USDA Natural Resources Conservation Service

Ecological site F131AY602MS
Batture - Frequently Flooded Very Poorly Drained Ponded Oxbow and Swale Forest

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 131A–Southern Mississippi River Alluvium

The Southern Mississippi River Alluvium (MLRA 131A) is the largest of 4 MLRAs within Land Resource Region O, the Mississippi Delta Cotton and Feed Grains Region. It occurs in portions of 7 states including Louisiana (32 percent), Arkansas (26 percent), Mississippi (26 percent), Missouri (12 percent), Tennessee (3 percent), Kentucky (1 percent), and Illinois (less than 1 percent). The MLRA is comprised of 29,555 square miles and extends roughly 650 miles from an area near Cape Girardeau, Missouri in the north to the MLRA's transition to the Gulf Coast Marsh (MLRA 151) in the south. Average elevations range from 330 feet in the north to sea level in the southern part of the area. For much of the north-south distance, the MLRA is bounded to the east by an abrupt rise in elevation of loess-capped bluffs and hills, the Southern Mississippi Valley Loess (MLRA 134). West of the Mississippi River, the boundary is less distinct except to the northwest where the MLRA abuts the Ozark Plateaus and Ouachita province (MLRAs 116A, 117, and 118A). South of the Ozark and Ouachita escarpment, the MLRA adjoins the Southern Mississippi River Terraces (MLRA 131D), which includes the fabled Grand Prairie and merges with the valleys of the Arkansas and Ouachita rivers (MLRA 131B) and the Red River (MLRA 131C). Occurring within or bordering the Southern Mississippi River Alluvium are three separate loess-capped, upland remnants: Crowley's Ridge, Macon Ridge, and Lafayette Loess Plain, which are western units of MLRA 134 (USDA-NRCS, 2006).

MLRA 131A is characterized by landscapes that were created and influenced by the current and earlier paths of the Mississippi River and its tributaries. Waters transporting the materials that formed the area originate from as far west as the east slope of the Continental Divide to the western edge of the Appalachian Divide in the east. This

comprises a drainage basin of roughly 1,245,000 square miles and includes all or parts of thirty-one U.S. states and two Canadian provinces (Elliott, 1932). The drainage basin of the Mississippi River roughly resembles a funnel which has its spout at the Gulf of America. Waters from as far east as New York and as far west as Montana contribute to flows in the lower extent of the river (USACE, 2017). The soils of these alluvial landscapes are very deep, dominantly poorly and somewhat poorly drained, and have textures that are mostly loamy or clayey. Principal soil orders are Alfisols, Vertisols, Inceptisols, and Entisols (USDA-NRCS, 2006).

The fluvial processes that shaped the area were highly dynamic, diverse, and complex. During the Pleistocene epoch, multiple continental glacial-interglacial cycles resulted in extreme fluctuations in river discharge and sediment loads. A braided river regime characterized the fluvial dynamics of the Mississippi River through much of the last glacial cycle (Autin et al., 1991; Rittenhour et al., 2007). Rapid aggradation of glacial outwash led to the development of prominent valley train features over a large portion of the area (Autin et al., 1991; Saucier, 1994; Aslan and Autin, 1999; Blum et al., 2000; Rittenour et al., 2007). A changing climate, meltwater withdrawal, and sea-level change induced a transition from a braided river regime to a predominantly single-channeled, laterally migrating river system during the Holocene epoch (Rittenhour et al., 2007; Shen et al., 2012) – characteristics that continue today. Fluvial dynamics of the migrating river resulted in the development of broad meander belts, backswamp environments, and extensive deltaic complexes (Saucier, 1994; Klimas et al., 2011).

Tremendous expanses of bottomland hardwood forests once covered much of the area. Today, the land base is largely in agriculture production, and soybeans, cotton, corn, and rice are the principal crops with sugarcane rising in importance in the southernmost portion of the MLRA (USDA-NRCS, 2022).

Due to its size and biophysical variability, the technical team advised subdividing the MLRA into six subregions: Western Lowlands, St. Francis Basin, Yazoo Basin, Tensas Basin, Delta Plain, and Batture.

LRU notes

For the purpose of ecological site concepts, the MLRA was separated by the technical team into 6 subregions based on various assemblages of data reviewed. The subregion where this site is delineated extends through the length of MLRA 131A, but it differs from other subregions because it is still hydrologically impacted by the regular flow of the Mississippi River and its tributaries. This subregion is locally known as “Batture” which is defined for the purposes of this Ecological Site as the alluvial land between the Mississippi River channel and the constructed levee system or other flood constricting natural features, such as natural levees or high bluffs. Individual levee systems have been present along the Mississippi River since the first Europeans settled the region in the early 18th century, but its design has changed many times since that first levee. The changes were brought about mainly by flooding, which in turn drove other factors such as costs and

politics (Rogers, 2005).

The Mississippi River and Tributaries (MR and T) Project is a comprehensive flood control and navigation plan for the Lower Mississippi River and tributary streams. The MR&T was authorized under the Flood Control Act of 1928 and is the responsibility of the Mississippi River Commission (MRC). The project consists primarily of a system of levees, channel improvement works, and floodways. Currently, the river is entirely contained by either bluffs or levees from Cairo, IL to a point 90 river miles below New Orleans, except where major tributaries are confluent. This effort has been extremely successful in reducing or eliminating flooding over most of the historic floodplain and contributing to agricultural and urban development. Over one million acres of this remnant bottomland forest lies within the leveed floodplain of the Lower Mississippi River where most sites are still subject to annual flooding. Peak river flows typically occur in March, April, and May (Klimas, 1988).

The Ecological sites within the Batture region of MLRA 131A will be the most transient of all the sites of the MLRA. In the protected subregions, the landscape will maintain a progression of development, unless there are anthropogenic forces that alter it or there is a catastrophic river event that breaches the levee system. Landforms throughout the Batture have direct hydrologic connectivity to the Mississippi River and are subject to annual or near annual flooding, sedimentation, and potential modification. For instance, low elevation landforms that are frequently flooded and ponded are subject to and may receive sediment deposition of several feet, transforming the local area to conditions more similar to a natural levee or ridge ecological site. Conversely, a local natural levee or ridge landform could receive severe scouring impacts during a catastrophic flood event, resulting in a complete removal of the former elevated feature to one that becomes lower in elevation and subject to frequent flooding and ponding. In this dynamic environment, migration of the river channel to new pathways along with redistribution of sediments is a persistent possibility. There is a potential for a given ecological site at the local level to undergo rapid transformation and development to any of the sites that have been identified within the Batture.

When working within the Batture Subregion, onsite verification of the conditions of a given location is critical to planning. It has been witnessed by the Author of this site concept, flooding in a crop field due to current high flows of the Mississippi River. While at the same time seeing irrigation of the adjacent growing crops, due to dry conditions in the higher elevation areas of the field. It has also been noted by members of the technical team, where restoration plantings on ridge sites was converted to eroded swales, while adjacent shallow water areas were completely filled by sandy sediment creating ridges, from a single flooding event.

Classification relationships

Major Land Resource Area (MLRA) and Land Resource Unit (LRU) (USDA-NRCS, 2006)
MLRA 131A Southern Mississippi River Alluvium

EPA Level IV Ecoregion - 73a Northern Holocene Meander Belts, 73k Southern Holocene Meander Belts

The Natural Communities of Louisiana - (Louisiana Natural Heritage Program - Louisiana Department of Wildlife and Fisheries) - Forested Wetland, Bottomland Hardwood Forest, Batture

Ecological site concept

This ecological site occurs within the undulating landscape between the active river and man-made levee or upland bluffs of adjacent MLRA's. Active flooding, overwash, scour and sedimentation by the Mississippi River will impact the site. These sites have been altered greatly by anthropogenic means; the hydrology, soils, and vegetation have been altered beyond what would have naturally occurred in the region. Due to these alterations by construction of flood protection levees, the ecological sites that would have occurred on these locations are no longer relevant. There will be similarities to the sites found on the protected side of the levees, however, the hydrology, sedimentation and erosion have overshadowed all other ecological processes.

This depressional to nearly level site supports wetland forests that occur on oxbow, swale, and scour positions. The deep to very deep soils formed in clayey alluvium, are poorly to very poorly drained, and comprised of young, weakly developed soils known as Inceptisols (Dowling and Fausse soil series) and soils with high shrink swell potential known as Vertisols (Sharkey soil series) are characteristic. Flooding is frequent with long durations that contribute to soil inundation and saturation for extended periods. Slopes range from 0 to 2 percent.

This site will cover a gradient from standing water to dry edges of ponded conditions. Over time, the species composition might change within the same location and may become colonized by less wet tolerant species. These changes occur for various reasons, such as sedimentation, reduced ponding if an outlet is eroded, and altered inflow of surface water as drainage patterns change. As part of the active river system, this site will receive sediment when a river stage is backing into these areas and can become eroded when the river stage is high. This ecological site is the wettest on the landscape and is often associated with standing water. Hydrology is a major driver of this site characteristics, as with all alluvial sites which received parent material from flooding.

Of note, this site occurs within the “unprotected” or “batture lands” (i.e., the alluvial land between the river channel and the constructed levee system) side of the extensive Mississippi River levee system and is distinguished from similar landforms that are protected from current flooding by constructed levees or natural features.

Associated sites

F131AY603MS	**Batture - Frequently Flooded Wet Backswamp Flat Forest** This site is slightly higher on the landscape and will not be as regularly flooded.
F131AY601MS	**Batture - Mississippi River Unprotected By Levee Sites** Will direct users to this site when on-site determinations verify that the areas being planned are in an oxbow or swale position that is regularly flooded or inundated.

Similar sites

F131AY501LA	**Delta Plain - Frequently Flooded Ponded Very Poorly Drained Oxbows and Swales** This site will be in a similar landscape position within the protected side of the levee in the Delta Basin of the MLRA.
F131AY401LA	**Tensas Basin - Frequently Flooded Ponded Very Poorly Drained Oxbows and Swales** This site will be in a similar landscape position within the protected side of the levee in the Tensas Basin of the MLRA.
F131AY301MS	**Yazoo - Frequently Flooded and Ponded Oxbow and Swale Forest** This site will be in a similar landscape position within the protected side of the levee in the Yazoo Basin of the MLRA.

Table 1. Dominant plant species

Tree	(1) *Taxodium distichum* (2) *Quercus lyrata*
Shrub	(1) *Cephalanthus occidentalis*
Herbaceous	Not specified

Physiographic features

Site concepts of the Batture subregion emphasize the extreme hydrologic drivers of them. The sites differ from the natural system due to increased frequency and duration of flooding as a result of confining the river to a narrowed floodplain. Within the Batture subregion there are open pastures and crop fields that can receive beneficial added nutrients and sediments from the flooding, but during extreme events can lose this sediment by erosion from the river’s currents. These flooding forces not only can remove recent sediment but can also scour the land's surface, leaving large gullies, as well as uprooting trees and causing similar erosion in forested areas.

A landscape profile shows the undulating nature of the landscape (Figure 1) between the constructed levees, and the surface elevation within the Batture may be higher than outside the levee system. This higher elevation could be attributed to the continuous accretion of material from flooding.

The additional sediment deposition on these sites has substantially altered them from their historical state. Most of the historic site soils are buried by the current soil surface, so to describe a historic landscape position is not beneficial. These sites potentially could be described as hardwood stands with relatively frequent inundation or flooding due to the proximity to the river channel over a gradient of species composition from the relatively bare soil surface of sandy material, through low frequently flooded backswamp positions to the higher natural levees.

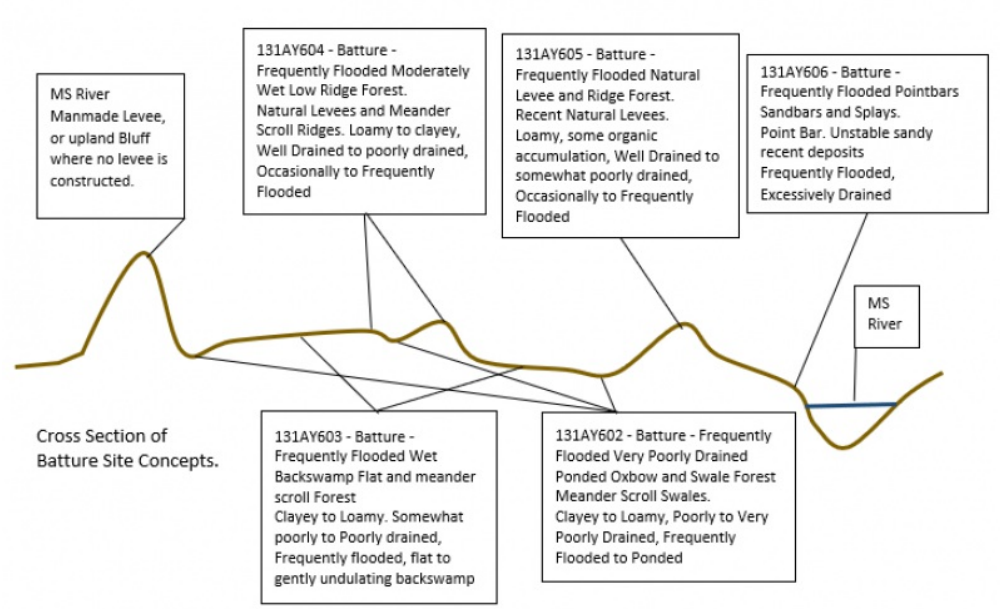


Figure 1. Batture Subregion typical cross section from the constructed levee to the Mississippi River Channel. Diagram notes the Ecological Sites as they would fit across the landscape.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Backswamp (2) Alluvial plain > Depression (3) Alluvial plain > Meander scar
Runoff class	Negligible to very low
Flooding duration	Extremely brief (0.1 to 4 hours) to very long (more than 30 days)
Flooding frequency	Very rare to frequent
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	Occasional to frequent
Elevation	0–91 m
Slope	0–2%
Ponding depth	0–229 cm
Water table depth	0–69 cm

Aspect	Aspect is not a significant factor

Climatic features

The climate of MLRA 131A is classified as humid subtropical (Koppen System), which is typified by mostly mild winters; long, hot summers; and no routinely recurring wet or dry season (Smith and Klimas, 2002; NCDC, 2018).

In the warmer season (and throughout much of the year), winds from the south convey moisture from the gulf leading to humid, subtropical conditions that are favorable for afternoon thunderstorms. These storms produce an average of about 25 percent of the area's annual precipitation and are at times accompanied by locally destructive winds. An additional hazard of concern during late summer through early fall is the tropical cyclone. While most impacts from hurricanes and tropical storms are confined along the coastal zone, heavy rainfall, severe flooding, and high winds can occur well into the Batture Subregion when such systems pass through the area. To the extreme, the region is susceptible to the effects of a strong Bermuda high during the summer, which can cause devastating drought conditions for weeks and even months in some years.

Table 3. Representative climatic features

Frost-free period (characteristic range)	192-221 days
Freeze-free period (characteristic range)	225-248 days
Precipitation total (characteristic range)	1,321-1,397 mm
Frost-free period (actual range)	186-223 days
Freeze-free period (actual range)	218-251 days
Precipitation total (actual range)	1,321-1,422 mm
Frost-free period (average)	206 days
Freeze-free period (average)	236 days
Precipitation total (average)	1,372 mm

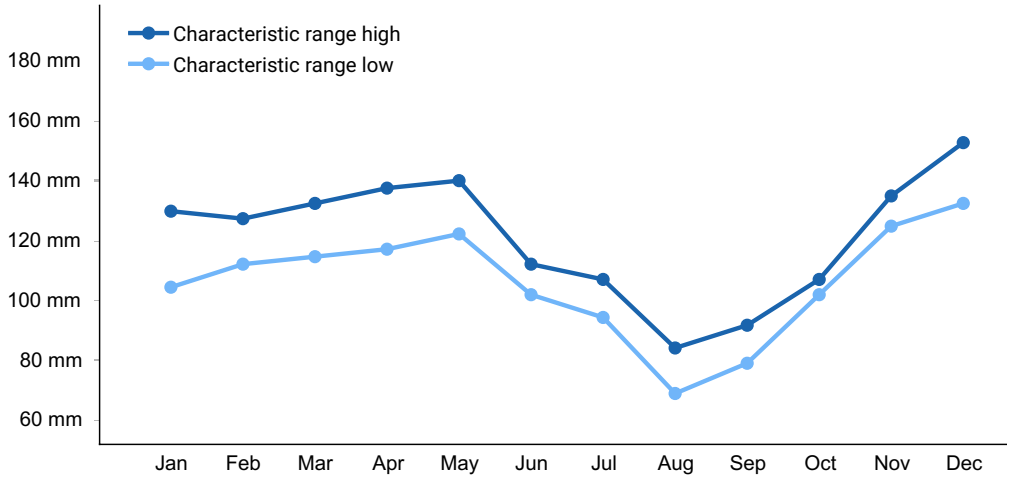


Figure 2. Monthly precipitation range

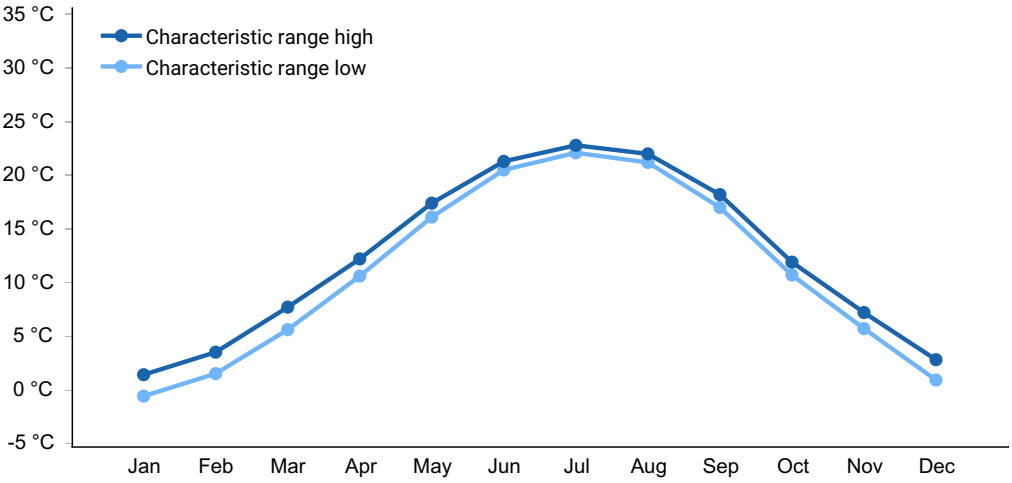


Figure 3. Monthly minimum temperature range

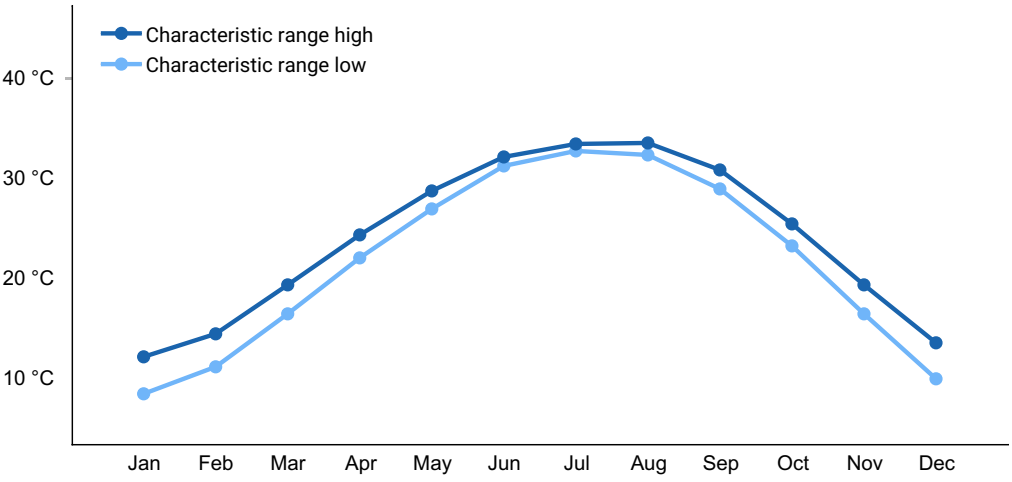


Figure 4. Monthly maximum temperature range

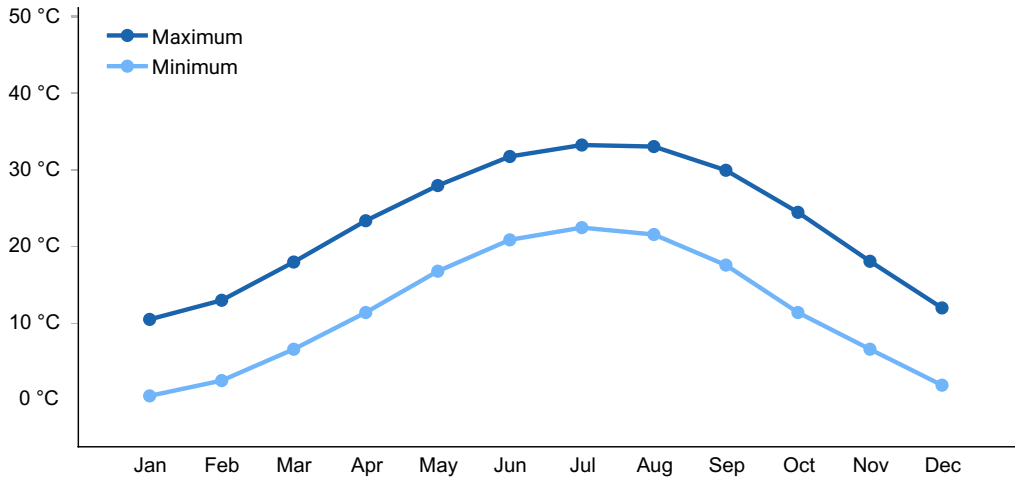


Figure 5. Monthly average minimum and maximum temperature

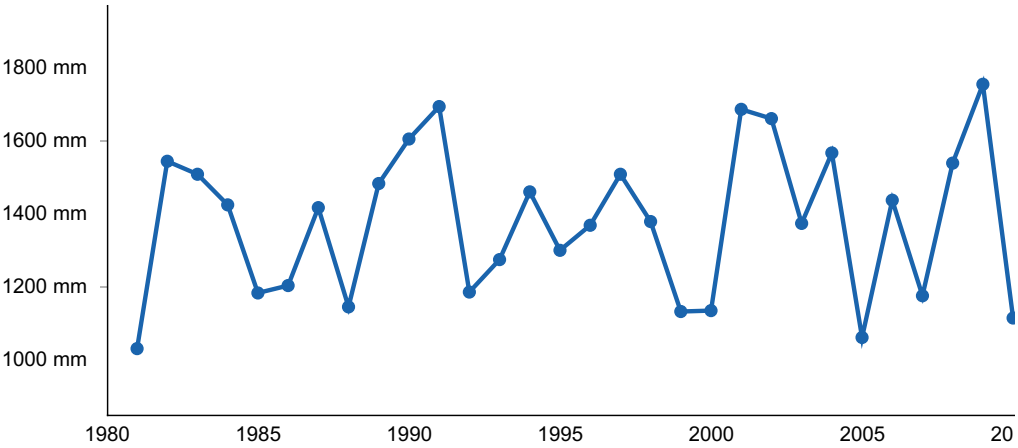


Figure 6. Annual precipitation pattern

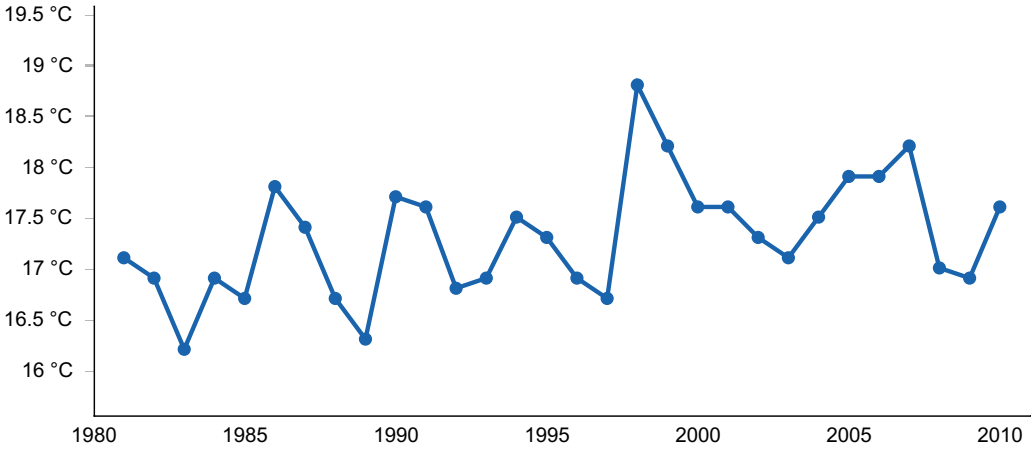


Figure 7. Annual average temperature pattern

Climate stations used

- (1) ST JOSEPH 3 N [USC00168163], Newellton, LA
- (2) STONEVILLE EXP STA [USC00228445], Leland, MS
- (3) TUNICA 2 N [USC00228998], Tunica, MS
- (4) CARUTHERSVILLE [USC00231364], Caruthersville, MO

Influencing water features

These sites are influenced by the whole of the Mississippi River watershed above their current location. They are directly impacted by flooding on a regular basis. This site is in a water-receiving position, generally the lowest on the local landscape. Flow may be received from adjacent landscapes, upstream sources, and backwater flooding.

Soil features

Please note that the soils listed in this section 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 131A 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 of this description to determine if another site may be a better fit for your area of interest.

Dowling is the modal Soil series for this site. Other soil series associated with this site are Sharkey, Fausse, and Alligator. These frequently flooded, very deep soils are very poorly to poorly drained and have very slow to slow permeability that formed in clayey alluvium. They have reactions ranging from very strongly acid to neutral.

Dowling (very-fine, smectitic, nonacid, thermic Vertic Endoaquepts) soils occur mainly in low, ponded oxbow depressions and backswamps. The Dowling soils remain constantly saturated in all layers below a depth of 24 inches. The Fausse (very-fine, smectitic, nonacid, hyperthermic Vertic Endoaquepts) soils are the hyperthermic equivalent to the Dowling soils. Sharkey (very-fine, smectitic, thermic Chromic Epiaquerts) soils occur on the lower parts of natural levees and in backswamps. While the Sharkey soils are saturated in the upper 6 inches during winter and spring, the soil profile dries out enough during the summer to form slickensides.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Clay (2) Silty clay
Drainage class	Very poorly drained to poorly drained

Permeability class	Very slow to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	10.92–19.05 cm
Calcium carbonate equivalent (Depth not specified)	0–3%
Electrical conductivity (Depth not specified)	0–3 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	6.2–7.5
Subsurface fragment volume <=3" (Depth not specified)	1–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

"Overall species richness is often high near the confluence of tributary streams and the Mississippi River. Overcup oak (*Quercus lyrata*) and bald cypress (*Taxodium distichum*) are commonly associated with oxbow lakes, and other Oak (Quercus) species are often present." (Klimas, 1988)

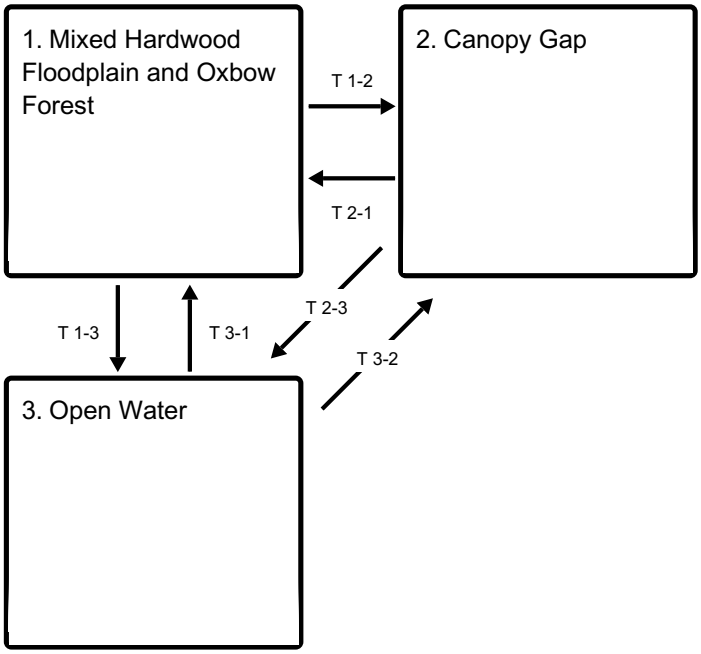
The site is a wetland forests occurring on oxbow and swale positions. Soil inundation and saturation is a major driver. Slopes are nearly level to concave that range from 0 to 1 percent in the Southern Mississippi Valley Alluvium.

This site will cover a gradient from standing water to dry edges of ponded conditions. Over time the species composition might change within the same location and may become colonized by less wet tolerant species. These changes occur for various reasons, such as sedimentation, reduced ponding if an outlet is eroded, and altered inflow of surface water as drainage patterns change.

This site is the wettest on the landscape and is often associated with standing water. Hydrologic regime is a major drive of this site. There may be significant inflow into this site from the local landscape and backwater flooding. This site regularly receives direct inflows from the Mississippi River.

State and transition model

Ecosystem states



T 1-2 - Wind or water force causing canopy gaps.

T 1-3 - Increased water depth.

T 2-1 - Regeneration of natural species.

T 2-3 - Increased water depth.

T 3-1 - Reduced water depth.

T 3-2 - Reduced water depth.

State 1
Mixed Hardwood Floodplain and Oxbow Forest

This is the lowest areas on the local landscape and they will likely have a species composition of baldcypress (*Taxodium distichum*), overcup oak (Quercus lyrate), water tupelo (*Nyssa aquatica*), common buttonbush (*Cephalanthus occidentalis*), red maple (*Acer rubrum*), eastern swampprivet (*Forestiera acuminata*).

State 2
Canopy Gap

This state consists of forest canopy openings that are created by catastrophic disturbances, allowing sunlight to reach understory strata and ground surfaces. Depending on local conditions and disturbance regime and intensity, a continuum or range of successional stages and community structure (physiognomy) is represented. Provisionally, this state includes seral stages ranging from recent disturbances that consist mainly of sparse herbaceous cover over mostly bare soil to the regeneration of woody species among a dense herbaceous cover (early stand initiation stage) to the initial stem exclusion stage where woody growth overtops and shades out the herbaceous stratum. In future ecological site development efforts, multiple community phases that describe the composition and progression from one stage to the next may be warranted for specifying

management strategies and actions.

State 3
Open Water

Open water habitats that are part of this site, will have few vegetative species colonizing due to the water depth and limited ability for germination.

Transition T 1-2
State 1 to 2

Wind or water force causing canopy gaps.

Transition T 1-3
State 1 to 3

Increased depth of permanent water due to erosion or reduced capacity of the outlet.

Transition T 2-1
State 2 to 1

Regeneration of natural species.

Transition T 2-3
State 2 to 3

Increased depth of permanent water due to erosion or reduced capacity of the outlet.

Transition T 3-1
State 3 to 1

Reduced permanent water depth due to sedimentation or erosion of the outlet.

Transition T 3-2
State 3 to 2

Reduced permanent water depth due to sedimentation or erosion of the outlet.

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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	03/22/2026
Approved by	Charles Stemmans
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:**
