, landform, vegetation, and physical location. If the site concepts do not match the attributes of the area of interest, please review the Similar or Associated Sites listed in the Supporting Information section of this description to determine if another site may be a better fit for your area of interest.

The soils of this site are well drained, have moderate permeability in the upper part, and formed in a mantle of loess. These soils are not affected by seasonal wetness. The principal soil of this ecological site consists of the Memphis (Fine-silty, mixed, active, thermic Typic Hapludalfs) series. Memphis soils formed in loess deposits more than 48 inches and have base saturations that generally exceed 60 percent, a taxonomic criteria for the series. Reaction ranges from moderately acid through very strongly acid in all horizons.

Secondary soils of this site consist of a single map unit of the Lexington (Fine-silty, mixed, active, thermic Ultic Hapludalfs) series. Lexington soils formed in a mantle of loess about 2 to 3 feet thick and in the underlying loamy and sandy marine sediments. Base saturation 50 inches below the top of the argillic horizon ranges from 36 percent to 59 percent, but is commonly less than 40 percent. Reaction ranges from moderately acid to very strongly acid in each horizon (USDA-NRCS, 2016).

**Table 4. Representative soil features**

| | |
|---|---|
| Surface texture | (1) Silt loam<br>(2) Silty clay loam |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Moderate to moderately rapid |
| Soil depth | 203 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 17.27–21.34 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 5.3–5.6 |
| Subsurface fragment volume <=3" (Depth not specified) | 2% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

The fertile, well drained soils of this site occur on higher elevations and landforms of the Western Lowlands. Landforms represented are generally classed as “rises” on terrace treads. More intuitively, these landforms include low, linear ridges; gently sloping mounds; and terrace scarps. The higher physiographic features of this site coupled with soil fertility create suitable conditions for supporting a rich and varied plant community. Although no publication adequately captures the historic natural vegetation occurring on this particular soil – site environment, Klimas et al. (2012) provide a list of species that represents potential natural vegetation of an environment that would include this site. The authors type this system as “Upland forests of Pleistocene outwash terraces and alluvial fans (U2).” With no extant examples to draw from, their assessment is followed with minor adjustments.

The list of species that Klimas et al. (2012) provide consists of taxa typically associated with upland environments. Dominant species listed for this site include southern red oak, post oak, water oak, and shagbark hickory with associates of black gum, white oak, and shortleaf pine. The authors emphasized the variability in composition per stand by pointing out differences in soils, drainage, and the presence/absence of fire.

Restricting our perspective to the better drained loessal soils of the Western Lowlands, two potential soil groupings stand out. These groupings include well drained, deep loess soils with no root restrictions (this site) and moderately well drained soils that perch water due to the presence of a fragipan. Examples of the former have been examined elsewhere in MLRA 134, and in general, deep loess soils on broad, ancient fluvial terraces have been observed to support incredible stands of timber that often include cherrybark oak, Shumard’s oak, white oak, swamp chestnut oak, sweetgum, ash, maple, American elm, in addition to many other species. Given the position and potential

productivity of the soils of this site, adjustments to the list of species in Klimas et al. (2012) may include a greater abundance of the preceding species, especially cherrybark oak, Shumard's oak, white oak, sweetgum, ash, and elm.

The pre-settlement plant community of this ecological site was removed decades ago, and there are no extant examples of that community remaining. Today, this high, well-drained site is favored for construction and building purposes that include private residences, commercial lots, and cemeteries. Areas that do not support structures are in agriculture production but few, if any, locations support natural vegetation. Outside of construction or building sites, cropland is the major land use, and possibly the only land use, of this site. Therefore, only two "realistic" states are indicated for this site, the perceived or projected reference conditions and agriculture production. One additional state is being provided to illustrate a conservation alternative. That state involves a discontinuation of production and the alternative to establish native vegetation, whether the establishment is predominantly of woodland conditions or an herbaceous community comprised of native grasses and forbs. Theoretically, a return to the reference state may not be possible because that former community no longer exists and there is an absence of examples from which to draw the composition and structural complexities of the historic system. Until additional information is discovered, actions leading back to reference conditions are not addressed in this description report.

Following this narrative, a "provisional" state and transition model is provided that includes the "perceived" reference state and several alternative (or altered) vegetation states that have been observed and/or projected for the Western Loess Terrace ecological site. This model is based on limited reconnaissance, literature, expert knowledge, and interpretations. Plant communities will differ due to natural variability in soils and physiography. Depending on objectives, the reference plant community may not necessarily be the management goal.

The environmental and biological characteristics of this site are complex and dynamic. As such, the following diagram suggests pathways that the vegetation on this site might take, given that the modal concepts of climate and soils are met within an area of interest. Specific locations with unique soils and disturbance histories may have alternate pathways that are not represented in the model. This information is intended to show the possibilities within a given set of circumstances and represents the initial steps toward developing a defensible description and model. The model and associated information are subject to change as knowledge increases and new information is garnered. This is an iterative process. Most importantly, local and/or state professional guidance should always be sought before pursuing a treatment scenario.

## State and transition model

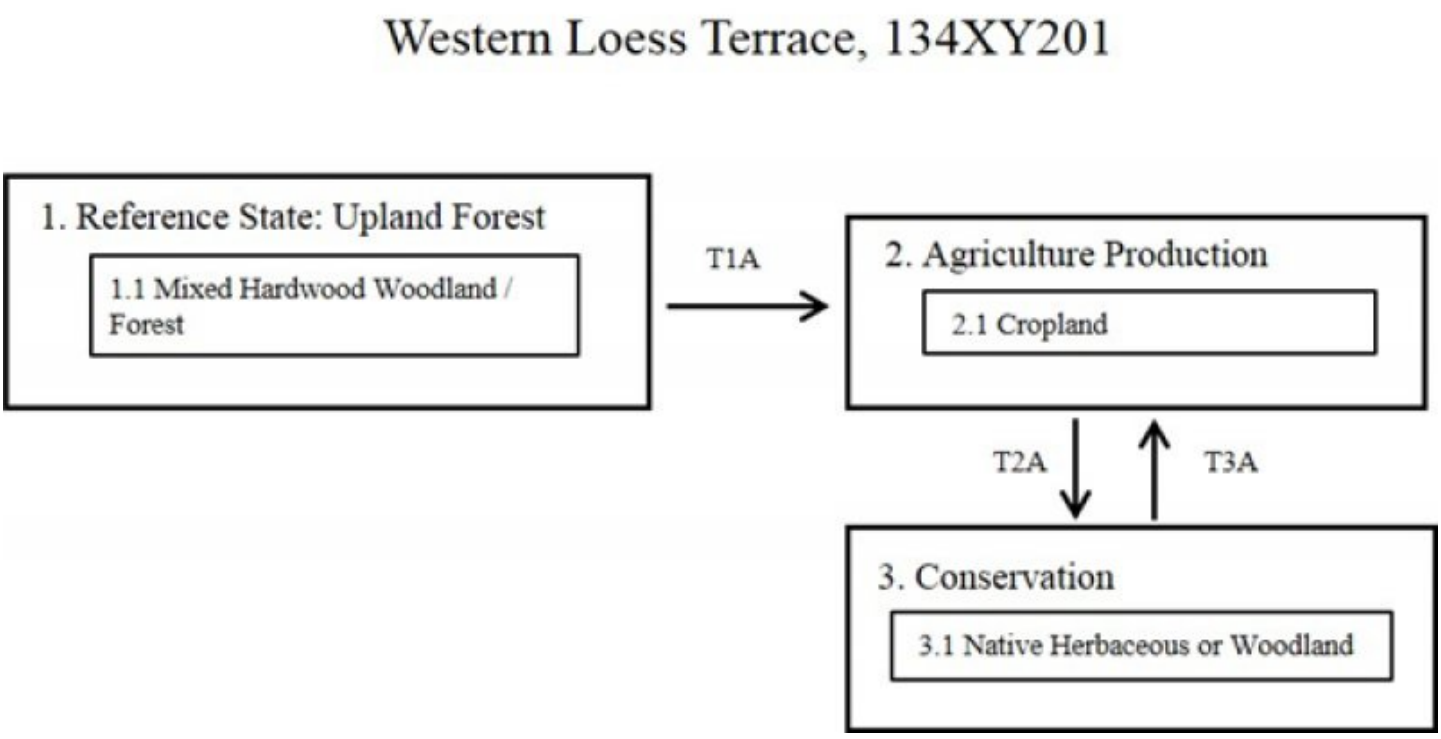


**Figure 5. STM - Western Loess Terrace**

| Pathway | Practice |
|---|---|
| T1A | mechanical removal of vegetation; establish cultivation practices (State 2) |
| T2A | discontinuing cultivation/production and establishing native grasses/forbs or trees; may include "guided" natural succession (State 3) |
| T3A | discontinuing conservation practices and return to production |

**Figure 6. Legend - Western Loess Terrace**

## State 1
## Upland Forest

The reference state of this ecological site was removed long ago and no extant examples of that former system remain. The name and description of the reference state listed above is largely drawn from the description of the potential natural vegetation presented in Klimas et al. (2012). They type or class this site as "Upland forests of Pleistocene outwash terraces and alluvial fans (U2)." The historic vegetation occurring on this site is believed to have been largely comprised of upland hardwoods. This projection of the natural community is well grounded given the well drained, loessal soils occurring on the higher and steeper landforms of this site. Klimas et al. emphasized that great variability in composition per location may have occurred due to site specifics such as varying soils, drainage, and the effects of fire. From a structural perspective, this site may have supported a mosaic of conditions that included closed forests, open woodlands, and meadows or small prairies either occurring along the fringes or within the site proper. A single community phase is provided to represent the range of conditions that may have occurred on this site. Additional reference community phases may be included in subsequent iterations of this ecological site description if warranted.

### Community 1.1
### Mixed Hardwood Woodland / Forest

The pre-settlement natural community of this site likely consisted of a mosaic of community types and/or structural complexities that included forest, open woodland, and meadows or small prairies. Forest or woodland components likely consisted of a diverse mixed hardwood system that included cherrybark, southern red oak, Shumard's oak, white oak, water oak, post oak, shagbark hickory, mockernut hickory, bitternut hickory, sweetgum, elm, ash, maple, black gum, in addition to a number of additional associates. Where periodic fires carried well into this site, structural conditions were likely open. Areas that sustained more influence from fire likely supported prairie to savanna-like profiles. The herbaceous community would have certainly been comprised of many species that also occurred in the fabled prairies of the Grand Prairie ecoregion. Dominants of that community likely consisted of big bluestem, little bluestem, Indian grass, along with many additional graminoids and a rich association of forbs.

## State 2
## Agriculture Production

Agriculture production on this site has no limitations. This is the prevailing land use on this site outside of residential and commercial establishments.

### Community 2.1
### Cropland

Crops grown on this site include cotton, soybean, winter small grain, and corn.

## State 3
## Conservation

This alternative state is included to represent the range or breadth of conservation actions that may be implemented and established should agriculture production be discontinued within a given location. Several actions may be chosen including the standard of establishing native warm season grasses; establishing a suite of suitable forbs for pollinators; establishing select native trees and managing for open woodland conditions; or establishing native upland hardwoods and managing for forest conditions. Of the options available, the one that best mimics the perceived reference conditions of this site would provide the best case conservation scenario. This action requires a concerted effort to reestablish herbaceous species most common to the Grand Prairie system with the possible

addition of widely spaced hardwoods (e.g., upland oaks from the reference state) mimicking savanna to open woodland conditions. If at all possible, the herbaceous species established should be derived from the “wild types” (genetic stock) from the Grand Prairie ecoregion. This action would help preserve the unique genetic material from that venerated system and would help to reintroduce the true prairie system back into a portion of its former range, the Western Lowlands. One caveat exists to the above discourse and this alternative state. This state only applies to those areas where the former landforms (or rises) still exist. Areas that have been leveled and the critical landform of this site removed are in an altered condition that has no parallel. Soils under those conditions need assessment and re-evaluation to ascertain what plants are best suited under those conditions.

### Community 3.1
### Native Herbaceous or Woodland

This community phase represents the establishment of select native plants to meet conservation objectives on this site. As alluded to above, the best case scenario is the establishment of species from the Grand Prairie region of Arkansas. Herbaceous species that may be suitable for establishing on this site include big bluestem, Indian grass, little bluestem, prairie blazing star, pinkscale blazing star, wild indigo, compass plant, meadow evening primrose, wild quinine, wooly ragwort, hoarypea, and Baldwin’s ironweed (Heineke, 1987; NatureServe, 2015). A much greater and more diverse listing of species of the Grand Prairie may be obtained from the Arkansas Natural Heritage Commission. Of current concern, finding the source of the Grand Prairie genetic material may be difficult at this time but efforts may be in place whereby a future source is a distinct possibility (T. Foti, personal communication). Tree species for planting include white oak, southern red oak, cherrybark oak, and Shumard’s oak. Many additional hardwoods will seed naturally, some desirable and some not so desirable.

### Transition T1A
### State 1 to 2

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; preparation for cultivation; crop establishment (State 2).

### Transition T2A
### State 2 to 3

This pathway represents the decision to discontinue cultivation/production and establish native grasses/forbs or trees on this site. This action also includes management activities to “guide” natural succession. Actions may include prescribed fire for maintaining and enhancing herbaceous establishment and herbicide treatments for controlling exotic species invasions and to ensure select tree establishment.

### Transition T3A
### State 3 to 2

This pathway represents the discontinuation of conservation practices and a return to production.

### Additional community tables

### Other references

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Woods, A.J., T.L. Foti, S.S. Chapman, J.M. Omernik, J.A. Wise, E.O. Murray, W.L. Prior, J.B. Pagan, Jr., J.A. Comstock, and M. Radford. 2004. Ecoregions of Arkansas (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,000,000).

## Contributors

Barry Hart

## Acknowledgments

Tom Foti (Ecologist, Arkansas Natural Heritage Commission) and Henry Langston (Arkansas Highway Department) provided invaluable discussion, knowledge, and experience with regards to the soils and vegetation associated with this site.

## 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:**

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:

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**

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