USDA Natural Resources Conservation Service

Ecological site F134XY017AL Northern Sandy Drainageway

Accessed: 12/08/2023

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. 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 are predominantly silty where loess thickness of the uplands are deepest but grade to loamy textures in watersheds covered by thin loess. Underlying the loess mantle are Tertiary deposits of unconsolidated sand, silt, clay, gravel, and lignite. 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 primarily along streams and associated floodplains that drain the thin loess and loamy uplands of MLRA 134 and portions of the Southern Coastal Plain, MLRA 133A. The site has a spotty and localized distribution in the MLRA but is broadly mapped from western Kentucky south to the Southern Rolling Plains (EPA Level IV Ecoregion: 74c) in southwestern Mississippi.

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 (USDA-NRCS, 2006)
-Environmental Protection Agency's Level IV Ecoregion: Loess Plains, 74b (Griffith et al., 1998; Woods et al., 2002; Chapman et al., 2004)
-231H - Coastal Plains-Loess section of the USDA Forest Service Ecological Subregion (McNab et al., 2005)
-LANDFIRE Biophysical Setting 4514730 Gulf and Atlantic Coastal Plain Floodplain Systems (LANDFIRE, 2008)
- East Gulf Coastal Plain Small Stream and River Floodplain Forest CES203.559 (NatureServe, 2012)
-Western Mesophytic Forest Region - Mississippi Embayment Section (Braun, 1950)

Ecological site concept

The Northern Sandy Drainageway is characterized by deep, excessively drained soils that formed in recent sandy alluvium. This site occurs mainly on natural levees and point bars of unmodified streams and rivers. However, the site may also occur behind the stream fronts where levees have been breached by flood waters. The distribution of the Sandy Drainageway is largely confined to streams and rivers that drain thin loess, loamy, and/or sandy uplands. Flooding ranges from rare to frequent during winter and spring, and the duration ranges from brief to long depending on stream and drainage basin size. Outside of flood events, the water table is usually below 40 inches most of the year. Slopes range from 0 to 5 percent. Natural vegetation of this site is somewhat variable and highly dependent upon landform (i.e., natural levee, point bar, and overwash deposits) and stage or frequency of flood disturbance and deposition. Newly and actively forming depositional zones may consist of pioneer species such as black willow, river birch, cottonwood, sweetgum, and sycamore. Older and more stable sites may consist of larger and older representatives of the former in addition to silver maple, red maple, water oak, willow oak, elm, and ash.

Associated sites

F134XY018AL	**Northern Alluvial Flat - PROVISIONAL**
F134XY019AL	**Northern Moderately Wet Alluvial Flat - PROVISIONAL**
F134XY020AL	**Northern Wet Alluvial Flat - PROVISIONAL**
F134XY021AL	**Northern Backswamp - PROVISIONAL**

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The Northern Sandy Drainageway is broadly distributed along the eastern boundary of the largest physiographic subsection or ecoregion of the MLRA, the Loess Plains. However, the site's greatest development and broadest distribution is within the loamy and sandy uplands of the Southeastern Plains (EPA Level III Ecoregion: 65). North to south, the site extends from western Kentucky southward to the Southern Rolling Plains in southwestern Mississippi. The latter forms the southern-most boundary of the site due to warmer average annual air temperatures, greater annual rainfall, and a transition to slightly warmer soils (Chapman et al., 2004).

Characteristics of this region generally include undulating uplands, gently rolling hills, and irregular plains. Topographic relief of the Loess Plains is generally low, averaging about 30 to 70 feet. Upland slopes typically range from 0 to 20 percent with 1 to 8 percent being dominant. Elevations in the range of 300 to 400 feet are commonplace to the south but increase to nearly 600 feet in the north. In portions of western Kentucky and Tennessee, the undulating pattern of the plains is interrupted by dissected landscapes. Such areas tend to be hillier with steeper slopes and greater relief and appear to be concentrated along the borders of broader valleys and floodplains. As the plains continue eastward, starkness of the terrain becomes even more pronounced, which signals the transition of the Loess Plains to the thin loess-capped ridges, hills, and plateaus along the western edge of the Southeastern Plains. To the south, through much of Mississippi, the Loess Plains consists of a very thin east – west belt, compressed between the dissected Loess Hills and Mississippi Alluvial Plain to the west and the Coastal Plain to the east. The convergence of such contrasting ecoregions contribute to a very complex pattern of soils, landforms, and vegetation communities.

This ecological site occurs mainly on natural levees and point bars of unmodified streams and rivers. However, the site may occur elsewhere within the floodplain environment (e.g., alluvial flat) as sand splays and overburden where levees have been breached by flood waters. The distribution of the Northern Sandy Drainageway is largely confined to streams and rivers that drain thin loess, loamy, and/or sandy uplands. The site's greatest development and broadest distribution is within the adjoining Southern Coastal Plain, MLRA 133A. It is provisionally included as a site in MLRA 134 due to its local influence and expanding distribution, especially within watersheds where erosion is fairly high.

Table 2. Representative physiographic features

Landforms	(1) Natural levee (2) Point bar (3) Flood-plain splay
Flooding duration	Long (7 to 30 days)

Flooding frequency	None to frequent
Ponding frequency	None
Elevation	200–600 ft
Slope	0–5%
Ponding depth	0 in
Water table depth	42–60 in
Aspect	Aspect is not a significant factor

Climatic features

This site falls under the Humid Subtropical Climate Classification (Koppen System). The average annual precipitation for this site from 1980 through 2010 is 56 and ranges from 53 in the north to 58 inches in the south. Maximum precipitation occurs in winter and spring and precipitation decreases gradually throughout the summer, except for a moderate increase in midsummer. Rainfall often occurs as high-intensity, convective thunderstorms during warmer periods but moderate-intensity frontal systems can produce large amounts of rainfall during winter, especially in the southern part of the area. Snowfall generally occurs in the north during most years. However, accumulations are generally less than 12 inches and typically melt within 3 to 5 days. South of Memphis, winter precipitation sometimes occurs as freezing rain and sleet. The average annual temperature is 60 degrees F and ranges from 58 in the north to 64 degrees F in the south. The freeze-free period averages 222 days and ranges from 206 days in the north to 252 days in the south. The frost free period averages 197 days and ranges from 191 in the north to 224 days in the south.

The broad geographic distribution of this site north to south naturally includes much climatic variability with areas farther south having a longer growing season and increased precipitation. These climatic factors likely lead to important differences in overall plant productivity and key vegetation components between the southern and northern portions of this site. As future work proceeds, the current distribution of this site will likely be revised with a "central" site interjected between the northern and southern extremes of this MLRA.

Table 3. Representative climatic features

Frost-free period (average)	197 days
Freeze-free period (average)	222 days
Precipitation total (average)	56 in

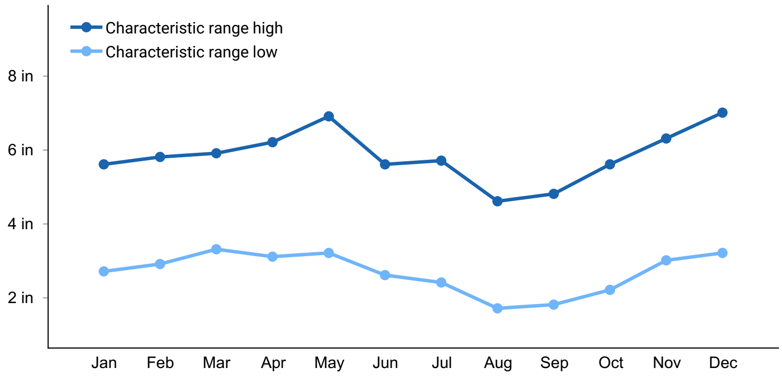

Figure 1. Monthly precipitation range

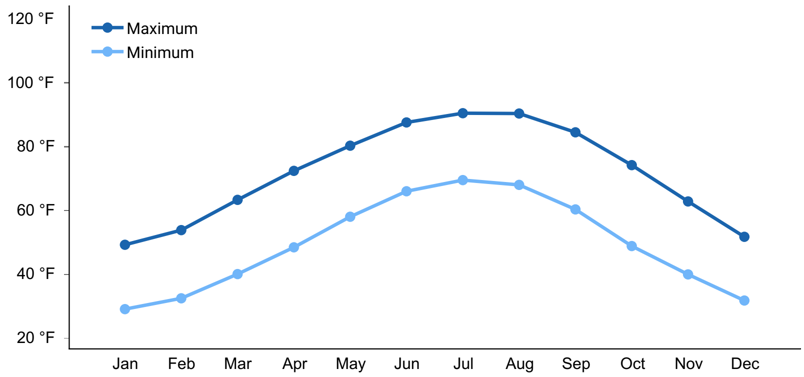

Figure 2. Monthly average minimum and maximum temperature

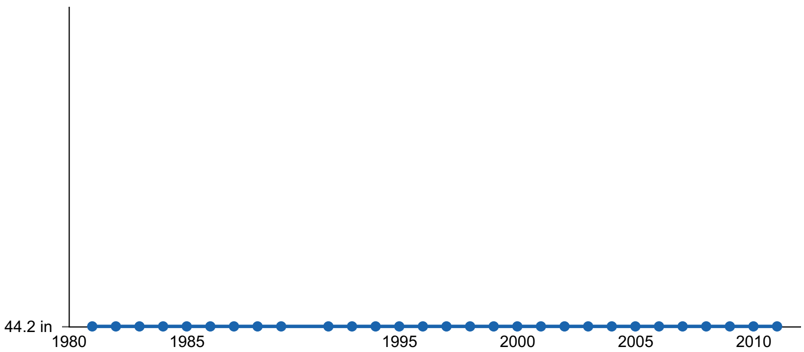

Figure 3. Annual precipitation pattern

Climate stations used

- (1) MURRAY [USC00155694], Murray, KY
- (2) HOLLY SPRINGS 4 N [USC00224173], Holly Springs, MS
- (3) LEXINGTON [USC00225062], Lexington, MS
- (4) DRESDEN [USC00402600], Dresden, TN
- (5) MILAN EXP STN [USC00406012], Milan, TN
- (6) BROOKPORT DAM 52 [USC00110993], Paducah, IL
- (7) YAZOO CITY 5 NNE [USC00229860], Yazoo City, MS
- (8) NEWBERN [USC00406471], Newbern, TN
- (9) LOVELACEVILLE [USC00154967], Paducah, KY
- (10) OAKLEY EXP STN [USC00226476], Raymond, MS
- (11) COLLIERVILLE [USC00401950], Collierville, TN
- (12) COVINGTON 3 SW [USC00402108], Covington, TN
- (13) BARDWELL 2 E [USC00150402], Bardwell, KY
- (14) GILBERTSVILLE KY DAM [USC00153223], Gilbertsville, KY
- (15) BATESVILLE 2 SW [USC00220488], Batesville, MS
- (16) CANTON 4N [USC00221389], Canton, MS
- (17) GRENADA [USC00223645], Grenada, MS
- (18) SENATOBIA [USC00227921], Coldwater, MS
- (19) VICKSBURG MILITARY PK [USC00229216], Vicksburg, MS
- (20) BOLIVAR WTR WKS [USC00400876], Bolivar, TN
- (21) UNION CITY [USC00409219], Union City, TN
- (22) PADUCAH [USW00003816], West Paducah, KY
- (23) JACKSON INTL AP [USW00003940], Pearl, MS

Influencing water features

This site occurs within floodplains of small to large stream systems. Overland flooding occurs over a large percentage of the site’s distribution. Flood duration is highly variable and directly dependent upon stream size and watershed position. Narrow floodplains of small streams are typically “flashy” and may flood occasionally to frequently but flood duration is generally brief. Sites associated with larger streams and drainage basins generally flood more frequently with much longer durations. On floodplains of larger stream systems, the water table may fluctuate between 3.5 to 6 feet of the surface during winter and early in spring in most years.

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 very deep, excessively drained that formed in sandy alluvium. These sandy soils primarily occur on point bars and natural levees and secondarily on other floodplain positions where heavy deposition occurred during flood events. They are subject to flooding during winter and early in spring, have slow runoff, and have moderately rapid to rapid permeability. Flood duration ranges from brief to very long depending on stream and drainage basin size and flood event. Slopes range from 0 to 2 percent on flatter, floodplain positions but may extend slightly higher to 5 percent on natural levees. Soil reactions generally range from strongly acid to very strongly acid.

The soils "provisionally" associated with this site include the Bruno (Sandy, mixed, thermic Typic Udifluvents), Crevasse (Mixed, thermic Typic Udipsamments), Nugent (Sandy, siliceous, thermic Typic Udifluvents), and Yeager (Sandy, mixed, mesic Typic Udifluvents) series. Both the Bruno and Crevasse soils are generally associated with the Southern Mississippi River Alluvium and have mixed mineralogy. However, both have been mapped in portions of MLRA 134. Bruno soils are typically associated with natural levee positions and contain strata of finer sediments. Crevasse soils lack strata of loamy fine sand or finer in the control section and occur as splays along levee breaks and recently deposited sediments on point bars. Nugent soils have thin strata of finer textured material and primarily occur on natural levees of streams that drain uplands of the Southern Coastal Plain, MLRA 133A.

Of the four soil series, Yeager soils are the most different and are included here due to the series' occurrence along the banks of the Ohio River, which captures the northern-most extent of this site. Yeager soils have a mesic soil temperature regime and a mineralogy that is distinctly of the Ohio River Valley. These soils are somewhat excessively drained with reactions ranging from very strongly acid to neutral (USDA-NRCS, 2016). Further review of the soils associated with this site may suggest removal of the Yeager series.

Table 4. Representative soil features

Surface texture	(1) Sand (2) Sandy loam (3) Loamy sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.6–3.9 in
Electrical conductivity (0-40in)	0 mmhos/cm

Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.5–7
Subsurface fragment volume <=3" (Depth not specified)	2–7%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Northern Sandy Drainageway is an ecological site that is somewhat out of context for the Southern Mississippi Valley Loess. Theoretically, all sites, upland and floodplains, should be defined by loess-influenced properties and possess soil textures that are predominantly silty. This site is "provisionally" included due to its relatively broad occurrence and potential influence on the vegetation dynamics of local floodplains within the MLRA. Therefore, this provisional site may be best captured by efforts in the adjoining MLRA, the Southern Coastal Plain.

The origins of this site stem from stream systems that head within the thin loess-capped and/or loamy and sandy uplands of the Southern Coastal Plain. As the streams flow westward to join the Mississippi River, the loamy and sandy sediments are conveyed (east to west) across the Loess Plains and deposited on the intervening floodplains of the Southern Mississippi Valley Loess. This site occurs on narrow floodplains of smaller stream environments (often upland tributaries) and on broad, level floodplains of river systems. The principal landforms associated with the site are natural levees and point bars where deposition is active and continually occurring. Secondarily, this site may occur along overwash channels where natural levees have been breached by flooding.

Natural vegetation of this site is somewhat variable and highly dependent upon landform (i.e., natural levee, point bar, overwash), stage of development, and/or frequency of flood disturbance and deposition. Newly and actively forming depositional zones may consist of pioneer species such as black willow, river birch, cottonwood, boxelder, sweetgum, and sycamore. Older and more stable sites may consist of larger representatives of the former, except willow and river birch, in addition to silver maple, red maple, water oak, willow oak, elm, and ash. The latter association forms the late development community of this site.

Unrelated to the site's formation along stream and riverfronts is another situation where the sandy soils of this site occur as excessive depositions on back-lying flats. Many of these situations are the result of stream modifications, primarily channelization, that have become completely filled with coarse sediments and debris. These channel obstructions are aptly termed "valley plugs", and they tend to develop where channelized streams lose their gradient profile as the stream approaches the flat, broad floodplains of the receiving stream or river. These obstructions cause stream flow to split and braid around the plugs, which transports floodwater and sediments onto floodplain surfaces. During particularly powerful food events, the channel obstruction can be blown out of the obstructed channel causing tremendous sand splays across portions of the receiving floodplain (Pierce and King, 2007). The impacts of excessive sand deposition onto these areas can change the functions of the affected site, kill the standing bottomland hardwoods, and alter forest composition (Pierce, 2005).

Even though the soils and vegetation communities of back-lying sand splays are similar to those deposited and developed on natural levees and point bars, the processes leading to their occurrence are typically associated with an altered or modified environment. For this reason, heavy sand depositions that form as a result of valley plugs are recognized as an altered state. This approach, as illustrated in an accompanying state and transition model, is somewhat unconventional but the recognition of valley plug-associated sand splays (or sand blows) is warranted given the local impacts they are creating within the MLRA. The model illustrating this "valley plug sand splay" state also serves as a feedback loop for other floodplain ecological sites (e.g., Northern Alluvial Flat, Moderately Wet Alluvial Flat, Wet Alluvial Flat, and Backswamp) that have become impacted by excessive sand depositions. Where depositional events occur on other floodplain ecological sites, an illustration of this altered state should be provided along with appropriate discussion. (It must be kept in mind that floodplain ecological sites are interconnected and depending on the level of natural or artificial perturbations, they can change from one form to another.)

The land uses of this site are somewhat limited due to seasonal flooding and the excessively drained, sandy soils. Reportedly, uses of this site include cropland, pastureland, and timberland. However, each of these uses experience limitations to some degree.

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 this ecological site. This model is based on limited inventories, literature, expert knowledge, and interpretations. Plant communities will differ across MLRA 134 due to natural variability in climate, 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

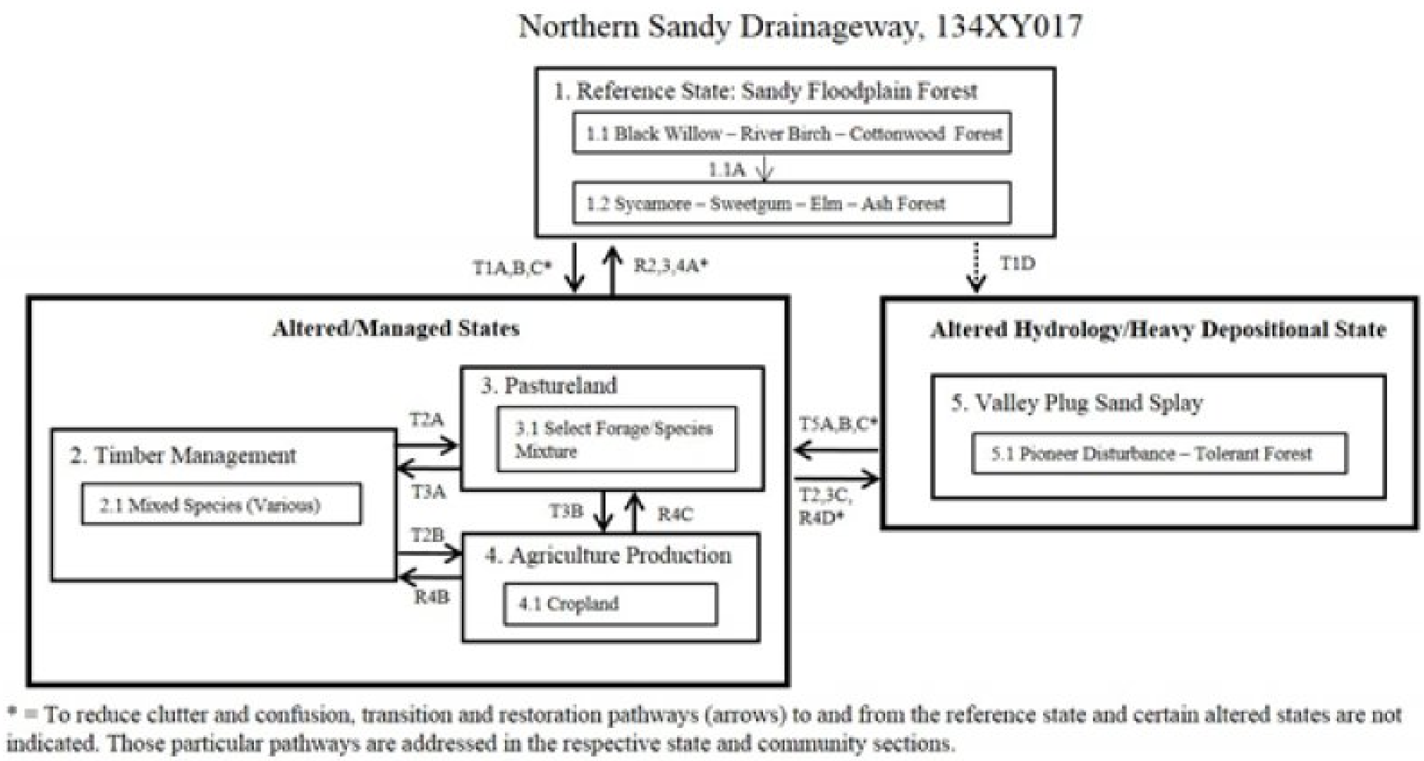

Figure 5. STM - Northern Sandy Drainageway

Pathway	Practice
1.1A	natural succession
T1A, T3A, R4B, T5A	beginning point even-aged or uneven-aged stand; goal of timber management (State 2)
T1B, T2A, R4C, T5B	mechanical removal of vegetation; herbicide application; seedbed preparation; planting desired species at appropriate rate (State 3)
T1C, T2B, T3B, T5C	removal of vegetation (mechanical/chemical); preparation for cultivation (State 4)
T1D	excessive sand deposition on floodplain flats; unrelated to transition of reference state (State 5)
R2A, R3A, R4A	natural succession over time; may require exotic plant control (State 1)
T2C, T3C, R4D	natural succession of sand splay; unrelated to reference state (similar soils and vegetation but different formational processes) (State 5)

Figure 6. Legend - Northern Sandy Drainageway

State 1
Sandy Floodplain Forest

This ecological site occurs on some of the most actively forming and aggrading landforms of the floodplain environment: the point bars and natural levees. Accordingly, reference conditions of this ecological site are mainly defined by pioneer species that can tolerate excessively drained soils and periodic flooding of varying durations. A minor but often secondary position and occurrence of the soils of this site pertain to overwash channels immediately behind natural levees that were breached during flood events. The coarse sediments often drop out quickly as flood waters enter the forested floodplain, creating complex soil textures. Natural vegetation of this site is somewhat variable and highly dependent upon landform, stage of development, and/or frequency of flood disturbance and deposition. Newly and actively forming depositional zones (e.g., point bars) generally consists of pioneer species such as black willow, river birch, cottonwood, boxelder, sweetgum, and sycamore (Community Phase 1.1). Older and more stable sites may consist of larger representatives of the former in addition to silver maple, red maple, water oak, willow oak, elm, and ash (Community Phase 1.2). To the south in Mississippi, loblolly pine may enter the community. By the time that a more mature and diverse plant community develops, soil forming processes may have led to greater soil development and the natural transition toward a different floodplain ecological site (e.g., Northern Alluvial Flat). This older community is often more typical of relict levee and point bar ridges, the latter becoming part of the ridge and swale complex with drier communities occurring on the relict ridges and wetter associations occupying the intervening swales.

Community 1.1
Black Willow – River Birch – Cottonwood Forest

This community phase represents the successional stage, composition, and structural complexity of stands supporting perceived reference conditions. In actively aggrading sites such as point bars, black willow is often the first species to colonize these sites. Willow is often quickly followed by river birch, eastern cottonwood, boxelder, silver maple, and red maple. Additional species such as sweetgum, sycamore, and sugarberry may occur on the ridgeline and backslopes of the levees and bars (Wharton et al., 1982). A very similar community composition and successional progression may occur on overwash deposits behind levee breaks. The early pioneer species, such as black willow, may differ on the overwash sites depending on the amount of shade cast by larger components of the surrounding floodplain community.

Community 1.2
Sycamore – Sweetgum – Elm – Ash Forest

This community phase represents the next major successional stage and composition of the site following the breakup of the pioneer species of black willow and river birch. The community phase name follows that suggested for “minor bottoms” in Hodges (1997). A greater diversity of species enters the site with newer components often being tolerant of shade. Elements of this community are capable of self-replacement and may persist as major components of the system as long as the site itself does not change. Species presence and abundance will vary by stand or location and may not necessarily express the dominance-implication of the community name. Characteristic overstory species anticipated to occur include American sycamore, sweetgum, elm, green ash, boxelder, sugarberry, silver maple, red maple, willow oak, water oak, and hickory. Over time, a greater abundance of oaks and hickory are anticipated to occur. Hodges (1997) emphasized that in major bottoms, especially within the Mississippi River system, succession tends toward an elm – ash – sugarberry association. Whether that transition occurs on these sandy soils within MLRA 134 is unknown. A return pathway to Community Phase 1.1 is not indicated because the pioneer species of river birch and black willow will likely be replaced by advanced reproduction of the components in Community Phase 1.2.

Pathway 1.1A
Community 1.1 to 1.2

This pathway represents natural succession occurring within the pioneer, disturbance-tolerant stand.

State 2
Timber Management

This state represents the breadth of forest management activities on this site. Various management or silvicultural methods can lead to very different structural and compositional results within a managed stand. The range of methods are diverse and include even-aged (e.g., clearcut and shelterwood) and uneven-aged (single tree, diameter-limit, basal area, group selection, etc.) approaches. Included within these approaches is an option to use disturbance mechanisms (e.g., fire, TSI, etc.) to reduce competition and achieve maximum growth potential of the desired species. Inherently, these various approaches result in different community or “management phases” and possibly alternate states. The decision to represent these varying approaches and management strategies into a single state and phase at this time hinges on the need for additional information in order to formulate definitive pathways, management actions, and community responses. Forthcoming inventories and description iterations of this site will provide more detail on this state and associated management phases. There are moderate limitations concerning management of this site. This site occurs within floodplain environments and seasonal or periodic flooding will require management activities to occur during drier times of the year. Additionally, the soils of this site are excessively drained, which may cause drought-induced stress to desirable trees and increase seedling mortality.

Community 2.1
Mixed Species (Various)

Timber management on this site is somewhat limited as to the species that can tolerate and respond well on these excessively drained, sandy soils. Site productivity and overall growing conditions may improve where moisture is retained for longer periods. The site may be poorly suited for hardwood production on physiographically dry situations (Broadfoot, 1976). Species that may be targeted on this site include cottonwood, river birch, pecan, sweetgum, sycamore, and willow and water oak in some locations. This site may also be suitable for loblolly pine management. There are a variety of silvicultural methods for achieving this management state including both uneven-aged approaches (e.g., group selection) and even-aged actions (e.g., clearcut). Finding the appropriate approach for a given stand and environment necessitates close consultation with trained, experienced, and knowledgeable forestry professionals. If there is a desire to proceed with this state, it is strongly urged and advised that professional guidance be secured and a well-designed silvicultural plan developed in advance of any work conducted.

State 3
Pastureland

This state is representative of sites that have been converted to and maintained in pasture and forage cropland, typically a grass – legume mixture. However, the excessively drained, sandy soils of this site are generally considered poorly adapted or suited for pasture (Capability Class IIIs). The droughty, nutrient poor soils can lead to severe plant stress during drier periods of the year (USDA-SCS, 1990). If pastureland is pursued on this site, then planning or prescribing the intensity, frequency, timing, and duration of grazing to help maintain desirable forage mixtures at sufficient density and vigor is a necessity (USDA-NRCS, 2010; Green et al., 2006). Establishing an effective pasture management program can help minimize the rate of weed establishment and assist in maintaining vigorous growth of desired forage. An effective pasture management program includes: selecting well-adapted grass and/or legume species that will grow and establish rapidly; maintaining proper soil pH and fertility levels; using controlled grazing practices; mowing at proper timing and stage of maturity; allowing new seedings to become well established before use; and renovating pastures when needed (Rhodes et al., 2005; Green et al., 2006). It is strongly advised that consultation with State Grazing Land Specialists and District Conservationists at local NRCS Service Centers be sought when assistance is needed in developing management recommendations or prescribed grazing practices. An additional limitation of this site is seasonal or periodic flooding, especially within unprotected floodplains.

Community 3.1
Select Forage/Species Mixture

This community phase represents commonly planted forage species on pasturelands and haylands. The suite of plants established on any given site may vary considerably depending upon purpose, management goals, usage, and soils. Most systems include a mixture of grasses and legumes that provide forage throughout the growing season. However, the excessively drained soils of this site limit the types of plants that can withstand or tolerate these droughty conditions. In general, this site is best suited to deep rooted perennial grasses, cool season re-seeding legumes, and cool season annual forage plants. Traditional pasture plants such as tall fescue and dallisgrass may not be appropriate for this site. Species and varieties that may be applicable (or adapted) include hybrid and common bermudagrass, bahiagrass, and ryegrass and small grains (generated from Pastureland

Suitability Group, 3a for Mississippi).

State 4
Agriculture Production

This state is representative of sites that have been converted to and maintained in cropland. However, the excessively drained, sandy soils of this site are generally considered poorly suited to unsuited for cropland (Capability Class IIIs). The droughtiness and nutrient leaching of the soils are management concerns. Also, seasonal flooding can limit the production and harvests of some crops. Because of the hazard of flooding in spring, planting short-season annuals such as soybeans or grain sorghum is recommended. Applications of lime and fertilizer are needed to maintain productivity (USDA-NRCS, 1997). However, where this site occurs along stream and riverfronts, fertilizer applications should be appropriately applied and measures implemented to avoid runoff in the adjoining stream system.

Community 4.1
Cropland

Due to site limitations, reported crops on this site are limited but may include soybeans, grain sorghum (USDA-NRCS, 1997), and potentially corn (USDA-NRCS, 2016).

State 5
Valley Plug Sand Splay

The inclusion and representation of this altered state, as illustrated in the accompanied STM, is unconventional. The dashed arrow (labeled T1D) of that diagram is meant to emphasize the similarity of the sandy soils and the corresponding vegetation community to that of the reference state. However, the processes leading to the creation and formation of this state is very different and typically associated with an altered or modified environment. Many of these situations are the result of stream modifications, primarily channelization, that have become completely filled with coarse sediments and debris. These channel obstructions are aptly termed “valley plugs”, and they tend to develop where channelized streams lose their gradient profile as the stream approaches the flat, broad floodplains of the receiving stream or river. These obstructions cause stream flow to split and braid around the plugs, which transports floodwater and sediments onto floodplain surfaces. During particularly powerful food events, the channel obstruction can be blown out of the obstructed channel causing tremendous sand splays across portions of the receiving floodplain (Pierce and King, 2007). The impacts of excessive sand deposition onto these areas can alter the functions of the affected site, kill the standing bottomland hardwoods, and alter forest composition (Pierce, 2005). The model illustrating this state is intended to serve as a feedback loop for other floodplain ecological sites (e.g., Northern Alluvial Flat, Moderately Wet Alluvial Flat, Wet Alluvial Flat, and Backswamp) that have become impacted by excessive sand depositions. These depositional events and the associated “valley plug sand splay” state can and often occurs on all floodplain ecological sites. For each of the floodplain sites, an illustration of this altered state should be provided on the respective STMs along with appropriate discussion in the site narratives. References should be made to this particular site, the Northern Sandy Drainageway, to emphasize the relationship of the valley plug altered state to the remaining three altered states of this site (i.e., the Timber Management - State 2; Pastureland - State 3; and Agriculture Production - State 4).

Community 5.1
Pioneer Disturbance – Tolerant Forest

This community phase represents the vegetation response on large sand splays that result from valley plugs. Soon after the sand splays occur on affected floodplain sites, the standing bottomland hardwoods of that site often dies. This dieback opens the canopy and pioneer species that can tolerant excessively drained sandy conditions colonize the sand blows. Most common species occupying valley plug sites include pioneer disturbance species of boxelder, black willow, green ash, red maple, sweetgum, sycamore, river birch, and American elm (Pierce, 2005). Species with the highest seedling densities often include boxelder, green ash, river birch, and elm. Pierce (2005) identified species combinations or associations on valley plug sites which mainly included a black willow – red maple, boxelder, and sweetgum – oak associations. All three were correlated with sites having greater percent sand present. More importantly, areas associated with valley plugs and heavy sand deposition had lower species diversity and no longer supported the typical bottomland hardwood associations of oak species or the bald cypress

– water tupelo community.

Transition T1A
State 1 to 2

This pathway consists of prescribed silvicultural activities specifically designed to meet stand compositional and production objectives. Of note, there are moderate limitations on this site due to seasonal and/or periodic flooding and droughty, excessively drained soils. Seedling mortality could be high on this site.

Transition T1B
State 1 to 3

Actions required to convert forests to pastureland or forage production include forest clearing, stump removal, herbicide application, seedbed preparation, and the establishment of desired plants. Of note, there are moderate to severe limitations to the establishment of forage on this site due to seasonal and/or periodic flooding and especially the droughty, excessively drained soils.

Transition T1C
State 1 to 4

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; and preparation for crop establishment. Caution, there are severe limitations to cropland establishment due to seasonal and/or periodic flooding and especially the droughty, excessively drained soils.

Transition T1D
State 1 to 5

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; and preparation for crop establishment. Caution, there are severe limitations to cropland establishment due to seasonal and/or periodic flooding and especially the droughty, excessively drained soils.

Restoration pathway R2A
State 2 to 1

Natural succession over a period of time may transition a former timber-managed stand to one supporting reference conditions (Community Phase 1.2). Some question remains whether a return to reference conditions will occur in every situation, especially since some components may have been selectively culled from the stand. Management activities to aide recovery may include exotic species control and silvicultural treatment.

Transition T2A
State 2 to 3

Actions required to convert forests to pastureland or forage production include forest clearing, stump removal, herbicide application, seedbed preparation, and the establishment of desired plants. Of note, there are moderate to severe limitations to forage establishment on this site due to seasonal and/or periodic flooding and especially, the sandy, excessively drained soils.

Transition T2B
State 2 to 4

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; and preparation for crop establishment. Caution, there are severe limitations to cropland establishment due to seasonal and/or periodic flooding and especially the droughty, excessively drained soils.

Transition T2C
State 2 to 5

This pathway represents the natural succession of former timberland that initially occurred on a sand splay or sand blow. The community that develops may superficially resemble elements of the reference state but the processes associated with its formation are very different.

Restoration pathway R3A
State 3 to 1

This pathway represents natural succession back to perceived reference conditions (Community Phase 1.2). The period required for this transition to take place likely varies by location and is dependent upon local site conditions. Some question remains whether a return to reference conditions will occur in every situation. Significant efforts may be required before a return to reference conditions is achieved (e.g., exotic species control, appropriate re-connectivity between stream and floodplain, potential artificial regeneration of community components, etc.).

Transition T3A
State 3 to 2

This pathway represents prescribed management strategies for transitioning abandoned pastureland to managed woodland. Activities may include artificial regeneration of and management for desired species and exotic species control.

Transition T3B
State 3 to 4

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; and preparation for crop establishment. Caution, there are severe limitations to cropland establishment due to seasonal and/or periodic flooding and especially the droughty, excessively drained soils.

Transition T3C
State 3 to 5

This pathway represents the natural succession of former pastureland that initially occurred on a sand splay or sand blow. The community that develops may superficially resemble elements of the reference state but the processes associated with the altered state’s formation are very different (State 5).

Restoration pathway R4A
State 4 to 1

This pathway represents natural succession back to perceived reference conditions (Community Phase 1.1). The period required for this transition to take place likely varies by location and is dependent upon local site conditions. Some question remains whether a return to reference conditions will occur in every situation. Significant efforts may be required before a return to reference conditions is achieved (e.g., exotic species control, appropriate re-connectivity between stream and floodplain, potential artificial regeneration of community components, etc.).

Restoration pathway R4B
State 4 to 2

This pathway represents prescribed management strategies for transitioning abandoned cropland to managed woodland. Activities may include artificial regeneration of and management for desired species and exotic species control.

Restoration pathway R4C
State 4 to 3

Seedbed preparation and establishment of desired forage/pastureland mixture.

Restoration pathway R4D

State 4 to 5

This pathway represents the natural succession of former cropland that initially occurred on a sand splay or sand blow. The community that develops may superficially resemble elements of the reference state but the processes associated with the altered state's formation are very different.

Transition T5A
State 5 to 2

This pathway consists of prescribed silvicultural activities specifically designed to meet stand compositional and production objectives. Of note, there are moderate limitations on this site due to seasonal and/or periodic flooding and droughty, excessively drained soils. Seedling mortality could be high on this site.

Transition T5B
State 5 to 3

Actions required to convert forests to pastureland or forage production include forest clearing, stump removal, herbicide application, seedbed preparation, and the establishment of desired plants. Of note, there are moderate to severe limitations to the establishment of forage on this site due to seasonal and/or periodic flooding and especially the droughty, excessively drained soils.

Transition T5C
State 5 to 4

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; and preparation for crop establishment. Caution, there are severe limitations to cropland establishment due to seasonal and/or periodic flooding and especially the droughty, excessively drained soils.

Additional community tables

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Contributors

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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	
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:**
